The Institute of Chartered Accountants of Bangladesh (ICAB)

Financial Management

Workbook
For CA Professional Level Exams

CA BANGLADESH

THE INSTITUTE OF CHARTERED ACCOUNTANTS OF BANGLADESH

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Contents

Questions within the Workbook should be treated as preparation questions, providing you with a firm foundation before you attempt the exam-standard questions. The exam-standard questions are found in the Question Bank.

CA OVERVIEW

The ICAB chartered accountancy qualification, the CA, is one of the most advanced learning and professional development programmes available. Its integrated components provide an in-depth understanding across accountancy, finance and business. Combined, they help build the technical knowledge, professional skills and practical experience needed to become an ICAB Chartered Accountant.

Each component is designed to complement each other, which means that students can put theory into practice and can understand and apply what they learn to their day-to-day work. The four components are:

ICAB constantly reviews the content of the CA qualification to reflect real life business challenges. Today's most urgent business challenges range from sustainability, to rapid changes in technology and the role of ethics in the profession. We work closely with employers, tuition providers, academics and examiners to ensure that the CA equips the chartered accountants of the future with the skills and knowledge they need to meet these challenges and to be successful.

THE CA QUALIFICATION AND SUSTAINABILITY

Finance and accounting professionals need to move beyond simply measuring and reporting the impact of climate change, environmental regulation, supply chain pressure and rising energy costs. They must focus on understanding those implications and integrating them into financial management and business planning. ICAB has been at the forefront of this movement over the past decade and has adapted the CA qualification to reflect that. We see its role as not simply integrating knowledge and understanding the broader implications of environmental, social and governance issues into organisations, but also seeding this thinking into the mindset of our members.

Our syllabus and ethical and professional development framework contribute towards creating ICAB Chartered Accountants who recognise that sustainability is at the core of what

they do and are capable of actively using their business skills to analyse how to make the new sustainable economy work for their business.

THE CA QUALIFICATION AND TECHNOLOGY

Rapid growth in technology has automated many compliance elements of accountancy. But, with technology also comes complexity and risk. Accountants need to adapt and develop new skills to manage these technological changes such as data analytics, automation and cyber security.

While there are many new technology capabilities that have broad application across the business and consumer environment, four trends have the greatest potential to transform the accountancy profession: **A**rtificial intelligence, **B**lockchain, **C**yber security and **D**ata (ABCD of technology).

These and other innovations are likely to have a significant impact on the way that accountants access, move and manage business finances.

Technology can provide information more quickly and often more accurately than humans, but it cannot replicate human intelligence and quality decision making. Therefore, chartered accountants hold a key role in data analytics, in validating the source of the data, interpreting and analysing the outputs. Technology provides opportunities for chartered accountants to use their professional skills to add value to their clients and/or the businesses in which they work.

As routine and compliance work reduces, there is greater focus on the development of skills which equip professionals to work with the outputs of automated processes, with other specialists, and in a changing world.

We believe that skills such as analysis, interpretation, professional scepticism, communication, collaboration, adaptability, resilience, and commerciality are essential for tomorrow's business leaders; these are imbedded throughout the CA exams and professional development framework.

THE CA QUALIFICATION AND ETHICS

Culture and values are central to long-term success. How a business adopts an ethical approach towards its staff, shareholders, customers and regulators, as well as within its own operations, has a bigger impact than any performance measure or operational improvement.

Demonstrating a clear commitment to ethical behaviour is one of the main drivers of better performance; it delivers an advantage when recruiting, it adds value to a brand, and it instils trust and confidence in partners, suppliers and others that the organisation is well run and resilient.

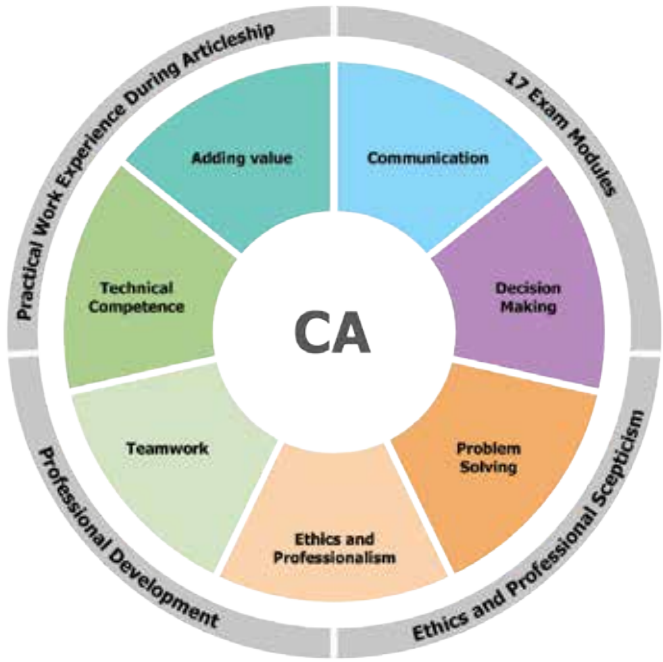
Achieving that is not a matter of simple knowledge. Few ethical challenges will have simple right and wrong responses. They require technical understanding, rigorous appraisal and skillful handling. Accountants must have the necessary skills to apply professional judgement in a given situation, taking into account what has been learned as a CA student about their ethical responsibilities as a Chartered Accountant.

There will be unique ethical challenges throughout any Chartered Accountant's process of learning and career. They serve a variety of masters: senior management, external stakeholders, regulators; and above all the public interest responsibility of their profession. Because of the rigorous and effective training (and continued professional development) chartered accountants can speak up and take a lead.

None of this can happen without one critical element: professionalism. That goes beyond merely knowing the Code of Ethics: it means embodying the right behaviours and having the ability and willingness to push back against those who might compromise the integrity of the business.

That confidence comes from a qualification that prioritises not only technical knowledge of the ethical framework but also challenges accountants with scenarios that accurately reflect the ethical dilemmas a Chartered Accountant may face in business.

PROFESSIONAL DEVELOPMENT



ICAB Chartered Accountants are known for their professionalism and expertise. Professional development prepares students to successfully handle a variety of different situations that they encounter throughout their career. The CA qualification improves students' ability and performance in seven key areas:

- Adding value – add value to the organisation, team or role in order to achieve objectives
- Communication – communicate effectively at all levels, using oral, written and presentational skills to achieve positive outcomes
- Decision making – gather, interpret and evaluate data to make effective decisions
- Ethics and professionalism – behave ethically and sustainably while respecting others to uphold the values of the organisation and the accountancy profession
- Problem solving – analyse a problem, generate options and make recommendations to arrive at appropriate solutions
- Teamwork – work collaboratively as a member or leader of a team to achieve shared goals
- Technical competence – seek, learn and use technology and technical information to support the achievement of organisation or team goals
- There are 17 exams over three levels – Certificate, Professional and Advanced.

CERTIFICATE LEVEL

There are seven exams at this level that introduce the fundamentals of accountancy, finance and business. Students may be eligible for credit for some exams if they have studied a qualification we recognise.

The Certificate Level exams are each 1.5 hours long except Business Laws and Information Technology which are 1 hour long and can be sat four times in the year.

PROFESSIONAL LEVEL

The next seven exams build on the fundamentals and test students' understanding and ability to use technical knowledge in real-life scenarios. The exams are taken in three times in the year.

The Professional Level exams are 3.5 hours long.

The Professional Level exams are flexible and can be taken in any order to fit with a student's day-to-day work. The Business Planning: Taxation & Compliance and Business Strategy and Technology exams in particular help students to progress to the Advanced Level.

The suite of Business Planning: Taxation & Compliance and Business exams is based on the same syllabus structure and skills frameworks, and will give students the opportunity to demonstrate their learning and use this in the context of taxation.

Financial Accounting and Reporting is in the contexts of IFRS Standards.

ADVANCED LEVEL

The Corporate Reporting and Strategic Business Management & Leadership exams test students' understanding and strategic decision-making at a senior level. They present real-life scenarios, with increased complexity and implications from the Professional Level exams.

The Case Study tests all the knowledge, skills and experience gained so far. It presents a complex business issue which challenges students' ability to problem solve, identify the ethical implications and provide an effective solution.

The Advanced Level exams are taken three times in the year.

The Corporate Reporting and Strategic Business Management & Leadership exams are 3.5 hours long. The Case Study exam is 4.5 hours long.

If a student is studying the CA independently, they should consider their future ambitions while selecting which exams to sit.

FLEXIBILITY

There are no regulations stipulating the order in which students must attempt the exams, allowing CA Firms to design Articleship programmes according to business needs. The exception to this rule is the Case Study. For attempting Case Study, students must be attempted the other subjects of Advanced Level.

Students have the unlimited attempts at all levels of exams.

CREDIT FOR PRIOR LEARNING (CPL)

Students with previous qualifications may be eligible to apply for CPL for modules which have been allowed by ICAB. For more information, visit **https://www.icab.org.bd/page/credit-for-prior-learning-cpl-exemption**.

DATA ANALYTICS

Chartered Accountants are increasingly using more advanced approaches to interrogate client data. To respond to this, ICAB has incorporated data analytics software within the Audit and Assurance and Corporate Reporting modules.

Embedding data analytic techniques within our exams ensures that we continue to reflect the current and future workplace and will also help to develop students' judgement professional scepticism and critical thinking skills.

Financial Management

Module aim

To enable you to recommend relevant options for financing a business, recognise and manage financial risks and make appropriate investment decisions.

On completion of this module, you will be able to:

- identify capital requirements of businesses, assess financing options and recommend relevant methods of financing;
- identify the financial risks facing a business and the principal methods of managing those risks; and
- apply appropriate investment appraisal techniques taking into account other factors affecting investment decisions.

Method of assessment

The Financial Management exam is 3.5 hours long.

Ethics and professional scepticism

In identifying financing options, managing financial risk and arriving at appropriate investment decisions, underlying ethical thinking is a requirement. The implications of financial strategy for all stakeholders must be evaluated and any ethical dilemmas resolved. Students will also be expected to apply professional scepticism and critical thinking when making all judgements.

Specification grid

This grid shows the relative weightings of subjects within this module and should guide the relative study time spent on each. Over time the marks available in the assessment will equate to the weightings below, while slight variations may occur in individual assessments to enable suitably rigorous questions to be set.

	Weighting (%)
1 Financing options	35
2 Managing financial risk	30
3 Investment decisions and valuation	35

Key resources

Whether you're studying the CA qualification with an employer, at university, independently, or as part of an articles, we provide a wide range of resources and services to help you in your studies.

Syllabus, skills development and technical knowledge grids

The syllabus presents the learning outcomes for each exam and should be read in conjunction with the relevant technical knowledge grids and, where applicable, the skills development grids.

Exam support

A variety of exam resources and support have been developed on each exam to help you on your journey to exam success. This includes expert guides, hints and tips, tuitions and more.

Skills within the CA

Professional skills are essential to accountancy and your development of them is embedded throughout the CA qualification.

The level of competency required in each of the professional skills areas to pass each module exam increases as CA trainees progress upwards through each Level of the CA qualification. The skills progression embedded throughout the CA qualification ensures CA trainees develop the knowledge and professional skills necessary to successfully operate in the modern workplace and which are expected by today's forward-thinking employers.

The following professional skills areas are present throughout the CA qualification.

Skill area	Overall objective
Assimilating and using information	Understand a business or accounting situation, prioritise by determining key drivers, issues and requirements and identify any relevant information.
Structuring problems and solutions	Structure information from various sources into suitable formats for analysis and provide creative and pragmatic solutions in a business environment.
Applying judgement	Apply professional scepticism and critical thinking to identify faults, gaps, inconsistencies and interactions from a range of relevant information sources and relate issues to a business environment.
Concluding, recommending and communicating	Apply technical knowledge, skills and experience to support reasoning and conclusion and formulate opinions, advice, plans, solutions, options and reservations based on valid evidence and communicate clearly in a manner suitable for the recipient.

The following provides further detail on the professional skills that you will develop in this particular module.

Assimilating and using information Understand the situation and the requirements

- Demonstrate understanding of the business context
- Recognise new and complex ideas within a scenario
- Identify the needs of customers and clients
- Explain different stakeholder perspectives and interests
- Identify risks within a scenario
- Identify elements of uncertainty within a scenario
- Explain ethical issues within given scenarios

Identify and use relevant information

- Interpret information provided in various formats
- Evaluate the relevance of information provided
- Filter information provided to identify critical facts

Identify and prioritise key issues and stay on task

- Identify business and financial issues from a scenario
- Prioritise key issues
- Work effectively within time constraints
- Operate to a brief in a given scenario

How skills are assessed: you may be required to:

- absorb and understand both structured and unstructured material; and
- give recommendations based on their understanding and interpretation of the information provided, supported by explanation of the reasoning behind and implications of their recommendations.

Structuring problems and solutions Structure data

- Structure information from various sources into suitable formats for analysis
- Identify any information gaps
- Structure and analyse financial and non-financial data to enhance understanding of business issues and their underlying causes
- Present analysis in accordance with instructions and criteria

Develop solutions

- Identify and apply relevant technical knowledge and skills to analyse a specific problem
- Identify creative and pragmatic solutions in a business environment
- Identify opportunities to add value
- Identify and anticipate problems that may result from a decision
- Identify a range of possible solutions based on analysis
- Identify ethical dimensions of possible solutions
- Select appropriate courses of action using an ethical framework
- Identify the solution which is the best fit with acceptance criteria and objectives
- Define objectives and acceptance criteria for solutions

How skills are assessed: you may be required to:

- assimilate significant amounts of information including information provided visually, to analyse it (including quantitative analysis) in a way that demonstrates relevant technical knowledge and to draw and support appropriate conclusions.

Applying judgement

Apply professional scepticism and critical thinking

- Identify faults in arguments
- Identify gaps in evidence
- Identify inconsistencies and contradictory information
- Exercise ethical judgement

Relate issues to the environment

- Identify related issues in scenarios
- Assess different stakeholder perspectives when evaluating options
- Retain an overview of the business issue or scenario
- Appraise corporate responsibility and sustainability issues
- Appraise the effects of alternative future scenarios
- Appraise ethical, public interest and regulatory issues

How skills are assessed: you may be required to:

- make sense of relatively large volumes of data including data provided visually, making judgments on the relevance of data for use in subsequent calculations and discussions;
- reflect on their calculations and the methodology employed and to identify and discuss the implications of calculations;
- make and justify judgements based on earlier calculations.

Concluding, recommending and communicating Conclusions

- Apply technical knowledge to support reasoning and conclusions
- Use valid and different technical skills to formulate opinions, advice, plans, solutions, options and reservations

Recommendations

- Present recommendations in accordance with instructions and defined criteria
- Make recommendations in situations where risks and uncertainty exist
- Formulate opinions, advice, recommendations, plans, solutions, options and reservations based on valid evidence
- Develop recommendations which combine different technical skills in a practical situation

Communication

- Present a basic or routine memorandum or briefing note in writing in a clear and concise style
- Present analysis and recommendations in accordance with instructions
- Communicate clearly to a specialist or non-specialist audience in a manner suitable for the recipient
- Prepare the advice, report, or notes required in a clear and concise style

How skills are assessed: you may be required to:

- recommend suitable courses of action in a given situation (financing decisions, dividend decisions, hedging decisions, investment appraisal decisions);
- incorporate advice within a 'business report' format, addressing both the strengths and weaknesses of any recommendations and/or reasons for the rejection of alternatives.

To help you develop your ability to demonstrate competency in each professional skills area, each chapter of this Workbook includes up to four Professional Skills Guidance points.

Each Professional Skills Guidance point focuses on one of the four CA Professional Skills areas and explains how to demonstrate a particular aspect of that professional skill relevant to the topic being studied. You are advised to refer back to the Professional Skills Guidance points while revisiting specific topics and during question practice.

Chapter 1

Objectives

Introduction

Learning outcomes

Syllabus links

Examination context

Chapter study guidance

Learning topics

1 Business and financial strategy

2 Stakeholders and their objectives

3 Sustainability and ESG

Summary

Further question practice

Self-test questions

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Answers to Self-test questions

Introduction

Learning outcomes

- Students will be able to identify capital requirements of businesses and assess financing options. This will involve being able to:
- explain the general objectives of financial management, identify and apply the fundamental principles of financial economics and describe the financial strategy process for a business;
- explain the roles played by different stakeholders, advisors and financial institutions in the financial strategy selected by a business and identify possible conflicts of objectives; and
- evaluate the ethical implications of an entity's financial strategy (including those for the organisation, individuals and other stakeholders) and recommend appropriate courses of action to resolve any ethical dilemmas that may arise.

Syllabus links

The area of corporate governance is more rigorously explored in the Business, Technology & Finance and Assurance exams. The financial strategy of a business will be strongly influenced by the business strategy chosen, hence this subject needs to be viewed in the context of the topics explained in Business Strategy & Technology.

In terms of linkages within Financial Management, this chapter provides a backdrop against which the techniques and topics explored in this Workbook can be viewed. It inevitably makes reference to ideas and terminology that are explored more fully in later chapters. Consequently, this chapter should be returned to after studying the other chapters in this Workbook.

Examination context

This brief chapter reviews the formulation of business strategy, and how decisions relating to financial management fit into business strategy as whole. The objectives of stakeholders are also discussed.

In the exam, candidates may be required to discuss the likely objectives of various stakeholders, and comment on how conflicting objectives might be reconciled. This potential for conflict has formed part of previous exam questions.

Shareholders are the most important stakeholders, and managers' interests will be significant. In a takeover situation, managers may stand to lose their jobs, while shareholders could stand to benefit.

There is also the issue of short versus long-term interests: directors know that their performance is usually judged on their short-term achievements. Shareholder wealth, on the other hand, is affected by the long-term performance of the firm. Agency theory highlights the potential conflicts that may occur between a company's shareholders and its directors If a business is planning significant changes, perhaps involving job losses, the interest of employees will be important, as will those of lenders if the business needs to borrow funds or is already highly geared.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	Business and financial strategy An entity's financial managers must plan their courses of action to achieve the entity's objectives. They will devise an overall business and financial strategy aimed at achieving these objectives.	Approach Read through this chapter of the Workbook to give yourself an appreciation of the objectives that underpin the decisions in this subject. Stop and think What are the three key decisions involved in financial strategy?	In the exam you may be asked to explain the general objectives of financial management, understand and apply the fundamental principles of financial economics and describe the financial strategy process for a business.	
2	Stakeholders and their objectives An appreciation of the practical significance of what objectives an organisation has, who its major stakeholders are, any potential conflicts that might arise and how these issues will be affected by time frame and risk environment will influence the decisions taken by a business.	Read through each section and use the section overviews as checklists of your knowledge. Work through the interactive and self- test questions carefully to ensure that you have grasped the main points in the chapter. Stop and think What do you think is the main objective of a commercial organisation and what conflicts might arise in pursuing this?	In the exam you may be asked to explain the roles played by different stakeholders, advisors and financial institutions in the financial strategy selected by a business and to identify possible conflicts of objectives. You may also be asked to evaluate the ethical implications of an entity's financial strategy and to suggest appropriate courses of action to resolve any ethical dilemmas that may arise.	IQ 1: Stakeholder objectives This question covers the main stakeholders in a business, what their objectives are, how they may conflict, and how this conflict may be resolved. It is essential this question is completed.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
3	Sustainability and ESG Sustainability is a large subject, encompassing environmental, social and ethical factors, as well as governance, and you will study sustainability throughout your ICAB studies. Business cannot ignore the wider impact that they have on society and on the planet. This section looks at why these are relevant to a business.	Read through this introduction to sustainability to understand the focus for the Financial Management exam. Stop and think What actions does your employer take in respect of climate change? Do they have a published policy about their approach? Find out and read it.	Questions in your Financial Management exam could include the topics of environmental objectives (this chapter) environmental costing (chapter 2), risk analysis (chapter 3) and green finance (chapter 4)	IQ: KN Sportswear Ltd Helps to test your understanding of the importance of businesses behaving in a socially acceptable way, even if that appears to conflict with maximising profits in the short run.

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1 Business and financial strategy

CHAPTER 1

Section overview

- Strategic planning addresses the long-term direction of the business.
- Business strategy is concerned with how the business will achieve its objectives.
- Financial strategy is concerned with the financial implications of the business strategy.

1.1 What is strategy?

Most businesses undertake some form of strategic planning (either formally or informally). Strategic planning is concerned with the long-term direction of the business (eg, which products should it sell in which markets), and how the business will achieve its objectives ie, its business strategy (or strategies). The Business Strategy and Technology exam deals with much of the detail relating to strategic planning and business strategy eg, how in order for a business to achieve its objectives it must interact with its environment, its available resources (eg, physical and human assets) and its stakeholders.

1.2 Financial strategy

Financial strategy is concerned with the financial aspects of the strategic planning process. This chapter examines some of the financial strategy aspects of setting objectives and dealing with stakeholders.

Having decided on its overall direction and objectives a firm must then make more detailed supporting financial decisions over the short- to medium-term. The Financial Management syllabus is concerned with three broad categories of financial decisions which must be made, and these are outlined below.

Other aspects of short-term decision making are dealt with in some of the other examinations eg, budgeting and variances are covered in the Management Information exam.

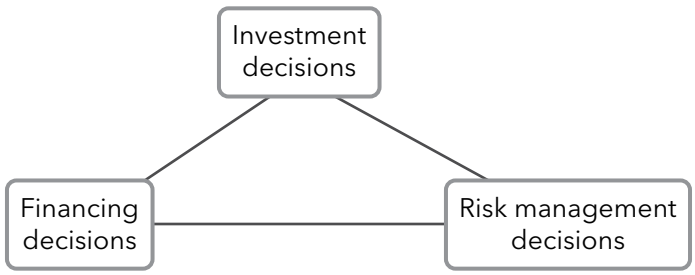


Figure 1.1: Three categories of financial decisions

1.3 Investment decisions

These are concerned with how a firm decides whether, for example, to buy plant and equipment or introduce a new product to the market.

Investment decisions were introduced in Management Information and are taken further in Chapter 2. These are of fundamental importance for the future of a business, but there is a

risk that things could go wrong. For example, if a firm introduces a new product and demand for it turns out to be far less than expected then, depending on the size of the investment made, the profitability and cash flows of the firm could be seriously – and adversely – affected, and in some instances, the future of the firm could be in jeopardy. Even when it survives, the firm will probably have to explain itself to its investors (eg, shareholders, banks).

1.4 Financing decisions

These are concerned with such matters as how a firm should be financed – solely by equity (shares) or by a combination of equity and debt, and in what proportions.Financing decisions are discussed in Chapters 4 and 5. Firms need to be able to raise finance when they need it, and they also need to keep the total amount of borrowings within manageable limits. In times of recession firms that have borrowed heavily may go bankrupt because cash flows have fallen to a level insufficient to make interest payments on debt. It is for this type of reason that a greater amount of equity finance (on which dividend payments are discretionary) may be preferable to debt. This is discussed further in Chapter 6.

Definition

Financing decision: How a firm should be financed – solely by equity (shares), or by a combination of equity and debt, and in what proportions.

1.5 The dividend decision

An important aspect of 'financing decisions' is the 'dividend decision'; this is concerned with whether or not a firm should pay a dividend and, if one is to be paid, how much that dividend should be.

Of particular importance here are the effects of cutting dividends – what will be the reaction of shareholders facing a cut in their income? If the company is quoted what will this do to the share price?

These issues are discussed in Chapter 7.

1.6 Risk management decisions

These are concerned with how a business manages risk in relation to investment decisions, financing decisions and liquidity, currency and credit decisions.

Aspects of risk and uncertainty surrounding investment appraisal are explored in Chapter 3. Financial risks, such as risks arising from uncertainty about future currency or interest rate changes, may create the need for risk reduction or hedging strategies. These are explored in Chapters 9 and 10.

Definition

Financial strategy: The detailed financial decisions that will support a business strategy over the short- to medium-term.

1.7 Inter-relationships

There are inter-relationships between all of these decisions. Chapter 8 explores business planning, which brings together investment and financing decisions.

Context example: Inter-relationships

Relationship	Example
A company's chosen business strategy will determine the investment decisions to put into place the required assets	A retailing company makes a strategic decision to widen its markets. This leads to investment in new stores and an online retailing operation.
The new assets trigger a demand for capital ie, financing decisions	A new issue of debt is made
The ongoing implementation of the strategy causes cashflow demands, as well as a different risk profile which requires risk management decisions to be taken.	Overseas expansion creates a need for hedging activity

Professional skills focus: Concluding, recommending and communicating

When recommending an appropriate financial strategy for a company, it may be important to consider the impact of one financial decision (eg, investment) on the other key decisions (eg,financing and dividend).

1.8 Financial economics

Financial economics is covered in this **Financial Management** Workbook as follows:

- Discounted cash flow and NPV – see Chapters 2 and 3.
- Financial economic models such as CAPM and Modigliani and Miller – see Chapters 3 and 6.

2 Stakeholders and their objectives

Section overview

- A stakeholder is someone who has an interest in the performance of a firm or who is in a position to influence decisions by the firm.
- Shareholders' objective – of wealth maximisation – is the primary objective.
- Companies have a framework of objectives, which may be in conflict with one another.

2.1 Objective

In order to make investment, financing, dividend and risk management decisions, a firm must know what its objectives are. A firm is managed in the interests of its main stakeholders, so the objectives of the firm should depend on the objectives of the key stakeholders who make up the firm.

Stakeholders are individuals or groups who have an interest in the performance of a firm although their various goals may not always coincide.

Interactive question 1: Stakeholder objectives

Answer the following questions.

1.1 Who are the main stakeholders in a business and what are their likely objectives?

1.2 How might they conflict?

1.3 How might the conflict be resolved?

See **Answer** at the end of this chapter.

Professional skills focus: Assimilating and using information

When reviewing a company's investment, financing and dividend decisions, it is important to consider different stakeholder perspectives and interests in a specific business scenario.

2.2 Conflict and an overriding objective

Return	It is generally accepted that the interests of shareholders should be put first (at least as a starting point in the decision- making process). This means taking decisions which seek to maximise the wealth of the shareholders. Wealth is measured by the value of the firm's shares, which reflects the present value of any projects taken on by the firm. The share price also takes into account the returns to the shareholders in terms of future expected dividend payments and the risk attached to those returns.
Risk	Risk may be viewed as the uncertainty about the amount of future returns that will be achieved. Logically, if two firms are expected to make the same returns but with different risks, the less risky firm ought to be worth more to a risk-averse investor because the future returns are more predictable.
Stakeholders	The existence of multiple stakeholders can lead to multiple objectives. These objectives may or may not be in conflict. For example, it seems reasonable to assume that a well-motivated workforce whose objectives of pay, security and conditions are met is consistent with a profitable and stable future for a firm and its shareholders. On the other hand, if controlling pollution imposes increased costs on a firm (through government legislation), then returns to shareholders may be reduced.
Shareholders	By focusing on a single objective (that of increasing shareholder wealth) clear decisions can be made. The rest of this workbook develops the decision- making tools which link to this objective. Once the basic decision is made in terms of whether or not shareholder wealth is maximised, the complications of multiple (conflicting) objectives can be taken into account.
Satisficing	The firm may then attempt to 'satisfice' – that is make decisions which allow for the (partial) satisfaction of the stakeholder objectives, but which do not fully maximise shareholder wealth. In these circumstances, the aim of a company will be to increase value for shareholders rather than maximise their wealth.

2.3 Agency theory and managerial objectives

The relationships between the various interested parties in a company are often described in terms of agency theory. Agency relationships occur when one party, the principal, employs another party, the agent, to perform a task or a set of tasks, on his behalf. In many of these principal/agent relationships conflicts of interest can exist.

Figure 1.2: Agency relationship

One of the most important of these potential conflicts is between shareholders (principals) and directors (agents) in companies whose shareholders are not also engaged in the management of the company. There can be differences between their objectives for the company. With some companies, shareholders insist that part of the directors' remuneration is linked to the extent to which shareholders' wealth is enhanced. For instance, directors are sometimes given long-term share option schemes. Sometimes management audits are used to monitor the actions of the directors and external audits monitor the financial statements produced by the directors. These arrangements have a cost to the shareholders, often referred to as agency costs.

Some of these agency costs will be considered in later chapters.

Interactive question 2: Conflicts between shareholders and directors

Specific areas in which conflicts of interest might occur between directors and shareholders include the following:

- Takeovers
- Time horizon
- Risk
- Debt

Requirement

For each of these, explain why the directors might pursue an agenda which is at odds with the maximisation of shareholder wealth.

See **Answer** at the end of this chapter.

Context example: Enron

It has been argued that in the 1990s, at a time when share prices were rising, directors used maximising shareholder wealth (or shareholder value) as a cover to do what they wanted.

Shareholders were not concerned about management decisions, as rising share prices kept them happy, whilst directors profited from share option schemes. Then in 2001 came major falls in world stock markets and revelations that in some cases criminal behaviour had been used to achieve higher share prices. A notable example was the US corporation Enron.

Enron was initially an energy producer, but moved on to the trading of energy and water – these commodities can be bought, sold, and hedged just like shares and bonds. By taking risky positions in these energy products, Enron grew to become America's seventh largest company, employing 21,000 staff in more than 40 countries.

Fortune magazine named Enron 'America's Most Innovative Company' for six consecutive years from 1996 to 2001. In one year, Ken Lay – Enron's founder and former chairman – earned $252 million including stock options.

Although the company continued to present itself to the outside world as a successful and profitable business, fraudulent methods were used to hide serious financial difficulties. Eventually the company collapsed.

Jeffrey Skilling, Enron's former Chief Executive, faced 28 counts of fraud, conspiracy, insider trading and lying to auditors for allegedly trying to fool investors into believing Enron was healthy before the firm crashed. Skilling was jailed for 24 years.

Ken Lay had faced six counts of fraud and conspiracy for perpetuating the scheme after Skilling quit in August 2001. Ken Lay died after being convicted.

Enron left behind $31.8 billion (£18 billion) of debts; its shares became worthless, and 21,000 workers around the world lost their jobs.

Shareholders have now begun to flex their muscles and take a much more active interest in what companies and directors are doing. In the UK, the Code of Corporate Governance includes the provision that directors of FTSE 350 companies should submit themselves for re-election every year, and this requirement puts pressure on directors to consider the effect that their actions or decisions may have on shareholders.

2.4 Ethical considerations

Directors/managers (and shareholders) are often faced with ethical considerations in setting objectives and making financial decisions. Some companies, especially listed and multinational companies, recognise the need for an ethical business policy. Ethical policy may relate to:

- dealings with customers;
- fair treatment of employees;
- use of suppliers who make use of child labour or slave labour, or who employ people in dangerous working conditions; or
- protection of the environment (see next section).

A company's value can depend very much on its reputation. Many, such as the major banks, spend years building trust with customers and suppliers, establishing a name for fair dealing and financial integrity.

Fraud, allegations of dishonesty or a reputation for sharp business practice and so on can undermine years of hard work and with it, shareholder value.

A recent example of ethical policies in relation to use of suppliers is the reported review of the purchasing policies by western garment companies who obtained supplies from the Rana Plaza factory in Bangladesh. The factory collapsed in April 2013 leaving over 1,000 dead and 2,500 injured, due to extremely poor health and safety provisions. The western companies recognised that unethical business practices by their suppliers could have a knock-on effect and damage their own reputation with consumers.

Some businesses explicitly state their ethical principles in order to distinguish themselves.

Context example: Co-operative Group

The Co-operative Group, a food retailer, insurer and provider of legal and funeral services in the UK, has set out the following ethical values to help guide staff behaviour:

- Openness – nobody's perfect, and we won't hide it when we're not
- Honesty – we are honest about what we do and the way we do it
- Social responsibility – we encourage people to take responsibility for their own community, and work together to improve it
- Caring for others – we regularly fund charities and local community groups from the profits of our businesses.

(Co-operative Group Ltd Code of Business Conduct [online]. Available at: colleagues.coop.co.uk/code-of-business-conduct, Accessed 17 August 2020)

Professional skills focus: Applying judgement

Directors must apply professional scepticism, critical thinking and exercise ethical judgement when setting and reviewing an entity's objectives.

3 Sustainability and ESG

Section overview

- Sustainability is about maintaining the world's resources rather than depleting or destroying them. This will ensure they support human activity now and in the future.
- Organisations are developing new strategies to meet sustainability and ESG (environmental, social and governance) objectives

3.1 Sustainability

Globally, there is now much greater awareness of the effects of climate change and the impact an organisation's operations can have on the environment, and stakeholders are requiring organisations to take action and disclose their activities. As a result, organisations are developing new strategies to meet sustainability and ESG objectives and to implement new ways of working in their product delivery, supply chain and operations.

Definition

Sustainability: The ability to meet the needs of the present without compromising the ability of future generations to meet their own needs.

3.1.1 Global initiatives to promote sustainable development

Sustainable development recognises the interdependence between business, society and the environment, since without the environment neither business nor society could exist.

Thus, for businesses to deliver value to their shareholders, they must respond to the needs and priorities of their stakeholders and not exhaust the world's capital.

There are a wide variety of UK, European and global initiatives to foster sustainable development, including steps taken by governments, businesses and other organisations. Such actions are shown to take the form of different mechanisms:

- Corporate policies
- Supply chain pressure (societal expectations)
- Stakeholder engagement
- Voluntary codes
- Rating and benchmarking
- Taxes and subsidies
- Tradable permits

3.2 Sustainability vs ESG

The words sustainability and ESG are sometimes used interchangeably but there is one main difference: sustainability is a general term and can be vague, whereas ESG is specific and measurable.

The term ESG stands for environmental, social and governance factors, all of which are critical to an organisation's overall strategy. Investors are increasingly evaluating companies' compliance with ESG as a way to decide which business they want to invest in. Customers, employees, and shareholders are demanding that brands consider the environmental and social impact of their business.

Definition

ESG: (Environmental, social and governance) is a set of criteria used to measure and report sustainability. Therefore, ESG reporting involves disclosing operational data on areas of ESG.

3.2.1 ESG objectives

While wealth maximisation may be the primary objective for many businesses, there is increasing recognition that objectives other than financial performance should be considered. Even where shareholders do only wish to consider their wealth, the value of a businesses is not only affected by financial performance, but by other factors that affect the risk and return of investments. These other factors are referred to as environmental, social and governance issues.

- **Environmental:** The environmental dimension is closely related to what most of us think of when we think of sustainability. It is focused on improving the environmental performance of a company. Environmental issues may include the use of fossil fuels and raw materials, as well as concerns over waste management, biodiversity, deforestation and greenhouse gas emission. Poor environmental behaviour can lead to fines, loss of reputation and legal claims by those affected by the poor environmental behaviour.

- **Social:** Social refers to the relationship the organisation has with stakeholders and society as a whole. People are an organisation's best assets and there is growing strategic importance on engaging them through learning and development opportunities whilst working in a safe, diverse and inclusive workplace. Companies also need to consider their social responsibilities: how they can support and ignite positive change in local communities, prioritising employee welfare, and considering the ethics of their supply chains.
- **Governance:** Governance refers to the way an organisation is managed – for example the structure of the board of directors and how the activities of the directors are monitored by other stakeholders, such as shareholders. Concerns around governance also look into the ethics of the business, shareholder rights, employee relations and retention, employee compensation and management structure. Poor governance can lead to significant problems, such as poor decision making, taking on too much risk or even fraud.

Investors are increasingly expecting the companies they invest in to adopt objectives relating to ESG in addition to financial objectives. They are becoming aware that economic sustainability requires consideration not just of short-term financial performance, but of the wider impact on society and the environment.

Interactive question 3: KN Sportswear Limited

KN Sportswear Limited (KN) is a UK-based company that sells branded sportswear (clothes and footwear) throughout the world. Many of its brands are promoted by well-known sports stars, who appear in KN's advertisements and wear its products while competing in events.

KN designs its products in-house but outsources their manufacture to partners outside the UK, where labour costs per unit are much lower. Recently, it has come to the attention of KN's board of directors that one of the company's partners employs children at its factories. These children are paid very low wages and work long hours, so they are unable to attend school.

Requirement

Discuss the factors the board of KN should consider when deciding whether to continue to work with this partner.

See **Answer** at the end of this chapter.

3.2.2 ESG reporting

There is an increasing sense of urgency to adopt a uniform strategy to address ESG issues by agreeing on standard metrics in each ESG area, which organisations will be expected to report on to demonstrate their commitment to improvement. This allows for meaningful and reliable comparisons between organisations, as well as an indication of their resilience to external variables like economic shocks or pandemic crises.

A sustainability report is a report published by companies on the environmental, social and governance (ESG) impacts of their activities. It enables addressees and users to understand more clearly the impacts of a company's business activities on the environment and society and to assess the risks and opportunities companies face, or which are offered to them. It is a communication tool that plays an important role in convincing sceptical observers that the company's actions are sincere.

IFRS adopted two sustainability standards titled IFRS S1- General Requirements for Disclosure of Sustainability-related Financial Information and IFRS S2- Climate-related Disclosures. IFRS S1 is to require an entity to disclose information about its sustainability-

related risks and opportunities that is useful to users of general purpose financial reports in making decisions relating to providing resources to the entity. The objective of IFRS S2 is to require an entity to disclose information about its climate-related risks and opportunities that is useful to users of general purpose financial reports in making decisions relating to providing resources to the entity.

ESG reporting globally On 21 March 2022, the Securities and Exchange Commission introduced important new rules regarding the disclosure of climate related risks for businesses in the United States. The new rules include requirements in relation to both direct and indirect carbon emissions. A lack of effective disclosure would likely raise red flags for investors in businesses and call to question the sincerity of boards in fighting for ESG related issues.

Why does this matter to businesses elsewhere, such as the United Kingdom? Clearly, the rules relating to disclosure and reporting will become a global benchmark with the harmonisation of standards over the coming years. For businesses, the scale of the task is huge and the sooner they start their ESG journey the better. In any event, the UK introduced its own requirements for reporting in 2021, which only adds to the plethora of reporting frameworks that have arisen over the past 10 years or so. Reporting frameworks will continue to drive regulatory requirements and change collective behaviour.

The Task-Force on Climate-related Financial Disclosure (TCFD) has been around since 2015 and encourages businesses to report on various aspects of their environmental impact and the financial risks pertaining to them.

A sustainability report should include:

- Environmental factors – materials, energy, water usage, emissions, effluents and waste, as well as environmental complaint mechanisms.
- Social factors – health and safety, product responsibility, employment practices, labour rights and supplier assessments.
- Governance factors – relating to the procedures in place to manage economic, environmental and social performance.
- Climate-related disclosures – relating to current regulations and potential future regulations.
- Policies, practice and performance – in relation to the ESG factors identified, providing descriptive and quantitative information on each of the factors for the reporting period. Actual performance should be described against targets.
- Targets – should be set out for the forthcoming year in relation to each ESG factor.

An organisation will need to develop its management information and data analytics systems to meet the requirements of sustainable development monitoring, reporting and evaluation. This may involve making better use of existing financial and non-financial information and data.

3.2.3 Measuring ESG performance

- A business may measure its performance using key performance indicators (KPIs). However, in practice, it can often be difficult or impossible to quantify ESG performance for the following reasons:
- The choice of KPIs often involves a certain degree of subjectivity.
- Qualitative effects can be difficult to measure (eg employee satisfaction).
- KPIs that are not sufficiently specific may be hard to measure (eg reducing environmental damage).

- It can be difficult to compare the ESG metrics of different businesses because different industries may lead to different impacts.

Worked example: ESG metrics

Nicol Ltd manufactures and supplies medical equipment to public and private sector hospitals. It wishes to establish KPIs to monitor its environmental, social and governance performance.

Requirement

What KPIs could it use and what evidence should be available to support the KPIs?

Solution

Environmental KPI	Evidence
Percentage of sustainable recycled materials used in products	Invoices from suppliers detailing sustainable or recycled materials
Percentage of waste recycled	Amount invested in recycling facilities at manufacturing

Social KPI	Evidence
Number of accidents at the manufacturing plant	Record of accidents
Number of complaints from hospitals	Number of refunds issued Number of complaints recorded
Gender diversity – percentage of female employees	Human resource files Results from staff surveys

Governance	
Management diversity – number of females in the senior management team.	Human resource files
Ethical behaviour – number of employees trained in anticorruption policies	Online training files

3.3 Focus for Financial Management exam

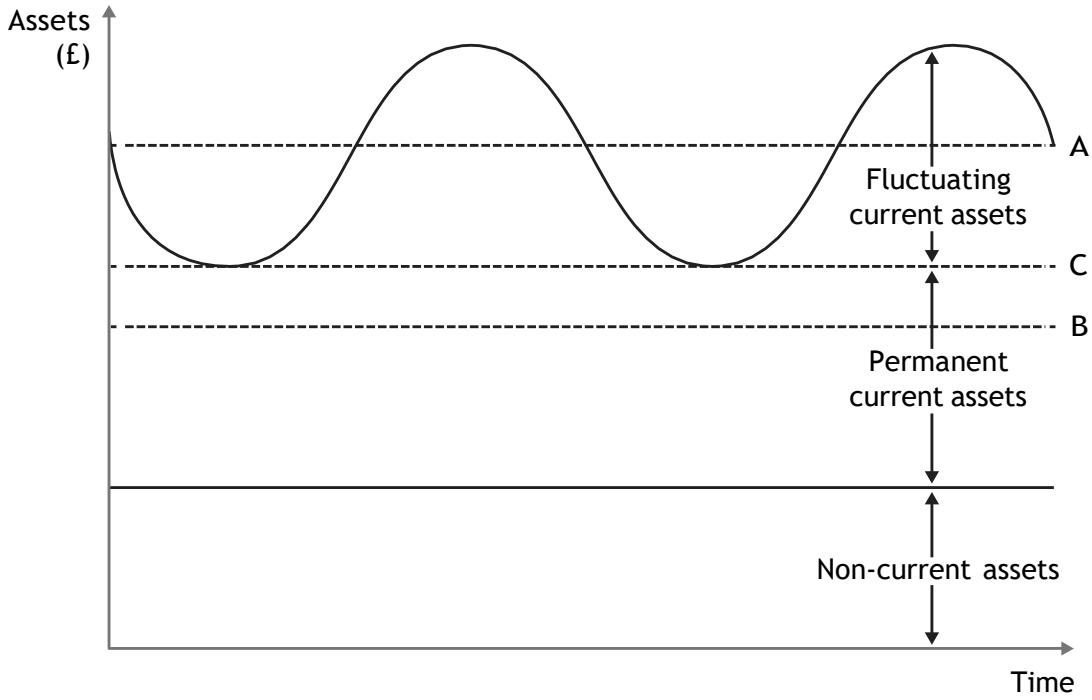
You will study sustainability throughout your ICAB studies. For the purposes of the Financial Management exam, you need knowledge of the following:

- **Risk management** – Climate change is clearly giving rise to significant risks for businesses. Whether those risks arise from more frequent and severe weather events or the transition to a net- zero carbon economy, expectations are growing that companies appropriately embed

  climate-related financial risk into their governance and risk management processes. Scenario analysis is key to better understanding and managing future risks today, as well as supporting the transition to a net-zero carbon economy. This will be discussed further in chapter 2 (environmental costing) and chapter 3 (risk analysis).

- **Finance** –Green Finance Strategy could be an example. Green finance is covered in more details in Chapter 4.
- **Metrics and targets** – Effective measuring and benchmarking requires the timely publication of information. Accountants have a role in supporting measurement of climate change and its consequences by providing relevant and reliable information in an accessible, meaningful and comparable way. Accountants will also have a role in interpreting the results of measures against targets. Measuring ESG performance is covered in the section above.

Summary


Assets
(£)
A
Fluctuating
current assets
C
B
Permanent
current assets
Non-current assets
Time

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. It not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Can you explain the three key decisions embedded in a company's financial strategy? (Topic 1)
2.	Can you name five stakeholders? (Topic 2)
3.	Do you know what the overriding objective of a listed company is? (Topic 2)
4.	Can you explain the roles played by different stakeholders and identify possible conflicts of objectives? (Topic 2)
5.	Can you identify some of the ESG issues that a company must consider? (Topic 3)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
Self-test question 2	This question will help you identify relevant stakeholders and financial management issues in a number of different situations.
Self-test question 3	This question will help you to understand the overriding goal of maximising shareholder wealth in the context of other major corporate objectives.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the relevant section in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your

queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Self-test questions

Answer the following questions.

1 Discussion

'Financial managers need only concentrate on meeting the needs of shareholders by maximising earning per share – no other group matters.'

Requirement

Discuss.

Total: 10 marks

2 Stakeholders and financial management

Many decisions in financial management are taken in a framework of conflicting stakeholder viewpoints.

Requirements

Identify the stakeholders and some of the financial management issues involved in the following situations.

2.1 A private company converting into a public company

2.2 A highly geared company attempting to restructure its capital

2.3 A large conglomerate 'spinning off' its numerous divisions by selling them, or setting them up as separate companies

2.4 Japanese car makers, such as Nissan and Honda, building new car plants in other countries

Total: 10 marks

3 Report for Managing Director

Assume you are Finance Director of a large multinational company, listed on a number of international stock markets. The company is reviewing its corporate plan. At present, the company focuses on maximising shareholder wealth as its major goal. The Managing Director thinks this single goal is inappropriate and asks his co-directors for their views on giving greater emphasis to the following:

- Cash flow generation
- Profitability as measured by profits after tax and return on investment
- Risk-adjusted returns to shareholders
- Performance improvement in a number of areas such as concern for the environment, employees' remuneration and quality of working conditions and customer satisfaction

Requirement

Provide the Managing Director with a report for presentation at the next board meeting which:

(1) discusses the argument that maximisation of shareholder wealth should be the only true objective of a firm; and

(2) discusses the advantages and disadvantages of the MD's suggestions about alternative goals.

Total: 10 marks

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

Answers to Interactive questions

Answer to Interactive question 1

1.1 Main stakeholders and likely objectives:

- Shareholders may be interested in the dividends they receive and the price of their shares (assuming they are quoted).
- Managers and board members may be interested in their salary, perks (eg, office size), relative power, etc.
- Employees and trade unions may be interested in pay, security of employment, working conditions, etc.
- Lenders will want to be reassured that their funds are 'safe' and that they will receive the expected returns on their lending investment.
- Government and its agencies may be interested in ensuring that firms do nothing illegal, pay appropriate taxes, etc. Regulators should be interested in ensuring that the firm complies with relevant regulations
- Society at large (public and communities) may be interested, for example in ensuring that pollution levels are kept to a minimum.
- Customers will be interested in the quality of products and achieving value for money.
- Suppliers will want to make sure that the company is able to pay them on time and ensure continuity of custom.
- Analysts/advisors/experts will be interested in obtaining accurate and honest information from the company.
- Business partners help companies provide best value for their customers. For example, supply chain partners often collaborate on transportation and logistics, distribution processes and environmental preservation. Not only do companies have business accountability to partners, but often also have ethical responsibilities toward them.

1.2 The conflicts are perhaps apparent. Shareholder returns will be compromised in the short term by allowing other stakeholders' objectives to be achieved. However, lenders will want to ensure that firms do not take excessive risks with their borrowed money.

Sustainability is a key objective for organisations. This is discussed in more detail in section 3. Shareholders' returns could be compromised in the short term in order to meet an organisation's social and environmental objectives. For example, significant investment in a waste recycling plant would reduce the amount that a company could pay out as dividends to shareholders.

1.3 The resolution of this conflict may be achieved by adjusting the firm's objectives to allow for the interests of all major stakeholders. Motivated managers, loyal customers etc, are likely to result in a more successful company. For example, greater sales, harder working employees, committed suppliers all contribute to higher growth, higher prices and a higher share price, hence maximising shareholder wealth.

Answer to Interactive question 2

- Takeovers

  Managers in target companies often devote large amounts of time and money to 'defend' their companies against takeover. However, in a takeover, the purchase price is often more than the target company is currently worth, so that shareholders receive a high and attractive price for selling their shares. On the other hand, managers of companies that are taken over frequently lose their jobs! This is a common example of the conflict of interest between the two groups (return for shareholders and job security for managers).

- Time horizon

  Managers know that their performance is usually judged on their short-term achievements; shareholder wealth, on the other hand, is affected by the long-term performance of the firm. Managers can frequently be observed to be taking a short-term view of the firm which is in their own best interest but not in that of the shareholders.

- Risk

  Shareholders appraise risks by looking at the overall risk of their investment in a wide range of shares. They do not have 'all their eggs in one basket', unlike managers whose career prospects and short-term financial remuneration depend on the success of their individual firm. So, in theory, managers are more likely to be risk averse than shareholders. However, this is not always the case, because managers can move on to work for other companies if their decisions don't work out well.

- Debt

  As managers are likely to be more cautious over risk than shareholders, they may wish to adopt lower levels of debt than would be optimal for the shareholders.

Answer to Interactive question 3

The lower cost of the child labour may reduce the cost of the goods produced for KN, increasing KN's profit margins.

However:

It is morally wrong and a breach of human rights to benefit from the exploitation of child labour, so for this reason alone KN should not consider continuing the relationship.

If KN did continue the relationship, it is likely that customers would become aware of KN's use of child labour, for example if a journalist discovered the matter. This would do huge damage to KN's reputation, leading to people boycotting the company's products. It is likely that the sports stars who promote the brands would no longer wish to be associated with the company, which would destroy the value of its brands. Therefore, from a business point of view, it would also not be advisable to continue with the partner; KN would be seriously damaging its economic sustainability by doing so.

Answers to Self-test questions

1 Discussion

Profit maximisation

One of the principles of the market economy is that if the owners of businesses attempt to achieve **maximum profitability** and **earnings** this will help to increase the wealth of society. As a result, it is usually assumed that a proper objective for private sector organisations is profit maximisation. This view is substantially correct. In general, the market economy has out-performed planned economies in most places in the world. Two key objectives of financial managers must therefore be the **effective management** of shareholders' funds and the provision of financial information which will help to increase shareholder wealth.

Problems with profit maximisation

However, profit-seeking organisations can also cause problems for society. For example, **monopolists** are able to earn large returns which are disproportionate to the benefits they bring to society. The **costs of pollution** fall on society rather than on the company which is causing it. A company may increase profitability by making some of its work force redundant, but the costs of unemployed people fall on society through the social security system.

The question that then follows is 'should individual companies be concerned with these market imperfections?'

Government's role

There are two opposing viewpoints. On the one hand it can be argued that companies should only be concerned with **maximisation of shareholders' wealth**. It is the role of government to pick up the problems of market imperfections (eg, by breaking up monopolies, by fining polluters and by paying social security benefits).

Stakeholder interests

An alternative viewpoint is that a company is a coalition of **different stakeholder** groups: shareholders, lenders, directors, employees, customers, suppliers, government, regulators and society as a whole. The objectives of all these groups, which are often in conflict, need to be considered by company managers when making decisions. From this viewpoint, financial managers cannot be content with meeting the needs of shareholders only.

Consideration of stakeholders

The truth is somewhere in between. The over-riding objective of companies is to create **long-term wealth for shareholders**. However, this can only be done if we consider the likely behaviour of other stakeholders. For example, if we create extra short-term profits by cutting employee benefits or delaying payments to creditors there are likely to be **repercussions** which reduce longer term shareholder wealth. Or if we fail to motivate managers and employees adequately, the costs of the resulting inefficiencies will ultimately be borne by shareholders.

Conclusion

In summary, the financial manager is concerned with **managing the company's funds** on behalf of shareholders and **producing information** which shows the likely effect of management decisions on shareholder wealth. However, management decisions will be made after also considering other stakeholder groups and a good financial manager will be aware that financial information is only one input to the final decision.

2 Stakeholders and financial management

2.1 When a private company converts into a public company, some of the existing shareholders/managers will sell their shares to outside investors. In addition, new shares may be issued. The dilution of ownership may cause loss of control by the existing management.

The stakeholders involved in potential conflicts are as follows.

Existing shareholders/managers: They will want to sell some of their shareholding at as high a price as possible. This may motivate them to overstate their company's prospects. Those shareholders/managers who wish to retire from the business may be in conflict with those who wish to stay in control – the latter may oppose the conversion into a public company.

New outside shareholders: Most of these will hold **minority stakes** in the company and will receive their rewards as **dividends only**. This may put them in conflict with the existing shareholders/managers who receive rewards as salaries as well as dividends. On conversion to a public company there should be clear policies on dividends and directors' remuneration.

Employees, including managers who are not shareholders: Part of the reason for the success of the company will be the efforts made by employees. They may feel that they should benefit when the company goes public. One way of organising this is to create **employee share options** or other bonus schemes.

2.2 The major conflict here is between **shareholders** and **lenders**. If a company is very highly geared, the shareholders may be tempted to take very high risks. If the gamble fails, they have limited liability and can only lose the value of their shares. If they are lucky, they may make returns many times the value of their shares. The problem is that the shareholders are effectively gambling with money provided by lenders. Lenders will want to ensure that the borrower's risks are kept within certain limits and that the return they receive on their lending is sufficient to compensate them for the risk.

Removal of risk

In restructuring the company, something must be done either to shift risk away from the lenders or to reward the lenders for taking a risk.

Risk can be **shifted away** from lenders by giving **security** on previously unsecured loans or by **writing restrictive covenants** into loan agreements (eg, the company agrees to set a ceiling to dividend pay-outs until gearing is reduced, or to confine its business to agreed activities).

Lenders can be **compensated** for the risks in their lending by demanding a higher interest rate,by the issue of 'sweeteners' with the loans, such as share warrants or the issue of convertible loan stock.

Other stakeholders

Other stakeholders who will be interested in the arrangements include **trade creditors** (who will be interested that loan creditors do not improve their position at the expense of themselves) and **managers**, who are likely to be more risk averse than shareholders if their livelihood depends on the company's continuing existence.

2.3 Large conglomerates may sometimes have a market capitalisation which is less than the total realisable value of the subsidiaries. This is referred to as **'conglomerate discount'**. It arises because more synergy could be found by the combination of the group's businesses with competitors than by running a diversified group where there is no obvious benefit from remaining together.

The stakeholders involved in potential conflicts are as follows.

- **Shareholders**

  They will see the chance of immediate gains in share price if subsidiaries are sold.

- **Subsidiary company directors and employees**

They may either gain opportunities (eg, if their company becomes independent) or suffer the threat of job loss (eg, if their company is sold to a competitor).

2.4 The stakeholders involved in potential conflicts are as follows.

- The shareholders and management of the Japanese company

  They will be able to gain from the combination of advanced technology with a cheaper workforce.

- Local employees and managers engaged by the Japanese company They will gain enhanced skills and better work prospects.

- The government of the local country, representing the tax payers

  The **reduction** in **unemployment** will ease the taxpayers' burden and increase the government's popularity (provided that subsidies offered by the government do not outweigh the benefits!)

- Shareholders, managers and employees of local car-making firms

  These will be in **conflict** with the **other stakeholders** above as existing manufacturers lose market share.

- Employees of car plants based in Japan

  These are likely to lose work if car making is relocated to lower wage areas. They will need to compete on the basis of higher efficiency.

3 Report for Managing Director

To: Managing Director

From: Finance Director

Date: 17 November 20X0

Subject: Discussion of corporate objectives

REPORT

Introduction

This report has been drafted for use as a discussion document at the forthcoming board meeting. It deals with the validity of continuing to operate with the single major goal of **shareholder wealth maximisation**. The remaining sections of the report contain an analysis of the advantages and disadvantages of some of the alternative objectives that have been put forward in recent discussions.

Maximisation of shareholder wealth

The concept that the **primary financial objective** of the firm is to **maximise** the **wealth** of shareholders, by which is meant the **net present value** of estimated future cash flows, underpins much of modern financial theory.

While the relevance of the wealth maximisation goal is under discussion, it might also be useful to consider the way in which this type of objective is defined, since this will impact upon both parallel and subsidiary objectives. A widely adopted approach is to seek to **maximise the present value of projected cash** flows. In this way, the objective is both made measurable and can be translated into a yardstick for financial decision making. It cannot be defined as a single attainable target but rather as a criterion for the continuing allocation of the company's resources.

It is debatable whether wealth maximisation should or can be the only true objective, particularly in the context of the multinational company. The **stakeholder view** of corporate objectives is that **many groups** of people have a stake in what the company does. Each of these groups, which include suppliers, workers, managers, customers and governments as well as shareholders, has its own objectives, and this means that a compromise is required.

Cash flow generation

The validity of **cash flow generation** as a major corporate objective depends on the timescale over which performance is measured. If the business maximises the net present value of the cash flows generated in the medium to long term, then this objective is effectively the same as that discussed above. However, if the aim is to **maximise all cash** flows, then decisions are likely to be disproportionately focused on **short-term performance**, and this can work against the long-term health of the business.

Profitability

Many companies use **return on investment (ROI)** targets to **assess performance** and **control the business**. This is useful for the comparison of widely differing divisions within a diverse multinational company and can provide something approaching a 'level playing field' when setting targets for the different parts of the business. It is important that the **measurement techniques** to be used in respect of both profits and the asset base are very clearly defined, and that there is a clear and consistent approach to accounting for inflation. As with the cash flow generation targets discussed above, the selection of the time frame is also important in ensuring that the selected objectives do work for the long-term health of the business.

Risk-adjusted returns

It is assumed that the use of **risk-adjusted returns** relates to the criteria used for investment appraisal, rather than to the performance of the group as a whole. As such, risk-adjusted returns cannot be used in defining the top level major **corporate goals**; however, they can be one way in which corporate goals are made **congruent** with operating decisions. At the same time, they do provide a **useful input** to the goal-setting process in that they focus attention on the company's policy with regard to making risky investments. Once the overall corporate approach to risk has been decided, this can be made effective in operating decisions, for example by **specifying the amount** by which the **cost of capital** is to be **augmented** to allow for risk in various types of investment decisions.

Performance improvement in non-financial areas

As discussed in the first section of this report, recent work on corporate objectives suggests that firms should take specific account of those areas which impact only indirectly, if at all, on financial **performance**. The firm has responsibilities towards many groups in addition to the shareholders, including:

(1) **Employees:** to provide good working conditions and remuneration, the opportunity for personal development, outplacement help in the event of redundancy and so on

(2) **Customers:** to provide a product of good and consistent quality, good service and communication, and open and fair commercial practice

(3) **The public:** to ensure responsible disposal of waste products

There are many **other interest groups** that should also be included in the discussion process. Non- financial objectives may often work indirectly to the financial benefit of the firm in the long term, but in the short term they do often appear to compromise the primary financial objectives.

Conclusions

It is very difficult to find a comprehensive and appropriate alternative primary financial objective to that of **shareholder wealth maximisation**. However, achievement of this goal can be pursued, at least in part, through the setting of specific **subsidiary targets** in terms of items such as return on investment and risk-adjusted returns. The establishment of non-financial objectives should also be addressed in the context of the overall review of the corporate plan.

Signed: Finance Director

Chapter 2
Investment appraisal

Introduction

Learning outcomes

Students will be able to apply investment appraisal techniques and calculate the value of shares and businesses.

This will involve being able to:

- outline the investment decision making process and explain how investment decisions are linked to shareholder value;
- appraise an investment from information supplied, taking account of relevant cash flows, inflation and tax;
- discuss how the interpretation of results from an investment appraisal can be influenced by an assessment of risk, including the impact of data analytics on that risk assessment;
- explain how the results of the appraisal of projects are affected by the accuracy of the data on which they are based and strategic factors (such as real options) which could not be included in the computational analysis;
- identify in the business and financial environment factors that may affect investment in a different country;
- calculate the optimal investment plan when capital is restricted; and
- recommend and justify a course of action which is based upon the results of an investment appraisal and consideration of relevant non-financial factors such as sustainability and which takes account of the limitations of the techniques being used.
- organise, structure and assimilate data in appropriate ways, using available statistical tools, data analysis and spreadsheets, to support business decisions.

Syllabus links

This chapter develops the basic investment appraisal decisions introduced at Certificate Level **Management Information**. The strategic context of these decisions is taken further in **Business Strategy and Technology**. The underlying techniques will be applied in exploring valuation methods in the Advanced Level exam **Strategic Business Management & Leadership**.

Examination context

Investment appraisal, first introduced at Certificate Level, is taken further at Professional Level, where you can expect to deal with more complicated scenarios. The preparation of more advanced net present value calculations is fundamental in the **Financial Management** examination. You may be asked to set out the relevant cash flows for a decision, including tax and inflation effects, decide whether or not to make an investment, and to discuss the financial and non-financial issues surrounding it.

Capital rationing is a very real issue for businesses. Scarce capital means that projects have to be ranked according to how efficiently they use that capital, which is a limiting factor.

Another aspect of the more complex approach to NPV calculations at Professional Level, placing investment appraisal in a strategic context, brings in the topic of real options. It is possible that a project with a negative NPV is accepted for 'strategic' reasons. Make sure that you know what a 'real option' is in an investment decision-making context, as this topic may feature in exam questions.

Similarly, risk when investing or trading overseas is a popular topic for questions. Candidates may need to advise the company on 'how political risk could potentially affect the value' of a project, and 'how it might limit its effects where such risk exists'.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**Ranking of investment** appraisal techniques Investment decisions (such as developing a new product or moving into a new market) are required by any business over time if they are to remain competitive and to generate new growth. Various techniques are used to analyse the costs and benefits of the investment under review. Each technique has its own strengths and weaknesses.	**Approach** Chapter 2 starts with a brief revision of basic investment appraisal. Move quickly onto dealing with relevant costs. Read through each section and use the section overviews as checklists of your knowledge. Stop and think What criteria would you use to judge an investment decision against?	Investment appraisal was introduced at Certificate level in the Management Information exam. The four key investment appraisal techniques are taken further in this subject where they are applied to more involved scenarios. This allows for a progression of skills from knowledge into application.	**IQ1: Revision** of basic techniques This is a good question to revise your knowledge of payback, ARR, NPV and IRR.
2	**Relevant cash flows** Cash flows should be used in investment appraisal rather than profits, as this more closely reflects the impact on shareholders' wealth. Relevant cash flows are those which are affected by the investment decision.	**Approach** Make sure you can identify relevant cashflows from a given scenario. Stop and think What is the definition of a relevant cash flow?	In the exam you are likely to have to examine financial information and to assess whether or not it represents a 'relevant' cash flow and therefore should be included in an analysis of an investment.	**IQ7: Relevant** costs This question includes many of the issues you could be presented with in the exam.
3	**Taxation** Taxation has two effects in investment appraisal, both give rise to relevant cashflows.	**Approach** Make sure you can calculate the tax charged on net cashflow and the tax relief given on assets via capital allowances.	Taxation appears in almost all NPV questions.	**IQ9: Capital** allowances This is a good question to practice calculating the tax relief generated via

Topic	Practical significance	Study approach	Exam approach	Interactive questions
		Stop and think Can you calculate the tax relief generated by capital allowances when acquiring a new asset?		capital allowances.
4	**Inflation** Inflation creates two problems in investment appraisal: (a) When estimating future cash flows, the rate of inflation must be taken into account. (b) The rate of return required by shareholders and lenders will increase as inflation rises; the discount rate is therefore affected.	**Approach** As examination questions are normally answered using the money method (see section 4.4), it is vital to determine whether the cash flows are given in money terms (prices after allowing for inflation) or current terms ('real' prices). Stop and think Do you know how to build in the cumulative impact of inflation each year?	**Use the money** method wherever possible unless a question directs otherwise.	**IQ11: Money @** money This question will allow you to practice calculating a projects NPV using the money method.
5	**Environmental costing** The impact on the environment of new ventures should be considered as part of the investment appraisal process.	**Approach** Read through this short section and make a note of the four types of environmental cost. **Stop and think** Businesses can save costs by considering environmental issues such as energy consumption and waste.	Investment appraisal questions could ask you to consider the impact of environmental costs on the NPV.	**IQ13:** Environmental costing This question will allow you to consider the impact of environmental costs on the NPV
6	**Replacement analysis** A business needs to know how often to replace assets such as machinery and motor vehicles. The optimal	**Approach** Make sure you can calculate the EAC, a good understanding of section 5.2 of this	In the exam you may be asked to recommend the optimal replacement policy for an asset. This requires the use of the EAC method.	**IQ14:** Replacement cycle This question will allow you to practice

Topic	Practical significance	Study approach	Exam approach	Interactive questions
	replacement cycle is the one with the lowest equivalent annual cost (EAC).	chapter is important.		calculating the EAC.
7	**Capital rationing** Scarce capital means that projects have to be ranked according to how efficiently they use the capital, which is a limiting factor.	**Approach** Make sure you can deal with both divisible and indivisible projects. **Stop and think** Do you know how to calculate the profitability index, and when it should be used?	In the exam you could be asked to calculate the optimal investment plan when capital is restricted.	**IQ15: Capital rationing** This question demonstrates how to deal with capital rationing for divisible projects.
8	**Investment appraisal in a strategic context** Investment projects will normally be identified as part of a firm's strategic planning process. Shareholder value analysis (SVA) is the process of analysing the activities of a business to identify how they will result in increasing shareholder wealth.	**Approach** Make sure you can discuss the principles of SVA and the application of real options to an investment decision. Stop and think What are the seven value drivers embedded in SVA?	In the exam you could be asked to recognise how the results of the appraisal of projects are affected by the accuracy of the data on which they are based and strategic factors (such as real options) which could not be included in the computational analysis.	
9	**Investing overseas** Overseas investment carries additional risks, including political and cultural risks.	**Approach** Make sure you can assess both political and cultural risk of a proposed investment. Stop and think Do you know the various strategies for dealing with political risks?	In the exam you could be asked to discuss how the interpretation of results from an investment appraisal can be influenced by an assessment of risk and to identify in the business and financial environment factors that may affect investment in a different country	

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1. Ranking of investment appraisal techniques

Section overview

- **Financial Management** progresses the skills from Certificate level into application level in the area of investment appraisal.
- Relative merits and demerits mean that discounted cash flow (DCF) techniques such as NPV and IRR are superior.

1.1 Recap of investment appraisal techniques

Investment appraisal was introduced at Certificate level in the **Management Information** exam. These techniques are taken further in this subject where they are applied to more involved scenarios. This allows for a progression of skills from knowledge into application.

Summary of techniques	
Payback period	The time taken for cash inflows from a project to equal the cash outflows.
Accounting rate of return	ARR = Average annual profit from investment/Initial investment × 100 Or, Average annual profit from investment/Average investment × 100 Where average investment = (Initial outlay + Scrap value)/2 Note. Profit is after depreciation.
Net present value	The maximum an investor would pay for a given set of cash flows (at their cost of capital) compared to the actual amount they are being asked to pay. The difference, the NPV, represents the change in wealth of the investor as a result of investing in the project. The NPV spreadsheet function is used to calculate the net present value (NPV). Spreadsheet functions are covered in more detail in Chapter 11. The NPV function assumes the first cell is a cash flow in year 1. Cash flows occurring immediately, such as the initial investment, must be adjusted for after the NPV calculation. If the cost of capital changes during the life of the investment, the NPV spreadsheet function cannot be used; in this case the NPV should be calculated using the discount tables provided in the exam. If a question includes annuities, you can use the annuity tables provided in the exam or use the NPV spreadsheet function by copying the same cash flow into a number of cells.
Internal rate of return	A cost of capital at which the NPV of a project would be £0. At Certificate level, you would have calculated IRR using interpolation with two discount rates. It is now easier and quicker to calculate IRR using the IRR spreadsheet function. This function is explained in detail in Chapter 11.

Interactive question 1: Revision of basic techniques

A company is considering expanding its business. The expansion will cost £350,000 initially for the premises and a further £150,000 to refurbish the premises with new equipment. Cash flow projections from the project show the following cashflows over the next six years.

Year	Net cash flows £
1	70,000
2	70,000
3	80,000
4	100,000
5	100,000
6	120,000

The equipment will be depreciated to a zero-resale value over the same period and, after the sixth year, it is expected that the new business could be sold for £350,000.

Requirements

1.1 Calculate the payback period for the project.

1.2 Calculate the ARR (using the average investment method).

1.3 Calculate the NPV of the project. Assume the relevant cost of capital is 12%.

1.4 Calculate the IRR of the project.

See **Answer** at the end of this chapter.

There are four basic investment appraisal techniques that are used in practice by companies. The reason why some are used more than others is because of their relative merits and demerits.

Interactive question 2: Ranking of techniques

What are the relative merits and demerits of the following investment appraisal techniques and what conclusion would you therefore draw about their relative attractiveness?

	Merits	Demerits	Rank
Payback period			
Accounting rate of return			
Net present value			

	Merits	Demerits	Rank
Internal rate of return			

See **Answer** at the end of this chapter.

1.2 Consideration of non-financial factors

Although projects with positive NPVs are an indication of a desirable investment, other factors such as real options (see section 7) and risk (see section 8 and Chapter 3) are also relevant. In addition, non-financial factors need to be considered which could ultimately affect shareholder value. These may include the following:

Compliance with current and future legislation: Legislation is an important factor as it may stop an investment from going ahead. For example, the construction industry is governed by a wealth of legislation which needs to be considered before going ahead with new investment projects.

Impact on staff morale: If management cannot adequately resource an investment project with the right amount and skill level of staff, this could over-burden existing staff due to increased workloads. This could lead to low staff morale, and possibly loss of staff as a result of being driven to seek employment elsewhere.

Impact on suppliers and customers: Firms need to consider suppliers and customers in their investment projects. For example, if a firm plans to invest in a project to automate services previously provided by humans, it would need to assess factors such as the following: Will the supplier(s) be able deliver what they need? Will customers be averse to automated services?

Reputation of organisation: Firms need to consider whether an investment project will involve unethical decisions and actions. As discussed in Chapter 1, unethical practices undertaken by a firm can be detrimental to its reputation and in turn affect its value.

Sustainability: As discussed in Chapter 1, sustainability should be an important part of a company's decisions and actions and should therefore be taken into account in investment decisions. This ties in with reputation above. Although a project may be desirable from an NPV perspective, if the project involves actions that compromise sustainability, for example, depleting water supplies of local communities, this could adversely affect the company's reputation and hence its value.

Professional skills focus: Applying judgement

Investment involves expenditure now in return for a stream of future returns. As in most decision- making situations, data is based on forecasts, which are subject to varying degrees of uncertainty. The task in investment appraisal involves deciding whether the uncertain cost of the investment is outweighed by its uncertain benefits. The calculation of an NPV is therefore simply an estimate of the addition to shareholders wealth at a point in time and will change as the underlying variables change. When producing recommendations, it is important to also consider the non-financial information you are presented within the question.

2 Relevant cash flows

Section overview

Cash flows should be used in investment appraisal rather than profits, as this more closely reflects the impact on shareholders' wealth.

- Relevant cash flows are those which are affected by the decision.
- Opportunity costs reflect the cash foregone as a consequence of using resources.

2.1 Why cash flows rather than profits?

When a firm makes a long-term investment in a project, rarely does the profit in any year of the project's life equal the cash flow. For example, in cash flow terms the purchase of plant and equipment may be represented by an outflow at the start of the first year (ie, the purchase) and an inflow at the end of the last year (ie, the scrap value). In the annual income statements in between, what appears is the difference between the initial cost and the scrap value ie, depreciation, which is **not** a cash flow.

In addition, profit measurement is concerned with the time period in which income and expenses are recognised. Thus, while the income statements may show £100,000 for sales, the actual cash receipts may be much less as some cash is still to be received, ie, there are receivables. This increase in receivables represents a further 'investment' in the project.

From a wealth point of view shareholders will be interested in when cash goes out and when it is returned to them in the form of dividends ie, the amount and timing of the flows are important to them.

Over the life of a project the undiscounted net flows will equal the total accounting profit/loss but (because of the above) the timing will be different.

It is also important to appreciate that not all cash flows are necessarily relevant. In **Management Information** the behaviour of costs was introduced. Over a given period some costs are fixed and some variable. Whilst all of the costs for a period will be reflected in the income statement ie, they will influence the profit, they may not all be relevant cash flows for a particular decision eg, fixed administrative expenses that are unaffected by the investment decision.

The section below on relevant cash flows explores this idea further.

2.2 Profits to cash flows

If income statement information is provided, there are two adjustments which should be made to convert to cash flows:

- **Depreciation** – As noted above, depreciation is **not** a cash flow and should be added back where it has been deducted in arriving at profits. The initial outflow and scrap inflow will deal with depreciation at the appropriate time
- **Working capital** – A project may involve not only investment in land, buildings etc, but also investment in working capital (inventory + receivables – payables). Increases in net working capital represent an outflow, decreases an inflow.

Worked example: Working capital

Gorgon plc expects the following sales from a new project over its three-year life:

	£
t_1	150,000
t_2	175,000
t_3	200,000

Working capital equal to 10% of annual sales is required and it needs to be in place at the start of each year.

Requirement

Calculate the working capital flows.

Solution

First, calculate the **absolute** amounts of working capital needed at the start of each year and then find the cash flows.

	t_0 £	t_1 £	t_2 £	t_3 £
Working capital at start	15,000	17,500	20,000	Nil
Cash flow	(15,000)	(2,500)	(2,500)	20,000

Only the incremental flow is relevant, so for example at t1 an additional £2,500 is required over and above the £15,000 already in place.

At the end of the project all working capital is assumed to be recovered ie, an inflow of £20,000 at t_3.

Interactive question 3: Changing working capital

A company plans to enter a four-year project that is forecast to generate revenue of £100,000 at t_1, increasing by 10% per annum until t_4. Working capital equal to 15% of annual sales is required at the start of each year, and will be fully recovered at the end of t_4.

Requirement

What is the working capital cash flows?

See **Answer** at the end of this chapter.

2.3 Relevant cash flows

The rule is to include only those costs and revenues which can affect the decision or be affected by it. This means using only **future incremental cash** flows. Future flows are used as no decision now can change past cash flows; incremental ie, changed, cash flows are used because flows which continue into the future regardless of the decision are irrelevant to the decision.

Definition

Relevant cash flows: Future, incremental cash flows arising from the decision being made.

The relevant cash flow is the difference between:

- the cash flow if the course of action is taken; and
- the cash flow if it is not.

The assessment of relevant cash flows needs to be done from the point of view of the business as a whole and not individual divisions or departments.

Typical items which are **excluded** from the analysis as irrelevant are discussed below:

- **Sunk costs** – money already spent eg, when trying to determine whether an existing machine which cost £250,000 three years ago should be used on a new project, the analysis should ignore the £250,000 as nothing can be done about it; instead, the machine's current worth (either scrap value or cash benefits from retention) should be included.
- **Accounting entries that do not have a cash** flow **impact** – eg, depreciation (as discussed above) is not a cash flow.
- **Unavoidable costs** – money already committed eg, a non-cancellable lease or **apportioned** fixed costs. As far as fixed costs are concerned it is the total amount of cash expenditure which is important (not any attempt to spread the fixed cost ie, apportionment). If the **total** changes, then this is relevant; if not, the fixed costs are ignored as they are unaffected by the decision. For example, if a firm can make a new product within its existing rented factory, then any share of the rent apportioned to the new product should be ignored as the **total** rent bill is unchanged. However, if a new factory needs to be rented, then the **additional** rent is relevant in the appraisal of the new product.
- **Finance costs** – eg, interest (the cost of capital, which includes interest costs, is provided for in the discount rate in DCF analysis).

Specifically **include**:

- all opportunity costs and revenues

2.4 Opportunity costs and revenues

Definition

Opportunity cost: The cash flow foregone if a unit of the resource is used on the project instead of in the best alternative way.

- If there are scarcities of resources to be used on projects (eg, labour, materials, machines), then consideration must be given to revenues which could have been earned from alternative uses of the resources.
- Shareholders are concerned with the flows generated by the whole organisation in terms of assessing their impact on their wealth.

- The cash flows of a single department or division cannot therefore be looked at in isolation. It is always the cash flows of the whole organisation that must be considered.

For example, the skilled labour needed for the new project may have to be withdrawn from normal production, causing a loss in contribution. This is obviously relevant to the project appraisal.

Worked example: Relevant cost of material

A new contract requires the use of 50 tonnes of metal ZX 81. This metal is used regularly on all the firm's projects. At the moment there are in inventory 100 tonnes of ZX 81, which were bought for £200 per tonne.

The current purchase price is £210 per tonne, and the metal could be disposed of for net scrap proceeds of £150 per tonne.

Requirement

With what cost should the new contract be charged for the ZX 81?

Solution

The use of the material in inventory for the new contract means that more ZX 81 must be bought for normal workings. The cost to the organisation is therefore the money spent on purchase, no matter whether existing inventory or new inventory is used on the contract.

Assuming that the additional purchases are made in the near future, the relevant cost to the organisation is current purchase price ie, 50 tonnes × £210 = £10,500.

Interactive question 4: Material with no alternative use

Suppose the organisation has no alternative use for the ZX 81 in inventory.

Requirement

What is the relevant cost of using it on the new contract?

See **Answer** at the end of this chapter.

Interactive question 5: Material with a scrap value

Suppose again there is no alternative use for the ZX 81 other than a scrap sale, but that there are only 25 tonnes in inventory.

See **Answer** at the end of this chapter.

Worked example: Relevant cost of labour

A mining operation uses skilled labour costing £8 per hour, which generates a contribution of £6 per hour, after deducting these labour costs.

A new project is now being considered which requires 5,000 hours of skilled labour. There is a shortage of the required labour. Any used on the new project must be transferred from normal working.

Requirement

What is the relevant cost of using the skilled labour on the project?

Solution

What is lost if the labour is transferred from normal working?

	£
Contribution per hour lost from normal working	6
Labour cost per hour which is not saved	8
Cash lost per hour as a result of the labour transfer	14
The relevant cost of skilled labour is 5,000 × £14	70,000

Interactive question 6: Relevant cost of surplus labour

The facts and requirement are as in the previous Illustration, but there is a surplus of skilled labour sufficient to cope with the new project. The idle workers are being paid full wages.

See **Answer** at the end of this chapter.

Interactive question 7: Relevant costs

A research project, which to date has cost the company £150,000, is under review.

If the project is allowed to proceed it will be completed in approximately one year, when the results are to be sold to a government agency for £300,000.

Shown below are the additional expenses which the managing director estimates will be necessary to complete the work:

Materials. This material has just been purchased at a cost of £60,000. It is toxic; and if not used in this project, it must be disposed of at a cost of £5,000.

Labour. Skilled labour is hard to recruit. The workers concerned were transferred to the project from a production department, and at a recent meeting the production manager claimed that if these people were returned to her they could generate sales of £150,000 in the next year. The prime cost of these sales would be £100,000, including £40,000 for the labour cost itself. The overhead absorbed into this production would amount to £20,000.

Research staff. It has already been decided that, when work on this project ceases, the research department will be closed. Research wages for the year are £60,000, and redundancy and severance pay has been estimated at £15,000 now, or £35,000 in one year's time.

Equipment. The project utilises a special microscope which cost £18,000 three years ago. It will have a residual value of £3,000 in another two years and has a current disposal value of £8,000. If used in the project it is estimated that the disposal value in one year's time will be £6,000.

Share of general building services. The project is charged with £35,000 per annum to cover general building expenses. Immediately the project is discontinued, the space occupied could be sub-let for an annual rental of £7,000.

Requirement

Advise the managing director as to whether the project should be allowed to proceed, explaining the reasons for the treatment of each item.

Note: Ignore the time value of money.

See **Answer** at the end of this chapter.

2.5 Deprival value of assets

When an asset which is currently owned by the business is required for another specific contract/project, the existing activity is to be deprived of that asset. The loss to the business from the existing activity being deprived of use of the asset is the deprival value. The value to be used in the investment appraisal is the asset's deprival value.

Worked example: Deprival value

A company has a printing press which needs to be used on a new contract.

The press could be sold for £1,000 or made use of to service the needs of existing customers for business which has a value (in present value terms) of £1,500.

Requirements

What is the opportunity cost of using the machine on a new contract?

(a) Assuming that it could not be replaced?

(b) If the printing press could be replaced at a cost of either:

- £800; or
- £1,800?

Solution

(a) The existing customers create more value than selling the machine, so the machine would not be sold.

Hence the opportunity cost is the value in use of £1,500.

This is the higher of its net realisable value (£1,000) and its value in an alternative use (£1,500).

Note: If the value in use ever dropped below the net realisable value (NRV), then the asset would not be worth keeping.

(b)

- If the new contract will make use of a currently owned machine, then in principle the cost of using it will be the replacement cost. If the value in use is £1,500, and the replacement cost is

  £800, then the machine will be replaced. The equipment cost of the new contract would therefore be £800.
- If, however, the replacement cost is £1,800 then it is not worth replacing. Thus, the relevant cost of equipment for the new contract will be the opportunity cost or benefit foregone – ie, the £1,500.

In each case therefore the relevant cost is the cash flow effect of the decision to use the existing resource – either the replacement cost or the benefit in the next best case ie, the deprival value.

This can be summarised as follows:

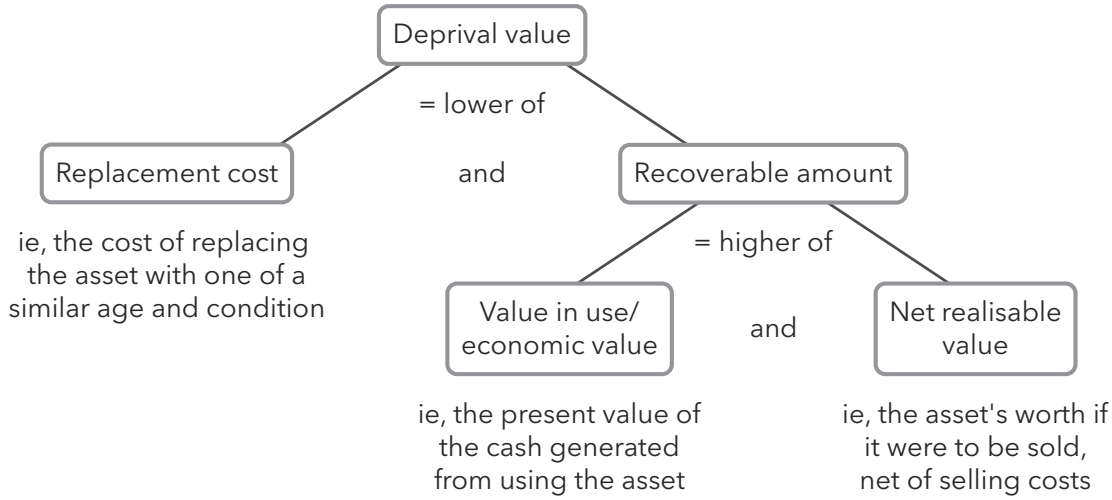


Figure 2.1: Deprival value

ie, the present value of the cash generated from using the asset

ie, the asset's worth if it were to be sold, net of selling costs

- If the asset has a net realisable value in excess of its economic value it should be sold ie, it is better to sell it than keep on using it. If the economic value is higher than the net realisable value, it is worth keeping and using. At this point, therefore, were the firm to be deprived of the asset, the best alternative foregone is the higher of the net realisable value or economic value (the 'recoverable amount').
- However, if the recoverable amount is less than the replacement cost, then the recoverable amount is the deprival value ie, the asset would not be replaced were the firm to be deprived of its use. If the recoverable amount exceeds the replacement cost, the asset should be replaced as the latter represents its deprival value.

Interactive question 8: Deprival value

JX Ltd. owns a machine purchased two years ago for £2,000. A similar machine would now cost

£1,000. The machine could be sold for £1,000 after spending £100 on advertising. The machine has two years of life remaining, and over this period the cost of renting the machine instead would be a present value of £800.

Requirement

What is the deprival value of the machine?

See Answer at the end of this chapter.

Professional skills focus: Concluding, recommending and communicating

It is good practice to clearly state your workings at each part of the calculation together with any assumptions you have made, and reservations as to the reliability of the outcome determined. This will provide depth to your conclusion, which demonstrates the ability to communicate the overall outcome to key stakeholders. Don't forget to clearly conclude whether the investment should be accepted or not.

3 Taxation

Section overview

- Taxable profit and accounting profit may not be the same.
- Tax is charged on net cash flow.
- Capital allowances reduce the tax payable.

3.1 Basics

Income statement

Imagine an income statement drawn up at the end of the first year of a project's life **using normal** financial **accounting principles**.

Worked example: Taxable profit

	£	£
Sales		10,000
Materials	1,000	
Labour	1,500	
Variable overheads	500	
Fixed overheads		
Depreciation	1,000	
Other	500	
		(4,500)
		5,500
Interest on loan to finance project		(3,000)
Profit		2,500

The above table shows the expected annual profit from a new project, if it is undertaken.

Requirement

To calculate the taxable profit each year for investment appraisal purposes, what are the relevant cash flows to be considered?

Solution

Corporation tax for year 1 of the project is not simply £2,500 at the prevailing tax rate. Some adjustments need to be made to the profit calculation before computing the tax charge:

- Only incremental relevant cash flows need be considered (as covered in section 2 above) and the incremental tax charge. Thus, some of the above costs eg, fixed costs, may not be relevant and therefore the tax effect of these is not relevant.
- Depreciation should be ignored (it is not allowed as a deduction from profits when calculating the tax – instead, tax relief is available in the form of capital allowances on plant and equipment purchased for the project (see below)).
- Interest should be ignored. The tax effect of interest is incorporated into the cost of capital.

3.2 Effects

Taxation has two effects in investment appraisal, both giving rise to relevant cash flows.

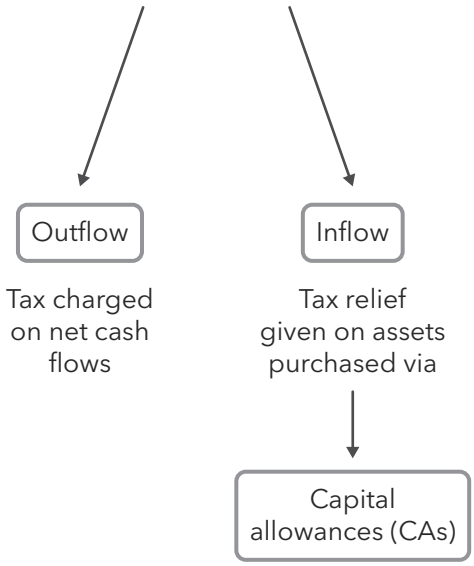


Figure 2.2: Impact of tax on investment appraisal

3.3 Capital allowances (CAs)

- Capital allowances equate to tax-allowable depreciation, as defined by the UK tax authority, HMRC. For the purposes of the examination, only CAs on plant and equipment are considered (though in practice there are other categories of non-current assets that attract CAs). There is tax relief on annual writing down allowances, and also either tax relief on a balancing allowance at the end of the project or tax payable on a balancing charge.
- **Unless otherwise stated:**
  - Calculate writing down allowances (WDAs) at 18% on a reducing balance basis.
  - There is no WDA in the year of sale; a balancing allowance or balancing charge is calculated instead. The balancing allowance provides tax relief for any of the capital cost that has not yet been relieved. A balancing charge claws back any excess relief given – assume that there are sufficient profits available elsewhere in the business to utilise all tax benefits in full and at once.

3.4 Other assumptions

- Although large companies make tax payments in four equal instalments during the accounting year, **for examination purposes, the whole tax payment is assumed to be made at the end of the year to which it relates**.
- For examination purposes **unless otherwise stated** corporation tax is assumed to be **paid at 25%** (although other rates are possible in the real world). The learning materials will use a tax rate of either 17% or 25%, it is important that you read the question carefully.
- The tax rate can be assumed to be **constant** over the life of the project (unlikely in practice).
- It should be assumed that working capital flows have **no** tax effects.

Worked example: Capital allowances

Happy plc bought a machine for £10,000 on 31 December 20X1, its accounting year end. The asset generated cash flows of £7,000 pa. It sold the asset on 31 December 20X3 for £2,000.

Timeline

The company pays tax at 17%. Capital allowances are available at 18% on a reducing balance basis.

Requirement

Show the WDAs and any balancing charge or allowance.

Solution

Year ended 31 December Tax WDV (WDV = written down value)

£	
20X1	10,000
WDA @ 18%	(1,800)*
20X2	8,200
WDA @ 18%	(1,476)*
20X3	6,724
Proceeds	(2,000)**
Balancing allowance	4,724

* Asset owned at end of each of 20X1 and 20X2 therefore 18% WDA calculated.

** In 20X3 asset sold. As proceeds (in this case) are less than WDV a balancing allowance is given.

Total reliefs = £(1,800 + 1,476 + 4,724) = £8,000 (= cost – scrap). Tax payments, cash flows etc, can then be shown as follows:

Tax computation

	31 December 20X1	31 December 20X2	31 December 20X3
	£	£	£
Net inflows		7,000	7,000
WDA/Balancing allowance	(1,800)	(1,476)	(4,724)
Taxable	(1,800)	5,524	2,276
Tax @ 17%	306	(939)	(387)

* Tax saved, assuming sufficient profits exist elsewhere in the business to obtain relief from WDA as soon as possible (section 3.3 above).

Normally the tax effect is shown as two separate elements:

	31 December 20X1	31 December 20X2	31 December 20X3
	£	£	£
Net inflows		7,000	7,000
(1) Tax paid @ 17%		(1,190)	(1,190)
WDAs/Balancing allowance	(1,800)	(1,476)	(4,724)
(2) Tax saved @ 17%*	306	251	803
Total tax (above) (1) + (2)	306	(939)	(387)

* ie, being able to **deduct** the WDA from profit **saves** tax @ 17%.

The NPV calculation would show (rounding to the nearest £):

	31 December 20X1	31 December 20X2	31 December 20X3
	£	£	£
Net inflows		7,000	7,000
Tax		(1,190)	(1,190)
Asset purchase	(10,000)		
Scrap			2,000
Tax saved on WDAs	306	251	803
Net CF for discounting	(9,694)	6,061	8,613

Interactive question 9: Capital allowances

- The following information is available:
- A company buys an asset for £10,000 at the end of its accounting period, 31 December 20X0, to under take a two-year project.

- Net trading inflows at t_1 and t_2 are £5,000.
- The asset has a £6,900 scrap value when it is disposed of at the end of year 2.
- Tax is charged at 17%. WDAs are available at 18% pa.

Requirement

Calculate the net cash flows for the project.

See **Answer** at the end of this chapter.

Interactive question 10: Timing issues

The facts are as in Interactive question 9, except that the asset is now bought on 1 January 20X1.

Requirement

Calculate the net cash flows for the project.

See **Answer** at the end of this chapter.

4 Inflation

Section overview

- Inflation rate can be incorporated into both cash flows and the discount rate ('money @ money').
- Inflation can be ignored in both cash flows and the discount rate ('real @ real').

Annual inflation in the UK has varied between 1% and 26% pa since 1945. As inflation will continue to occur in the future, account needs to be taken of its effects ie, increases in prices, when appraising projects. It creates two problems in investment appraisal:

- Estimating future cash flows – the rate of inflation must be taken into account
- The rate of return required by shareholders and lenders will increase as inflation rises – the discount rate is therefore affected

4.1 Real and money (or nominal) rates

- The rates of interest that would be required in the absence of inflation in the economy are referred to as the real rates of interest.
- When real rates of interest are adjusted for the effect of **general** inflation, measured by the consumer prices index (CPI), the results are referred to as money (or nominal) rates of interest.

Worked example: Impact of inflation

Kuman is considering a choice. He can spend £100 on consumables now or he can invest it for a year, but will only do so if he can consume more of it at that time.

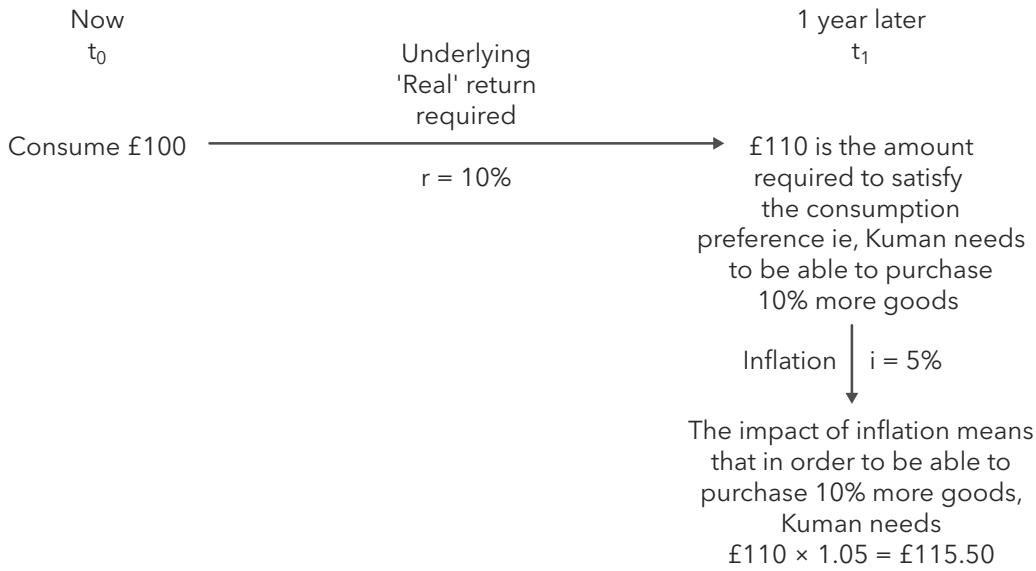
The underlying real rate of interest for Kuman is 10%, and general inflation is 5%.

Requirement

What return in money terms does Kuman require?

Solution

The total return must provide Kuman with the real return of 10% that he requires, and to do this it must also protect his return against the effects of inflation at 5%.



This can be illustrated as follows.

In order to receive the equivalent of £100 now, in a year, Kuman needs £115.50 of **money** in a year

£100 × (1.10)(1.05) = £115.50

Overall money return (m) required = £15.50/£100 = 15.5%

Money rates, real rates and general inflation (CPI) are linked by Fisher's (1930) equation:(1 + m) = (1 + r) (1 + i)

Where:

m = money rate r = real rate

i = general inflation

Thus, in the example above:

(1 + m) = (1.10) (1.05) = 1.155

m = 15.5%

4.2 Money and current cash flows

As examination questions are normally answered using the money method (see section 4.4 below) it is vital to determine whether the cash flows are given in money terms (prices after allowing for inflation) or current terms ('real' prices).

- Money (or nominal) cash flows are cash flows where any inflationary effects have **already** been taken into account.
- Current cash flows are cash flows expressed in **today's** terms which will be affected by inflation in the future and have **not** yet been adjusted.

4.3 General and specific inflation rates

It is also important in examination questions to determine what sort of inflation rate is applicable to the items in the question.

- A general inflation rate is a weighted average of many specific inflation rates eg, CPI, and is normally applied to the real rate in order to derive the money rate (section 4.1 above).
- A specific inflation rate is the expected rate of inflation for an individual item of revenue, savings or cost eg, the rate at which labour costs per hour will increase.
- Examples:

Individual item	Specific inflation
Bread	1% pa*
Milk	3% pa*
Cheese	2% pa*
Etc.	

* CPI is a weighted average of these rates

- Economic forecasters will regularly publish estimates of general inflation. Estimating individual rates is much more difficult, and decision makers should recognise that they are just that – estimates, and subject to a degree of error.

4.4 Discounting

Money method ('money @ money')

It is essential to match like with like when performing NPV calculations. In the real world, money flows are the easiest to deal with as they are the everyday flows people are used to. So, to use the money method:

- Adjust the individual cash flows eg, sales/revenue, materials, labour using their specific inflation rates to convert to money cash flows ie, the flows which are expected to actually occur.
- Discount these money flows using the money rate, which is the market cost of capital.

This is the simplest technique. Use wherever possible unless a question directs otherwise.
Real method ('real @ real')

An alternative way of reaching the same NPV and again matching like with like, is to use the

real method. The problem with this method is that real cash flows and interest rates are not directly identifiable in the way that money flows and money rates are. For example, banks regularly publish money interest rates on savings accounts, overdrafts, etc. The unpublished real rate needs to be derived by stripping out the general inflation used to determine the money rate (as in section 4.1 above). So, to use the real method:

- Remove the effects of **general** inflation from money cash flows to generate real cash flows.
- Discount using real rate.

Although this achieves the same NPV as the money method, it is often very long-winded and would only be useful in a question where the real flows and interest rate were **already given**.

Interactive question 11: Money @ money

The following information is available:

Project	Invest £10,000 at t_0 in new plant and equipment
	Returns £5,000 pa in current terms for three years, inflating at 7% pa
	Money rate of interest is 10%

Requirement

Calculate the project's NPV using the money method.

See Answer at the end of this chapter.

Effective method

- This method can sometimes be a short cut for the money method eg, for long projects with annuity or perpetuity cash flows.
- To use the effective method, leave cash flows in current (t_0) terms and adjust the discount rate as shown below to incorporate both inflating and discounting.
- Discount current terms cash flows using effective rate (e): $1 + e = (1 + m)/(1 + i_s)$

  where i_s = inflation specific to given cash flow.

Interactive question 12: Effective rate

Labour costs inflate at 8% pa in perpetuity.

Money rate = 10%

Labour currently costs £10,000 in t_0 terms.

Requirement

Calculate the present value of labour costs.

See **Answer** at the end of this chapter.

4.5 Practical considerations

- General inflation may not be constant, which means that the money discount rate may vary from year to year. In order to discount cash flows with a different money interest rate in each year, the money @ money approach discussed above should be used.
- The impact of inflation is more significant for longer periods as the increase in prices is compounded year on year. However, as noted earlier, the further into the future the more difficult it is to estimate specific inflation rates, so errors in estimates will be compounded.

4.6 NPV proforma

The following proforma summarises the topics dealt with so far and provides a layout for NPV calculations useful in 95%+ of situations:

=NPV(0.10,C13:E13)

	A	B	C	D	E
1		t_0	t_1	t_2	t_3
2		£	£	£	£
3	Operating cash flows				
4	Sales/revenue*		X	X	X
5	Costs*		(X)	(X)	(X)
6	Net cash flow		X	X	X
7	Tax		(X)	(X)	(X)
8	Asset				
9	Purchase	(X)			
10	Scrap				X
11	Tax on WDAs/balancing allowance or charge	X	X	X	X
12	Working capital	(X)	(X)	(X)	X
13	Net flows	(X)	X	X	X
14	PV of cash flows @10% T1–3	X			
15	Less outflow at T0	(X)			
16	NPV	X			

* Adjust for inflation and include only relevant cash flows

Professional skills focus: Assimilating and using information

When performing an NPV calculation, it is important to review, and reflect on, all of the information available. There is likely to be an abundance of information available in an exam question covering relevant costs, tax and inflation. Make notes on the question screen and determine how each piece of information relates to the overall NPV calculation.

5 Environmental costing

Section overview

- The impact on the environment of new ventures should be considered as part of the investment appraisal process.
- Environmental costs can be classified as prevention, appraisal, internal failure and external failure costs.

5.1 Managing environmental costs

Accountants need to be aware of the environmental costs associated with business activities. The general public are becoming more conscious about the environment and therefore customer habits and choices are being influenced by environmental factors and whether businesses are perceived as being 'green'.

Businesses, however, often face difficulties with defining, identifying and controlling environmental costs.

Environmental costs such as energy costs are often treated as production overheads and therefore effectively hidden from management scrutiny. As well as being more difficult to identify, environmental costs may also be more difficult to quantify. For example, businesses may suffer a loss of reputation if problems arise.

Even where environmental costs are captured within accounting systems, the difficulty lies in pinpointing them and allocating them to a specific product or service. Typical environmental costs are listed below.

- Consumables and raw materials
- Transport and travel
- Waste
- Waste and effluent disposal
- Water consumption
- Energy

Once a business has defined, identified and allocated environmental costs, it can begin the task of trying to control them through environmental management systems.

5.2 Benefits of understanding environmental costs

There are, of course, ethical reasons why environmental costs are important to the accountant. For example, using energy generates carbon dioxide emissions, and these contribute to climate change and threaten the future of our planet. Accountants, however, should also consider environmental costs for the following reasons.

(a) Identifying environmental costs associated with individual products, services or processes helps with correct product or service pricing. Correct pricing helps to increase profitability.

(b) Poor environmental behaviour can result in fines, increased liability to environmental taxes and damage to the business' reputation.

(c) Recording environmental costs is important, as some may require regulatory compliance. Most Western countries now have laws to cover land-use planning, smoke emissions, water pollution and destruction of animals and natural habitats.

(d) Saving energy generally leads to cost savings.

A question in your Financial Management exam could include the identification of environmental costs and the impact they may have on a project. Monitoring of resource usage and consideration of environmental impacts should be accounted for as part of capital investment decisions.

5.3 Environmental cost classification

It is useful to classify environment costs under four headings:

Environmental prevention costs	Costs required to eliminate environmental impacts before they occur. For example, forming environmental policies, performing site and feasibility studies, staff training.
Environmental appraisal costs	Costs involved with establishing whether activities are complying with environmental standards and policies. For example, developing performance measures, monitoring, testing and inspection costs, site survey costs.
Environmental internal failure costs	Costs of activities that must be undertaken when contaminants and waste have been created by a business but not released into the environment. Examples include maintaining pollution equipment and recycling scrap.
Environmental external failure costs	Costs that arise when a business releases harmful waste into the environment. A business can harm its reputation by doing this. Examples include cleaning up oil spills or decontaminating land.

Interactive question 13: Environmental costs

Lomond Tours plc is a company that specialises in adventure holidays. The Finance Director has just completed the investment appraisal of a proposed new hotel based in the Highlands of Scotland. The project looks promising with a forecast NPV of £3.5 million.

The company has hired an external environmental consultant to ensure that the project complies with the company's sustainability policy as the hotel will be built in a National Park. The consultant has estimated the following environmental costs associated with the project:

(1) Site survey costs £100,000

(2) Installation of recycling equipment: £200,000

(3) Staff training to ensure operational environmental policies are adhere to £5,000

(4) Installation of a wind turbine onsite £345,000

Requirement

Discuss the impact of the environmental costs on the project.

See **Answer** at the end of this chapter.

6 Replacement analysis

Section overview

- The optimal replacement cycle is the one with the lowest equivalent annual cost.
- The analysis assumes the replacement decision will apply indefinitely.

- So far it has been assumed that investment in an asset is a one-off decision. However, a project is likely to involve commitment to long-term production, and machinery will therefore need to be replaced regularly at the end of its useful life.
- A business needs to know how often to replace such assets. Replacing after a long time means not replacing as often, so delaying the cost of a new replacement machine. However, this invariably means keeping an asset whose value is declining and which costs more to maintain and repair. These costs and benefits need to be balanced.

Worked example: Replacement decision

A decision has to be made on replacement policy for vans. A van costs £12,000. Vans can be replaced after one, two, or three years. The following additional information applies:

Interval between replacement	Trade-in allowance	Age at year end	Maintenance cost (paid at end of year)
(Years)	£	(Years)	£
1	9,000	Year of replacement	Nil
2	7,500	1	2,000
3	7,000	2	3,000

Requirement

Calculate the optimal replacement policy at a cost of capital of 15%. There are no maintenance costs if the van is replaced after one year. Ignore taxation and inflation.

Solution

NPVs

1-year cycle NPV = (12,000) + (9,000/1.15) = £(4,174)

2-year cycle NPV = (12,000) + ((2,000)/1.15) + (7,500/1.15^2) = £(8,068)

3-year cycle NPV = (12,000) + ((2,000)/1.15) + ((3,000)/1.15^2) + (7,000/1.15^3) = £(11,405)

These costs are not comparable, because they refer to different time periods. The reason the one- year cycle appears cheaper is because it only reflects the cost of having a machine for one year, whereas the £11,405 for the three-year cycle is the cost to the business of keeping the resource for three years. There are two possible approaches to making the costs comparable.

6.1 Lowest common multiple approach

One method of comparing the different replacement options is to evaluate the costs over a time frame which makes them consistent.

In the above example, this will be achieved if the costs incurred **under each cycle** were compared over the same number of years for each.

For example:

Time	1-year cycle	2-year cycle	3-year cycle
	£'000	£'000	£'000
0	(12)	(12)	(12)
1	9 + (12)	(2)	(2)
2	9 + (12)	7.5 + (12)	(3)
3	9 + (12)	(2)	7 + (12)
4	9 + (12)	7.5 + (12)	(2)
5	9 + (12)	(2)	(3)
6	9	7.5	7

In order to be comparable, the analysis has to be continued for six years (the lowest common multiple of the different replacement cycles). Stopping before this means one of the replacement options would be part way through a replacement cycle. At the end of six years is the earliest occasion that all three cycles come to an end at the same time (ie, a new van is required under each cycle). The lowest common multiple approach will give a solution, but is rather long winded. The equivalent annual cost approach is a better method and is discussed below.

6 .2 Equivalent annual cost (EAC)

In **Management Information**, the method for finding the present value of an annuity was introduced.

PV of an annuity = Annuity × Annuity Factor (AF) for n periods at a discount rate r

This can be applied here to restate the present value of the costs over a life cycle into an annuity – the equivalent annual cost – over the life cycle, as follows:

The NPVs calculated above are converted into equivalent annual costs ie, the equivalent constant annual sum payable at the end of each year for any given cycle.

The equivalent annual costs **can** be compared.

1-year cycle

(4,174) = X_1 × AF 1 year @ 15%
(4,174) = X_1 × 0.870
X_1 = £(4,798)

2-year cycle

(8,068) = X_2 × AF 2 years @ 15%
(8,068) = X_2 × 1.626
X2 = £(4,962)

3-year cycle

(11,405) = X_3 × AF 3 years @ 15%
(11,405) = X_3 × 2.283
X3 = £(4,996)

Thus, it is cheapest to replace the vans every year, because this cycle has the lowest cost in NPV terms.

So, the method can be summarised as:

(a) Calculate the NPV of each replacement strategy.

(b) Calculate the equivalent annual cost of the NPV for each strategy.

(c) Choose the strategy with the lowest equivalent annual cost.

Interactive question 14: Replacement cycle

A machine costs £20,000 and it can be replaced every year or every two years. Delaying the replacement causes the running costs to increase and the scrap proceeds to decrease as follows:

	Running costs £	Scrap proceeds £
Year 1	5,000	16,000
Year 2	5,500	13,000

Company's cost of capital = 10%.

Requirement

Should the machine be replaced every one or every two years?

See **Answer** at the end of this chapter.

Professional skills focus: Structuring problems and solutions

From the question requirement it may not be obvious that you should calculate the EAC. If you are provided with information on cash flows and asked to assess how often an asset should be replaced,it is likely that you will need to calculate the EAC of each possible replacement cycle.

6.3 Limitations of the replacement analysis performed

This method assumes that a firm is continually replacing like with like, and therefore determines a once-and-for-all optimal replacement cycle. In practice this is unlikely to be valid due to the following:

- Changing technology, which can quickly make machines obsolete and shorten replacement cycles. This means that when an asset is replaced, it is not replaced with an identical asset.
- Inflation, which by altering the costs of assets means that the optimal replacement cycle can vary over time.

- If inflation affects all variables equally it is best excluded from the analysis by discounting real cash flows at a real interest rate – the optimal replacement cycle will remain valid.
- Differential inflation rates mean that the optimal replacement cycle varies over time.
- The effects of taxation (which are ignored in the analysis above but they could be incorporated into the cash flows).
- The fact that use of the machines is unlikely to continue in perpetuity.

7 Capital rationing

Section overview

- Scarce capital means that projects have to be ranked according to how efficiently they use the capital, which is a limiting factor.
- Divisible projects are ranked using NPV per £ of scarce capital.
- Indivisible projects are ranked using trial and error by finding the combination of projects that maximises NPV.

Definition

Capital rationing: The situation where insufficient funds exist to undertake all positive NPV projects,so a choice must be made between projects.

7.1 Two types of rationing

- **Hard rationing**: where the external capital market (banks, stock exchange, etc) limits the supply of funds.
- **Soft rationing**: where internally the firm imposes its own constraint on the amount of funds raised. This investment limit may be used as a surrogate for other constraints eg, insufficient managerial capacity to handle all positive NPV projects.

Soft rationing may also arise where it is impractical for the firm to go to the market and raise a small amount of finance.

7.2 Single period rationing

When funds are scarce in one year only, but freely available otherwise, the selection of divisible projects for investment is based on a simple ranking system.

Projects are ranked by NPV per £ capital outlay in the rationed period. (This can be referred to as the ' profitability index'.) This is an extension of key factor analysis covered at the Certificate Level. The NPV per £ capital outlay rule applies only to divisible projects.

The situation where funds are rationed in more than one time period (multi-period capital rationing) is beyond the syllabus.

Interactive question 15: Capital rationing

A business has £50,000 available at t_0 for investment.Four divisible projects are available:

Project	NPV £	Funds required at t_0 £
A	100,000	(50,000)
B	(50,000)	(10,000)
C	84,000	(10,000)
D	45,000	(15,000)

Requirement

Which project(s) should be undertaken?

See **Answer** at the end of this chapter.

7.3 Indivisible projects

The solution to Interactive Question Capital rationing assumes it is possible to accept half of project A ie, that projects are perfectly divisible, so half the outlay gives half the NPV, etc.

In reality projects may be indivisible ie, the investment is all or nothing, in which case trial and error is necessary to find the optimal combination.

In Interactive question Capital rationing above, possible combinations are:

	NPV £	Funds £
A	100,000	50,000
C and D	129,000	25,000

7.4 Therefore, choose C and D.

Mutually exclusive projects

It may be the case that projects are mutually exclusive ie, it is not possible to undertake both at the same time, perhaps because management would be overstretched in trying to run both projects.

Imagine that a firm facing single period capital rationing is trying to choose between five indivisible projects – P, Q, R, S and T. P and Q are mutually exclusive ie, either P or Q but not both could be undertaken. In order to make the choice it should apply the procedures in the two sections above to two separate groupings and see which produces the higher overall NPV, as shown below:

- P, R, S, T
- Q, R, S, T

7.5 Project synergy

So far projects have been considered independently. It may be the case that by undertaking certain combinations of projects, some synergy (extra NPV) is created eg, from cost savings.

Interactive question 16: Project Synergy

A firm has £100,000 available for investment at t_0.Three divisible projects are available:

Project	NPV £	Funds required at t_0 £
X	25,000	100,000
Y	11,000	50,000
Z	8,000	40,000

If Y and Z were undertaken together an extra £4,400 of NPV could be earned.

Requirement

Which project(s) should be undertaken?

See **Answer** at the end of this chapter.

8 Investment appraisal in a strategic context

Section overview

- Investment appraisal needs to be considered in a strategic context.
- Shareholder value analysis (SVA) focuses on decisions which maximise shareholder wealth.
- Investment may give rise to new opportunities, known as real options.

8.1 Project generation, decision making and control

Investment projects will normally be identified as part of a firm's strategic planning process. This is covered in detail in the **Business Strategy and Technology** exam. In outline the process is as follows:

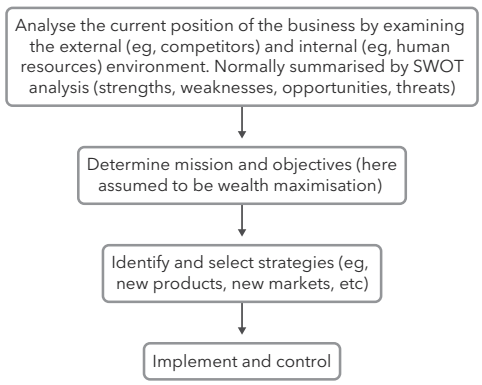


Figure 2.3: Strategic planning process

- Once potential projects are identified eg, replacing an existing product with a new one, the relevant costs and revenues associated with the proposal must be determined. Care must be taken to avoid bias in estimates eg, from managers closely associated with the proposal.
- The relevant costs and revenues should be assessed using NPV to determine whether wealth is expected to increase. Where there are competing projects, those that offer the best NPV should be chosen (capital rationing may need to be considered at this point).
- Chosen projects are then implemented and performance monitored eg, actual outcomes v budget etc.

8.2 Shareholder value analysis

Definition

Shareholder value analysis (SVA): The process of analysing the activities of a business to identify how they will result in increasing shareholder wealth.

Managers may sometimes be influenced to act in a manner which is inconsistent with maximising shareholder wealth. The claimed advantage of SVA, as a **philosophy** of business decision-making, is that the actions of managers can be directly linked to value generation and the outcomes of decisions can be assessed in that context.

Interactive question 17: SVA

Explain what possible problems are created when using the following measures to assess management effectiveness:

- Return on capital employed
- Earnings per share

See **Answer** at the end of this chapter

8.3 The principles of SVA

A business has a particular value at a particular time because of the expected future cash flows from its activities. The value will be based on their timings and riskiness. According to the principles of SVA, the value of the business is affected or 'driven' by just seven factors, known as 'value drivers'. To increase the value of the business, ie, to generate additional value, one or more of these seven will need to alter in a favourable direction. The value drivers, and their effect on shareholder value, are shown below.

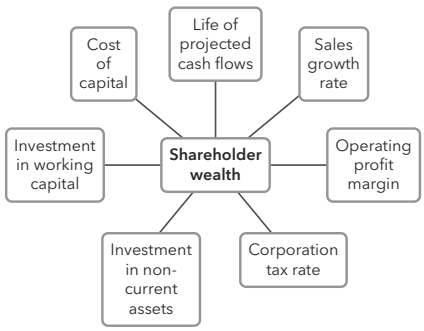


Figure 2.4: The seven value drivers

These seven factors all impact on the operating cash flows and, through them, the value of the business and the wealth of the shareholders.

These will be examined in turn and related to individual parts of the business.

Sales growth rate	If a greater level of sales can be generated in the future than was expected, this should create more cash flows and, therefore, value. The greater level of sales could come from a new product and, provided that this did not have an adverse effect on one of the other value drivers, greater value would be created. Similarly, preventing an expected decline in sales levels for some existing product has the potential to generate value.
Operating profit margin	The operating profit margin is the ratio of net profit, before financing charges and tax, to sales. The higher this ratio the more cash flows there are from each £1 of sale. So, if costs can be controlled more effectively, more cash will tend to flow from each £1 of sales and value will be enhanced.
Corporation tax rate	This clearly affects cash flows and value because, broadly, tax is levied directly on operating cash flows. Management's ability to affect the tax rate and the amount of tax paid by the business trends, at best, to be marginal. However, sometimes management can use tax avoidance measures to reduce tax.
Investment in non-current assets	Normally cash has to be invested in additional non-current assets in order to enhance shareholder value. Wherever managers can find ways of reducing the outlay on plant etc, without limiting the effectiveness of the business, this will tend to enhance shareholder value.
Investment in working capital	Nearly all business activities give rise to a need for working capital: inventories, receivables, payables and cash. Large amounts may be tied up in working capital. Steps that can be taken to reduce the amount of working capital required, for example to encourage trade receivables to pay more quickly, will bring cash flows forward and tend to generate value, as long as the benefits of receiving quicker payment outweigh the cost of achieving it.
Cost of capital	The cost of funds used to finance the activities of the business will typically be a major determinant of shareholder value. So, if the business can find alternative, cheaper, sources of long-term finance, value tends to be enhanced.
Life of projected cash flows	Clearly, the longer the life of any cash-generating activity, the greater is its potential to generate value.

8.4 How can SVA be used?

Where SVA is seen to be most useful is in highlighting the key drivers of value. This enables managers to set targets for achieving value-enhancing strategies in each area. It can help to create an environment where value enhancement is at the top of the agenda for managers in all areas of the business. In this way the primary financial objective of the business can be achieved. SVA can also be used to value a business (see Chapter 8).

8.5 Real options

One problem with NPV analysis is that it only considers cash flows related directly to the project. It is possible that a project with a negative NPV is accepted for 'strategic' reasons. This is because management accept that there are options associated with a particular project which outweigh the conventionally-calculated negative NPV.

Context example: Real options

Situation	Real option
Follow-on options A firm is considering investing in a project to manufacture microcomputers. The initial NPV is negative.	Launching this project would give a later opportunity to launch a second (and third and so on) version which could be highly profitable or could lose money. Launching the first version effectively gives the right to invest in later versions. The right to invest or buy is known as a call option.
Abandonment options A firm is considering investing in two projects, both having the same expected NPV. The first uses a highly-specialised machine with little resale value or alternative use. The second involves expenditure mainly on highly marketable land and buildings.	Both projects offer the right to abandon the project if things go wrong, by selling the assets. The value of the second option is much greater and could well be preferred by management. The right to sell is known as a put option. Some projects such as those in the natural resource industry (timber, mining etc) have inbuilt options to reduce capacity or suspend operations temporarily.
Timing options A firm has the development rights over a piece of land. The rights can be exercised any time over the next five years.	Projects where commencement can be delayed are often attractive. In a volatile market a project that can be delayed is like a call option with a long period of expiry. If the company can delay investment it can wait and see what happens to the market before investing or not (exercising the option or not). The longer the delay, the more valuable the option. The option to delay is only valuable if it offsets any loss from delaying; eg, delay might result in a competitor establishing a loyal customer base that
	makes it difficult for the company to enter the market later. Patents and other barriers to entry can offer some protection against this.

Situation	Real option
Growth options **New technology, deregulation etc, present uncertain growth opportunities for firms – investing could produce substantial losses.**	Choices may include: • Full investment and hope it pays off (high risk) • Wait and see, but competitors might take a lead • Acquire 'growth option' Growth options include: • Start with small capacity, expanding later if market conditions are good • Joint ventures and strategic alliances as entry strategies into emerging markets eg, China R&D avoiding 'wait and see' risk and, if prospects look poor, no full investment eg, pharmaceutical companies Follow-on options, noted above
Flexibility options **A power station could be constructed to generate electricity using only gas as the input fuel. Whilst this might be the cheapest option it lacks flexibility in the face of volatile gas prices.**	A more expensive station capable of using gas or coal or oil gives greater flexibility. This flexibility option has a value which must be included in the evaluation.

The above refers to options associated with investments – so called 'real' options. Chapters 9 and 10 will introduce how options to buy and sell currency, shares, bonds, etc, can be used to manage risks such as interest rates and exchange rates.

9 Investing overseas

Section overview

- Overseas investment carries additional risks, including political and cultural.
- The methods of financing overseas subsidiaries will depend on the length of investment period envisaged, also the local finance costs, taxation systems and restrictions on dividend remittances.

When deciding what types of country a company should enter (in terms of environmental factors, economic development, language used, cultural similarities and so on), the major criteria for this decision should be as follows.

- **Market attractiveness**. This concerns such indicators as GNP/head and forecast market demand.
- **Competitive advantage**. This is principally dependent on prior experience in similar markets and having a cultural understanding of customers and the market.
- **Risk**. This involves an analysis of political stability, the possibility of government intervention and similar external influences.

9.1 Political risks

Definition

Political risk: The risk that political action will affect the position and value of a company.

When a multinational company invests in another country eg, by setting up a subsidiary, it may face a political risk of action by that country's government which restricts the multinational's freedom.

If a government tries to prevent the exploitation of its country by multinationals, it may take various measures, including the following:

Quotas	Import quotas could be used to limit the quantities of goods that a subsidiary can buy from its parent company and import for resale in its domestic markets.
Tariffs	Import tariffs could make imports (such as from parent companies) more expensive and domestically-produced goods therefore more competitive.
Non-tariff barriers	Legal standards of safety or quality (non-tariff barriers) could be imposed on imported goods to prevent multinationals from selling goods through a subsidiary which have been banned as dangerous in other countries.
Restrictions	A government could restrict the ability of foreign companies to buy domestic companies, especially those that operate in politically sensitive industries such as defence contracting, communications, energy supply and so on.
Nationalisation	A government could nationalise foreign-owned companies and their assets (with or without compensation to the parent company).
Minimum shareholding	A government could insist on a minimum shareholding in companies by residents. This would force a multinational to offer some of the equity in a subsidiary to investors in the country where the subsidiary operates.

9.1.1 Assessment of political risk

There are a large number of 'macro factors' that can be taken into account when assessing political risk, for example:

- Government stability
- Political and business ethics
- Economic stability/inflation
- Degree of the country's international indebtedness
- Financial infrastructure
- Level of import restrictions
- Remittance restrictions
- Evidence of expropriation
- Existence of special taxes and regulations on overseas investors, or investment incentives

In addition, 'micro factors', factors only affecting the company or the industry in which it invests, may be more significant than macro factors, particularly in companies such as hi-tech organisations.

9.1.2 Dealing with political risks

There are various strategies that multinational companies can adopt to limit the effects of political risk.

Negotiations with host government	The aim of these negotiations is generally to obtain a concession agreement. This would cover matters such as the transfer of capital, remittances and products, access to local finance, government intervention and taxation, and transfer pricing.
Insurance	In the UK the Export Credits Guarantee Department (ECGD, also known as UK Export Finance) provides protection against various threats including nationalisation, currency conversion problems, war and revolution. See Chapter 10 where overseas trade is explored.
Production strategies	It may be necessary to strike a balance between contracting out to local sources (thus losing control) and producing directly (which increases the investment and hence increases the potential loss). Alternatively, it may be better to locate key parts of the production process or the distribution channels abroad. Control of patents is another possibility, since these can be enforced internationally.
Management structure	Possible methods include joint ventures or ceding control to local investors and obtaining profits by a management contract.

9.2 Cultural risk

(a) The following areas may be particularly important depending upon the location of the overseas investment:

(b) The cultures and practices of customers and consumers in individual markets

(c) The media and distribution systems in overseas markets

(d) The different ways of doing business in overseas markets

The degree to which national cultural differences matter for the product concerned (a great deal for some consumer products eg, washing machines where some countries prefer front-loading machines and others prefer top-loading machines, but less so for products such as gas turbines)

9.3 Factors influencing the choice of finance for an overseas subsidiary

(e) In determining how an overseas investment should be financed, the following considerations need to be made:

(f) The local finance costs, and any subsidies which may be available

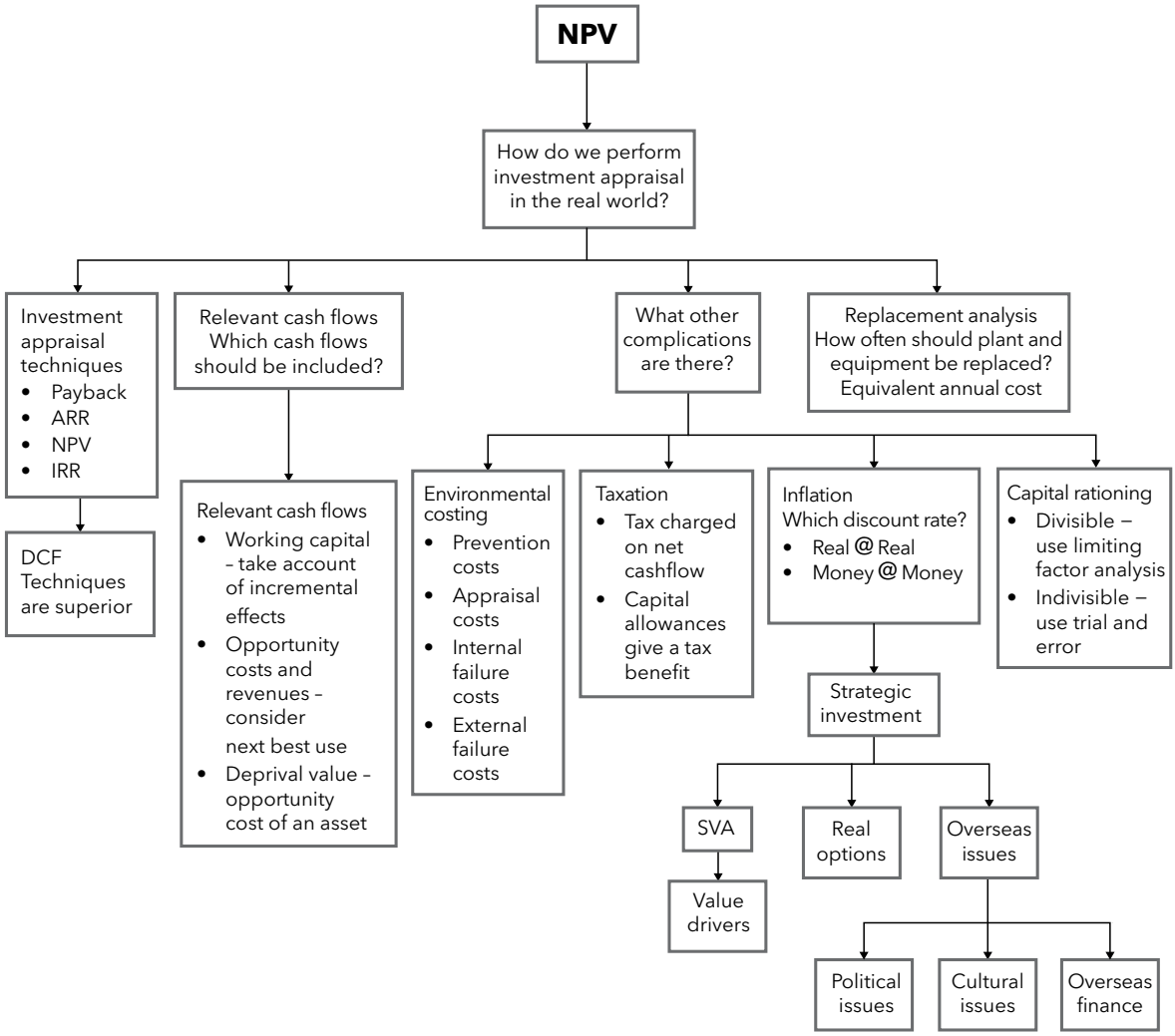
(g) Taxation systems of the countries in which the subsidiary is operating. Different tax rates can favour borrowing in high-tax regimes, and equity financing elsewhere. Tax-saving opportunities may be maximised by structuring the group and its subsidiaries in such a way as to take the best advantage of the different local tax systems.

(h) Any restrictions on dividend remittances

(i) The possibility of flexibility in repayments to the parent company, which may arise from the parent/subsidiary relationship

Access to capital. Obtaining capital from foreign markets may increase liquidity, lower costs and make it easier to maintain optimum gearing.

Summary


NPV
How do we perform investment appraisal in the real world?
Investment appraisal techniques
• Payback
• ARR
• NPV
• IRR
DCF Techniques are superior
Relevant cash flows Which cash flows should be included?
Relevant cash flows
• Working capital – take account of incremental effects
• Opportunity costs and revenues – consider next best use
• Deprival value – opportunity cost of an asset
What other complications are there?
Environmental costing
• Prevention costs
• Appraisal costs
• Internal failure costs
• External failure costs
Taxation
• Tax charged on net cashflow
• Capital allowances give a tax benefit
Inflation Which discount rate?
• Real @ Real
• Money @ Money
Strategic investment
SVA
Value drivers
Real options
Overseas issues
Political issues
Cultural issues
Overseas finance
Replacement analysis How often should plant and equipment be replaced? Equivalent annual cost
Capital rationing
• Divisible – use limiting factor analysis
• Indivisible – use trial and error

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Can you calculate the ARR? (Topic 1)
2.	Can you explain what a relevant cost is? (Topic 2)
3.	Can you calculate the tax relief generated by capital allowances? (Topic 3)
4.	Can you apply the money approach to NPV? (Topic 4)
5	What are the four types of environmental costs? (Topic 5)
6.	What is the name of the technique needed to identify the optimal replacement cycle? (Topic 6)
7.	When can the profitability index be used to assess capital rationing? (Topic 7)
8.	What are the seven drivers of SVA? (Topic 7)
9.	Can you explain four examples of political risk? (Topic 8)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
UGL Ltd	A comprehensive NPV question including tax and inflation.
Igloo plc	This is a good question to test your understanding of which projects to accept during a period of capital rationing.
Taleb Ltd	A good question covering the principals of asset replacement.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the relevant section in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Self-test questions

Answer the following questions.

1 Pretorius Ltd

Pretorius Ltd expects to have spare production capacity during the coming year and its directors are considering whether to undertake a contract for a fixed price of £100,000. Their objective is to maximise the net cash inflows to the company. Work on the new contract would have to start immediately and would take 48 weeks to complete. The company's cost accountant has submitted the following statement to the directors and advises rejection of the contract:

	£	£
Materials		
A (100 tonnes at £140 per tonne)	14,000	
B (130 tonnes at £50 per tonne)	6,500	
C (80 tonnes at £45 per tonne)	3,600	
		24,100
Labour		
4 employees at £300 each per week	62,400	
Supervisor (£17,000 plus overtime at £500)	17,500	
Overheads		
20% of total labour cost		15,980
Total cost		119,980
Mark up		
10% of total cost		11,998
		131,978
Contract price		100,000
Deficit		31,978

As a financial consultant to the company, you have made further enquiries regarding this contract and have ascertained the following information:

- 40 tonnes of material A are already in stock at an original cost of £100 per tonne. The current replacement cost of material A is £140 per tonne and existing stocks would realise £110 per tonne net of selling costs. There is no alternative use for material A within the company for the foreseeable future.
- The company has no stocks of material B, nor is it committed to buying any. The current purchase price of material B is £50 per tonne.
- The required quantity of material C was purchased last year at £45 per tonne. In its

present form it has no alternative use in the company. If the contract was not undertaken, material C could be sold at a price of £30 per tonne. However, the company would have to pay transportation costs of

£10 per tonne. Alternatively, material C could be used as a substitute for material D which is in regular use in the company. Material D currently costs £35 per tonne. In order to use material C as a substitute for material D, the company would have to pay conversion costs of £5 per tonne.

- Four skilled employees would be needed for the contract at a weekly wage of £300 each. Three of these could be transferred from other departments. However, this would require hiring three less skilled employees at a wage of £250 per week to fill the gaps created. The fourth would have to be specially recruited for the contract and would require one week of initial training (at a cost of £300) before the contract commenced. The company operates a 48-week working year but is also committed to paying full wages to all staff during their four weeks of annual holiday.
- The supervisor is a member of the permanent staff of the company and, if the contract were accepted, he would be required to work overtime costing £500.
- Overhead costs are currently allocated to contracts on the basis of 20% of total labour cost. If this contract is undertaken, it is envisaged that overhead costs will increase by £5,000 in the forthcoming year.
- The machine needed for the contract is seldom used and it has a book value of £5,000. It was previously decided to scrap it in the forthcoming year and the costs of dismantling it at any time are expected to absorb its sale proceeds. The production manager has pointed out that, over the forthcoming year, the company could use the machine for sub-contract work yielding net cash inflows of £4,000.
- It is company policy to apply a mark-up of 10% of total costs to all contracts.

Requirements

(a) Determine whether or not the directors of Pretorius Ltd should accept the contract.

You must show all calculations and also provide an explanation for your treatment of each item and state any assumptions made.

(13 marks)

(b) Discuss any other considerations that you think the directors should take into account when deciding whether or not to accept the contract.

(4 marks)

Total: 17 marks

2 Tinoco plc

In January 20X3 Tinoco plc gave the go-ahead to its research and development department to pursue work on a major new product line, code-named 'Product Z'. The cash expenditure to date on this development has totalled £200,000, consisting of £70,000 during 20X3 and £130,000 during 20X4. The work is now complete, resulting in a marketable product.

In order to market this product, the company will need to build and equip a new factory specifically for the purpose. A suitable site has been found which, if the company decides to go ahead with production, will be purchased on 1 January 20X5 at a cost of £270,000. Construction of the factory will then commence immediately and take an estimated two years at a total cost of £2.5 million. Half of this sum will be payable as a stage payment at the end of the first year of construction, the balance being payable on completion. Installation

of the necessary machinery can be done during the last two months of construction and will cost a total of £1,250,000. £250,000 of this will be paid upon delivery and the balance in two equal annual instalments on the anniversary of delivery.

The company intends to undertake a significant advertising campaign for this new product, which will commence 12 months before completion of the factory. During its first year this campaign will cost £150,000 and will then continue for the next two years at a cost of £250,000 and £100,000 respectively in each of those years. Payment will be made at the end of each of the three years. As a consequence of this campaign the company is forecasting an annual demand for Product Z of 400,000 units and expects this demand level to continue for 10 years after production commences. Initial production will commence immediately upon completion of the factory at an annual rate to match demand.

Production costs will consist of £4 per unit of variable costs and annual fixed costs of £300,000. After five years of production the equipment within the factory will need replacement. The old machinery will be sold for £250,000 and new equipment acquired at the same cost and on the same terms as the original equipment. This replacement can be achieved without disruption to production.

At the end of the 10-year production period the product will be abruptly discontinued, and the production facility will then be surplus to the company's requirements. It is expected that the

machinery can be sold at that time for £250,000 and that the factory and site will command a price of

£3 million.

Despite extensive market research during the last six months at a cost of £50,000 the company remains uncertain as to the price it will be able to charge for this new product. However, the sales director is currently suggesting a selling price of £7.50 per unit.

The company's discount rate is 15% per annum.

Requirements

(a) Calculate the net present value of the proposed new production, assuming the sales director's forecast selling price is correct.

(12 marks)

(b) Calculate the minimum selling price that must be set in order to make Product Z a viable proposition.

(3 marks)

(c) Tinoco plc has employed an environmental consultant to ensure that the project is undertaken in line with its sustainability policy. The consultant has estimated that the environmental appraisal costs associated with the project will be between £0.7 million and £1.1 million. The uncertainty over the total estimated costs is due to the fact that testing and inspection of the site revealed that the factory is being built near a rare bird sanctuary and therefore additional measures will be required to ensure the birds will remain protected.

Requirement

Discuss the benefits of understanding environmental costs and the impact of the environmental consultant's estimates on the NPV.

Total: 15 marks

3 Shaw Security Systems plc

Shaw Security Systems plc, a company financed by a mixture of equity and debt capital, manufactures devices which seek to deter the theft of motor vehicles. The company's development department has recently produced a new type of anti-theft device. This device, which will be known as an Apollo, will be fitted to private motor vehicles. The Apollo emits an electronic signal which can be picked up by an electronic sensor fitted to police cars, enabling the police to locate stolen cars and, possibly, apprehend the thief. Development costs totalled £500,000. These were all incurred in 20X5.

A decision now needs to be taken as to whether to go ahead with producing and marketing Apollos. This is to be based on the expected net present value of the relevant cash flows, discounted at the company's estimate of the 20X5 weighted average cost of capital of 8% (after tax). The company's management believes that a three-year planning horizon is appropriate for this decision, so it will be assumed that sales will not continue beyond 20X8.

Following discussions with a number of police forces, the company has reached agreement that, if it decides to go ahead with the project, one of the Midland forces will trial the Apollo system, and the sensors will be fitted to its police cars.

The cost of providing and fitting the sensors to the police cars would be borne by the company, which would retain ownership. The police force would bear the cost of maintenance. The sensors would be manufactured and fitted by a sub-contractor, who has offered to do this work by the end of 20X5 for a total cost of £1 million, payable immediately on completion of the work. This cost would attract the normal capital allowances for plant and equipment at 18% reducing balance. If the company were to make the investment, it would elect for the sensors to be treated as a short-life asset. At the end of three years the sensors would be scrapped.

The first sales of Apollos would be expected to be made during the year ending 31 December 20X6. There is uncertainty as to the level of sales which could be expected, so a market survey has been undertaken at a cost of £100,000.

The survey suggests that, at the company's target ex-works price of £200 per Apollo, there would be a 60% chance of selling 10,000 Apollos and a 40% chance of selling 12,000 during 20X6.

If the 20X6 sales were to be at the lower level, 20X7 sales would be either 8,000 Apollos (30% chance) or 10,000 (70% chance). If 20X6 sales were to be at the higher level, 20X7 sales would be estimated at 12,000 Apollos (50% chance) or 15,000 (50% chance).

20X8 sales would be expected to be 50% of whatever level of sales were to occur in 20X7.

Sales of Apollos would be expected to have an adverse effect on sales of the Mercury, a less sophisticated device produced by the company, to the extent that for every two Apollos sold one less Mercury would be sold. This effect would be expected to continue throughout the three years.

Materials and components would be bought in at a cost of £70 per Apollo. Manufacture of each Apollo would require three hours of labour. This labour would come from staff released by the lost Mercury production. To the extent that this would provide insufficient hours, staff would work overtime, paid at a premium of 50% over the basic pay of £6 an hour.

The Mercury has the following cost structure.

	£ per unit
Selling price (ex-works)	100
Materials	20
Labour (4 hours)	24
Fixed overheads (on a labour hour basis)	33

The management team currently employed by the company would be able to manage the Apollo project except that, should the project go ahead, four managers, who had accepted voluntary redundancy from the company, would be asked to stay until the end of 20X8. These managers were due to leave the company on 31 December 20X5 and to receive lump sums of £30,000 each at that time. They were also due to receive an annual fee of £8,000 each for consultancy work, which the company would require of them from time to time. If they were to agree to stay on, they would receive an annual salary of £20,000 each, to include the consultancy fee. They would also receive lump sums of £35,000 each on 31 December 20X8. It is envisaged that the managers would be able to fit any consultancy requirements round their work managing the Apollo project. These payments would all be borne by the company and would qualify for full tax relief.

Apollo production and sales would not be expected to give rise to any additional operating costs beyond those mentioned above.

Working capital to support both Apollo and Mercury production and sales would be expected to run at a rate of 15% of the ex-works sales value. The working capital would need to be in place by the beginning of each year concerned. There would be no tax effects from changes in the level of working capital.

The company's accounting year end is 31 December. Sales should be assumed to occur on the last day of the relevant year. The company's corporation tax rate is expected to be 17% throughout the planning period. Tax cash flows occur at the end of the accounting period to which they relate.

Requirements

(a) Prepare a schedule which derives the annual expected net cash flows from the Apollo project, and use it to assess the project on the basis of its expected net present value.

(18 marks)

(b) Comment on the assessment of the project made in requirement (a) and any reservations you have about using it as the basis for making a decision as to whether to proceed with the project.

(4 marks)

Note: Ignore inflation and work to the nearest £1,000.

Total: 22 marks

4 Fiordiligi plc

Fiordiligi plc is evaluating a potential new product, the ottavio, in which the following costs are involved.

(1) Labour

Each ottavio requires 1/2 hour of skilled labour and 2 hours of unskilled labour. During the next year Fiordiligi expects to have a surplus of skilled labour, retained on contracts under which the minimum wage is guaranteed. This surplus is sufficient to complete the budgeted quantity of ottavios in the first year, but there will be no surplus there after. All unskilled labour will be taken on as required.

The wage rates are £4.00 per hour for skilled labour and £2.50 per hour for unskilled.

(2) Overheads

(a) Variable overheads are expected to be incurred at the rate of £1.40 per skilled labour hour. This represents the extra cash cost expended.

(b) Fixed overheads will be affected by the project as follows.

- A new factory will be leased at an annual rental of £2,000 in advance for the life of the project.
- Rates on the factory (payable in arrears) will be £1,000 per annum.
- The equipment (see below) will be written down to its realisable value over the life of the project.
- The central management accounting department will absorb administration costs into production on the basis of £0.50 per unskilled labour hour. Direct administration of the project will be carried out by management without any increase in overtime or staffing levels.

(3) Materials

(a) Material 'Ping' is used in the ottavios, 2 kg per unit. No inventories of Ping are held by the company.

(b) Material 'Pang' is used at the rate of 0.5 kg per unit of ottavio. Sufficient of this material to meet the entire budgeted production is already in inventory; it has no other use.

(c) Material 'Pong' is also used; 1.5 kg are required per unit. Some inventories are already held; further supplies may readily be purchased. Pong is used in the manufacture of another product, the masetto, which earns a contribution of £0.85 per kilo of Pong, net of the cost of Pong, and depreciation at an estimated £0.06 per kilo.

The value of the various materials may be summarised as follows.

	Ping	Pang	Pong
	£	£	£
Cost of material in inventory (per kg)		2.00	0.70
Current replacement cost (per kg)	1.40	2.20	0.80
Current realisable value (per kg)	1.10	1.80	0.65

Any materials requiring purchase will be bought in advance of the year for which they are needed.

It is expected that ottavios will be produced for three years at the rate of 10,000 units per annum, and then for a further two years at the rate of 8,000 units per annum. The selling price will be £18 per unit in the first three years and £14 thereafter.

Special machinery will be purchased at the start of the project for £60,000. It will be sold at the end of the fifth year for £6,000.

Requirement

Calculate the net present value of the projected production of ottavios, and hence advise the directors whether or not to proceed. The company's cost of capital for investments of this nature is15%.

Note: Ignore taxation.

Total: 15 marks

5 Giovanni Ltd

Giovanni Ltd is considering investing in an ice cream plant to operate for the next four years. After that time the plant will be worn out, and Giovanni, the owner of the company, wishes to retire in any case. The plant will cost £5,000 and is expected to have no realisable value after four years. If worthwhile, the plant will be purchased at the end of an accounting period. Capital allowances at the rate of 18% per annum (reducing balance) will be available in respect of the expenditure.

Revenue from the plant will be £7,000 per annum for the first two years and £5,000 per annum thereafter. Incremental costs will be £4,000 per annum throughout.

You may assume that all cash flows occur at the end of the financial year to which they relate. Assume Giovanni Ltd pays corporation tax at 17% and has a cost of capital of 10%.

Requirements

(a) Calculate the tax saved through capital allowances and show when the savings arise.

(3 marks)

(b) Advise Giovanni Ltd on whether or not to proceed with investment in the ice cream plant.

(4 marks)

(c) Show what difference it would make if the plant were to be purchased and sold at the beginning of the accounting period. Comment on the wisdom of disposing of an asset on the first day of an accounting period.

(3 marks)

Total: 10 marks

6 Shareholder value

(a) The following statements appear in the objectives of two well-known UK public limited companies.

'We never confuse why we exist – to create the maximum possible returns to our shareholders.'

'In everything the company does, it is committed to creating wealth, always with integrity, for our employees, customers, suppliers and the community in which we operate.'

Requirement

Discuss these two different perspectives of the operation of a firm, and explain why they are not necessarily contradictory.

(b) The managing director of the first company believes that the best external measure of shareholder wealth maximisation is growth in earnings per share (EPS).

Requirement

(5 marks)

Critically evaluate this belief. Suggest three value drivers on which a business can focus, and why their management will increase shareholder wealth.

(6 marks)

Total: 11 marks

7 UGL Ltd

UGL Ltd (UGL) manufactures domestic solar panels and has a financial year end of 31 December. Its directors are now considering expanding UGL's scale of operations via an initiative called 'Project North'.

If 'Project North' is to proceed, then UGL would have to invest in new capital equipment which would cost £1.3 million and be purchased on 31 December 20X1. Because of the fast rate of technological change in the solar panel industry, UGL's directors estimate that 'Project North' would enjoy a three- year period of competitive advantage (20X2–20X4).

UGL has paid for market research which produced the following estimates for 'Project North':

Year to 31 December 20X2 (all figures expressed in December 20X1 prices)

Total sales	£2,200,000
Total variable costs	£1,200,000
Total fixed costs (including interest paid of £17,000)	£427,000
Increase in sales volume in 20X3 and 20X4	10% pa
Inflation rates:	
Sales prices	5% pa
All costs	8% pa
Working capital (to be in place at the start of each trading year)	10% of total sales
Trade-in value of capital equipment (in December 20X4 prices)	£600,000

Capital allowances

UGL's machinery and equipment attracts capital allowances, but is and will be excluded from the general pool. The equipment attracts 18% (reducing balance) capital allowances in the year of expenditure and in every subsequent year of ownership by the company, except the final year. In the final year, the difference between the machinery's written down value for tax purposes and its disposal proceeds will be either:

- treated by the company as an additional tax relief, if the disposal proceeds are less than the tax written down value; or
- be treated as a balancing charge to the company, if the disposal proceeds are more than the tax written down value.

Other information

- UGL uses a post-tax money weighted average cost of capital of 14%.
- UGL's directors would like to assume that the corporation tax rate will be 17% for the foreseeable future and tax will be payable in the same year as the cash flows to which it relates.
- Unless otherwise stated all cash flows occur at the end of the relevant trading year.

Requirements

(a) Calculate the net present value of the 'Project North' initiative at 31 December 20X1 and advise UGL's directors whether they should proceed with it.

(12 marks)

(b) Calculate the sensitivity of the decision in part (a) to changes in the estimated volume of sales. Candidates should ignore the impact of working capital in this calculation.

(5 marks)

(c) Advise UGL's directors whether the 'Project North' initiative should proceed if the trade-in value of the capital equipment at 31 December 20X4 were to be £100,000 (in December 20X4 prices).

(4 marks)

(d) Explain briefly your treatment of UGL's interest payments of £17,000 in part (a).

(2 marks)

(e) Explain Shareholder Value Analysis and identify the extent to which its principles are employed in making the decision in part (a).

(4 marks)

Total: 27 marks

8 Ainsdale plc

Ainsdale plc, an all equity company, manufactures a single product, an item of exercise equipment for use in the home. The company is considering moving one of its factories to a new site.

Moving to new premises would take place on 1 January 20X1. It would cause significant disruption to existing sales and production, and incur substantial initial costs. The new site would mean, however

that output would no longer be constrained by the size of the factory and hence, when there is sufficient demand, higher output and sales can be achieved.

If the move takes place the existing premises would be leased out indefinitely for an annual rental of £450,000 payable in advance commencing 1 January 20X1. Lease rentals would be subject to corporation tax.

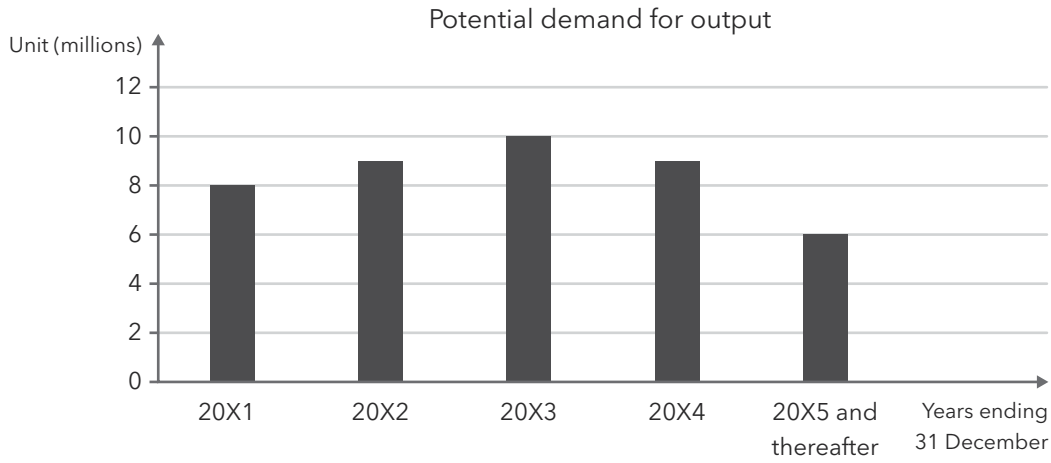
The cost of new premises would be £10 million payable on 1 January 20X1. Assume that the premises would not qualify for industrial buildings allowances.

Improved machinery for the new factory would be purchased at 31 December 20X0 at a cost of £1 million. This machinery would be expected to be sold on 31 December 20X4 for £300,000. The old machinery, which has a zero written down value, would need to be scrapped at 31 December 20X0 if the new factory is purchased but, due to its specialist nature, would not generate any proceeds. It would, however, continue to be used if the company were not to move to the new factory.

Machinery is subject to a 'short-life' asset election and excluded from the general pool (ignore re- pooling). This means that it attracts 18% (reducing balance) tax allowances in the year of its acquisition and in every subsequent year of its being owned by the company, except the last year. In the last year the difference between the machinery's written down value for tax purposes and its disposal proceeds will either be allowed to the company as an additional tax relief, if the disposal proceeds are less than the written down value, or be charged to the company if the disposal proceeds are more than the tax written down value.

The maximum production capacity of the new factory would normally be 10 million units per year and that of the existing factory is 6 million units per year. Due to setting-up time and disruption from moving, however, the capacity of the new factory in 20X1 would be only 5 million units. Potential demand for the company's output in the years ending 31 December is

estimated as follows:



Given that projected sales and output are equal for both factories in the year 20X5 and there after, no incremental manufacturing costs or revenues will arise from the move after 20X4.

Labour is employed under flexible contracts. It is thus estimated that labour costs will vary directly with output, being £1 per unit of output. This is the case at both the existing and the new factory.

Material quantities per unit of output and costs per kilo are as follows:

	Quantity kg	**Cost per kg £**
Material XM2	2	1.50
Material TS4	1	1.25

Material XM2 would only be available from an overseas supplier during 20X1 and 20X2, and this would lead to a transport cost on material purchases of £1.75 per kilo in addition to the basic £1.50 per kilo during those two years. From 20X3, however, it is expected that a UK supplier will be able to provide the material for £1.50 per kilo.

The selling price per unit is set to achieve a contribution of 40% of selling price. For this purpose, contribution is defined as selling price less labour and material costs. It excludes transport costs, training and redundancy costs.

If the company decides to move site, some employees are expected to refuse to move. This is expected to lead to redundancy payments of £200,000 which will be made on 1 January 20X1. Retraining costs of £100,000 will be incurred on 31 December 20X0 in respect of the replacement employees.

The corporation tax rate can be assumed to be 17%. Assume that tax is paid at the end of the accounting year in which the transaction occurs. There are expected to be sufficient taxable profits available to set off all allowances.

The annual after-tax cost of capital is 10%. The company prepares its accounts to 31 December each year. All cash flows can be assumed to arise at year ends unless otherwise specified.

Requirements

(a) Identify the annual net incremental cash flows that would arise from Ainsdale plc's decision to move the location of its factory and use them to calculate the net present value at 1 January 20X1.

(18 marks)

(b) Calculate the payback period in respect of the incremental cash flows which would arise from Ainsdale plc's decision to move the location of its factory.

Note: Ignore taxation.

(3 marks)

Total: 21 marks

9 Arcadian Products plc

The management of Arcadian Products plc is considering the introduction of a new product, code named NP14. The company's finance department has undertaken some investigations and has assembled the following information relating to NP14 production.

Annual contributions from NP14s are expected to be as follows:

Year	£m
20X1	2.5
20X2	3.5
20X3	3.5
20X4	2.5

Production and sales would be expected to cease at the end of 20X4. Sales and operating expenses are assumed to occur on the last day of the relevant year. The company's accounting year is to 31 December.

Production of NP14s would require the use of some new equipment.

This equipment could be bought and paid for at the end of 20X0 at a cost of £12 million. It would be scrapped at the end of 20X4 for an estimated £2 million. Under the contract to buy this equipment there would be an obligation for the supplier to maintain the equipment throughout its four-year life at no cost to the company.

Alternatively, production could use existing equipment already owned by the company. This equipment is currently not in use and would be sold on 31 December 20X0 for an estimated £3 million, were it not to be used in NP14 production. It was bought for £10 million and first used during 20W8. It would be expected to continue to operate effectively in the production of NP14s until the end of 20X4, when it would be expected to be scrapped (zero sales proceeds).

You should assume that all items of equipment are treated as 'short-life' assets and excluded from the 'pool'. This means that the equipment attracts a 18% (reducing balance) tax allowance in the year of acquisition and in every subsequent year of ownership by the company, except the last year. In the last year the difference between the equipment's written-down value for tax purposes and its disposal proceeds is expected to be treated as an additional relief, if the disposal proceeds are less

than the written-down value; or be charged to the company, if the disposal proceeds are more than the tax written-down value.

A problem with using the existing equipment is that it would require a relatively high level of maintenance to enable it to operate as effectively as the new equipment. The annual maintenance costs of the old equipment are estimated to be as follows.

Year	£m
20X1	0.5
20X2	1.5
20X3	2.0
20X4	2.5

- Labour for NP14 production, included in calculation of the contributions, would be hired for the duration of the production period.
- NP14 production would require the support of working capital equal to 10% of the contributions. This would need to be in place by the start of each year. It has no tax implications. The maintenance costs, were the existing plant to be used, would not give rise to any working capital requirement.
- The corporation tax rate is expected to be 17% for the foreseeable future. Assume that tax will be paid at the end of the year in which the event giving rise to it occurs.
- All operating cash flows are expected to increase by an annual factor of 3%, due to general inflation. Except for the expected disposal proceeds of the equipment, all of the financial information given above is expressed in terms of 1 January 20X1 prices.
- The company's real cost of capital, on all of its activities, is estimated at 10% per annum.
- There are no incremental costs or benefits other than those to which reference is made above.

Requirements

(a) Assuming that NP14 production and sales would be economically viable, produce a schedule of annual cash flows and use it to indicate whether the company should use the existing equipment or acquire new equipment.

(b) Taking account of the decision reached in (a), produce a schedule of annual cash flows and use it to indicate whether NP14 production would be economically viable.

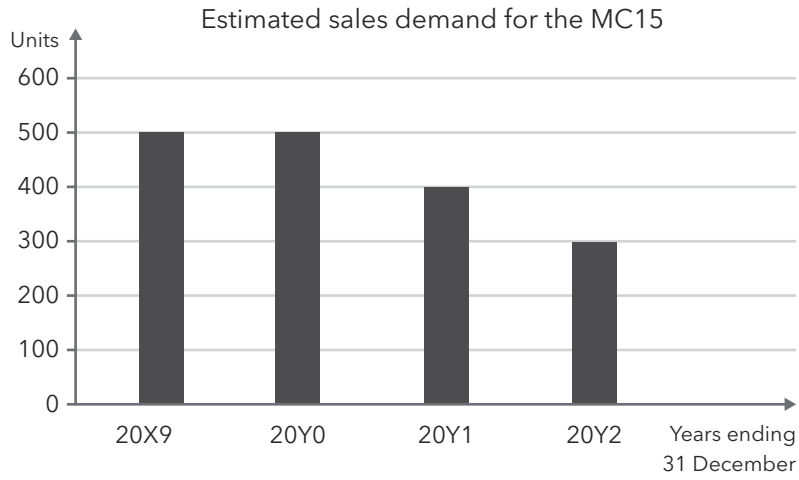
Note: Work to the nearest £'000.

Total: 8 marks

10 Juno Products plc

Juno Products plc leases a factory in North Wales where, among other products, it makes a component, known as the MC15, which is used in the manufacture of civil airliners and sold to aircraft manufacturers worldwide. The factory's lease expires on 31 December 20Y2, so the company intends to review the future of all of its production there in anticipation of that event. Meanwhile the immediate future of MC15 production is in doubt. Some members of the company's management team believe that recent developments in aircraft design have rendered the MC15 an uneconomic prospect for the company during the four years 1 January 20X9 to 31 December 20Y2. As a member of the company's finance staff you have been asked to make an assessment of the economic viability of the MC15 over the next four years on the basis of net present value. It seems fairly certain that, irrespective of the short-term future of the MC15, its manufacture will not be continued beyond 20Y2.

Estimated sales demand for the MC15 over the next four years ending 31 December at a unit selling price of £35,000 is as follows.



It is believed, however, that were a modification to be made to the design of the MC15, demand could be raised to 700 units in each of the first two years, but this modification would have no effect on demand for 20Y1 and 20Y2. The modification could be effected by 31 December 20X8. It would cost £8 million, payable on 31 December 20X8, and this amount would be fully allowable for corporation tax for the year in which this expenditure would be incurred.

The factory is leased for a fixed £6 million per annum payable annually in advance. The direct, variable manufacturing costs of each MC15 are as follows.

	£
Direct labour	4,000
Raw material and brought-in parts	7,000

The company generally operates a 'just-in-time' inventory holding policy, which means that the inventories of nearly all of the materials and parts are negligible. In the case of one bought-in part, however, there will be an inventory of 1,000 units at 1 January 20X9. This arose because, early in 20X8, the company was offered a special deal on this item provided that it was prepared to make a bulk purchase. This bought-in part is included in the raw material and bought-in parts total above at its normal price of £1,000 per unit. Each MC15 requires the use of one of these parts and this part can be used only in the manufacture of MC15s. The bulk purchase was made at a price of £800 per unit. If MC15 production were not to continue, the inventory could be sold for £600 per unit on 31 December 20X8 for immediate cash settlement. Any necessary tax adjustments resulting from this inventory can be ignored.

Ceasing MC15 production would release 25% of the factory space, but this could not be used for any other activity. The labour released could, however, be transferred to another department of the factory for work on another of the company's products. Demand for that product exceeds the ability of the company to meet it due to a shortage of labour, a shortage which would otherwise persist throughout the four years. For every £1's worth of labour transferred, it is estimated that a contribution (sales revenue less direct labour and materials) of £3 could be generated. The possible additional sales of MC15s during 20X9 and 20Y0, should the modification be undertaken, would not affect the output of the other product.

Plant, bought for £10 million on 1 January 20X7, is used in the manufacture of MC15s. It could be disposed of on 31 December 20X8 for an estimated £6 million. By 31 December 20Y2 it would be expected to have no market value. This plant was the subject of an election to be treated as a 'short- life asset' and excluded from the 'pool'. This means that it attracted 18% (reducing balance) tax allowances in the year of its acquisition and in every subsequent year of its being owned by the company, except the last year. In the last year the difference between the plant's written down value for tax purposes and its disposal proceeds will either be allowed to the company as an additional tax relief, if the disposal proceeds are less than the tax written down value, or be charged to the company if the disposal proceeds are more than the tax written down value.

It is estimated that overheads (excluding lease payments) apportioned to MC15 total £5 million per annum. Of this amount £2 million can be avoided by ceasing MC15 production.

The company's accounting year end is 31 December. The corporation tax rate is expected to be 17% throughout the period concerned. Tax can be assumed to be payable at the end of the year in which the event giving rise to it occurs.

There are no other incremental cash flows associated with MC15 production and sales.

All cash flows can be treated as occurring on the last day of the year to which they relate, unless specified otherwise.

The company uses its after-tax long-term borrowing rate of 5% per annum to assess projects, and you are expected to follow this approach.

Requirements

(a) Assuming that MC15 production and sales continue until 20Y2, assess whether it would be economically viable to pay for the modification to the design of the product.

(4 marks)

(b) Using the results from (a), prepare a statement which shows the annual relevant cash flows associated with a decision on whether on the basis of net present value to cease production ofMC15s at 31 December 20X8 or to continue production until 31 December 20Y2.

(11 marks)

(c) Discuss the suitability of using the long-term borrowing rate as the discount rate for project evaluation.

Note: Ignore inflation.

(3 marks)

Total: 18 marks

11 Rexal ltd

Rexal Ltd is a small company that specialises in the manufacture of pit-props and supports.

Management see the maximisation of shareholders' wealth as the primary business objective. The company is profitable and is able to utilise capital allowances obtained on new capital investment at the earliest opportunity. The directors have never felt comfortable with debt finance and as a consequence there is negligible long-term debt in the company's capital structure.

A local coal field has approached Rexal Ltd recently requesting the production of some special pit- props. After researching the contract, it emerged that there were two options available to the company.

These are outlined below.

Option 1

A new machine will be purchased for £80,000, payable on 1 January 20X1. The machinery will be sold for £8,000 on 31 December 20X3.

Any labour required under this option will have to be recruited. The net year-end operating cash inflows are budgeted as follows.

Year	£
20X1	60,000
20X2	74,000
20X3	88,000

These figures are stated in money terms and are before corporation tax.

Option 2

As an alternative to acquiring new equipment and extra labour, use could be made of existing resources.

A machine acquired many years ago for £120,000 could be used on this project. It was to be sold on 1 January 20X1 for £30,000. If used it is felt that its realisable value would be zero due to the three extra years of use. The current tax written down value of this asset is nil; all available capital allowances on this asset were taken as 100% first year allowances in its first year of use.

The net year-end operating cash inflows under option 2 are the same as for option 1, except for the following two factors.

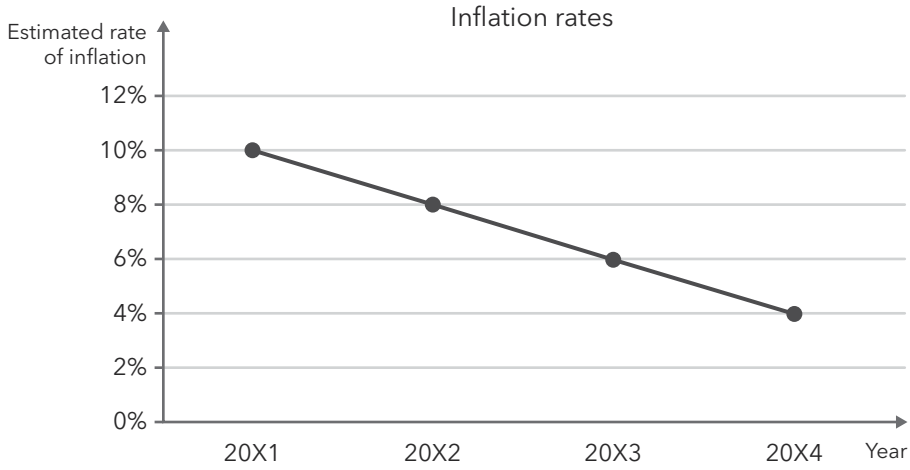
(1) Extra running costs of £5,000 in 20X1, which will rise in line with inflation thereafter, will be incurred due to using the old machinery.

(2) The labour used for option 2 will be moved from existing company operations. This will lead to a loss of contribution on such operations of £20,000, £22,000 and £23,500 in the three years respectively.

Working capital equal to 10% of that year's net cash inflows, excluding tax flows, will be required at the beginning of each year for both options. This will be released at the end of the project. There are no tax effects associated with movements in working capital. (In the case of option 2, net cash inflows should be taken as the values after adjustment for the machine and labour costs.)

The company's real cost of capital is estimated at 15% per annum and is expected to remain at that rate for the foreseeable future.

Inflation rates have been estimated for the next four years as follows:



The company's financial year runs to 31 December. Corporation tax is payable at 17%.

Requirements

(a) Calculate the net present values at 31 December 20X0 of each of the two options.

(15 marks)

(b) Indicate any reservations you might have in basing an investment decision on these figures.

(3 marks)

Total: 18 marks

12 Southsea plc

Southsea plc (Southsea) manufactures high specification stretchers for its sole customer, HealthTrans plc (HealthTrans), which supplies ambulances and ancillary products to the UK National Health Service and a range of private hospitals and firms.

HealthTrans is currently experiencing rapid growth in business levels. As a result, Southsea has recently been offered a new five-year contract with HealthTrans which will start on 1 January 20X2. Under this contract HealthTrans would guarantee to buy its entire stretcher requirements from Southsea, assuming that Southsea were able to supply all of its needs.

Demand from HealthTrans under the existing contract in the year ending 31 December 20X1 is expected to be 1,000 stretchers. However, HealthTrans forecasts that this demand will rise at a compound rate of 10% pa over the five years of the new contract.

At the present time Southsea has a production capacity of 1,050 stretchers pa, but the company is considering making an investment in production facilities that would see its annual capacity rise to 1,500 stretchers pa. However, the new contract with HealthTrans will go ahead, using existing production facilities, whether or not Southsea decides to increase its production capacity. In any one year, Southsea will only ever produce sufficient stretchers to meet that year's annual demand ie, it will not hold inventory.

In the year ending 31 December 20X1, the price per stretcher is £2,500, but the contract on offer contains a commitment from HealthTrans to accept an increase in this price over the period of the contract at the UK rate of inflation, which is expected to be 2% pa up to 31 December 20X4 and 3% pa thereafter.

The total cost of the component parts of each stretcher during the year ending 31 December 20X1 is £1,200. Due to the highly competitive nature of the market for these component parts, this cost will not be subject to annual inflation, but rather is expected to fall at a compound rate of 1% pa over the life of the contract due to the economies of scale that would arise from the increased levels of production.

Labour costs are also expected to be subject to efficiency gains which will be sufficient to cancel out the effect of any wage inflation. The cost of labour is therefore expected to remain constant over the life of the contract at £300 per stretcher.

Anticipated efficiency gains associated with the increased production levels also mean that the impact on working capital requirements and fixed costs will be negligible and can be ignored.

In order to achieve the proposed increase in production capacity, investment in production facilities of £2 million would be required and this would take place on 31 December 20X1. The new facilities would have an estimated useful life of five years at the end of which they are estimated to have no residual value.

The company's corporation tax rate is expected to be 17% for the foreseeable future, and it can be assumed that tax payments occur at the end of the accounting year to which they relate. The directors are also assuming that the new facilities will attract full capital allowances at 18% pa on a reducing balance basis commencing in the year of purchase and continuing throughout the company's ownership of the new facilities. A balancing charge or allowance will arise on disposal of the new facilities which can be assumed to be on 31 December 20X6. Sufficient profits are available for the firm to claim all such tax allowances in the year they arise.

The company's real after-tax cost of capital is 7% pa, and its accounting year end is 31 December. Assume that all annual operating cash flows arise at the year end.

As the relationship between Southsea and HealthTrans has developed, directors of both companies have increasingly considered the possibility of a merger between the two companies.

Requirements

(a) Calculate the net present value at 31 December 20X1 of the proposed investment in increased production facilities and, on the basis of your calculation, state whether or not Southsea should proceed.

(b) Identify and explain the type of real option that might be most relevant to Southsea's consideration of its investment decision.

(16 marks)

(c) Outline in general terms the potential advantages of a merger between Southsea and HealthTrans.

(3 marks)

Total: 22 marks

13 RFA Ltd

RFA Ltd (RFA), an all equity financed company, manufactures a limited range of sports equipment. Its financial year end is 31 March. RFA's board is considering replacing one of its machines (the RF13) which is employed in the manufacture of golf balls. It is estimated that the RF13 has two more years of production left, but the new machine (which, if purchased, would be known as the RF17) has an improved technical specification and could produce

a higher quality ball which, it is felt, would generate an increase in sales. The new machine would be bought at the end of the current financial year ie, 31 March 20X9 and would cost £1.7 million. Technological advancement in RFA's market is rapid and its board therefore has plans to use the new machine for a maximum of three years to 31

March 20Y2. The estimated sales figures (expressed in March 20X9 prices) from using the two machines are:

Year ended	Existing machine (RF13)	New machine (RF17)
	£'000	£'000
31 March 20Y0	620	1,150
31 March 20Y1	600	1,450
31 March 20Y2	0	1,320

Variable costs

The average variable costs of the two machines (as a percentage of sales revenue in 20X9 prices) are as follows:

	RF13 %	RF17 %
Raw materials	10	12
Other variable costs	25	18

Labour costs

RFA uses contractors to operate its machines. The cost is £150,000 per annum. If the RF17 is purchased annual savings of 12% will be made on these contracted labour costs. All of these costs are expressed in March 20X9 prices.

Estimated annual inflation rates (April 20X9 to March 20Y2)

	%
General (applies to RFA's sales and other variable costs above)	3
Raw materials	5
Contracted labour	2

Working capital

RFA's policy is that, at the start of each financial year, it has working capital in place that is equivalent to 10% (in money terms) of the estimated sales for that year. RFA assumes that all working capital is recoverable once the equipment is sold.

Capital allowances

RFA's machinery attracts capital allowances, but is/will be excluded from the general pool. The RF13 has a negligible tax written down value and it has a current resale value of £100,000. Its use would be discontinued as soon as the RF17 was purchased. RFA's board believes that the RF13 would have a resale value of £80,000 (in money terms) at 31 March 20Y1 and that the RF17 would have a resale value of £200,000 (in money terms) at 31 March 20Y2.

Assume that this means that the RF17 will attract 18% (reducing balance) tax allowances in the year of expenditure and in every subsequent year of ownership by the company, except the final year. In the final year, the difference between the machinery's written down value

for tax purposes and its disposal proceeds will be either be treated by the company as an additional tax relief, if the disposal proceeds are less than the tax written down value, or be treated as a balancing charge to the company, if the disposal proceeds are more than the tax written down value.

Corporation tax

RFA assumes that the tax rate will remain at 17% per annum and is payable in the same year as the cash flows to which it relates.

Cost of capital

RFA uses a money cost of capital of 11% per annum for appraising its investments.

Requirements

(a) Advise RFA's management whether it is beneficial, in net present value terms, to acquire the RF17 and dispose of the RF13.

(20 marks)

(b) Compare sensitivity analysis and expected values as methods of dealing with uncertainty.

(4 marks)

Total: 24 marks

14 Sticky Fingers plc

After paying £15,000 for a preliminary investigation, the costing department of Sticky Fingers plc was able to calculate the cash flows for the following investment projects.

	t_0 Immediate outlay	t_1	t_2	t_3	t_4
	£'000	**£'000**	**£'000**	**£'000**	**£'000**
Project A	(1,500)	(500)	1,200	600	300
Project B	(2,000)	(1,000)	2,500	2,500	2,500
Project C	(1,750)	500	1,100	1,400	1,000
Project D	(2,500)	700	900	1,300	300
Project E	(1,600)	(500)	200	2,800	2,300

Note: All cash flows take place at the end of the year.

You have only just taken up the appointment of financial analyst. The cash flows from the various projects, as shown above, have been given to you with a memorandum from the managing director outlining your first task.

Requirements

Advise the company in the following circumstances.

(a) The company's cost of capital has been calculated as 15%. Cash is freely available and all projects are independent and divisible. Prepare calculations showing which projects should be accepted.

(3 marks)

(b) The amount of cash available for investment at time 0 has been limited to £3 million. None of the projects can be delayed.

Which projects should be accepted?

(3 marks)

(c) The amount of cash available for investment at time 1 has been limited to £200,000. None of the projects can be delayed. There is now no rationing at time 0.

Which projects should be accepted?

(5 marks)

(d) The situation is as in part (b) except that now all projects are independent but indivisible, and

£3.5 million is available.

Which projects should now be accepted?

(2 marks)

Total: 13 marks

15 Igloo plc

Igloo plc has identified the following investment projects.

	Immediate outlay t_0	t_1	t_2
	£'000	**£'000**	**£'000**
Project A	(100)	(100)	303.6
Project B	(50)	(100)	218.9
Project C	(200)	100	107.8
Project D	(100)	(50)	309.1
Project E	(200)	(50)	345.4

Requirements

Advise in the following circumstances.

(a) The company faces a perfect capital market, where the appropriate discount rate is 10%. All projects are independent and divisible.

Which projects should the firm accept?

(2 marks)

(b) The company faces capital rationing at t_0. There is only £225,000 of finance available. None of the projects can be delayed.

Which projects should the firm accept?

(2 marks)

(c) The situation is as in part (b) above, except that you are now informed that projects A and B are mutually-exclusive.

Which projects should now be accepted?

(d) The solution is as in part (b) above, except that you are now told that all projects are independent but indivisible.

(2 marks)

Which projects should be accepted? What will be the maximum NPV available to the company?

(2 marks)

(e) All projects are independent and divisible. There is capital rationing at t_1 only. No project can be delayed or brought forward. There is only £150,000 of external finance available at t_1.

Which projects should be accepted?

(3 marks)

Total: 11 marks

16 Stan Beldark

Stan Beldark is a wholesaler of lightweight travelling aids. His company employs a large number of sales representatives, each of whom is supplied with a company car. Each sales representative travels approximately 40,000 miles per annum visiting customers. Stan wishes to continue his present policy of always buying new cars for the sales representatives but wonders whether the present policy of replacing the cars every three years is optimal. He believes that keeping the cars longer than three years would result in unacceptable unreliability and wishes to consider whether a replacement period of either one year or two years would be better than the present three-year period. The company's fleet of cars is due for replacement in the near future.

The cost of a new car, at current prices, is £5,500. Resale values of used cars, which have travelled similar mileages to those of Stan's firm, are £3,500 for a one-year-old car, £2,100 for a two-year-old car and £900 for a three-year-old car, all at current prices. Running costs at current prices, excluding depreciation, are as follows.

	Road fund licence and insurance	**Fuel, maintenance repairs, etc**
	£	**£**
During first year of car's life	300	3,000
During second year of car's life	300	3,500
During third year of car's life	300	4,300

Stan uses a discount rate of 10% when making such decisions.

Running costs and resale proceeds are paid or received on the last day of the year to which they relate. New cars acquired for use from the start of year 1 are purchased on the last day of the previous year.

Requirement

Prepare calculations for Stan Beldark showing whether he should replace the cars of sales representatives every one, two or three years.

Note: Ignore taxation.

Total: 7 marks

17 Taleb Ltd

Taleb Ltd is a manufacturing company which makes a wide range of products. One of these, the Bat, requires the use of a special Dot machine. The company's present policy is to replace each Dot machine at the end of its physical productive life of four years. The directors are now considering whether to replace the machine more frequently than once every four years in view of the fact that its productive capacity declines as it gets older and potential sales of Bats are lost. There is insufficient demand for the company's Bats to justify the purchase of a second Dot machine.

Taleb Ltd charges a selling price of £0.12 per Bat, at which price it is able to sell up to 500,000 per annum. Variable costs, excluding machine depreciation and running costs, amount to £0.04 per Bat. Details of productive capacities and running costs (including maintenance) of the Dot machine are as follows.

Year of machine's life	Productive capacity	Running costs
	Bats	£
First	500,000	6,000
Second	500,000	6,500
Third	400,000	7,500
Fourth	400,000	9,000

Annual running costs are independent of the number of Bats manufactured.

The directors wish to continue their present policy of always buying new Dot machines at a price of

£60,000 each. Resale values of Dot machines are £40,000 for one-year-old machines, £25,000 for two-year-old machines, £10,000 for three-year-old machines and zero for four-year-old machines. The company provides depreciation on all its non-current assets using the straight-line method.

All costs and revenues are paid or received in cash at the end of the year to which they relate, with the exception of the initial price of the Dot machine which is paid immediately on purchase. Taleb Ltd has an annual cost of capital of 10%.

Requirement

Prepare calculations for the directors of Taleb Ltd showing whether they should replace the Dot machine every one, two, three or four years.

Total: 10 marks

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

Answers to Interactive questions

Answer to Interactive question 1

1.1 Payback period for the project:

Time	Cumulative cash flow
	£
0	(500,000)
1	(430,000)
2	(360,000)
3	(280,000)
4	(180,000)
5	(80,000)
6	40,000

Payback = 5.67 years

1.2 Profit calculation:

	£
Total cash flows from operations	540,000
Total depreciation	(150,000)
Total profits	390,000
Average profits (÷6)	65,000 pa

Average investment calculation (500,000 + 350,000)/2 = £425,000 ARR = 65/425 = 15.3%

1.3 NPV @ 12%:

=NPV(0.12,C2:H2)

	A	B	C	D	E	F	G	H
1	Time period	0	1	2	3	4	5	6
2	Net cash flow (£)	(500,000)	70,000	70,000	80,000	100,000	100,000	470,000
3	PV of cash flows @12% T1-6	533,657						
4	Less outflow at T0	(500,000)						
5	NPV	33,657						

Traditionally, you may have calculated the NPV using discount factors taken from discount tables. This would give the same result and is illustrated below (there is a small rounding difference due to the discount tables). The remaining NPV workings throughout your learning materials will use the NPV spreadsheet function as this is what you will use in the exam.

Time		**Discount factor**	**PV**
	£'000	12%	£'000
0	(500)	1.000	(500.00)
1	70	0.893	62.51
2	70	0.797	55.79
3	80	0.712	56.96
4	100	0.636	63.60
5	100	0.567	56.70
6	470 (350 +120)	0.507	238.29
		NPV	33.85

1.4

=IRR(B2:H2)

	A	B	C	D	E	F	G	H
1	Time period	0	1	2	3	4	5	6
2	Net cash flow (£)	(500,000)	70,000	70,000	80,000	100,000	100,000	470,000
3	IRR	13.71%						

Traditionally, you may have calculated IRR using interpolation with two discount rates. This would give a similar result and is illustrated below (the interpolation method is less accurate). The remaining IRR workings throughout your learning materials will use the IRR spreadsheet function.

Time		Discount factor	PV
	£'000	15%	£'000
0	(500)	1.000	(500.00)
1	70	0.870	60.90
2	70	0.756	52.92
3	80	0.658	52.64
4	100	0.572	57.20
5	100	0.497	49.70
6	470	0.432	203.04
		NPV	(23.60)

At 15% NPV = (23.60)
At 12% NPV = 33.85

$$IRR = 12 + \frac{33.85}{(33.85 + 23.60)}(15-12) = 13.8\%$$

Answer to Interactive question 2

	Merits	Demerits	Rank
Payback period	Simple to understand, quick for initial screening of projects and considers risk (very crudely).	Unsophisticated, no account is taken of the time value of money and cash flows received/paid after payback are ignored.	Useful as an initial filtering device
Accounting rate of return	Use of profit consistent with ROCE and EPS, use of balance sheet values (asset backing) and relative score is easy to understand.	Not consistent with wealth maximisation; no account is taken of time value of money; investment decisions should be based on expected cash flows rather than accounting profits; percentage figure may give misleading advice when choosing between alternatives; profits can be manipulated.	Unlikely to be useful as a decision-making tool
Net present value	Take into account the time value of money; gives an absolute measure, allowing for comparison of projects; considers all cash flows of projects.	The need to estimate a cost of capital; difficulty in obtaining all relevant costs/benefits; assumes cash flows occur at annual intervals.	Technically superior technique
Internal rate of return	Takes into account the time value of money; represents a breakeven point so does not need an exact cost of capital; considers all cash flows of projects.	May conflict with NPV decision for mutually exclusive projects – a project may have a lower NPV than another but a higher IRR; assumes cash reinvested at IRR.	Easier to use and communicate practically

The above example emphasises the idea of progression – the techniques introduced at Certificate level will be applied here to solve real world problems.

Answer to Interactive question 3

	t_0	t_1	t_2	t_3	t_4
	£	£	£	£	£
Sales		100,000	110,000	121,000	133,100
Working capital required	15,000	16,500	18,150	19,965	0
Cash flow	(15,000)	(1,500)	(1,650)	(1,815)	19,965

Answer to Interactive question 4

Now the only alternative use for the material is to sell it for scrap. To use 50 tonnes on the contract is to give up the opportunity of selling it for 50 × £150 = £7,500. The relevant cost of the material is therefore this amount.

Answer to Interactive question 5

The relevant cost of 25 tonnes is £150 per tonne. The organisation must then purchase a further 25 tonnes and, assuming this is in the near future, it will cost £210 per tonne.

The relevant cost of materials is:

	£
25 tonnes @ £150	3,750
25 tonnes @ £210	5,250
	9,000

Answer to Interactive question 6

What revenue is lost if the labour is transferred to the project from doing nothing? Nothing. The relevant cost is zero.

Answer to Interactive question 7

Costs and revenues of proceeding with the project

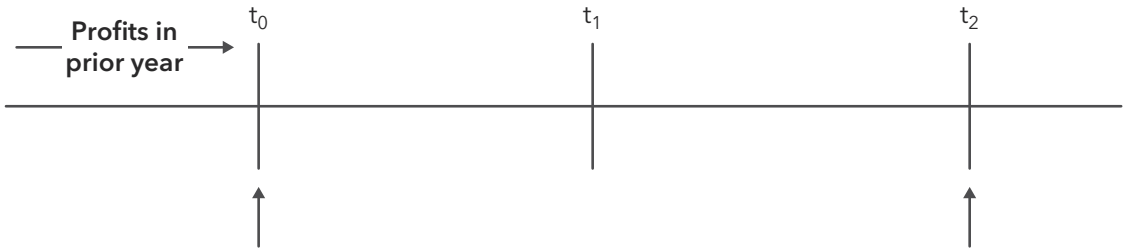
		£
(1)	Costs to date of £150,000 are sunk costs, therefore ignore.	0
(2)	Materials – purchase price of £60,000 is also sunk.	
	There is an opportunity benefit of the disposal costs saved.	5,000
(3)	Labour cost – the direct cost of £40,000 will be incurred regardless of whether the project is undertaken or not – and so is not relevant.	
	Opportunity cost of lost contribution = 150,000 – (100,000 – 40,000)	(90,000)
	The absorption of overheads is irrelevant – it is merely an apportionment of existing costs which do not change.	0
(4)	Research staff costs	
	Wages for the year	(60,000)
	Saving of redundancy pay	15,000
	Cost of redundancy pay	(35,000)
(5)	Equipment	
	Deprival value if used in the project = disposal value	(8,000)
	Disposal proceeds in one year	6,000
	(All book values and depreciation figures are irrelevant)	
(6)	General building services	
	Apportioned costs – irrelevant	0
	Opportunity costs of rental foregone	(7,000)
		(174,000)
	Sales value of project	300,000
		126,000
	Advice. Proceed with the project.	

Answer to Interactive question 8

The recoverable amount is the £900 NRV (which is higher than the £800 economic value). As this is lower than the £1,000 replacement cost, £900 is the deprival value.

Answer to Interactive question 9

	t_0	t_1	t_2
	£	£	£
Net trading revenue		5,000	5,000
Tax @ 17%		(850)	(850)
Asset	(10,000)		6,900
WDA (W)	306	251	(30)
Net cash flow	(9,694)	4,401	11,020



- Asset purchased 1 January 20X1 which is effectively (for discounting purposes) the same as 31 December 20X0 ie, t0
- First WDA will be set off against profits earned in year 1 (t0 → t1)
- First tax relief at t1
- Asset sold 31 December 20X2
- No WDA in year of sale – balancing adjustment instead

WORKING
WDA

		£	**Tax relief at 17%**	**Timing**
31 December 20X0	Investment in asset	10,000		
	WDA @18%	(1,800)	306	t_0
		8,200		
31 December 20X1	WDA @ 18%	(1,476)	251	t_1
		6,724		
31 December 20X2	Proceeds	6,900		
	Balancing charge*	(176)	(30)	t_2
	*Asset value dropped 10,000 – 6,900	3,100		
	*WDA claimed 1,800 + 1,476	(3,276)		

*Relief reclaimed ('clawed back')[176]

Answer to Interactive question 10

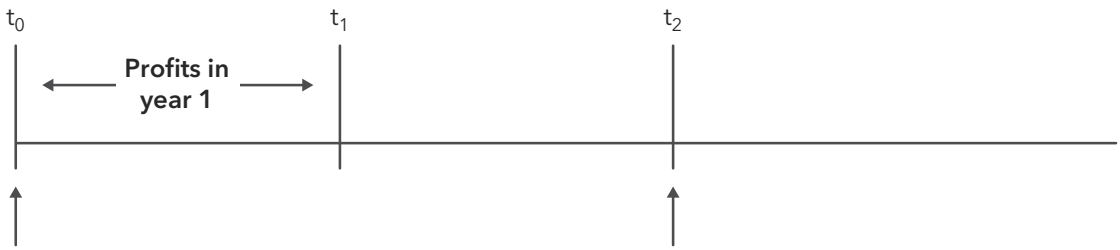
	t_0	t_1	t_2
	£	£	£
Net trading revenue		5,000	5,000
Tax @ 17%		(850)	(850)
Asset	(10,000)		
Scrap proceeds			6,900
Tax savings on WDAs (W)		306	221
Net cash flow	(10,000)	4,456	11,271

WORKING

Tax computation

t_2

t_0 t_1



- Asset purchased 1 January 20X1 which is effectively (for discounting purposes) the same as 31 December 20X0 ie, t_0
- First WDA will be set off against profits earned in year 1 ($t_0 \rightarrow t_1$)
- First tax relief at t_1
- Asset sold 31 December 20X2
- No WDA in year of sale
  – balancing adjustment instead

		£	Tax relief at 17%	Timing
1 January 20X1	Investment in asset	10,000		
31 December 20X1	WDA @18%	(1,800)	306	t_1
		8,200		
31 December 20X2	Proceeds	6,900		
	Balancing charge	(1,300)	221	t_2

Answer to Interactive question 11

=NPV(0.10,C5:E5)

	A	B	C	D	E
1		t_0	t_1	t_2	t_3
2		£	£	£	£
3	Invest	(10,000)			
4	Returns inflated at 7%		5,350	5,725	6,125
5	Net cash flow	(10,000)	5,350	5,725	6,125
6	PV of cash flows @10% T1–3	14,197			
7	Less outflow at T0	(10,000)			
8	NPV	4,197			

Answer to Interactive question 12

First

Calculate effective **rate**

(1 + m) = (1 + e)(1 + is)

1.1 = (1 + e)(1.08)

e = 0.019 (or 1.9%)

Second

Discount cash flow in perpetuity using the effective rate

PV = £10,000/0.019 = £526,316

Answer to Interactive question 13

The total estimated environmental costs of the project are £650,000. Assuming that they are incurred immediately (ie, time period 0) this would mean that the project NPV is reduced from £3.5 million to £2.85 million. Although the project would still generate a positive NPV, inclusion of environmental costs will reduce the NPV by almost 19%.

Answer to Interactive question 14

Replace after two **years**

=NPV(0.1,C5:D5)

	A	B	C	D
1	Cash flow	Time 0	Time 1	Time 2
2	Purchase	(20,000)		
3	Running costs		(5,000)	(5,500)
4	Scrap proceeds			13,000

	A	B	C	D
5	Net cash flow	(20,000)	(5,000)	7,500
6	PV of CF @10% T1–2	1,653		
7	Less outflow @T0	(20,000)		
8	NPV	18,347		

Annual equivalent = £18,347/$AF_{2\ year\ @\ 10\%}$ = £18,347/1.736 = £10,569

Replace after one year

=NPV(0.1,C5)

	A	B	C
1	Cash flow	Time 0	Time 1
2	Purchase	(20,000)	
3	Running costs		(5,000)
4	Scrap proceeds		16,000
5	Net cash flow	(20,000)	11,000
6	PV of CF @10% T1	10,000	
7	Less outflow @T0	(20,000)	
8	NPV	(10,000)	

Annual equivalent = £10,000/$AF_{1\ year\ @\ 10\%}$ = £10,000/0.909 = £11,001The machine should be replaced after two years because the cost is lower in NPV terms.

Answer to Interactive question 15

Project	NPV/outlay	Rank
A	100,000 ÷ 50,000 = 2	3
C	84,000 ÷ 10,000 = 8.4	1
D	45,000 ÷ 15,000 = 3	2

Project B is rejected because of its negative NPV. Plan:

	NPV	Funds
	£	£
Accept C	84,000	10,000
Accept D	45,000	15,000
		25,000
Accept 1/2 of A	50,000	25,000
	179,000	50,000 available

The solution assumes it is possible to accept half of project A ie, projects are perfectly divisible so that half the outlay gives half the NPV, etc.

Answer to Interactive question 16

Considering X, Y and Z independently:

Project	NPV/outlay	Rank
X	25,000/100,000 = 0.25	1
Y	11,000/50,000 = 0.22	2
Z	8,000/40,000 = 0.20	3

Project X using all £100,000 available, NPV £25,000 Considering X and Y + Z:

Project	NPV/outlay	Rank
X	25,000/100,000 = 0.25	2
Y + Z	(11,000 + 8,000 + 4,400)/(50,000 + 40,000) = 0.26	1

Plan:

	NPV	Funds
	£	£
Accept Y + Z	23,400	90,000
Accept one tenth of X	2,500	10,000
	25,900	100,000

Therefore, accept Y + Z + one tenth of X.

Answer to Interactive question 17

Traditional accounting-based measures of management effectiveness, like the return on capital employed ratio (ROCE) and the earnings per share value (EPS), have been criticised for not focusing sufficiently on what businesses ultimately seek to do, namely to generate wealth for their shareholders.

The problem with the accounting measures is that they tend to focus on sales and profit increases, not on value generation.

For example, it is always open to a business to increase its ROCE and EPS, at least in the short term, by taking on more risky activities. Such activities may well have the effect of reducing value.

The increasing emphasis on the wealth of the shareholders as a corporate goal, has led to the emergence of ideas like shareholder value analysis (SVA). SVA is based on the totally logical principle that the value of the business overall is equal to the sum of the present values (PVs) of all of its activities. The shareholders' financial stake in the business is the value of the business, less the value of its outstanding debt. Thus if the value of the PVs of the various activities of the business can be increased, this should mean greater value for shareholders, either to be paid out as dividends or reinvested in other projects that will, in turn, result in still more shareholder value.

Answers to Self-test questions

1 Pretorius Ltd

(a)

	£
Material A: 100 tonnes required	
40 @ resale value = 40 × £110	4,400
60 @ purchase cost = 60 × £140	8,400
The relevant cost of the 40 tonnes already in stock is its net realisable value.	6,500
The relevant cost of the 60 tonnes to be purchased is its current replacement cost.	
Material B: 130 tonnes required	
130 @ current purchase price = 130 × £50	
The relevant cost of the 130 tonnes is its current replacement cost.	
Material C: 80 tonnes required	2,400
Use as substitute for D = 80 × £30	
Disposal of the 80 tonnes would yield a net £20 per tonne, whilst use of the 80 tonnes as a substitute for material D would yield a net £30 per tonne.	
The latter would be the preferable option, so this is the opportunity cost of using it on this contract.	

Skilled labour

Replacement for 3 employees: × £250 × 52 weeks	39,000
New employee – 52 + 1 week training: 1 × £300 × 53 weeks	15,900
The incremental impact of recruiting three new employees is £250 per week per employee.	
The incremental impact of recruiting the fourth employee is £300 per week for 53 weeks.	

Supervisor

Assuming that they would be employed regardless, the only incremental cost in respect of the supervisor arising from undertaking this contact is their overtime.	500

Overheads (additional cost only)

The company's internal allocation of overheads is irrelevant. The only relevant cost is the incremental impact of the new contract.	5,000
Machine Sub-contract work (only the opportunity cost is relevant)	4,000
Total relevant cost	86,100

Contract price	100,000
Surplus	13,900

Profit margin – this is irrelevant and can be ignored in light of the stated objectives

of the directors.

Therefore, on the basis of the financial information available,the contract should be accepted as it will generate a cash surplus for the company of £13,900.

(b)

- Reliability of the data provided needs to be considered
- Availability of resources (both materials and labour – willingness to work overtime) Likelihood of meeting deadlines – impact of any potential penalties?
- Is machine sub-contract work readily available? Potential future business opportunities
- Possible consideration of the time value of money
- Possible impact of finance charges/tax/cash flows and liquidity (payment by instalments?) Possible impact on other projects or on competitiveness
- Credit worthiness of other party?

2 Tinoco plc

(a) NPV of new production

A number of the cashflows are given as annuities, therefore you need to use the discount tables provided in the exam to calculate the NPV. The NPV spreadsheet function cannot be used with annuity cashflows.

Time		Cash flow £	15% factor	Present value £
0	Cost of site	(270,000)	1	(270,000)
1	Factory, stage payment	(1,250,000)	0.870	(1,087,500)
2	Balance for factory	(1,250,000)	0.756	(945,000)
2	Deposit for machinery	(250,000)	0.756	(189,000)
3–4	Instalment on machinery	(500,000)	1.230	(615,000)
2	Advertising	(150,000)	0.756	(113,400)
3	Advertising	(250,000)	0.658	(164,500)
4	Advertising	(100,000)	0.572	(57,200)
3–12	Variable costs	(1,600,000)	3.795*	(6,072,000)
3–12	Fixed costs	(300,000)	3.795	(1,138,500)

7	Scrap proceeds	250,000	0.376	94,000
7	Deposit for new	(250,000)	0.376	(94,000)
8–9	Instalment on new	(500,000)	0.611	(305,500)
12	Scrap proceeds	250,000	0.187	46,750
12	Value of factory	3,000,000	0.187	561,000
				(10,349,850)
3–12	Sales revenue	3,000,000	3.795	11,385,000
	Positive net present value			1,035,150

* $DF_{1-12} - DF_{1-2} = 5.421 - 1.626$

(b) Minimum selling price

Product Z is viable provided the present value of sales revenue is at least £10,349,850. Annual sales revenue must be at least £10,349,850/3.795 = £2,727,233.

Selling price must be at least 2,727,233/400,000 = £6.82.

(c) The benefits of understanding environmental costs are:

(1) Environmental costs may be significant. Once identified, environmental costs can be controlled and reduced. For example, the consultant has estimated that the environmental appraisal costs of the project could be as high as £1.1 million, this is almost 40% of the forecast investment expenditure of the project.

(2) There is increasing worldwide regulation and a need for regulatory reporting of environmental costs.

(3) Ethical issues – businesses should be aware of how their production methods will affect the environment (eg, carbon emissions). The rare bird sanctuary is likely to be highly protected by the local community and Tinoco plc will need to make sure that is seen to protect the surrounding environment to avoid any negative press or boycott of their products.

(4) Improved brand image – 'green' ways of doing business can be a selling point.

(5) Associating environmental costs with individual products will lead to more accurate pricing and improved profitability.

The forecast NPV of the project is £1.035 million. If the environmental consultant's estimate is at the lower end of the scale (£0.7 million), the project will still return a positive NPV and should be accepted. However, if the costs are closer to £1.1 million, the NPV will be negative and the project will be rejected. There is a significant range of uncertainty (£0.4 million) over the total estimated costs and therefore it would be advisable to wait until the environmental consultant is able to provide a more accurate forecast before commencing the project.

3 Shaw Security Systems plc

(a) Investment appraisal schedule – Apollo project

=NPV(0.08,C14:E14)

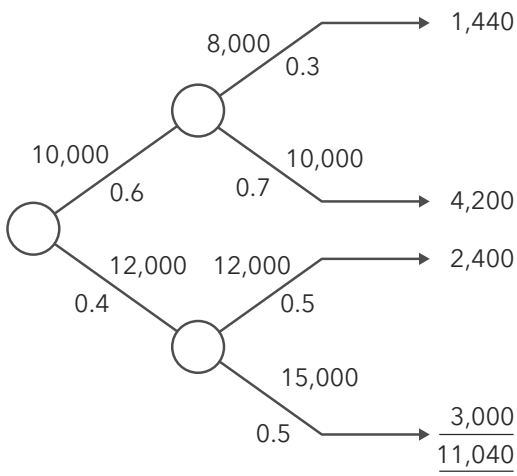
	A	B	C	D	E
1		t_0	t_1	t_2	t_3
2	Item	£'000	£'000	£'000	£'000
3	Sales revenue (W1)		2,160	2,208	1,104
4	Materials and components (W2)		(756)	(773)	(386)
5	Incremental labour costs (incl. overtime) (W3)		(97)	(99)	(50)
6	Management salaries (W4)		(48)	(48)	(48)
7	Lost contributions (W5)		(432)	(442)	(221)
8	Redundancy costs (W6)	120			(140)
9	Taxable cash flows	120	827	846	259
10	Tax (17%)	(20)	(141)	(144)	(44)
11	Production costs	(1,000)			
12	Working capital requirements (W7)	(243)	(5)	124	124
13	Tax saved on WDAs (W8)	31	25	21	94
14	Relevant cash flows	(1,112)	706	847	433
15	PV @8% T1–3	1,724			
16	Less outflow @ T0	(1,112)			
17	NPV	612			

NPV of project = £612,000WORKINGS

(1) Expected sales – units at £200

20X6 (0.6 × 10,000) + (0.4 × 12,000): 10,800 units

20X7 Expected sales (units)



20X8 11,040 × 50%: 5,520 units

(2) Materials and components

	£'000
t_1 10,800 × £70	756

t_2 11,040 × £70	773
t_3 5,520 × £70	386

(3) Incremental labour costs and overtime

	Labour hours required by Apollo		Labour hours released by Mercury Overtime		hours required by Apollo
20X6	(10,800 × 3)	32,400	(5,400 × 4)	21,600	10,800
20X7	(11,040 × 3)	33,120	(5,520 × 4)	22,080	11,040
20X8	(5,520 × 3)	16,560	(2,760 × 4)	11,040	5,520

Therefore, incremental labour costs:

		£'000
20X6	10,800 × £9*	97
20X7	11,040 × £9	99
20X8	5,520 × £9	50

*(£6 × 150%)

(4) Management salaries

£(20,000 – 8,000*) = £12,000 × 4 = £48,000 pa

* Consultancy fees saved/avoided as result of project.

(5) Lost contribution from lost Mercury sales

	Sales lost		Gross * CPU	£'000
20X6	5,400	×	£80 =	(432)
20X7	5,520	×	£80 =	(442)
20X8	2,760	×	£ 80 =	(221)

* Direct labour costs treated as a 'fixed' cost, since they will be paid whether or not Apollo is produced. Therefore, effect on cash flow of lost Mercury sale is (100 – 20) = £80 per unit.

(6) Redundancy costs

t_0 £120,000 saved at t_0 if Apollo is produced

t_3 £140,000 incurred at t_3 if Apollo is produced.

(7) Working capital requirements

* WDA of 18% assumed.

** Figures to nearest £1,000 as required by question.

*** Payment on £1m occurs at end of accounting period (ie, 20X5); therefore, first WDA occurs at t_0.

(b) Comments on the Apollo proposal

Based on the above cash flow projections, the project should be accepted as it has a positive NPV.

Reservations in connection with this recommendation

- Demand for Apollo is subject to great uncertainty. Sensitivity analysis could be carried out to see how responsive the project's NPV is to fluctuations in the expected sales volume.
- The project's sales are subject to uncertainty; consequently, the Apollo project is risky and should be appraised using a discount rate reflecting this level of risk. The company's current WACC is therefore highly unlikely to be appropriate. Moreover, a suitably risk-adjusted discount rate may result in the project having a negative NPV.
- How reliable are the estimates of costs? For example, Apollo sales may affect sales of the Mercury more severely than anticipated.
- The attitude to risk of the directors/shareholders needs to be considered. Despite having a positive NPV the project may be considered too risky and hence be rejected.
- Have all costs associated with the project been identified and quantified? (Note that the project has been appraised with reference to relevant costs only – sunk costs eg, development and marketing costs, have been ignored.)

4 Fiordiligi plc

=NPV(0.15, D27:H27)

	A	B	C	D	E	F	G	H
1			t_0	t_1	t_2	t_3	t_4	t_5
2			£'000	£'000	£'000	£'000	£'000	£'000
3	Labour							
4	Skilled	10,000 × 0.5 × Nil						
5		10,000 × 0.5 × £4.00			20.0	20.0		
6		8,000 × 0.5 × £4.00					16.0	16.0
7	Unskilled	10,000 × 2 × £2.50		50.0	50.0	50.0		
8		8,000 × 2 × £2.50					40.0	40.0
9	Materials							
10	Ping	10,000 × 2 × £1.40	28.0	28.0	28.0			
11		8,000 × 2 × £1.40				22.4	22.4	
12	Pang	46,000 × 0.5 × £1.80	41.4					
13	Pong	10,000 × 1.5 × £0.80	12.0	12.0	12.0			

	A	B	C	D	E	F	G	H
14		8,000 × 1.5 × £0.80				9.6	9.6	
15	Overheads							
16	Variable	10,000 × 0.5 × £1.40		7.0	7.0	7.0		
17		8,000 × 0.5 × £1.40					5.6	5.6
18	Fixed	Rent	2.0	2.0	2.0	2.0	2.0	
19		Rates		1.0	1.0	1.0	1.0	1.0
20			83.4	100.0	120.0	112.0	96.6	62.6
21	Revenue							
22		10,000 × £18		180.0	180.0	180.0		
23		8,000 × £14					112.0	112.0
24	Costs (as above)		(83.4)	(100.0)	(120.0)	(112.0)	(96.6)	(62.6)
25	Purchase of plant		(60.0)					
26	Resale							6.0
27	Net cash flow		(143.4)	80.0	60.0	68.0	15.4	55.4
28	PV @15% T1–5		196					
29	Less outflow @T0		(143.4)					
30	NPV		52.6					

NPV = +£52,600Therefore, accept.

5 Giovanni Ltd

(a) Capital allowances

	A	B	C	D	E	F
1	Cash flows	t_0	t_1	t_2	t_3	t_4
2		£	£	£	£	£
3	Purchase of machine	(5,000)				
4	Tax saved through WDAs	153	125	103	84	384
5	Net revenues		3,000	3,000	1,000	1,000
6	Tax on net revenues		(510)	(510)	(170)	(170)
7	Net cash flow	(4,847)	2,615	2,593	914	1,214
8	PV@10% T1–4	6,036				
9	Less outlay @T0	(4,847)				
10	NPV	1,189				

NPV = +£1,189 Therefore, accept the project.

(c) Different timing of initial purchase

PV of tax savings as shown above.

	£
£153 + £125 × 0.909 + £103 × 0.826 + £84 × 0.751 + £384 × 0.683	677
Hence PV if delayed by one year £677 × 0.909	615
Difference	62

Hence, new NPV = £(1,189–62)

- = £1,127 ie, project still worthwhile.

Wisdom

- Fine if there is a balancing charge (delay it!)
- Not so if there is a balancing allowance

6 Shareholder value

(a) Business decisions

The first statement supports the view that the governing objective of a business should be to maximise shareholder value. A classic view in corporate finance, this belief has gained much recent exposure with the rise of shareholder value analysis (SVA) as a business tool. SVA suggests that all business activities, including strategic decisions and performance evaluation, should be managed with the objective of maximising the present value of the firm.

The second statement suggests that a business has a wider duty of care to a group of stakeholders who have an interest in the business. These needs should be balanced, rather than maximising the needs of a single group such as shareholders.

Certain authors have suggested that these views of business lie at opposite ends of the spectrum. This view arises from the belief that stakeholder needs conflict, and maximising one group will by necessity mean that other groups will suffer. This view is supported by high profile cases such as that of Rail track, which was accused of abandoning customer safety in the pursuit of shareholder value.

It is true that companies have in the past made short-term, uneconomical decisions in an attempt to enhance share price that have resulted in other stakeholder groups suffering. Cost-cutting and employee downsizing decisions would be examples.

However, and as long as the long-term effects of business decisions are considered, the picture changes. Companies that consistently destroy shareholder value will find themselves starved of capital as their investors move elsewhere. Without capital they will not be able to invest in the future of their customers, employees, etc, and these groups will suffer. To deliver value to these stakeholders, long-term value will need to be delivered also to shareholders.

(b) Shareholder value analysis

Shareholders value the future cash returns that their investments will generate, and will also be concerned with the level of risk inherent in those investments.

The discounted cash flow (DCF) model is consistent with this type of value. It focuses on future cash flows and, by discounting them at an appropriate rate, it takes into account the investors' view of risk.

- Many people believe that growth in earnings per share (EPS) is the best external measure to track shareholder value creation. This is not necessarily the case, for the following reasons:
- Profit is not necessarily the same as cash flow, and cannot be 'spent' by investors.
- Profit can be manipulated by use of different accounting policies.
- EPS is historic focused, sunk as far as investors are concerned.

  EPS growth does not incorporate an adequate risk hurdle. Value is created if businesses earn more than the cost of equity. The only hurdle to be overcome before positive profit is obtained is the debt bill.

The SVA approach to business focuses on identifying 'value drivers' which, if managed correctly, can increase the PV of the firm and therefore increase shareholder value.

(1) These drivers are as follows (choose three from seven):

(2) Sales growth rate – increasing the growth rate should generate larger future cash inflows which could translate into greater value.

(3) Operating profit margin – increasing this, perhaps via better cost control, will generate more net cash flow from each extra sale.

(4) Investment in non-current assets – if this outlay can be reduced without limiting effectiveness, cash will be saved and value added.

(5) Investment in working capital – reducing working capital releases cash back into the business. If this can be done without compromising effectiveness, value will be added.

(6) Cost of capital – reducing the cost of capital, perhaps via use of debt finance, will increase the PV of the cash flow stream and therefore value.

(7) Life of projected cash flows – if the life of a potential cash flow stream can be extended (eg, via patent protection), the larger its potential to generate value.

Corporation tax rate – a lower tax rate will leave more cash available for the business. However, management's ability to affect the tax rate may be limited.

7 UGL Ltd

(a)

=NPV(0.14,C10:E10)

	A	B	C	D	E
1		**20X1**	**20X2**	**20X3**	**20X4**
2		£	£	£	£
3	Capital equipment cost	(1,300,000)			600,000
4	Tax saved on equipment (W1)	39,780	32,620	26,748	19,852
5	Sales (W2)		2,310,000	2,668,050	3,081,598
6	Variable costs (W3)		(1,296,000)	(1,539,648)	(1,829,102)
7	Fixed costs (W4)		(442,800)	(478,224)	(516,482)
8	Taxation on extra profit (W5)		(97,104)	(110,530)	(125,122)

	A	B	C	D	E
9	Working capital (W6)	(231,000)	(35,805)	(41,355)	308,160
10	Total cash flows	(1,491,220)	470,911	525,041	1,538,904
11	PV @14% T1–3	1,855,798			
12	Less outflow @T0	(1,491,220)			
13	NPV	364,578			

The NPV is positive and so UGL's management should proceed with the proposed investment as it will enhance shareholder value.

WORKINGS

(1) Tax saved on equipment

	20X1	20X2	20X3	20X4
	£	£	£	£
WDV b/f	1,300,000	1,066,000	874,120	716,778
WDA @ 18%	(234,000)	(191,880)	(157,342)	(116,778)
WDV c/f	1,066,000	874,120	716,778	600,000
Tax saving @ 17%	39,780	32,620	26,748	19,852

(2) Sales

		20X1	20X2	20X3	20X4
		£	£	£	£
Sales	£2,200,000 × 1.05	2,310,000			
£2,310,000 × 1.05 × 1.10				2,668,050	
£2,688,050 × 1.05 × 1.10					3,081,598

(3) Variable costs

		20X1	20X2	20X3	20X4
		£	£	£	£
VCs	£1,200,000 × 1.08	1,296,000			
£1,296,000 × 1.08 × 1.10				1,539,648	
£1,539,648 × 1.08 × 1.10					1,829,102

(4) Fixed costs

		20X1	20X2	20X3	20X4
		£	£	£	£
FCs	(£427,000 – £17,000) × 1.08	442,800			
£442,800 × 1.08				478,224	
£478,224 × 1.08					516,482

(5) Taxation on profit

	20X1 £	20X2 £	20X3 £	20X4 £
Sales (W2)		2,310,000	2,668,050	3,081,598
VCs (W3)		(1,296,000)	(1,539,648)	(1,829,102)
FCs (W4)		(442,800)	(478,224)	(516,482)
Extra profit		571,200	650,178	736,014
Tax on extra profit @ 17%		97,104	110,530	125,122

(6) Working capital

Total	20X1 £	20X2 £	20X3 £	20X4 £
£2,310,000 × 10%	231,000			
£2,668,050 × 10%		266,805		
£3,081,598 × 10%			308,160	
Change in working capital	(231,000)	(35,805)	(41,355)	308,160

(b)

=NPV(0.14,B7:D7)

	A	B	C	D
1		20X2	20X3	20X4
2		£	£	£
3	Sales	2,310,000	2,668,050	3,081,598
4	Variable costs	(1,296,000)	(1,539,648)	(1,829,102)
5	Contribution	1,014,000	1,128,402	1,252,496
6	Less taxation	(172,380)	(191,828)	(212,924)
7	Net cash flow	841,620	936,574	1,039,572
8	PV @14%	2,160,608		

Sensitivity of sales volume is £364,578/£2,160,608 = 17.0%.

So, ignoring the impact on working capital, if sales volumes are 17% lower than estimated, the NPV will be negative and UGL should not proceed with the investment.

(c) Impact of scrap value of £100,000

	£
Loss of scrap value	(500,000)
Increase in balancing allowance (£500,000 × 17%)	85,000
Net decrease in cash flow (Y3)	(415,000)
PV of loss of cash flow in 20X4 (£415,000 × 0.675)	280,125

Thus the NPV of the proposed scheme would decrease by £280,125 and this means that the amended NPV would be £364,578 – £280,125 = £84,453 – so a more marginal decision for the UGL directors.

(d) The process of discounting takes account of the time value of money eg, interest paid on funds borrowed. Thus the interest payments will be dealt with as part of the WACC and so, to avoid double counting, it is necessary to ignore specific interest payments.

(e) Shareholder Value Analysis (SVA) concentrates on a company's ability to generate value and thereby increase shareholder wealth. SVA is based on the premise that the value of a business is equal to the sum of the present values of all of its activities. SVA posits that a business has seven value drivers:

(1) Life of projected cash flows

(2) Sales growth rate

(3) Operating profit margin

(4) Corporate tax rate

(5) Investment in non-current assets

(6) Investment in working capital

(7) Cost of capital

The value of the business is calculated from the cash flows generated by drivers 1–6 which are then discounted at the company's cost of capital (driver 7).

In the case of UGL, all of the seven SVA value drivers are relevant and are used in the calculation. UGL's (three-year) strategy of expanding its solar panel market will increase the value of the firm.

8 Ainsdale plc

(a) Incremental NPV of moving the factory Existing premises

Lease = 450,000 + (450,000/0.1) = 4,950,000

After tax = 4,950,000 – [(4,950,000 × 0.17)/1.1] = £4,185,000

New premises Cash flows

=NPV(0.1, C12:F12)

	A	B	C	D	E	F
1	At 31 December	20X0	20X1	20X2	20X3	20X4
2		£	£	£	£	£
3	Premises	(10,000)				
4	Machinery	(1,000)				300
5	Labour (W1)		1,000	(3,000)	(4,000)	(3,000)
6	Materials (W2)		7,750	(23,250)	(17,000)	(12,750)
7	Sales (W3)		(8,750)	26,250	35,000	26,250
8	Redundancies	(200)				
9	Retraining	(100)				

	A	B	C	D	E	F
10	Tax (W4)	17	34	–	(2,380)	(1,785)
11	Capital allowances (W5)	31	25	21	17	26
12	Net cash flow	(11,252)	59	21	11,637	9,041
13	PV@ 10% T1–4	14,989				
14	Less outflow @T0	(11,252)				

Total NPV = £3,737,000
Overall NPV

	£'000
NPV of lease	4,185
Per DCF statement	3,737
	7,922

(1) WORKINGS

	New factory	Old factory	Incremental	Unit labour cost	Labour cost
	000 units	000 units	000 units	£	£'000
20X1	5,000	6,000	(1,000)	1.00	(1,000)
20X2	9,000	6,000	3,000	1.00	3,000
20X3	10,000	6,000	4,000	1.00	4,000
20X4	9,000	6,000	3,000	1.00	3,000

After 20X4 the sales are equivalent, so no incremental costs arise.

(2) Material costs

	New factory	Old factory	Incremental	Unit labour cost	Labour cost
	000 units	000 units	000 units	£	£'000
20X1	5,000	6,000	(1,000)	7.75	(7,750)
20X2	9,000	6,000	3,000	7.75	23,250
20X3	10,000	6,000	4,000	4.25	17,000
20X4	9,000	6,000	3,000	4.25	12,750

After 20X4 the sales are equivalent, so no incremental costs arise.

(3) Sales

40% margin on sales is equivalent to a 66.67% mark-up on cost.

	Unit material cost	Material cost	Labour cost	Total cost	Margin (66.7%)	Sales
	£	£'000	£'000	£'000	£'000	£'000
20X1	4.25	(4,250)	(1,000)	(5,250)	(3,500)	(8,750)
20X2	4.25	12,750	3,000	15,750	10,500	26,250
20X3	4.25	17,000	4,000	21,000	14,000	35,000
20X4	4.25	12,750	3,000	15,750	10,500	26,250

(4) Corporation tax

	20X0	20X1	20X2	20X3	20X4
	£	£	£	£	£
Labour		1,000	(3,000)	(4,000)	(3,000)
Materials		7,750	(23,250)	(17,000)	(12,750)
Sales		(8,750)	26,250	35,000	26,250
Redundancies/training	(100)	(200)			
Taxable profit			0	14,000	10,500
Tax payable (excl CAs)			0	(2,380)	(1,785)

(5) Capital allowances

If move premises:

Year		WDA	Tax @ 17%
	£'000	£'000	£'000
20X0	1,000	180	31
20X1	820	148	25
20X2	672	121	21
20X3	551	99	17
20X4	452		
Proceeds	(300)		
Balancing allowance	152	152	26

(b) Calculation of the payback period

	20X0	20X1	20X2	20X3	20X4	20X5
	£'000	£'000	£'000	£'000	£'000	£'000
Cash flows	(11,252)	59	21	11,637	9,041	
Lease	450	450	450	450	450	450
Lease tax	0	(77)	(77)	(77)	(77)	(77)
	(10,802)	432	394	12,010	9,414	373

Thus the payback period is three years (assuming year end cash flows).

Tutorial Note

The likelihood of producing precisely the correct answer for requirement (a) is low, because there are many opportunities to make errors, major and minor. There are however plenty of easy marks in this question and you should be able to earn them. Requirement (a). Make sure you approach the requirement in a logical and methodical way, as this will help build up a good total of marks. A common pitfall in this question relates to the lease of the old premises. This is perpetual, yet it is often treated as if it only lasts as long as there are incremental operating cash flows from the move. Another common though more minor error relates to the tax payment timing. The question made clear that tax should be assumed to be paid at the end of the year to which it relates so be careful not to lag the payment a year.

9 Arcadian Products plc

(a)
=NPV(0.133,C10:F10)

	A	B	C	D	E	F
1	**Year**	**20X0**	**20X1**	**20X2**	**20X3**	**20X4**
2		£'000	£'000	£'000	£'000	£'000
3	New plant	(12,000)				2,000
4	CAs (W3)	367	301	247	202	582
5	Old plant	3,000				
6	CAs (W3)	633				
7		(206)	(169)	(138)	(113)	(517)
8	Maintenance cost (money terms (W1)		515	1,591	2,185	2,814
9	Tax thereon		(88)	(270)	(371)	(478)
10	Net cash flow	(8,206)	559	1,430	1,903	4,401
11	PV@13.3% T1–4 (1.10 × 1.03)	5,587				
12	Less outflow@T0	(8,206)				
13	NPV	(2,619)				

Net present value = £(2,619,000)

Thus retaining the existing equipment would be preferable to buying new.

WORKINGS

(1) Maintenance costs

	20X1	**20X2**	**20X3**	**20X4**
	£'000	£'000	£'000	£'000
Maintenance (real)	500	1,500	2,000	2,500
Maintenance (money)	515	1,591	2,185	2,814

(2) NP14 contributions

		20X1	**20X2**	**20X3**	**20X4**
		£'000	**£'000**	**£'000**	**£'000**
Contributions (real)	2,500		3,500	3,500	2,500
Contributions (money)	2,575		3,713	3,825	2,814

(3) Capital allowances

New plant

Year		**Tax @ 17%**
		£'000	**£'000**
20X0	Cost	12,000	

Year		£'000	Tax @ 17% £'000
	WDA	**(2,160)**	**367**
20X1		9,840	
	WDA	(1,771)	301
20X2		8,069	
	WDA	(1,452)	247
20X3		6,617	
	WDA	(1,191)	202
20X4		5,426	
	Disposal	(2,000)	
	Balancing allowance	3,426	582

Old plant

Year		£'000	Tax @ 17% £'000
20W8	Cost	10,000	
	WDA	(1,800)	
20W9		8,200	
	WDA	(1,476)	
20X0		6,724	
	Disposal	(3,000)	
	Balancing allowance	3,724	633

or

Year		£'000	Tax @ 17% £'000
20X0	WDV b/f	6,724	
	WDA	(1,210)	206
20X1		5,514	
	WDA	(993)	169
20X2		4,521	
	WDA	(814)	138
20X3		3,707	
	WDA	(667)	113
20X4		3,040	
	Disposal	0	
	Balancing allowance	3,040	517

(b) Viability of the NP14 product

=NPV(0.133,C11:F11)

	A	B	C	D	E	F
1	Year	**20X0**	**20X1**	**20X2**	**20X3**	**20X4**
2		£'000	£'000	£'000	£'000	£'000
3	Old plant	(3,000)				
4	CAs (W3)	(633)				
5		206	169	138	113	517
6	Contributions (money terms) (W2)		2,575	3,713	3,825	2,814
7	Tax thereon		(438)	(631)	(650)	(478)
8	Maintenance cost (money terms (W1)		(515)	(1,591)	(2,185)	(2,814)
9	Tax thereon		88	270	371	478
10	Working capital	(257)	(114)	(11)	101	281
11		(3,684)	1,765	1,888	1,575	798
12	PV@13.3% T1–4	4,596				
13	Less outflow @T0	(3,684)				
14		912				

Net present value = £912,000

Thus using the existing equipment to produce NP14s would be viable.

10 Juno Products plc

(a) Modification decision

=NPV(0.05,C10:D10)

Tutorial Note

A common pitfall on this question is confusing 'real' and 'money' values in the same assessment. Either approach is equally correct, but it must be applied consistently in the same assessment. In practice the 'money' approach tends to be less difficult to apply.

In part (a), be careful not to overlook the balancing allowance that would arise should the existing equipment be sold.

	A	B	C	D
1			**Timing**	
2	31 December	**20X8**	**20X9**	**20Y0**
3		**0**	**1**	**2**
4		£'000	£'000	£'000
5	Modification costs	(8,000)		

	A	B	C	D
6			5,000	5,000
	Extra contribution (excluding one bought-in part) 200 units per annum × £25,000 per unit (W1)			
7	Extra parts to be bought (400 ×1,000) (W1)			(400)
8		(8,000)	5,000	4,600
9	Tax effect at 17%	1,360	(850)	(782)
10	Net cash flow	(6,640)	4,150	3,818
11	PVT1–2 @ 5%	7,415		
12	less outlay	(6,640)		

(b) Net Present Value = 775 As the NPV is above 0 the modification should take place.

Relevant CFs if continue:

=NPV(0.05,C16:F16)

	A	B	C	D	E	F
1				**Timing of cash** flows		
2	**31 December**	**20X8**	**20X9**	**20Y0**	**20Y1**	**20Y2**
3		**0**	**1**	**2**	**3**	**4**
4		£'000	£'000	£'000	£'000	£'000
5	Modification costs	(8,000)				
6	Contribution (excluding one bought-in part) (W2)		11,500	11,500	5,200	3,900
7	Cost of extra parts			(400)	(400)	(300)
8	Opportunity costs of parts	(600)				
9	Overheads that would be avoided if production ceased (lease cost unavoidable)		(2,000)	(2,000)	(2,000)	(2,000)
10	Annual taxable net revenues	(8,600)	9,500	9,100	2,800	1,600
11	Tax @ 17%	1,462	1,615	1,547	(476)	(272)
12	Plant and equipment					
13	Disposal proceeds avoided	(6,000)				
14	Balancing allowance avoided (W3)	(374)				
15	Tax re WDAs if continue (W3)	251	206	169	138	630
16	Net CFs	(13,261)	8,091	7,722	2,462	1,958
17	PV @ 5% T1-4	18,447				
18	Less outlay	(13,261)				

NPV = 5,186.

As NPV is > 0 therefore continue.

WORKINGS

(1) Contribution per unit for modification decision

	£
Selling price	35,000
Labour	(4,000)
Materials (excluding the component type that is in inventory)	(6,000)
	65,000

There are enough bought-in parts in inventory to make 1,000 units. This will cover the first two years of production if no modifications are made in the first year, and 300 units worth of production in the second year if modifications are made. Thus an additional 400 units of parts would have to be bought in year 2 if modifications were to take place.

(2) Contributions per unit (excluding brought-in part)

Years 1 and 2: First 500 units – need to take into account lost contribution from other products that could have been sold.

	£
Selling price	35,000
Labour (4,000 × 4)	(16,000)
Materials	(6,000)
	13,000

Additional 200 units do not affect sales of the other product, therefore use contribution per unit of £25,000 as in (1) above.

Years 3 and 4: All units have contribution of £13,000 per unit as calculated above.Therefore contribution figures in total are:

£'000

Year 1 500 × 13 + 200 × 25	11,500
Year 2 500 × 13 + 200 × 25	11,500
Year 3 400 × 13	5,200
Year 4 300 × 13	3,900

(3) Balancing allowance if sold on 31 December 20X8

Accounting period	Narrative	£'000	Tax relief @ 17%	Timing
			£	£
20X7	Bought	10,000		
	WDA @ 18%	(1,800)		
20X8		8,200		

Accounting period	Narrative	£'000	Tax relief @ 17%	Timing
		£	£	
	Disposal proceeds	6,000		
	Balancing allowance	(2,200)	374	t_0

WDAs if kept

Accounting period	Narrative	£'000	Tax	relief @ 17%	Timing
		£		£	
20X8	B/f	8,200			
	WDA @ 18%	(1,476)		251	t_0
20X9		6,724			
	WDA @ 18%	(1,210)		206	t_1
20Y0		5,514			
	WDA @ 18%	(993)		169	t_2
20Y1		4,521			
	WDA @ 18%	(814)		138	t_3
20Y2		3,707			
	Disposal proceeds	0			
	Balancing allowance	(3,707)		630	t_4

(C) Discount rate

The long-term after-tax borrowing rate is not a suitable discount rate for the following reasons.

- It completely ignores the views and requirements of shareholders. The role of directors is to make the shareholders wealthy, so a discount rate should be used that incorporates their required return or cost of equity. Most firms do this by using a weighted average cost of capital (WACC).
- It is a risk-free (or at least a very low risk) discount rate. The project cash flows are uncertain, so a higher discount rate should be used to reflect this. In particular, changes in risk – due to changes in the type of activity undertaken or due to changes in gearing – need to be incorporated. Again, looking at the cost of equity could help.

Tutorial Note

A good answer would correctly deduce whether it would be economically beneficial to modify a product which would have the effect of increasing market demand for it (requirement (a)). It would then correctly assess a decision on the cessation of manufacture of the products, taking account of the decision in requirement (a) (requirement (b)). It would then go on to comment appropriately on the suitability of the discount rate suggested in the question (requirement (c)).

For requirement (a) one complicated way of attacking the requirement is to carry out two sets of calculations, one assuming the modification would take place and the other assuming that it would not. This is a complicated way of dealing with the modification question which is more likely to lead to errors. Simply picking up the cash flow differentials between each of the cases is a more straightforward approach.

A common pitfall in this question is to omit the cashflows associated with operating costs and/or tax, both of which varied with the decision.

In requirement (b) if you organise your answers in a logical way you should correctly pick up the relevant areas of cash flows. Make sure that if you (correctly) concluded in requirement (a) that modification should take place, don't ignore this in part (b).

11 Rexal ltd

(a) **Net present value calculations**

Option 1

31 December	**20X0**	**20X1**	**20X2**	**20X3**
Time	**0**	**1**	**2**	**3**
	£	£	£	£
Capital outlay	(80,000)			
Scrap proceeds				8,000
Net cash inflows		60,000	74,000	88,000
Tax on net inflows		(10,200)	(12,580)	(14,960)
Writing down allowances (W1)		2,448	2,007	7,785
Working capital	(6,000)	(1,400)	(1,400)	8,800
Net cash flow	(86,000)	50,848	62,027	97,625
Discount factor (W2)	1	0.791	0.636	0.522
	(86,000)	40,221	39,449	50,960

NPV = £44,630

Option 2

31 December	**20X0**	**20X1**	**20X2**	**20X3**
Time	**0**	**1**	**2**	**3**
	£	£	£	£
Opportunity cost - disposal proceeds foregone (W3)	(30,000)			

Balancing charge avoided (W3)		5,100		
Net cash inflows (W4)		35,000	46,600	58,776
Tax on inflows		(5,950)	(7,922)	(9,992)
Working capital	(3,500)	(1,160)	(1,218)	5,878
Net cash flow	(33,500)	32,990	37,460	54,662
Discount factor (W2)	1	0.791	0.636	0.522
	(33,500)	26,095	23,825	28,534

NPV = £44,954

Both projects show a positive NPV. Since they are mutually exclusive, option 2 should be preferred since it has the higher NPV.

WORKINGS

(1) Option 1 – WDAs

A/c period ended			Time
31 December	Investment	80,000	

A/c period ended					Time
20X1					
	WDA at 18%	(14,400)	Tax saved at 17%	2,448	1
		65,600			
31 December 20X2	WDA at 18%	(11,808)	Tax saved at 17%	2,007	2
		53,792			
31 December 20X3	Scrap proceeds	(8,000)			
Bal allowance		45,792	Tax saved at 17%	7,785	3

(2) Calculation of discount factors

Because the cash flows in the question are given in money terms (or, in the case of the machine maintenance, costs that can easily be converted into money terms) the most efficient discounting method is to discount net monetary values at a money cost of capital.

Note: An alternative is to convert all money terms into current terms and then discount at the real rate, but this would be a far less efficient approach and is definitely not recommended.

Using the relationship1 + m = (1 + r)(1 + i)

where

m = money cost of capital r = real cost of capital

i = inflation rate then, money cost

for 20X1 = (1.15) × (1.1) – 1 = 0.265 ie, 26.5%

for 20X2 = (1.15) × (1.08) – 1 = 0.242 ie, 24.2%

for 20X3 = (1.15) × (1.06) – 1 = 0.219 ie, 21.9%

for 20X4 = (1.15) × (1.04) – 1 = 0.196 ie, 19.6%

The discount factors are as follows

Time 1 (31 December 20X1): 1/1.265 = 0.791
Time 2 (31 December 20X2): (1/1.265) × (1/1.242) = 0.636
Time 3 (31 December 20X3): (1/1.265) × (1/1.242) × (1/1.219) = 0.522
Time 4 (31 December 20X4): (1/1.265) × (1/1.242) × (1/1.219) × (1/1.196) = 0.437

(3) Option 2 – Capital cost

This option utilised an existing machine. The cost to the business is the opportunity cost of the sale proceeds foregone at 1 January 20X1 (ie, Time 0).

However, by not selling the machine a balancing charge of £30,000 × 0.17 = £5,100 is avoided. This flow would have arisen on 31 December 20X1 (ie, Time 1) and not 31 December 20X0, since the asset was to be sold on the first day of an accounting period.

(4) Option 2 – Net cash inflows

	20X1		**20X2**		**20X3**
	£		£		£
Per question (option 1)	60,000		74,000		88,000
Less: Additional machine costs	(5,000)	× 1.08 =	(5,400)	× 1.06 =	(5,724)

	20X1	**20X2**	**20X3**
	£	£	£
Lost contribution	(20,000)	(22,000)	(23,500)
	35,000	46,600	58,776

Reservations

- Reservations in basing an investment decision on these figures concern the accuracy of the data and the inherent assumptions.
- How reliable are the estimates of operating cash flows?
- Are estimates of scrap proceeds appropriate?
- Is the working capital requirement sufficient?
- Operating cash flows have allowed for inflation. These values can change significantly if the estimates of inflation are incorrect.
- The real cost of capital is 15%. How reliable is this figure and should it remain static over the life of the project?
- All cash flows are assumed to arise at the year end. Is this appropriate?
- Will the tax rates assumed and the available capital allowances materialise in the future? Clearly it is difficult to predict with certainty the Government's future budgets.

The ultimate NPVs are fairly similar and make any decision taken between the projects somewhat marginal.

12 Southsea plc

(a)

	20X1	20X2	20X3	20X4	20X5	20X6
	£	£	£	£	£	£
Incr. Rev (W1)	–	127,500	416,160	745,493	1,131,462	1,266,750
Components (W2)	–	(59,400)	(188,160)	(327,084)	(477,342)	(513,450)
Labour (W3)	–	(15,000)	(48,000)	(84,300)	(124,200)	(135,000)
Cash flows	–	53,100	180,000	334,109	529,920	618,300
Tax @ 17%	–	(9,027)	(30,600)	(56,799)	(90,086)	(105,111)
Investment	(2,000,000)					
CA (W4)	61,200	50,184	(41,151)	33,744	27,670	126,052
NC	(1,938,800)	94,257	190,551	311,054	467,504	639,241
DF (W5)	1.000	0.916	0.840	0.769	0.698	0.633
PV	(1,938,800)	86,339	160,063	239,201	326,318	404,640
NPV	**(722,239)**					

On the basis of this negative NPV, the recommendation should be to reject the investment.

WORKINGS

(1) Sales units

	20X2	20X3	20X4	20X5	20X6
With new facilities	1,100	1,210	1,331	1,464	1,500 (max.)
With old facilities	1,050	1,050	1,050	1,050	1,050

	20X2	20X3	20X4	20X5	20X6
Increase in unit sales	50	160	281	414	450
Revenue:					
Selling price/unit: (£)	2,550	2,601	2,653	2,733	2,815
Incremental revenue	127,500	416,160	745,493	1,131,462	1,266,750

(2) **Components**

	20X2	20X3	20X4	20X5	20X6
Cost/unit	1,188	1,176	1,164	1,153	1,141
Incremental cost	(59,400)	(188,160)	(327,084)	(477,342)	(513,450)

(3) **Labour**

	20X2	20X3	20X4	20X5	20X6
Labour (units × £300)	(15,000)	(48,000)	(84,300)	(124,200)	(135,000)

Gross figures would have been as follows (in £):

Revenue:	20X2	20X3	20X4	20X5	20X6
With new facilities	2,805,000	3,147,210	3,531,143	4,001,112	4,222,500
Without facilities	2,677,500	2,731,050	2,785,650	2,869,650	2,955,750
Components:	127,500	416,160	745,493	1,131,462	1,266,750
With new facilities	1,306,800	1,422,960	1,549,284	1,687,992	1,711,500
Without facilities	1,247,400	1,234,800	1,222,200	1,210,650	1,198,050
Labour:	(59,400)	(188,160)	(327,084)	(477,342)	(513,450)
With new facilities	330,000	363,000	399,300	439,200	450,000
Without facilities	315,000	315,000	315,000	315,000	315,000
	(15,000)	(48,000)	(84,300)	(124,200)	(135,000)

(4) **Capital**

			CA (17%)
Allowances:		£	£
31 December 20X1	Cost	2,000,000	
31 December 20X1	WDA	360,000	61,200
		1,640,000	
31 December 20X2	WDA	295,200	50,184
		1,344,800	
31 December 20X3	WDA	242,064	41,151

			CA (17%)
Allowances:		£	£
		1,102,736	
31 December 20X4	WDA	198,492	33,744
		904,244	
31 December 20X5	WDA	162,764	27,670
31 December 20X6	Bal. All.	741,480	126,052

Discount factors

20X2: $1/(1.07 \times 1.02) = 1/1.0914 = 0.916$

20X3: $1/1.0914^2 = 0.840$

20X4: $1/1.0914^3 = 0.769$

20X5: $0.769 \times 1/(1.07 \times 1.03) = 0.769 \times 1/1.1021 = 0.698$

(b) 20X6: $0.769 \times 1/1.1021^2 = 0.633$

The obvious problem is that the negative NPV arises principally because the almost 50% increase in production capacity is not fully used until the final year of the project. However, the investment in additional production capacity therefore comes with the real option of finding new customers for the spare capacity in the first four years of the contract.

(c) This is an example of a 'follow-on' (growth) option and if this could be achieved then the whole project has the potential to be financially viable from a shareholder wealth perspective.

- Potential advantages:
- Synergistic savings may be achieved (administration, leaner management structures)
- Risk reduction (lower risk may create a lower WACC)
- Backward vertical integration gives control over supply (quantity/quality)

13 RFA Ltd

(a)

=NPV(0.11,C13:E13)

	A	B	C	D	E
1		**20X9**	**20Y0**	**20Y1**	**20Y2**
2		**t_0**	**t_1**	**t_2**	**t_3**
3		£	£	£	£
4	New machine	(1,700,000)			200,000
5	CA's on new machine (W1)	52,020	42,656	34,978	125,345
6	Old machine (W2)	83,000		(66,400)	
7	Sales (W3)		545,900	901,765	1,442,400
8	Raw materials (W4)		(79,800)	(125,685)	(183,368)
9	Other variable costs (W5)		(53,560)	(117,760)	(259,632)
10	Wages (W6)		18,360	18,727	(140,079)
11	Tax (W7)		(73,253)	(115,098)	(146,085)
12	Working capital (W8)	(54,590)	(35,587)	(54,063)	144,240
13	Total cash flows	(1,619,570)	364,716	476,464	1,182,821
14	PV @ 11% Time 1–3	1,580,150			
15	Less outlay at time 0	(1,619,570)			
16	**NPV**	**(39,420)**			

The NPV is negative and so RF 17 should not be purchased as this would reduce shareholder wealth.

WORKINGS

(1) **Capital allowances**

	t_0 £	t_1 £	t_2 £	t_3 £
Cost	1,700,000	1,394,000	1,143,080	937,326
WDA @ 18%	(306,000)	(250,920)	(205,754)	(737,326)
WDV	1,394,000	1,143,080	937,326	200,000
Capital Allowances @ 17%	52,020	42,656	34,978	125,345

(2) **Old machine**

	£	£	£	£
RF13 resale value	100,000		(80,000)	
Balancing charge	(17,000)		13,600	
	83,000		(66,400)	

(3) **Sales**

		£	£	£
Sales RF17 (real)		1,150,000	1,450,000	1,320,000
Sales RF13 (real)		620,000	600,000	0
Increase (real)		530,000	850,000	1,320,000
Inflation		1.030	1.061	1.093
Increase (money)		545,900	901,765	1,442,400

(4) **Raw materials**

		£	£	£
Raw materials RF17 (real)		(138,000)	(174,000)	(158,400)
Raw materials RF13 (real)		(62,000)	(60,000)	0
Increase (real)		(76,000)	(114,000)	(158,400)
Inflation		1.050	1.103	1.158
Increase (money)		(79,800)	(125,685)	(183,368)

(5) **Other variable costs**

	£	£	£
Other VC RF17 (real)	(207,000)	(261,000)	(237,600)
Other VC RF13 (real)	(155,000)	(150,000)	0
Increase (real)	(52,000)	(111,000)	(237,600)
Inflation	1.030	1.061	1.093
Increase (money)	(53,560)	(117,760)	(259,632)

(6) **Wages**

	£	£	£
Labour saving (real) [£150,000 × 12%]	18,000	18,000	18,000
Inflation	1.020	1.040	1.061
Labour saving (money)	18,360	18,727	19,102
Labour cost for extra year [150,000 × 1.02^3]	0	0	(159,181)
Net saving/(cost)	18,360	18,727	(140,079)

(7) **Tax**

	£	£	£
Sales (W3)	545,900	901,765	1,442,400

Raw materials (W4)	(79,800)	(125,685)	(183,368)
Other variable costs (W5)	(53,560)	(117,760)	(259,632)
Wages (W6)	18,360	18,727	(140,079)
Taxable profits	430,900	677,047	859,321
Tax @ 17%	(73,253)	(115,098)	(146,085)

(8) **Working capital**

	£	£	£	£
Working capital required (sales × 10%)		54,590	90,177	144,240
Investment	(54,590)	(35,587)	(54,063)	144,240

(b) **Sensitivity analysis** considers the degree of sensitivity of forecasts. It calculates the change necessary for a project to break even.

- It is a simple approach and identifies those areas which are critical to the success of a project. It enables management to decide the likelihood of the possible outcomes under consideration.
- However, it assumes that changes to variables can be made independently of other variables.
- It ignores probability.
- It does not point directly to the correct decision.

  The **expected value** is an average of possible outcomes, weighted by the probability of each outcome occurring.
- Thus the information is reduced to a single number for each choice.
- However it may be difficult to estimate the probabilities of the possible outcomes.
- The average may not correspond to any of the possible outcomes.
- The average ignores risk as it gives no indication of the spread of possible results.

Tutorial Note

Part (b) of the question assumes knowledge of sensitivity analysis and expected values. These are covered in Chapter 3.

14 Sticky Fingers plc

(a) No rationing

=NPV(0.15,C4:F4)+B4

	A	B	C	D	E	F	G
1	**Year**	**0**	**1**	**2**	**3**	**4**	**5**
2	**Time**	**T0**	**T1**	**T2**	**T3**	**T4**	**NPV**
3		£'000	£'000	£'000	£'000	£'000	£'000

4	Project A	(1,500)	(500)	(1,200)	600	300	(461)
5	Project B	(2,000)	(1,000)	2,500	2,500	2,500	2,094
6	Project C	(1,750)	500	1,100	1,400	1,000	1,009
7	Project D	(2,500)	700	900	1,300	300	(184)
8	Project E	(1,600)	(500)	200	2,800	2,300	1,273

The formula used in cell G4 is =NPV(0.15,C4:F4)+B4.

This approach can then be copied into cells G5 through to G8.

Therefore, accepting all projects with a positive NPV, accept projects B, C and E.

(b) Single-period capital rationing

Project	**A**	**B**	**C**	**D**	**E**
NPV (£'000)	(461)	2,094	1,009	(184)	1,274
Investment, t_0 (£'000)	1,500	2,000	1,750	2,500	1,600
NPV/£	–	£1.05	£0.58	–	£0.80
Rank	–	1st	3rd	–	2nd

Therefore, accept B and $^{10}/_{16}$ E.

(c) Single-period capital rationing – inflows and outflows, negative NPVs

Using benefit cost ratios: NPV/initial investment

	Benefit/cost	**NPV per** £1 invested	Ranking
Project A			*
Project B	£2,094/£1,000	£2.10	2
Project C			*
Project D	£(184)/£700	£(0.26)	**
Project E	£1,273/£500	£2.55	1

* Project A would never be accepted because it has a negative NPV and uses up funds in the restricted year.

Project C would always be accepted since it has a positive NPV and releases funds in the restricted year. A total of £700,000 is then available.

** Project D has a negative NPV but releases funds at t_1.

If project D is accepted, this makes an extra £700,000 available at t_1. However, in doing so a negative NPV (–£184,000) is incurred. Thus, it is necessary to examine whether the extra positive NPV generated by the additional investment finance outweighs this cost.

1 Available capital = £200,000. Accept projects C, E and 20% B. Total NPV = £2,703,000.

2 If D is accepted the available capital becomes £1,400,000 [£200,000 + £500,000 (from project C) + £700,000 (from project D)].

Accept projects C, D, E and 90% B. Total NPV = £3,985,500. This is the optimal solution.

(d) Possible investment 'portfolios' are B or C or E or (C and E).

The portfolio which has the highest NPV is C and E requiring an investment of £3.35 million and generating £2.3 million.

15 Igloo plc

(a) No capital rationing

Accept all projects with NPV > 0.

	NPV
	£'000
Project A	+ 60
Project B	+ 40
Project C	– 20
Project D	+ 110
Project E	+ 40

Therefore accept A, B, D and E.

(b) Single period capital rationing

Using benefit cost ratios (NPV/£): NPV/initial investment

		NPV/£	**Rank**
Project A	+ 60 / 100	= 0.60	3
Project B	+ 40 / 50	= 0.80	2
Project C	– 20 / 200	= (0.10)	5
Project D	+ 110 / 100	= 1.10	1
Project E	+ 40 / 200	= 0.20	4

£225,000 available, therefore accept D, B, ¾ of A.

(c) This problem is solved by trial and error, using the rankings from (b) above. The two alternative project combinations are as follows:

D, B, $37^1/_2$ % E: NPV (£'000) = 110 + 40 + 15 = 165D, A, $12^1/_2$ % E: NPV (£'000) = 110 + 60 + 5 = 175

Therefore the better combination is D, A and 12½ % E.

(d) Again trial and error is required.

Possible combinations, given the limited finance available, are as follows.A and B; A and D; B and D; or any single project.

Examining all the different whole project combinations shows that A and D produce the maximum amount of total NPV, the amount being £170,000.

(e) **Restrictions with inflows, outflows and negative NPVs**

Recalculating the benefit-cost ratios, now using t_1 outlays.

		NPV/£	Rank
Project A	+ 60 / 100	= 0.60	3
Project B	+ 40 / 100	= 0.40	4
Project C	– 20 / (100)	= 0.20*	?
Project D	+ 110 / 50	= 2.20	1
Project E	+ 40 / 50	= 0.80	2

It is worth simplifying the problem with some rational analysis.

In this case not much can be done. However, it may be that some projects can automatically be **eliminated** (with negative NPVs and using up funds in the restricted year). It may also happen that some projects can be automatically **elected** (with positive NPVs and providing additional funds in the restricted year). Here the problem concerns C (negative NPV but providing funds for time 1).

If project C is accepted, this makes an extra £100,000 of investment finance available at t_1. However, in doing so a negative NPV (– £20,000) is incurred. Thus one must consider whether the extra positive NPV generated by the additional investment finance outweighs this cost.

£150,000 of capital, accept D, E and $^1/_2$ A. Total NPV = £180,000.

£150,000 + £100,000 of capital, accept D, E, A, $^1/_2$ B and C. Total NPV = £(110,000 + 40,000 + 60,000 + 20,000 – 20,000) = £210,000. This is the optimal combination.

Having found that, with £150,000 available, the 'money dries up' half way through project A, it is clear by comparing A's NPV/£ of £0.60 with C's (strange) NPV/£ of £0.20, that every £1 C provides at time 1 increases the NPV by a net £0.40. It is also worth using C to supply funds for project B.

16 Stan Beldark

Optimal replacement period

The effects of increasing running costs and decreasing resale value have to be weighed up against capital cost. Road fund licence etc, can be ignored, since Stan will always pay £300 per year per car.

The following table is one of the quickest ways to reach an answer.

	Running cost £	PV of RC £	Cum PV of RC £	Resale value £	PV of RV £	NPV of car £	Cum discount factor	EAC £
Life 1	3,000	2,727	2,727	3,500	3,182	5,045*	0.909	5,550
Life 2	3,500	2,891	5,618	2,100	1,735	9,383	1.736	5,405
Life 3	4,300	3,229	8,847	900	676	13,671	2.487	5,497

* NPV = 5,500 cost + 2,727 running cost – 3,182 resale value = £5,045

From the above table it can be seen that the optimal replacement period is every two years.

17 Taleb Ltd

Summary showing the optimal replacement policy for Taleb's Dot machines

Replacement cycle	**Annual equivalent net revenue**
£'000	
One year	8.0

Replacement cycle	**Annual equivalent net revenue** **£'000**
Two years	11.1*
Three years	9.8
Four years	10.3

* Optimal policy. Replacement of the Dot machine every two years results in the greatest annual equivalent net revenue for the company (ie, £11,100) and therefore is the recommended replacement policy.

Annual production/sales (units)	500,000		400,000
		£	£
Annual revenue (£0.12 per unit)		60,000	48,000
Less annual variable costs (£0.04 per unit)		(20,000)	(16,000)
Contribution		40,000	32,000

WORKINGS

(1) **One-year replacement**

	Year 0	**Year 1**
Machine outlay	£'000	£'000
	(60)	
Scrap value		40
Running cots		(6)
Contribution		40
Net cash flow	(60)	74

Net present values

= -60 + 74 × 0.909

= 7.266

Annual equivalent

= 7.266/0.909

= £7,993

(2) **Two-year replacement**

	Year 0	**Year 1**	**Year 2**
Machine outlay	£'000 (60.0)	£'000	£'000
Scrap value			25.0
Running cots		(6.0)	(6.5)
Contribution		40.0	40.0
Net cash flow	(60.0)	34.0	58.5

Net present values

= –60 + 34 × 0.909 + 58.5 × 0.826

= 19.227

Annual equivalent

= 19.227 × 1.736

= £11,075

(3) Three-year replacement

	Year 0	Year 1	Year 2	Year 3
Machine outlay	£'000 (60.0)	£'000	£'000	£'000
Scrap value				10.0
Running cots		(6.0)	(6.5)	(7.5)
Contribution		40.0	40.0	32.0
Net cash flow	(60.0)	34.0	33.5	34.5

	Year 0	Year 1	Year 2	Year 3	Year 4
Machine outlay Scrap value	£'000 (60.0)	£'000	£'000	£'000	£'000 0
Running cost		(6.0)	(6.5)	(7.5)	(9.0)
Contribution		40.0	40.0	32.0	32.0
Net cash flow	(60.0)	34.0	33.5	24.5	23.0

Net present values

= –60 + 34 × 0.909 + 33.5 × 0.826 + 24.5 × 0.751 + 23 × 0.683

= 32.6855

Annual equivalent

= 32.6855/ 3.170

= £10,311

Tutorial Note

The notable feature of this question is that it involves revenues as well as costs in the replacement decision. Several approaches can be taken but the above is probably the simplest. Other approaches, including the opportunity cost of contribution foregone, are acceptable and, although they will produce different figures, they should give the same ranking.

Chapter 3
Risk and decision-making

Introduction

Learning outcomes

Students will be able to identify capital requirements of businesses and assess financing options.

Students will be able to apply investment appraisal techniques and calculate the value of shares and businesses.

These will involve being able to:

- calculate and justify an appropriate discount rate for use in an investment appraisal taking account of both the risk of the investment and its financing;
- calculate and examine the sensitivity of an investment decision to changes in the input factors;
- discuss how the interpretation of results from an investment appraisal can be influenced by an assessment of risk, including the impact of data analytics on that risk assessment; and
- recommend and justify a course of action which is based upon the results of an investment appraisal and consideration of relevant non-financial factors such as sustainability and which takes account of the limitations of the techniques being used.
- organise, structure and assimilate data in appropriate ways, using available statistical tools, data analysis and spreadsheets, to support business decisions.

Syllabus links

This topic is taken forward at Advanced Level at a higher technical level, and in the Case Study where the ideas are applied pragmatically.

Examination context

In the exam you may be asked to take into account risk and uncertainty either by calculating a project's sensitivity to various input factors (such as selling price or the cost of equity) or by calculating expected values.

You may also be asked to comment upon the reasonableness of the estimates made, or adjust the required rate of return to reflect risk.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**Introduction to risk and uncertainty** Risk and uncertainty are a constant feature	**Approach** This chapter follows on from investment appraisal in the	In the exam you could be asked to discuss how the interpretation of	

Topic	Practical significance	Study approach	Exam approach	Interactive questions
	of real life decision-making and the techniques explored in this chapter illustrate how businesses can take account of it in their decision-making processes.	previous chapter. Ensure you know how businesses deal with risk and uncertainty in a practical way. **Stop and think** How reliable are the cash flow estimates in an NPV calculation? What steps would you take to address shortcomings?	results from an investment appraisal can be influenced by an assessment of risk.	
2	**Sensitivity analysis** Sensitivity analysis in investment appraisal is a technique for assessing the sensitivity of a project's return or NPV to a variation in each of the items of cost or benefit in the project.	**Approach** Make sure you can calculate and discuss the sensitivity of an investment decision to changes in individual input factors. **Stop and think** What is the formula for calculating the sensitivity of an NPV to individual factors?	In the exam you may be asked to calculate and discuss the sensitivity of an investment decision to changes in the input factors. This is a popular requirement in NPV questions.	**IQ1: Sensitivity analysis** This question asks you to calculate a project's NPV and assess how sensitive the result is to various input factors.
3	**Predictive and prescriptive analytics** In the real world it is likely that more than one factor will change at the same time. The increasing use of Big Data within organisations has created new forms of data that can be used to create predictions and opportunities for identifying new types of trends to understand how the organisation may be affected by future events.	**Approach** Make sure you can discuss the advantages and disadvantages of each technique covered in this section.	In the exam you could be asked to apply simulation as a technique for assessing the risk of a project.	

3: Risk and decision-making

Topic	Practical significance	Study approach	Exam approach	Interactive questions
4	**Statistical tools** Where outcomes associated with risk can be predicted reliably, and the probabilities of those outcomes can be estimated, statistical techniques can be used to analyse those risks.	**Approach** Work through the examples in the chapter to make sure you understand each of the statistical techniques that can be used to analyse risk. You also need to be able to calculate and explain the meaning of the mean and the co- efficient of variation.	In the exam you may be asked to use statistical tools to interpret the risk associated with an investment.	
5	**Expected values and attitude to risk** The simplest way to assess possible outcomes and their associated probabilities is to use expected values or weighted averages.	**Approach** Work through the examples in the chapter to make sure you can calculate expected values and interpret decision trees.	In the exam you may be asked to take into account risk and uncertainty either by calculating a project's sensitivity to various input factors (such as selling price or the cost of equity) or by calculating expected values.	**IQ4: Uncertain sales** This question will allow you to practice calculating EVs. Follow this through to **IQ5: Uncertain contribution,** and the following analysis in section 4.2.
6	**Diversification and the portfolio effect** A different approach to allowing for risk and uncertainty in a project is to increase the cost of capital for projects that are riskier. This approach is commonly taken by investors.	**Approach** Work through each section and make sure you understand the concepts of portfolio risk, systematic and unsystematic risk and CAPM. CAPM is then developed further in Chapter 6. **Stop and think** What is the difference between systematic and unsystematic risk?	In the exam you may be asked to calculate and justify an appropriate discount rate for use in an investment appraisal taking account of both the risk of the investment and its financing	**IQ7:** **Diversification** This question introduces you to the concept of diversification.

Once you have worked through this guidance, you are ready to attempt the further question practice included at the end of this chapter.

1 Introduction to risk and uncertainty

Section overview

- All business decisions are based on forecasts.
- All forecasts are subject to varying degrees of risk or uncertainty.
- Consideration needs to be given as to how risk and uncertainty can be reflected in financial evaluations.

There is possibly an upside to a decision – things may go better than expected (upside risk or potential). On the other hand, there may be a downside where things go worse than expected (downside risk). Shareholders are likely to be risk averse. This does not mean that they will not accept any potential downside to investment or projects. (In order to avoid downside risk completely a firm would have to undertake no projects at all.) However, it does mean that investors will expect to be compensated for taking risks ie, the greater the risk taken, the higher the returns required.

Some authors draw a distinction between risk and uncertainty as explained below.

1.1 Risk

When making a business decision, outcomes normally depend on the happening of various external events beyond the firm's control. Decisions are usually said to be subject to risk if it is known that more than one future outcome from a decision is possible. With risk analysis, an attempt may be made to assess the probability of each different possible outcome, and a decision is then based on the balance of probabilities and the expected returns or costs for each different outcome.

For example, the toss of a coin or the roll of the dice are examples of risk. The possible outcomes and probability of each are known.

Similarly, a company considering whether to invest in a new product may need to consider the possible outcomes if:

(a) it obtains patent protection for the product; or

(b) it fails to obtain patent protection.

The probability of each possible outcome (getting or not getting patent rights) may be estimated, together with the expected cash flow returns for each of the two possible outcomes.

1.2 Uncertainty

Very often future outcomes for an investment cannot be predicted with much confidence from the available data. For example, the probabilities of various outcomes will be unknown. The estimate of sales for a new product may be 10,000 units per year but, in reality, this estimate could be based on a view that sales may be anywhere between 5,000 and 15,000 units. Similarly, an investment may be based on expectations of what materials costs or labour costs will be, but these expectations are estimates, not certainties, and they could turn out to be wrong.

Although there is a distinction between 'risk' and 'uncertainty', in practice the terms are often used interchangeably.

1.3 Methods of dealing with decision-making under risk and uncertainty

Risk may be analysed and assessed using probability distributions, expected values, simulation, portfolio theory, the capital asset pricing model and risk-adjusted discount rates. All of these are dealt with later in this chapter.

Techniques for handling uncertainty are generally more crude but practically just as useful. These include the following:

(a) Setting a minimum payback period for projects

(b) Increasing the discount rate subjectively in order to submit the project to a higher 'hurdle' rate in investment appraisal

(c) Making prudent estimates of outcomes to assess the worst possible situation

(d) Assessing both the best and the worst possible situations to obtain a range of outcomes

(e) Using **sensitivity analysis** to measure the 'margin of safety' on input data (see next section)

Professional skills focus: Applying judgement

As in most decision-making situations the data you are provided with in a question is based on

estimates which are subject to varying degrees of uncertainty. When analysing an issue, you will need to show awareness of the potential drawbacks of the approaches that you have used.

2 Sensitivity analysis

Section overview

- How sensitive is the decision to the individual forecasts made?
- The technique is to take each factor in the forecast in turn and find the change needed that would cause the project to breakeven.

2.1 Introduction

Investment involves expenditure now in return for a stream of future returns. The investment could be in the form of physical assets (capital budgeting or working capital management) or securities. As in most decision-making situations data is based on forecasts which are subject to varying degrees of uncertainty. The task in investment appraisal involves deciding whether the uncertain cost of the investment is outweighed by its uncertain benefits.

2.2 Basic principle

Sensitivity analysis in investment appraisal is a technique for assessing the sensitivity of a project's return or NPV to a variation in each of the items of cost or benefit in the project. The technique is to take the estimate for each uncertain factor one by one, and calculate the change necessary for the NPV to fall to zero ie, this is essentially breakeven analysis in NPV terms. Break even analysis was introduced in Management Information.

If sensitivity analysis is to be carried out, it is often useful to calculate net present values for each factor or cash flow item in such a way that PVs are found of individual elements of costs and revenues over the life of the project.

Worked example: Sensitivity analysis

Butcher Ltd is considering whether to set up a division in order to manufacture a new product, the Azam. The following statement has been prepared, showing the projected profitability per unit of the new product.

	£	£
Selling price		22.00
Less direct labour	5.00	
material 3 kg @ £1.50 per kg	4.50	
variable overheads	2.50	
		(12.00)
Net contribution per unit		10.00

It is expected that 10,000 Azams would be sold each year at the above selling price. Demand for Azams is expected to cease after five years. Direct labour and material costs would be incurred only for the duration of the product life. Other incremental overheads have been calculated as follows:

	£
Additional rent	8,000
Salary of additional manager	5,000

Manufacture of the Azam would require a specialised machine costing £250,000.

The cost of capital of Butcher Ltd is estimated at 5% pa in real terms. Assume all costs and prices given above will remain constant in real terms. All cash flows would arise at the end of each year, with the exception of the cost of the machine which would be payable immediately.

Requirements

1 Prepare net present value calculations, based on the estimates provided, to show whether Butcher Ltd should proceed with the manufacture of the Azam.

2 Prepare a statement showing the sensitivity of the net present value of manufacturing Azams to errors of estimation in each of the following three factors: material cost per unit, annual sales volume, and product life.

Note: Ignore taxation.

Solution

1 NPV calculation

Cash flows resulting from manufacture and sale of Azams

Time		Cash flows	Discount factor	Present value
0	Machine	£'000 (250)	1	£ (250,000)
1–5	Factory rent	(8)	4.329	(34,632)
1–5	Manager's salary	(5)	4.329	(21,645)
1–5	Materials cost	(45)	4.329	(194,805)*
1–5	Direct labour	(50)	4.329	(216,450)*
1–5	Variable overheads	(25)	4.329	(108,225)*
1–5	Sales revenue	220	4.329	952,380*
	Annual cash flow	87		
Net present value				126,623

*comes to 432,900

On the basis of the estimates given, manufacture of the Azam is worthwhile.

2 Sensitivity to forecast errors

A summary of the analysis is shown in the following table:

Item	Upper/lower limit for project acceptability	Maximum percentage error not affecting decision
Material cost per Azam (W1)	£7.425	65%
Annual sales volume (W2)	7,075 units	29%
Product life (W3)	3.2 years (approx)	36%

The table shows that the manufacture of Azams would still be worthwhile if product life were to fall to about 3.2 years, or if annual sales were to fall to 7,075 units, or if material costs were to

increase to £7.42 per Azam. These figures represent percentage errors of 36%, 29% and 65% respectively on the original estimates. If the actual figures were within these percentages of the original estimates, the decision to go ahead would still have been valid. These are large percentages and the net present value is, therefore, remarkably insensitive to errors of estimation in the three factors.

The approach taken is:

Sensitivity = NPV of project/PV of cash flow subject to uncertainty

WORKINGS

(1) Material price

For the project to break even:

- the NPV must fall by £126,623
- the PV of materials cost (£194,805) must rise by £126,623
- this PV must rise by £126,623 ÷ £194,805 = 65%

Annual materials cost, and therefore unit materials cost, must rise by 65%.If this unit price rise were caused entirely by a rise in material price:

the increase per unit would be £4.50 × 0.65 = £2.925

and the break-even materials price would be £7.425 (£4.50 + £2.925).

Since the NPV would be slightly negative if the cost is £7.43, the breakeven cost is £7.42.

(2) Annual sales volume

The part of NPV that is affected by change in sales volume is:

(£952,380 revenue – £108,225 variable overheads – £216,450 direct labour – £194,805 materials) = £432,900 (see cash flow table in NPV above)

If the project NPV is to fall by £126,623 as a result of the sales volume falling, this PV of £432,900 must fall by £126,623. This is a fall in the PV of contribution by: Sensitivity = NPV of project/PV of cash flow subject to uncertainty = £126,623/£432,900 = 0.2925 (29%)

The way in which the PV of annual contribution will fall by 29% is if contribution itself falls by 29%. This in turn is the result if sales volume falls by 29%.

An alternative approach to this calculation is to use contribution and the annuity factor: Contribution per unit = £10 (£22 sales revenue – £12 variable cost)

The fall in annual contribution which gives a drop in NPV to break-even point (ie, a drop of £126,623) is, using 4.329 the five-year annuity factor:

Fall in annual contribution × 4.329 = £126,623

Fall in annual contribution = £126,623/4.329 = £29,250

ie, if annual contribution falls by £29,250 pa the NPV will be zero. This is caused by a fall in annual demand of:

£29,250/£10 = 2,925 units ie, a fall of 29.25% of the planned volume of 10,000 units. The breakeven volume is therefore 7,075 units (10,000 – 2,925).

(3) Product life

The approach to sensitivity analysis to find the breakeven position is to set the NPV equal tozero.

ie, NPV= (outlay) + PV of inflows

Zero = (250,000) + 87,000 × Annuity factor for product life at 5% Therefore, annuity factor for product life at 5% = 250,000/87,000 = 2.874It is necessary to know for how many years this is the 5% annuity factor:

From annuity tables

Annuity factor for three years @ 5% = 2.723 Annuity factor for four years @ 5% = 3.546 Therefore, project NPV is zero if life is greater than:

3 + ((2.874 – 2.723)/(3.546 – 2.723)) years (approximately) = 3.2 years

(Strictly speaking it should be said that the project will only change from being a success to a failure if its life falls from four to three years, as all cash flows are assumed to be at the year end.)

The project's planned life is five years. It can be shortened by 1.8 years (5 – 3.2 breakeven life) which is 36% of the planned life.

In a practical situation this process would be continued to determine the sensitivity of the project to all variables involved. This would include all costs, revenues and the discount rate (ie, finding the IRR of the project). Managers could then assess which variables were most crucial to the success of the investment, and decide whether there were any ways of reducing the uncertainty relating to them.

Professional skills focus: Structuring problems and solutions

Applying sensitivity analysis to an investment decision can identify opportunities to add value. If a variable is deemed to be too sensitive to change and therefore too high risk, decisions can be made before the investment proceeds to manage this risk. For example, if the NPV is highly sensitive to changes in sales revenue, marketing expenditure could be increased to promote the product and reduce this risk to a more acceptable level.

Interactive question 1: Sensitivity analysis

The following information applies to a new project:

Initial cost	£125,000
Selling price	£100/unit
Variable costs	£30/unit
Fixed costs	£100,000 pa
Sales volume	2,000 units pa
Life	5 years
Discount rate	10%

Requirement

Calculate the project's NPV and show how sensitive the result is to the various input factors.

See **Answer** at the end of this chapter.

Where annual flows are not annuities, the approach remains the same (ie, at what point does the NPV become zero), although the calculations are rather more cumbersome.

Interactive question 2: Non-recurring cash flows

A company is about to embark on a two-year project. Estimates of relevant inflows and outflows in current terms are as follows:

	Year 1	Year 2
	£	**£**
Sales	50,000	50,000
	Year 1	Year 2
	£	**£**
Costs	30,000	32,000

The following inflation rates are applicable to the flows:

Sales 6% pa

Costs 4% pa

Tax is payable at 17% on net flows.

The net cost of the project at t_0, after allowing for capital allowance tax effects, is £20,000.The money cost of capital is 10% pa.

Requirements

1.1 Calculate the NPV of the project.

1.2 Assess the sensitivity of the investment decision to changes in sales revenue.

See **Answer** at the end of this chapter.

2.3 Strengths and weaknesses of sensitivity analysis

	Strengths
Sensitivity	Information will be presented to management in a form which facilitates subjective judgement to decide the likelihood of the various possible outcomes considered.
Critical issues	Identifies those areas which are critical to the success of the project; if the project is undertaken, those areas can be carefully monitored. For example, if sales volume and/or price is identified as critical, further market research may help to improve confidence in the estimates. If the cost of materials or bought-in components is critical, then fixed price contracts may be a possible way of limiting the cost and uncertainty. Alternatively, it may be possible to use futures and options to limit materials costs. However, it should be noted that these attempts to reduce risk are not costless – market research costs money, option premiums must be paid, suppliers may demand up-front payments on fixed price contracts. Environmental issues such as climate change are giving rise to significant risks for businesses. Whether those risks arise from more frequent and severe weather events or the transition to a net-zero carbon economy, expectations are growing that companies appropriately embed climate-related financial risk into their governance and risk management processes. Scenario analysis is key to better understanding and managing future risks today, as well as supporting the transition to a net-zero carbon economy.
Independence	It assumes that changes to variables can be made independently eg, material prices will change independently of other variables, which is unlikely. If material prices were to rise, the firm would probably increase selling price at the same time and there may be little effect on NPV (depending on the effect of a price rise on sales demand).
Independence	It assumes that changes to variables can be made independently eg, material prices will change independently of other variables, which is unlikely. If
	material prices were to rise, the firm would probably increase selling price at the same time and there may be little effect on NPV (depending on the effect of a price rise on sales demand).

	Strengths
Ignores probability	It only identifies how far a variable needs to change; it does not look at the probability of such a change. In the above worked example, sales volume appears to be the most crucial variable, but if the firm were facing volatile raw material markets, a 65% change in raw material prices would be far more likely than a 29% change in sales volume.
No clear answer	It is not an optimising technique. It provides information on the basis of which decisions can be made. It does not point directly to a correct decision.

One way in which some of these shortcomings can be addressed is scenario building. If the essentials of the project being assessed are put on to a computer spreadsheet the analysis can be taken a lot further. A series of assumptions can be made about the variables and the effect of each combination of assumptions can be assessed eg, best and worst cases.

Professional skills focus: Concluding, recommending and communicating

You are expected to be able to make recommendations in situations where risks and uncertainty exist. This means that you need to be able to interpret the results of your analysis (such as sensitivity analysis) as well as performing the calculations.

3 Predictive and prescriptive analytics

Section overview

- Predictive analytics uses historical and current data to create predictions about the future.
- Prescriptive analytics software can be used to calculate the optimum outcome from a variety of business decisions.
- Simulation allows for more than one variable at a time to change.
- Monte Carlo simulation uses random numbers to determine outcomes.
- Environmental risk analysis
- Data bias and professional scepticism

3.1 Predictive analytics

Predictive analytics use historical and current data to create predictions about the future. Predictive techniques are already commonly used by accountants eg, in sales forecasting and investment appraisal.

The increasing use of Big Data within organisations has created new forms of data that can be used to create predictions and opportunities for identifying new types of trends to understand how the organisation may be affected by future events.

Examples of predictive analysis include:

- Linear regression models
- Decision trees
- Simulations

3.1.1 Linear regression models

Linear regression is a statistical technique that attempts to identify the factors that are associated with a change in the value of a key variable (eg, sales or project NPV or the value of a company).

The variable that a business is trying to predict is called the **dependent variable**, and the factors that are thought to have an impact on this are called **independent variables.**

Linear regression quantifies the relationship between the dependent variable and the independent variables.

A simple example of regression analysis is quantifying how sales growth (the dependent variable) has changed over time (the independent variable) in order to forecast how sales may be expected to grow in the future. Where there is a single independent variable, this can be illustrated graphically:

Note: It is currently 20X5.

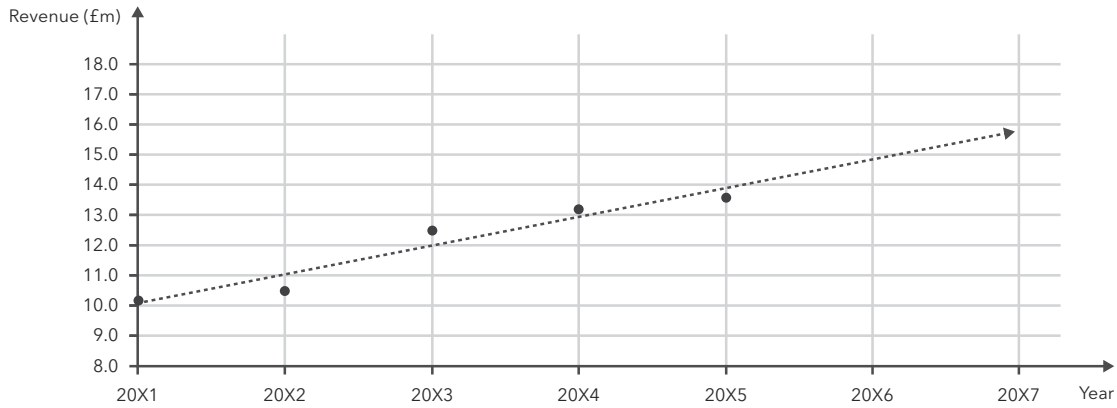


Figure 3.1: Revenue (£m) over time

Mathematically, this could be expressed in the form of a linear equation y = a + bx, where y is the independent variable (eg, year) and x is the dependent variable (the variable we are trying to predict).

Here this equation is approximately y = 10 + 0.9x which means that starting from 10 (£m) sales are predicted to increase by approximately 0.9 (£m) each year.

A regression equation will not be 100% reliable. This can be seen in the (previous) graphical expression of the regression equation of revenue over time which shows that in most years there is a small deviation from the regression line (eg, sales are above expectations in 20X3 and below in 20X2 and 20X5).

Investment appraisal and regression analysis

Regression analysis can be useful in investment appraisal to identify a set of factors that have a strong link to the returns from a project.

The regression equation helps to build an understanding of the sensitivity of a project's NPV to changes in these factors.

For example, the impact of sales volume on NPV could be modelled.

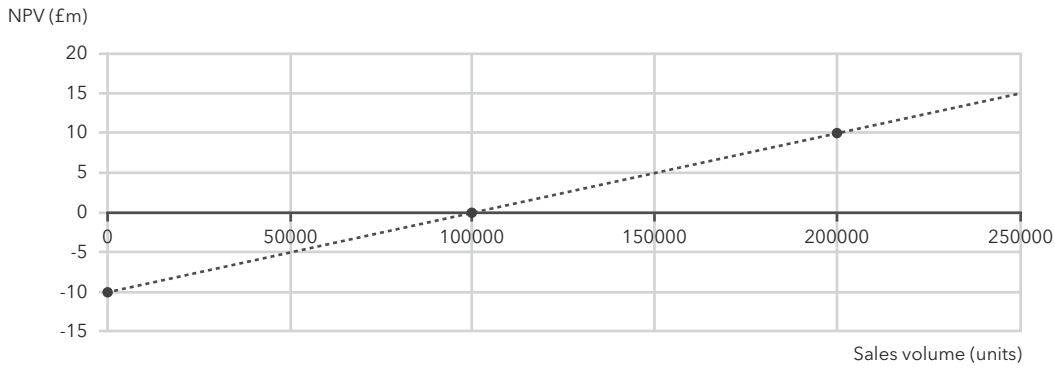


Figure 3.2: Impact of sales volume on NPV (£m)

Here this equation is approximately y = –10 + 0.0001x which means that starting from –10 (£m), NPV increases by approximately 0.0001 (£m) for each forecast unit of sales. This could also be used, as part of sensitivity analysis, to compare the impact of changes in one variable (such as the sales volume) to the predicted NPV of a project.

A regression equation is unlikely to fully explain the relationship between y and x, and the failure of the regression equation to fully explain the relationship between the dependent (y) and independent

(x) variable results in an error variable, so the regression equation becomes y = a + bx + error. The larger the error term is, the less certain is the regression line.

Multiple regression analysis

Multiple regression analysis involves exploring whether identifying more than one independent variable reduces the error term and identifies the most important independent variables that reduce the error term as low as possible. This aims to provide a stronger regression line that quantifies the key independent variables that are associated with changes in the value of the dependent variable.

Multiple regression analysis will result in a more complex formula. For example, if two key independent variables (x1 and x2) had been identified then the formula would be y = a + bx1 + cx2 + error.

From the previous example, if the two independent variables affecting sales had been identified as time (X1) and economic growth (X2) then the regression equation could be y = 10 + 0.9X1 + 0.05X2.

The increasing availability of Big Data also makes it possible to identify the relationship between non-financial factors (eg, rainfall, social media followers, website hits) and the revenue from a project or even the overall NPV.

Multiple regression analysis can also be used to help make predictions of the value of a company which can be useful in evaluating a takeover. For example, some of the variables that could affect share prices include company profits, forecast revenue growth, the gearing ratio, and the number of competitors in the industry.

Advantages of linear regression

- Linear regression models are simple to use and easy to explain to non-financial managers.

- Linear models can be used to predict the impact of expanding variables beyond current estimates (such as identifying the impact of sales volumes or material costs being higher than predicted).

Limitations of linear regression

- There will not always be a linear relationship between variables and outcomes.
- Basic linear regression models can only consider the impact of one variable at a time. More complex multi-linear models are required to consider additional variables at the same time.
- Linear models may identify spurious relationships between variables and outcomes as they do not consider the difference between correlation and causation.
- Will be less meaningful if the data collected is inaccurate or if the error term is large.

3.1.2 Correlation vs causation

A cause and effect relationship (also known as a causal relationship) exists between two variables when a change in one **causes** the change in the other.

For example, if staff are paid hourly, then as hours worked increase, wage costs will increase. The increase in hours worked has **caused** the increase in wage costs. There is a positive correlation between the number of hours worked and wage costs that, in this case, can be described as a cause and effect relationship.

However, **correlation does not necessarily mean that a cause and effect relationship exists**. There may be a reason for the correlation that is not **causal**.

For example, when the sales of sun cream increase, the sales of ice cream also increase. The increase in sun cream sales is not causing the increase in ice cream sales. There is a third variable, namely the weather, influencing both types of sales. This variable is known as a confounding variable.

Also, correlation may occur by pure chance; this is more likely to happen with a small set of data.

This highlights the need to exercise professional scepticism when analysing data and drawing conclusions.

Questions to consider might include:

- Does the relationship seem plausible?
- Could the relationship be because of chance or could a third variable be involved?

3.1.3 Data outliers

Data outliers are observations that are abnormal and can therefore significantly distort the results. Sometimes outliers are removed from the data set before applying forecasting techniques.

The following graph shows the number of passengers at Heathrow airport from January 2015 to January 2021. (Figures from www.heathrow.com/company/investor-centre/reports/traffic-statistics.)

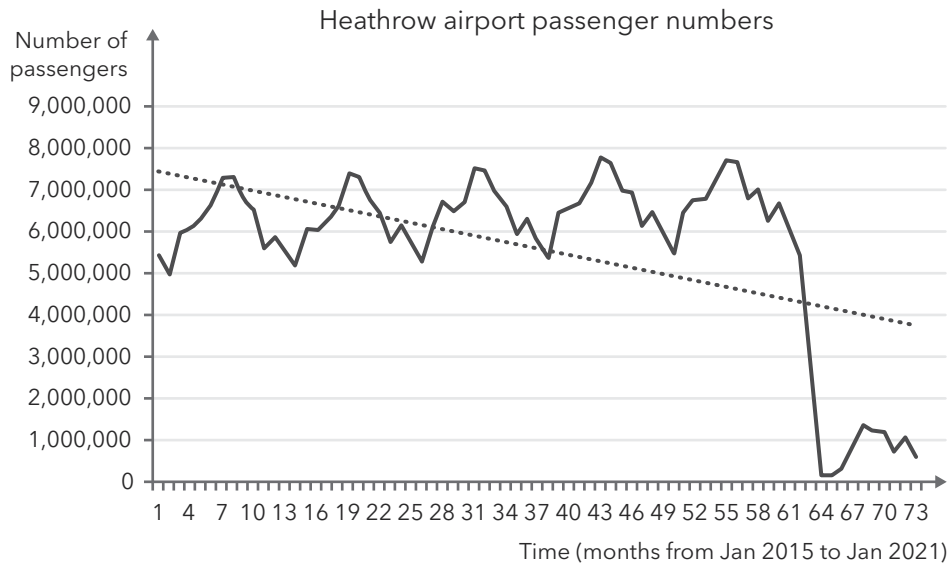


Figure 3.3: Heathrow airport passenger numbers Jan 2015–Jan 2021

The trend line is the dotted line and the Covid-19 lockdown began at the end of March 2020 (month 63). You can see that the severe drop in passenger numbers from March 2020 has caused a dramatic change in the direction of the trend. The drop in passenger numbers is not something that could have been forecast in the 2020 budget. Forecasting passenger numbers for the future will require consideration about whether the trend seen before March 2020 will resume.

Sometimes outliers are deleted from the data set. However, it is important to have a clear and valid reason for excluding data outliers, otherwise there is the danger that excluding them will result in data being manipulated ie, introducing bias into the data.

3.1.4 Decision trees

Decision trees are a predictive analytics technique that can be used to identify the impact of different decisions and variables on the outcome of an investment.

The example below shows the four different NPVs that are predicted to occur based on one decision (the size of the investment) and one variable (economic conditions).

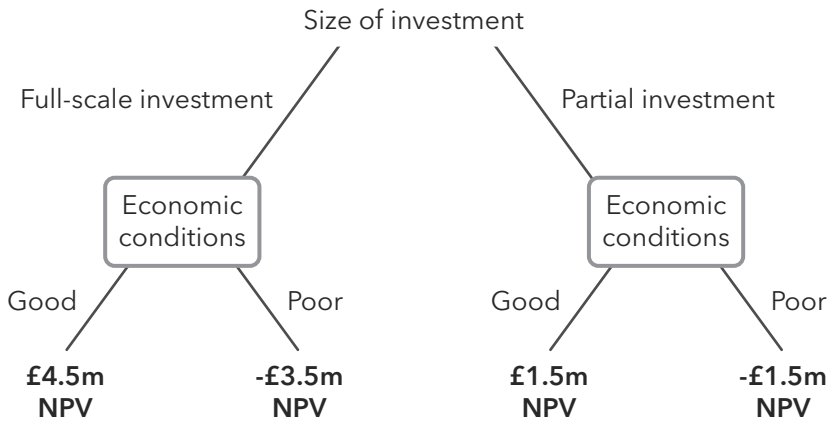


Figure 3.4: Impact of one variable on NPV

This technique can be used to show the impact of multiple decisions or variables. The following example shows the impact of changes to two different variables.

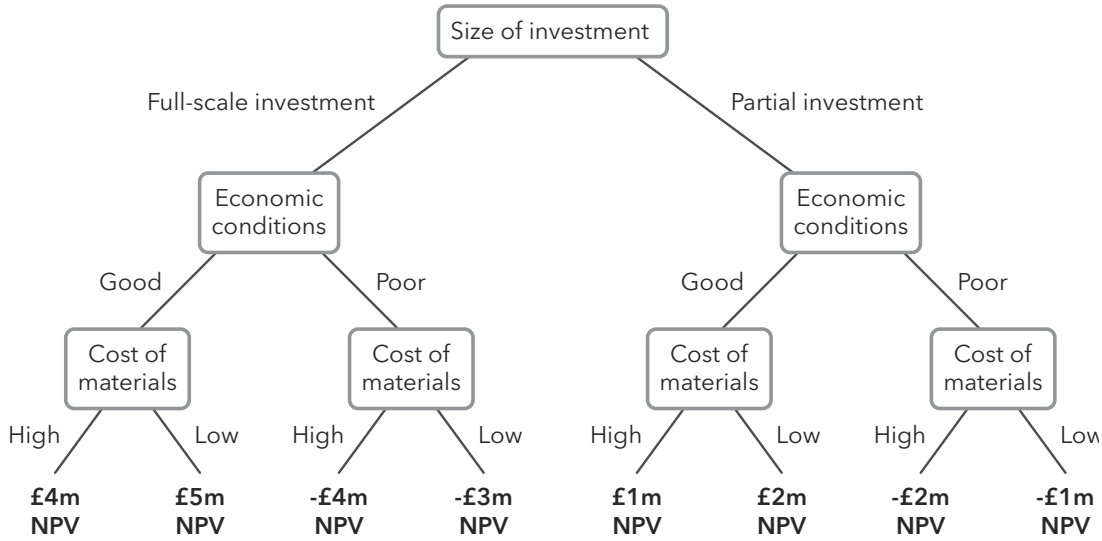


Figure 3.5: Impact of two variables on NPV

Probabilities and expected values (section 4) could be used to evaluate the decision tree. The evaluation of decision trees is examinable in *Business Strategy & Technology* only.

Advantages of decision trees

- Simple decision trees are easy to explain and logical to use.
- Can be used to consider the different outcomes that can occur based on changes in a number of variables.
- Can be used to consider multiple decisions (such as the initial investment decision plus the impact of real options such as follow-on decisions).

Limitations of decision trees

- In order to avoid over complicating the decision tree, variables usually have to be restricted to a small number of possible outcomes (eg, economic conditions have been restricted to good or poor in the examples above when there could be a range of actual conditions).
- Large decision trees can become difficult to interpret, which restricts their overall value to the user.

3.2 Monte Carlo simulation

As noted above, one weakness of sensitivity analysis is that only one factor at a time is changed eg, material price, product life etc. In the real world it is likely that more than one factor will change **at the same time**. Simulation is a technique which allows the effect of more than one variable changing at the same time to be assessed. Monte Carlo simulation is a technique based on the use of random numbers and probability statistics to investigate problems.

3.3 Who uses it?

Many companies use Monte Carlo simulation as an important tool for decision-making. For example,both General Motors and Procter and Gamble use simulation to estimate both the average return and the riskiness of new products.

Context example: Monte Carlo simulation

Outcome	Probability
Head	0.5
Tail	0.5

A simulation of a coin being tossed might work as follows.If a random number is selected:

- between 0–4 (5 numbers), then a tail is assumed.
- between 5–9 (5 numbers), then a head is assumed.

Random numbers	Simulated outcome
9	H
4	T
3	T
7	H
7	H
0	T
0	T
1	T
9	H
8	H

Thus, in this Monte Carlo simulation of a coin being tossed 10 times, heads and tails appeared an equal number of times.

3.4 Results of a simulation exercise

Imagine that a firm is choosing between two projects and, using simulation, it has generated the distribution of the NPVs for each project.

The results might look like this:

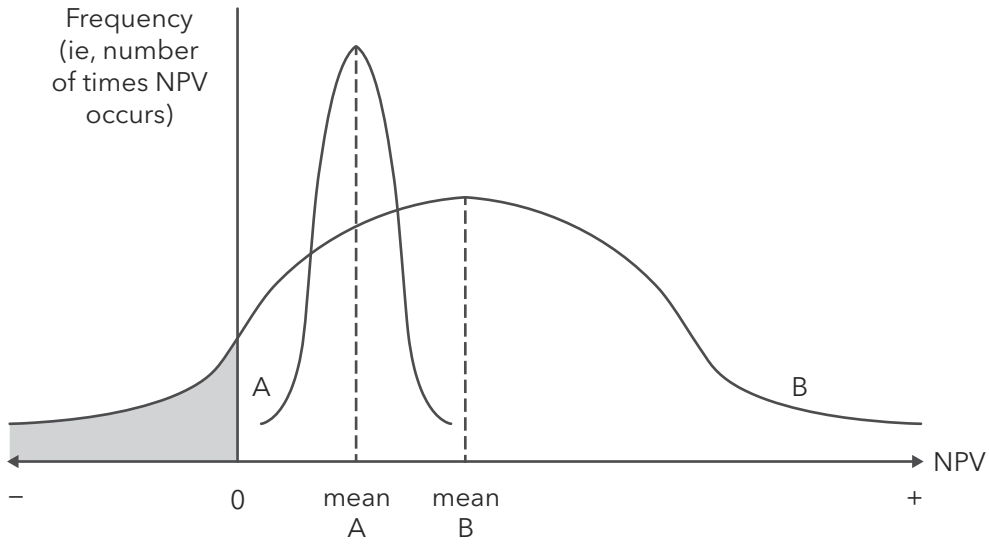


Figure 3.6: Distribution of simulated NPVs for two projects

Project A has the lower average NPV but also is less risky (its outcomes are less widely dispersed about the mean).

Project B has the higher average NPV but also is more risky (higher dispersion of outcomes).

All simulation will do is to give the firm the above results. It **will not** tell the firm which is the better project. That depends on the investors' attitude to risk (see section 5 below). Project A may be preferred to Project B as there is no chance of its NPV being negative. Statistical techniques can be used to analyse the risk associated with a project; this is covered in section 4 below.

3.5 Advantages and limitations of simulation

Advantages

- It gives more information about the possible outcomes and their relative probabilities.
- It is useful for problems which cannot be solved analytically.

Limitations

- It is not a technique for making a decision, only for obtaining more information about the possible outcomes.
- It can be very time-consuming (and so impractical) without a computer.
- It can be expensive to design and run a simulation for complex projects.
- Monte Carlo techniques require assumptions to be made about probability distributions and the relationships between variables, and these may be unreliable.

3.5.1 Environmental risk analysis

Environmental issues such as climate change are giving rise to significant risks for businesses. Whether those risks arise from more frequent and severe weather events or the transition to a net- zero carbon economy, expectations are growing that companies appropriately embed

climate-related risk into their governance and risk management processes. Simulation and scenario analysis is key to better understanding and managing future risks today, as well as supporting the transition to a net-zero carbon economy.

Environmental costing was covered in Chapter 2. The impact on the environment of new ventures should be considered as part of the investment appraisal process. Simulation can be used to give more information about the impact of environmental costs on new ventures by incorporating possible outcomes and their relative probabilities to provide management with a better understanding of the impact of environmental costs on shareholder value.

3.6 Prescriptive analytics

By combining the statistical tools utilised in predictive analytics with Artificial Intelligence and algorithms, prescriptive analytics software can be used to calculate the optimum outcome from a variety of business decisions.

For financial management, these could include the following:

- Capital rationing decisions
- Replacement analysis
- Identifying the optimal balance of finance

Advantages

- Prescriptive models have the capability to identify optimum investment decisions whilst considering the impact of multiple decisions and variables.

Limitations

- Creating reliable prescriptive models is complex and requires specialist data science skills, which are typically outside the scope of finance managers.
- The reliability of such models depends on the reliability of the data that they use and the ability to predict future outcomes accurately from past data.

3.7 Data bias and professional scepticism

Businesses use data to aid decision making in the face of uncertainty. The amount of data available is greater than ever, but there is still often a need to make generalisations about a wider group (eg, the population) based on samples of data available. This can lead to errors, incorrect conclusions and flawed decision making.

Users of information produced by data analytics should therefore take steps to ensure the analysis is reliable, and should apply a degree of professional scepticism in their interpretation of this data.

Scepticism does not mean that the users assume that the data or its conclusions must be wrong; rather it means being aware that data analysis is not always accurate for several reasons:

- There may be bias inherent in the data that is analysed. This may be intentional or unintentional.
- The data may have been intentionally manipulated during the analysis process.
- The data may have been analysed accurately, but the presentation of the data, or the conclusions drawn from it may be flawed or may have been designed to mislead the users.

3.7.1 What is data bias?

Data is biased when it is not representative of the population. Data may be biased before its analysed just because the method of collecting the data means that some members of the population have a lower (or zero) chance of being included in the sample. People who analyse data and reach conclusions can also introduce bias.

For example, during elections, pollsters call samples of voters and ask them how they intend to vote in the forthcoming election. They use this as a basis for predicting what the results of the election will be. One reason that polls are often wrong is because people are not always honest when talking about their voting intentions, perhaps feeling embarrassed about admitting which party they truly intend to vote for.

There are several different types of data bias.

Type of bias in data	Meaning
Selection bias	This occurs when the data is not selected randomly and leads to a sample that is not representative of the population. In order to be representative, all items in the population should have an equal chance of being selected for the sample.

Type of bias in data	Meaning
Self-selection bias	This is a type of selection bias. It occurs when individuals select themselves to be part of a sample. **Example – online questionnaire**
	People are often provided with the opportunity to be entered into a prize draw if they complete an online questionnaire. Only people who are interested in being entered into the draw are likely to participate in the questionnaire. The questionnaire will not therefore reflect the opinions of those who are not.
Observer bias	This occurs when observing and recording results and relates to interpretation. The researcher allows their assumptions (which may be unconscious) to influence their observations.
Omitted variable bias	Exploratory data analysis aims to identify relationships between data – for example, finding out what characteristics people who are potential customers display. Omitted variable bias is where key variables are not included within the data to be analysed. For example, the researcher may omit to record the ages of people, even though this might be a factor that determines whether a person is a potential customer.
Cognitive bias	This relates to human perception and includes bias depending on how data is presented (eg, infographics or the order of presentation), the context in which it is presented, and 'anchoring', where the perception of whether something is good or not is influenced by being shown a previous or expected value for that variable. **Example – recognising the context of performance** A company's profits for the year show a 20% increase compared to the previous year. This information is likely to sound impressive to shareholders. If, however, shareholders are first told that the market growth was 30% over the last year, shareholders will recognise the company's 20% growth as less impressive.
Confirmation bias	This occurs when people see data that confirms their beliefs and they ignore (consciously or sub-consciously) data that disagrees with their beliefs. **Example – new product/market research** Managers who have already made a decision (eg, to invest in a new product) may ignore marketing research that suggests that the product will not be successful, while fully paying attention to research that confirms their decision.
Survivorship bias	This is where the sample contains only items that survived some previous event. **Example – exam results** An accountancy firm only lets students sit the FM exam if they achieve at least 45% in the mock exam. The firm boasted that 95% of their students passed FM in the last sitting. This 95% did not include the students who had not been allowed to sit the exam because they had achieved less than 45% in their mock exams.

4 Statistical tools

Section overview

Where outcomes associated with a risk can be predicted reliably, and the probabilities of those outcomes can be estimated, statistical techniques can be used to analyse the risks. The statistical methods covered here are:

- Mean (or average)
- Standard deviation
- Co-efficient of variation
- Normal distribution
- Skewness

4.1 Mean

Definition

Mean: The mean (or average) of a set of data is calculated by taking the sum of all the values and dividing by the number of values in the distribution.

Worked example: Mean

The daily takings of a shop last week were:

Day	Takings (£)
Monday	5,000
Tuesday	5,500
Wednesday	7,500
Thursday	9,300
Friday	12,000
Saturday	15,325
Sunday	12,700
Total	67,075

Requirement

Calculate the mean daily sales.

Solution

=AVERAGE(B1:B7)

	A	B
1	Monday	5,000
2	Tuesday	5,500
3	Wednesday	7,500
4	Thursday	9,300
5	Friday	12,000
6	Saturday	15,325
7	Sunday	12,700
8	Mean	9,582

4.2 Standard deviation

Definition

Standard deviation: This shows the average amount of variability in a data set, showing how far, on average, each result lies from the mean (or expected value).

The mean (or expected value) does not indicate the level of risk associated with an event. There could be two risks that both have the same mean or expected value, but very different risk profiles. Risk means the variability of outcomes and can be measured using standard deviation.

The lower the standard deviation, the closer the data points are to the mean, meaning the decision being taken has lower variability and therefore lower risk. Conversely, a higher standard deviation indicates that the data points are spread out over a wider range of values, increasing the risk of the expected return.

Context example: Example: Standard deviation and climate

Standard deviation can be used to monitor daily maximum temperatures. Consider two cities, one on the coast and one inland. During the day they both have the same average maximum temperature of 25°C. Based on this data, it could be said that the temperatures of the two cities are the same.

However, let us examine the variation in temperatures further.

The coastal city has a more stable temperature than inland. Temperatures can rise to 28°C but rarely fall below 22°C.

The inland city sees greater temperature fluctuations. Temperatures have been known to rise to 40°C and fall to 10°C.

It can be seen that there is much greater variability in daily temperature in the inland city than the coastal city. The standard deviation for the inland city is therefore greater than that of the coastal city, whose temperatures are clustered around the mean. Standard deviation is useful in showing the level of variation and therefore uncertainty that exists.

4.2.1 Interpretation of standard deviation

Standard deviations can be used when evaluating the risks associated with particular strategies or decisions, if the information is available. Strategies may be rejected if the standard deviation is considered too high, given the risk appetite of the organisation.

In the exam, it is vital that you interpret its meaning and explain what the implications are for the organisation in the scenario.

Worked example: Interpretation of standard deviation

The daily customer footfall in a city-centre store last week was:

=AVERAGE(B2:B8)

	A	B
1		Daily footfall
2	Mon	10,500
3	Tues	9,300
4	Weds	10,010
5	Thurs	11,508
6	Fri	13,210
7	Sat	29,461
8	Sun	21,557
9	Average	15,078

Requirement

Using the data above, calculate and comment on the standard deviation of daily footfall. We can use the STDEV spreadsheet functionality to perform the calculations.

Solution

=STDEV(B2:B8)

	A	B
1		Daily footfall
2	Mon	10,500
3	Tues	9,300
4	Weds	10,010
5	Thurs	11,508

6	Fri	13,210
7	Sat	29,461
8	Sun	21,557
9	Standard deviation	7,584

The standard deviation of daily footfall is 7,584. This recognises that, whilst expected daily footfall is 15,078 (average or mean), the actual daily footfall will differ from this. On some days, footfall will be lower and sometimes it will be significantly higher (for example at the weekends). On average the difference between actual daily footfall and the average (or mean) footfall will be 7,584.

From the perspective of a retail outlet, this large standard deviation shows that customer footfall fluctuates widely. Shop managers must therefore be careful to monitor staffing requirements and inventory levels to ensure that the shop can meet the changing demand levels.

4.2.1 Interpreting the standard deviation

The bigger the standard deviation, the more widely dispersed the possible outcomes of an event are. A bigger standard deviation means a higher risk.

If distributions have a smaller standard deviation, it means that the actual outcomes will generally be closer to the expected outcome, while a larger standard deviation means the outcomes will be further away from the expected value.

4.2.2 Use of standard deviation in risk management

Standard deviations can be used when evaluating the risks associated with particular strategies or decisions, if the information is available. Strategies may be rejected if the standard deviation is considered too high, given the risk appetite of the organisation.

In the investment industry, standard deviations are calculated for investments, for example, as a measure of the volatility of share prices on the stock markets. Investment decisions are taken based on the expected return and standard deviation of the investment returns. If the standard deviation is high, a higher expected return will be required by investors.

4.3 Co-efficient of variation

Definition

Co-efficient of variation: Co-efficient of variation is the ratio of the standard deviation to the mean, calculated as (standard deviation ÷ mean) × 100.

Care must be taken when interpreting the standard deviation, as it can be misleading. A standard deviation may be larger in comparison to others, simply because the values in the data set used to calculate the standard deviation are higher. A more meaningful measure in such circumstances is theco-efficient of variation, which measures the standard deviation as a percentage of the mean. The higher the percentage, the wider the dispersion of data around the mean.

The co-efficient of variation therefore allows for meaningful comparisons between data sets whenthey have different mean values or different scales of measurement.

Worked example: Co-efficient of variation

A manufacturing company sources a key raw material component from two countries – the USA and India. An analysis over the past five months reveals the prices paid per unit in each country. The procurement manager is concerned about fluctuations in prices and has prepared some calculations to assess this. He believes that raw material prices fluctuate more in India than in the USA based on the standard deviation he has calculated.

	A	B	C
1		Unit price (US$)	Unit price (Rupees)
2	March	2.72	13,065
3	April	2.98	12,065
4	May	3.05	11,720
5	June	2.71	12,138
6	July	2.68	12,978
7	Mean	2.83 [1]	12,393 [2]
8	Standard deviation	0.17 [3]	596 [4]

1 =AVERAGE(B2:B6)

2 =AVERAGE(C2:C6)

3 =STDEV(B2:B6)

4 =STDEV(C2:C6)

Requirement

Using the data, assess whether the procurement manager is correct in his assumption.

Solution

The standard deviation reveals the spread of the data around the mean. A higher standard deviation indicates that the data points are spread out over a wider range of values, suggesting an increased variability in the Indian component prices. However, the procurement manager has not taken into consideration the scale of the data, caused by comparing different currencies. Indian rupee values are larger than dollar values, resulting in a larger standard deviation.

If we calculate the co-efficient of variation (Standard deviation ÷ mean) we can take account of the different scale of data and make a like for like comparison.

=B3/B2

	A	B	C
1		Unit price (US$)	Unit price (Rupees)
2	Mean	2.83	12,393
3	Standard deviation	0.17	596
4	Co-efficient of variation	6.0% [1]	4.8% [2]

1 =B3/B2

2 =C3/C2

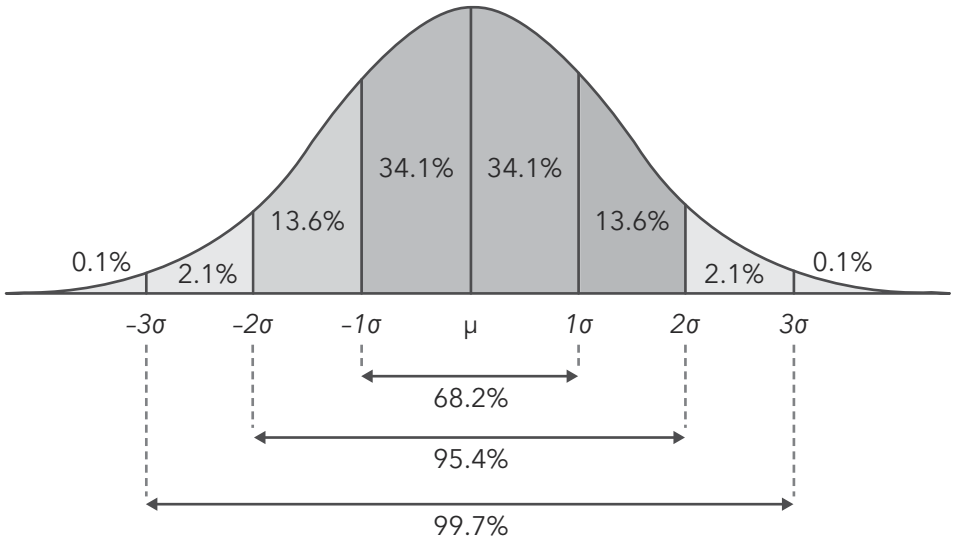
The co-efficient of variation is higher in the USA (6%) than in India (4.8%) indicating that prices actually fluctuate more widely in the USA.

4.4 The normal distribution

Definition

Normal distribution : A frequency distribution which is important because it arises frequently in 'real-life'. It is any distribution that is symmetrical around the mean.

Many large data sets in the real world approximate the normal distribution. In a normal distribution, 68% of the data is within one standard deviation above/below the mean. In general, 95% of the data lies within two standard deviations from the mean and 99.7% lies within three.



μ is the mean of the distribution (and the median and the mode).

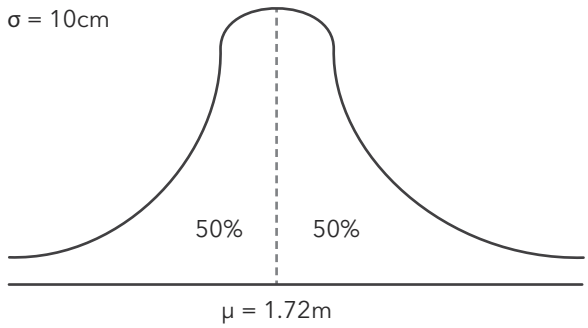
σ represents the standard deviation.

The area under the curve shows the probabilities of being within certain ranges of the mean, where distance from the mean is measured in standard deviations.

Standard deviation can be interpreted using the concept of normal distribution. It has been found that many probability distributions are close enough to a normal distribution to be treated as one without any significant loss of accuracy. This means that the normal distribution can be used as a tool in business decision making involving probabilities.

For example, if we take the population of the UK and look at the distribution of the height of all adults it would almost certainly follow a normal distribution. This results in a bell-shaped curve, with the majority of heights lying near to the average (or mean) height.

This can be seen in the below diagram where the average (μ) height is 1.72m and the standard deviation (σ) is 10cm.



The total area under the curve represents 100% of the population. The normal distribution range is approximately six standard deviations. In other words, adult heights range between:

$\mu - 3\sigma = 1.72m - (3 \times 10cm) = 1.42m$ $\mu + 3\sigma = 1.72m + (3 \times 10cm) = 2.02m$

This is more easily expressed in percentage terms since in a normal distribution 68%, 95%, and 99.7% of the values lie within one, two and three standard deviations of the mean, respectively. Applying this to the height example we can see that:

- 68% of the population lie within the height range of 1.62m to 1.82m (one standard deviation)
- 95% of the population lie within the height range of 1.52m to 1.92m (two standard deviations)
- 99.7% of the population lie within the height range of 1.42m to 2.02m (three standard deviations)

Context example: Normal distribution

The mean number of units produced by a machine is 1,000 per day, with a standard deviation of 25 units. The Production Manager wishes to know what is the probability of producing between 950 and 1,000 units in a particular day. Assume that daily output is normally distributed.

950 units is two standard deviations below the mean of 1,000 units. We are therefore looking at the probability of being in the range between the mean and two standard deviations below the mean.

Using the normal distribution (refer to diagram above), we can see that there is a 47.7% probability of being between the mean and two standard deviations below it (34.1% + 13.6%).

There is, therefore, a 47.7% chance that the machine will produce between 950 and 1,000 units per day.

Context example: Normal distribution 2

The number of units produced by a machine is 1,000 per day, with a standard deviation of 25 units. The Production Manager wishes to know what is the probability of producing between 975 and 1025 units on a particular day. Assume that daily output is normally distributed.

In this case, we are looking for the probability of being between one standard deviation below the mean and one standard deviation above the mean. Referring to Figure 5.4 above we can see that the probability of being in the range from one standard deviation below to

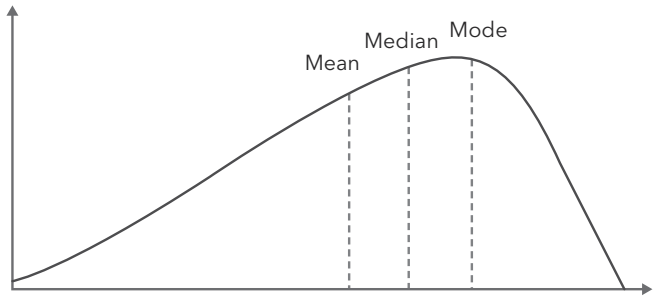
one standard deviation above the mean is 68.2%. Therefore, the probability of producing between 975 and 1025 is 68.2%. These calculations are for illustration only and would not be asked for in your FM exam.

4.5 Skewness

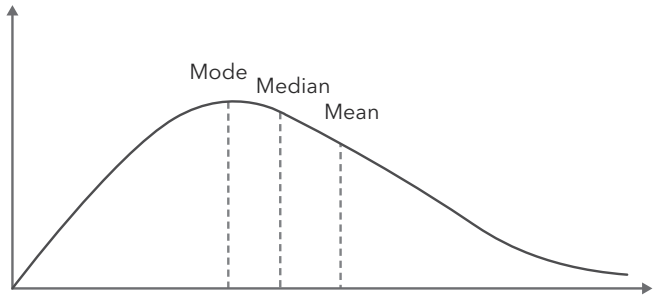
The normal distribution is symmetrical, with half the values lying above the mean, and half lying below. When evaluating data, it is often useful to assume that it has a normal distribution, but in fact most distributions are not symmetrical, and are therefore said to be skewed or asymmetric to some degree.

- A left-skewed (negatively skewed) distribution has the majority of values concentrated on the right-hand side of the distribution. There are fewer values on the left-hand side of the distribution but these are more spread out, so the curve has a long left-hand tail but appears to lean slightly to the right. The mode typically occurs at the highest point in the distribution and, typically, the median is to the left of the mode (so it has a lower value than the mode) and the mean is to the left of the median (so it has a lower value than both the mode and the median)'.
- A right-skewed (positively skewed) distribution has the majority of values concentrated on the left-hand side of the distribution. There are fewer values on the right-hand side of the distribution but these are more spread out, so the curve has a long right-hand tail but appears to lean slightly to the left. Again, the mode typically occurs at the highest point in the distribution and, typically, the median is to the right of the mode (so it has a higher value than the mode) and the mean is to the right of the median (so it has a higher value than both the mode and the median).
- The normal distribution is not skewed, and the mean = the median = the mode at the highest point of the distribution.

Skewness can be illustrated by the following diagrams:



Left skewed



Right skewed

In a very skewed set of data, with extreme values at one end of the distribution, the mean of the data is not representative of the data as a whole. This means the data is more difficult to analyse using statistics. Skewness is often indicative of bias in the data.

5 Expected values and attitude to risk

Section overview

Expected values allow different outcomes to be built into the decision evaluation.

- Expected values ignore risk.
- Risk averse investors require an extra return to compensate for risk.

5.1 Expected values

The simplest way to assess possible outcomes and their associated probabilities is to use expected values or weighted averages.

The expected value is an average (arithmetic mean) of possible outcomes, weighted by the probability of each outcome occurring.

Worked example: Expected values

A firm has to choose between two possible projects, the outcome of which depend on whether the economy is in recession or slow recovery:

	Probability	Project A NPV	Project B NPV
		£m	£m
Recession	0.6	– 100	– 50
Slow recovery	0.4	+ 250	+ 200

Requirement

Using expected values, which project should be chosen?

Solution

Project A expected NPV = (0.6 × –£100m) + (0.4 × £250m) = £40m

Project B expected NPV = (0.6 × –£50m) + (0.4 × £200m) = £50m

Based on expected values, project B is the better project.

Interactive question 3: Expected payoff

Payoffs represent the net present value of projects in £m where the possible outcomes depend on what the state of the market will be.

State of market	Diminishing	Static	Expanding
Probability	0.4	0.3	0.3
Project 1	100	200	1,000
Project 2	0	500	600
Project 3	180	190	200

Requirement

Based on expected values, which is the best project?

See **Answer** at the end of this chapter.

Interactive question 4: Uncertain sales

Mun is trying to evaluate a two-year project using NPV. There is uncertainty as to the level of sales (in units) in each of the two years:

Year 1Sales (units)	Probability	Year 2Sales (units)	Probability
10,000	0.3	8,000	0.2
		10,000	0.8
		(if year 1 sales are 10,000)	
15,000	0.7	20,000	0.6
		10,000	0.4
		(if year 1 sales are 15,000)	

Requirement

On what expected level of sales in years 1 and 2 should Mun base her NPV calculation?

See **Answer** at the end of this chapter.

Interactive question 5: Uncertain contribution

Imagine in Interactive question 4, above, that the project outlay is £230,000 and each unit sold has a contribution of £10.

Requirement

If Mun's cost of capital is 10%, what is her project's expected NPV?

See **Answer** at the end of this chapter.

5.2 Analysing the outcomes

In Interactive questions 4 and 5, the information could have been laid out as follows:

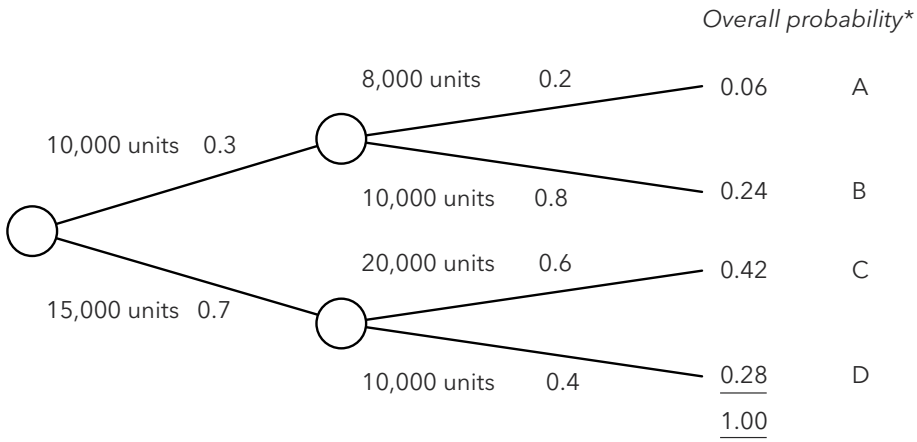


Figure 3.7: Decision tree – probability of sales

* probability of year 1 sales × probability of year 2 sales eg, year 1 (10,000) and year 2 (8,000), overall probability is 0.3 × 0.2 = 0.06.

There are now four possible outcomes with NPVs as follows:

(a)	(10,000 × £10)/1.1 + (8,000 × £10)/1.1^2 – £230,000 = £(72,975) × 0.06 =	£(4,379)
(b)	(10,000 × £10)/1.1 + (10,000 × £10)/1.1^2 – £230,000 = £(56,466) × 0.24 =	£(13,547)
(c)	(15,000 × £10)/1.1 + (20,000 × £10)/1.1^2 – £230,000 = £71,653 × 0.42 =	£30,094
(d)	(15,000 × £10)/1.1 + (10,000 × £10)/1.1^2 – £230,000 = £(10,992) × 0.28 =	£(3,078)
The	expected NPV can be calculated as:	£9,090

This is the same conclusion that you should have reached in answering Interactive question 5, but there is now much more information.

Range of outcomes	It can be argued that as the expected value of the NPV is positive, the project is worthwhile. However, the expected value outcome of £9,090 cannot occur if this project is undertaken only once. The possible outcomes in NPV terms are a loss of £72,975 or £56,446 or £10,992, or a gain of £71,653.
Probability of outcomes	In addition, the chance of a positive NPV is 0.42 (or 42%). The chance of a negative NPV must therefore be (1 – 0.42) = 0.58 or 58%. If the project is undertaken once only, it does not look particularly attractive despite the positive expected value of the NPV.
Average return	However, if the project were repeated very many times, then the expected average of the NPVs would be £9,090 and it would therefore be acceptable to invest in the project many times over.

5.3 Advantages and limitations of expected values

Advantages

The advantages of expected values are as follows.

- The information is reduced to a single number for each decision option.
- The idea of an average is readily understood.

Limitations

The limitations of expected values are as follows.

- The probabilities of the different possible outcomes may be difficult to estimate. It is possible to use:
  - Objective probabilities based on past experience of similar projects; or
  - Subjective probabilities eg, from the results of market research, where there is no past experience as a guide to the future.
- The expected value may not correspond to any of the possible expected outcomes.
- Unless the same decision has to be made many times, the expected value will not be achieved; itis therefore not a valid way of making a decision in 'one-off' situations unless the firm has a number of independent projects and there is a portfolio effect.
- The average gives no indication of the spread of possible results ie, it ignores risk.

Professional skills focus: Assimilating and using information

You are expected to be able to filter information provided to identify critical facts. The information needed to perform an expected value calculation is normally embedded within lots of detail in the question scenario. It can be helpful to annotate the relevant part of the scenario on the screen and prepare a separate expected value calculation as part of the overall NPV, using a decision tree approach for more complex problems.

5.4 Attitude to risk

The problems with applying expected values to a risky decision can be illustrated with a gambling example.

Context example: Risk aversion

Suppose I am going to toss a coin 100 times.

Every time it shows heads you will pay me 30p, and every time it shows tails I will pay you 50p. Would you accept the gamble? You probably would accept. The expected value of the gamble is as follows:

		Payoff
Heads	0.5 × (30p)	(15)
Tails	0.5 × 50p	25
		10

All that is meant by the expected value is that if I toss the coin a large number of times, your average win per game is 10p. After 100 games you are likely to have won 100 × 10p = £10 which is very acceptable, considering that your maximum loss on any game is 30p, and the chances of losing anything significant are very small.

The expected value computation is relevant because:

- the game is repeated many times; and
- the sums of money involved are small compared with your overall wealth.

Interactive question 6: Risk aversion

However, now suppose I offer you a different gamble. I am going to toss a coin just once.If the result shows heads, you will pay me £3,000. If tails, I will give you £5,000.

Requirement

Answer the following:

- Would you accept this gamble?
- What factors would determine your choice?

See **Answer** at the end of this chapter.

Definition

Risk-averse investor: One who requires a higher average return in order to take on a higher level of risk.

This principle applies just as much to decisions made by directors of companies. A project which has a positive expected value of NPV, but which nevertheless carries a fair chance of forcing the company into liquidation if things go wrong, would probably be rejected.

Context example: Attitude to risk

Renu Panesar is a retailer currently earning profits of £40,000 pa. She is considering two alternatives for expansion:

Alternative 1. Build a new counter in an unused area of the shop which will create an additional net contribution of £8,000 pa with a high degree of certainty.

Alternative 2. Open a completely new franchise operation. If the franchise proves successful, it will generate an additional net contribution of £40,000 pa. The problem, however, is that even if the franchise is unsuccessful Renu will be committed to minimum royalty payments of £20,000 pa indefinitely into the future. There is a 50% chance of success or failure.

Consider the intuitive reaction to such a decision. Most business people would prefer Alternative 1, because although the possibility of a very high contribution does not exist, there is no risk of any loss.

6 Diversification and the portfolio effect

Section overview

- Risk can be reduced by diversification.
- Well-diversified investors face systematic risk, which can be measured by a beta value.
- CAPM gives a return for systematic risk – it assumes investors have well-diversified investments.
- The beta value can be adjusted to reflect gearing (financial risk).

6.1 Introduction

A different approach to allowing for risk and uncertainty in a project is to increase the cost of capital for projects that are more risky.

This approach is commonly taken by investors.

For example, when comparing a low-risk building society investment with one in high-risk equities, a higher return from equities is normally required.

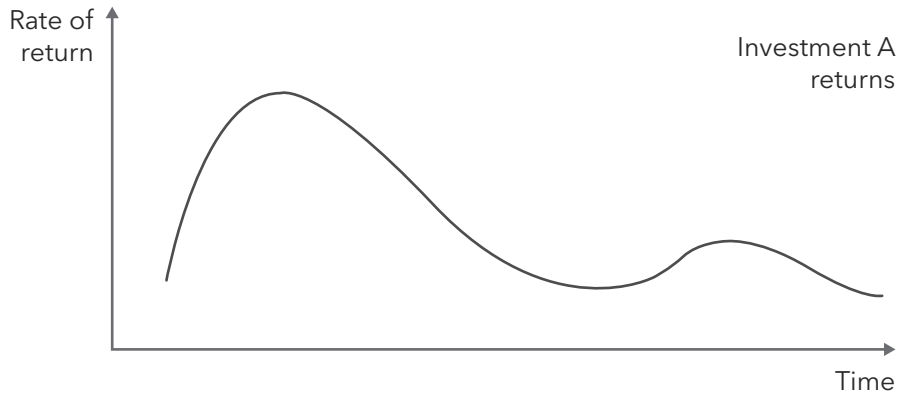
Similarly, when appraising equity investments in a well-established property company against a similar investment in a recently-listed computer manufacturer, a higher return would usually be demanded from the second investment to reflect its higher risk.

Investors seldom hold securities in isolation, as a single investment. They usually attempt to reduce their risks by 'not putting all their eggs into one basket', and they therefore hold a portfolio of different securities.

6.2 The portfolio effect

A portfolio is simply a combination of investments. If an investor puts half of his funds into an engineering company and half into a retail company, it is possible that any misfortunes in the engineering company (eg, a strike) may be to some extent offset by the performance of the retail company investment.

This effect is illustrated in the following graphs. Assume two companies, A and B, whose fortunes are inversely correlated (ie, when A does well B does badly and vice versa).



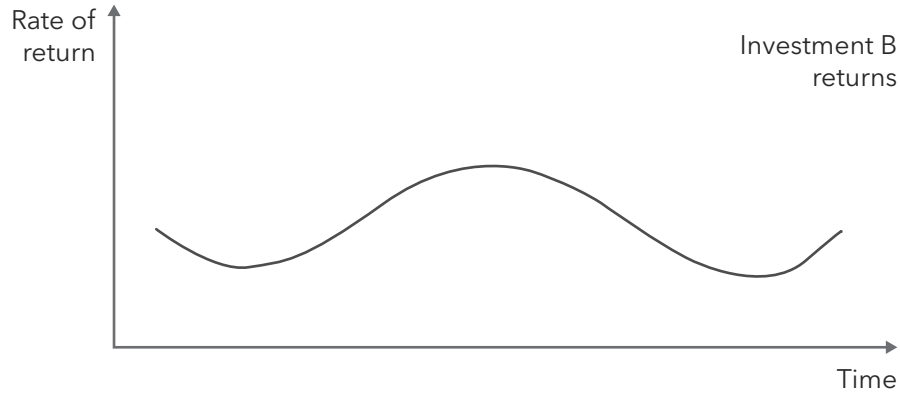
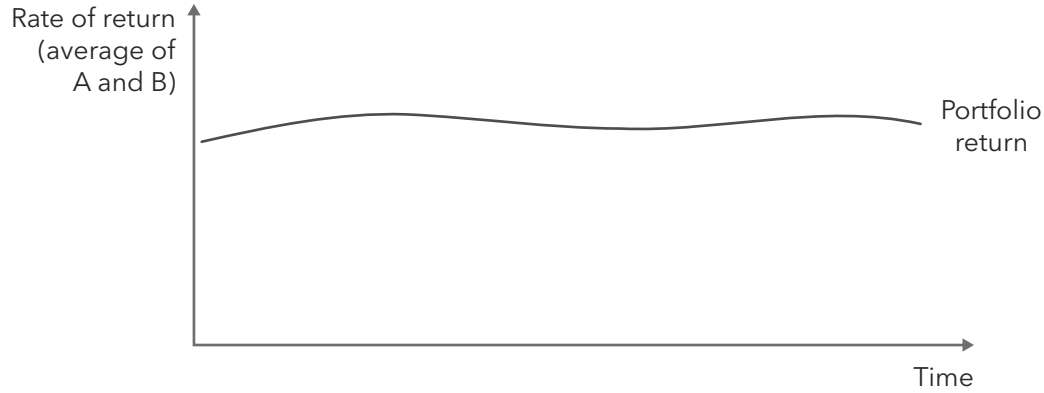


Figure 3.8: Individual returns

Both investment A and investment B show fluctuating returns over time. They both have about the same amount of variability. When A does well, B does badly, and **vice versa**. If both investments are held, the resulting portfolio will show the same average return but a greatly reduced risk, because the 'ups' of A cancel with the 'downs' of B and **vice versa**.



The same effect can be illustrated by a simple computational example.

Context example: Risk reduction

Two traders sell their goods from a stall on the seafront at Brighton during the tourist season. One sells ice cream, the other umbrellas. Assuming there are two possible states of the weather – sun and rain – when the sun is out, the ice cream seller makes a daily contribution of £200 but, when it rains, she only makes £20.

The returns made by the umbrella stall holder are the same, £200 and £20, but in rain and sun respectively.

State	Sun	Rain	Average	Risk
Probability	0.5	0.5		
Contribution – Ice creams	200	20	110	High
Contribution – Umbrellas	20	200	110	High

Although both businesses are profitable, the traders are a little unhappy about riding the roller coaster of risk.

What would happen if the two traders pooled their resources and each offers the other product as well as their own?

Now both hold half their inventory as umbrellas and half as ice creams.

When it is sunny, they would both make (1/2 × £20) + (1/2 × £200) = £110, and, When it rains, they both make (1/2 × £20) + (1/2 × £200) = £110.

State	Sun	Rain	Average	Risk
Probability	0.5	0.5		
Contribution	110	110	110	Zero

The average return is the same as before, but the risk is diversified away.

The above example is extreme in that risk has been completely eliminated. In practice risk reduction is less than 100% when investments are combined.

Interactive question 7: Diversification

Morag plc can invest up to £4 million in either or both of the following projects:

Project	Outcome (NPV as % of investment)	Probability
X	Outcome 1 + 30%	0.5
	Outcome 2 – 15%	0.5
Y	Outcome 1 + 30%	0.5
	Outcome 2 – 15%	0.5

X and Y are independent of each other ie, project X's outcome in no way influences that of project Yand **vice versa**.

Requirements

Calculate the following.

1.1 The best, worst and expected outcomes if the whole £4 million is invested in project X or project Y.

1.2 The best, worst and expected outcomes, together with associated probabilities, if half of the £4 million is invested in X and the other half in Y.

See **Answer** at the end of this chapter.

6.3 Systematic and non-systematic risk

As seen above, investing in a portfolio of different securities reduces the investment risk, but does not eliminate it entirely. Increasing the number of different securities in a portfolio of investments reduces the risk further, but still does not eliminate it entirely.

This is because the returns on investments are affected in the same way by market factors, such as the general state of the economy. When the economy goes into a downturn, the returns on most company shares will fall to a greater or lesser extent.

Investment risk can be divided into two types: risk that can be reduced or eliminated through diversification, and market risk that cannot be avoided entirely.

For every individual security or investment, investment risk can be defined as the possibility that the actual return may be more or less than expected. This risk can be attributed partly to factors that are specific to the investment or security, and an investor can reduce this investment risk by diversification. However, some of the risk with an individual security or investment is attributable to factors that cannot be eliminated through diversification: returns are affected to some extent by general market conditions.

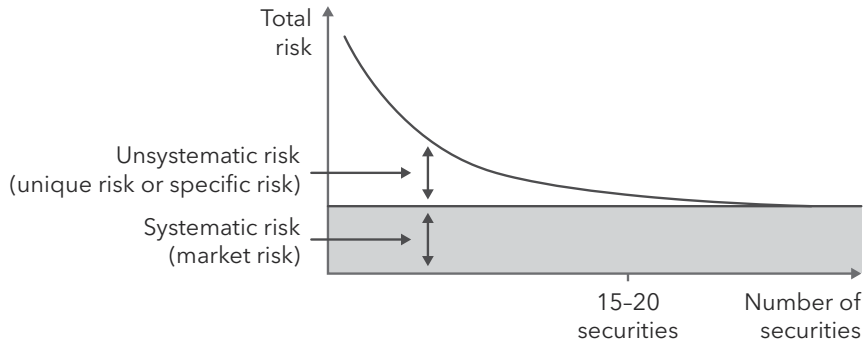


Figure 3.10: Portfolio size and risk reduction

Initially, substantial reductions in total risk are possible as long as securities from different industries are chosen. However, as the portfolio becomes more and more diversified, risk reduction slows down and eventually stops ie, each additional security yields successively less risk reduction.

Definition

Unsystematic risk, unique risk or specific risk: This is investment risk that can be eliminated by diversification.

Unsystematic risk is related to factors that affect the returns of individual investments in unique ways (eg, the risk that a particular firm's labour force might go on strike or its IT systems might fail).

Definition

Systematic or market risk: This is investment risk that cannot be eliminated by diversification.

To some extent the fortunes of all companies are dependent on the economy. Changes in macroeconomic variables such as interest rates, exchange rates, taxation, inflation etc, affect all companies to a greater or lesser extent and cannot be avoided by diversification. They apply systematically to the entire market.

6.4 Systematic risk and return

6.4.1 Systematic risk

For the purpose of making investment decisions, the relevant risk with an individual security is its systematic risk, and it is on the basis of systematic risk that a well-diversified investor will make investment decisions. Unsystematic risk can be eliminated and is of no consequence

to the well- diversified investor. Note that it is not necessary to hold the 'whole market portfolio' (every security in the market) to diversify away unsystematic risk – a portfolio of 15–20 randomly-selected securities will eliminate most of it.

It is not the case that individual shares carry the same amount of systematic risk. Some shares are more susceptible to economic factors (market factors) than others. For example, returns on shares in retailing companies are usually less susceptible to market factors and economic conditions than shares in companies in the construction industry.

As unsystematic risk can be diversified away, investors need only concern themselves with systematic risk. The return that they expect from their portfolio of investments should depend only on the amount of systematic risk that they take.

6.4.2 Measuring systematic risk

A problem is how to measure the systematic risk of investments and the required returns from an investment, given its systematic risk. A model for measuring systematic risk is the **capital asset pricing model** (CAPM).

The method adopted by CAPM is to measure systematic risk as an index, normally referred to as beta (ß).

As with any index, some base points need to be established and then other observations will be calibrated around these points. The two base points are a risk-free security and the market portfolio.

(a) Risk-free security – this carries no risk at all, and the return from this security is certain. The security therefore has no systematic risk. A risk-free security has a beta of zero.

(b) The market portfolio – this is a portfolio of all risky investments in the market, weighted to allow for the different market values of the investments. The market portfolio represents the ultimate in diversification and the investment risk consists entirely of systematic (market) risk. CAPM sets beta to 1.00 for the market portfolio and this will represent the average systematic risk for all risky securities in the market.

These two points may be represented on the following graph: r_f represents the rate of return on a risk-free investment and r_m represents the return on the market portfolio.

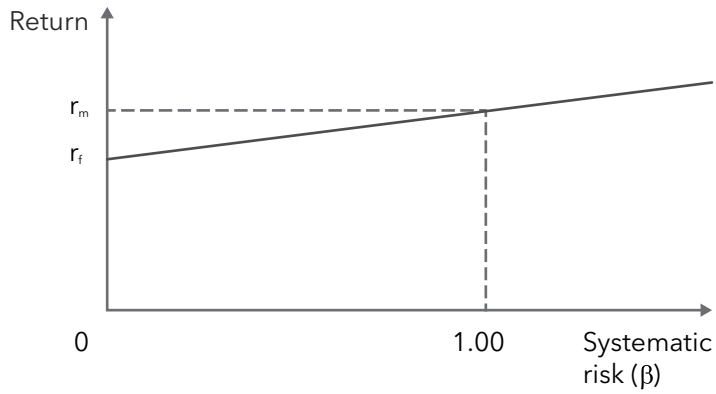


Figure 3.11: Graphical representation of CAPM

The required return on individual securities (shares in individual companies), allowing for systematic risk only and ignoring unsystematic risk, cannot be less than the risk-free rate of return. It may be more or less than the average market return, depending on the amount of systematic risk for the security.

The upward-sloping line in the graph shows the relationship between systematic risk and return: the higher the systematic risk, the higher the required rate of return, ignoring unsystematic risk.

Do not be surprised that some securities carry a systematic risk greater than 1.0. This merely means that these individual investments are affected more by changes in the economy and market conditions than the **average** market portfolio.

For example, shares in construction companies are strongly influenced by changes in economic factors and therefore have betas greater than 1.0.

6.5 CAPM equation

6.5.1 Calculations

The required return on a security, as illustrated by the line in the above graph, is expressed in the capital asset pricing model as an equation:

$r_j = r_f + ß_j (r_m - r_f)$

where

r_j = required rate of return on investment j r_f = risk-free rate of interest

r_m = return on the market portfolio

$ß_j$ = beta factor for investment j (= index of systematic risk for security j)

Note that when applied to shares, r_j is the same as the cost of equity capital k_e: (see Chapter 5 on cost of capital).

This CAPM formula is provided in the examination. The calculations are simple, but you should be able to **explain** how the equation works.

6.5.2 Explanation

There is a basic risk-free return (r_f) which reflects the rational nature of investors: investors require a return on their investment to reflect the time value of money. On top of a risk-free rate of return, investors require a premium for systematic risk. The average market premium for such risk is ($r_m - r_f$). The premium for individual investments or securities depends on their beta factor: if an investment has more systematic risk than the market average, beta is > 1.00 and the premium (beta ($r_m - r_f$)) is therefore greater than the market average. Similarly, if the beta factor for a security or investment is less than 1.00, the required return is less than the return on the (average) market portfolio.

6.5.3 Estimating the variables

The problem with estimating r_f is finding a risk-free asset and estimating its expected future returns. Government short-dated bills (Treasury bills) are probably the closest thing available in the real world and the return they provide can be predicted with reasonable accuracy by economic forecasters.

Estimating r_m is perhaps even more difficult. History shows a very volatile performance for the stock market over time. The long-term average premium (ie, $r_m - r_f$) is around 5% pa.

6.5.4 Overall equity beta factors for a diversified company

The equity beta of a company that has operations in different industry sectors will reflect the systematic risk of each sector.

Worked example: Equity beta for a diversified company

XYZ plc (XYZ) has 75% of its operations by market value in supermarkets and 25% of its operations in holiday companies. The equity betas, which reflect the gearing of XYZ, of the supermarket division and holiday company division are 0.80 and 1.10 respectively.

Requirement

Calculate the overall equity beta of XYZ.

Solution

The overall equity beta of XYZ will be: 0.80 × 0.75 + 1.10 × 0.25 = 0.875.

6.6 Aggressive and defensive shares

The returns on the market portfolio will change in relation to altered economic conditions. Changing market conditions will also result in a change in the return on individual shares, depending on their beta factor.

Beta is a measure of the responsiveness of the share return to changes in the average return for the market as a whole. Shares with high betas are termed 'aggressive', and those with betas less than one are termed 'defensive'.

As far as stock market investment tactics are concerned, an investor should buy high beta shares if the market is expected to rise (a 'bull' market) because they can be expected to rise faster than the market. If the market is expected to fall (a 'bear' market), low beta shares are more attractive.

The only problem with this strategy is the need to forecast general market movements in advance, otherwise an investor may end up holding an aggressive share in a falling (bear) market.

Interactive question 8: Different sectors

You are considering investing in the sectors listed below.

- Supermarkets
- Pharmaceuticals
- Construction
- Airlines
- Car manufacturing

Requirement

For each, estimate the expected beta value and thus the likely performance of the stock.

See **Answer** at the end of this chapter.

6.7 Application of the CAPM to project appraisal

6.7.1 Developed for shares

The capital asset pricing model was originally developed to explain how the returns earned on shares are dependent on their risk characteristics. However, its greatest potential use in the financial management of a company is in the setting of minimum required returns (ie, risk-adjusted discount rates) for new capital investment projects.

6.7.2 Risk-adjusted discount rate

The great advantage of using the CAPM for project appraisal is that it clearly shows that the discount rate should be related to the project's risk. It is not good enough to assume that the firm's present cost of capital can be used for investment appraisal if the new project has different risk characteristics from the firm's existing operations. After all, the cost of capital is merely a return which investors require on their money, and this will go up if risk increases.

In addition, in making a distinction between systematic and unsystematic risk, it shows how a highly speculative project such as mineral prospecting may have a lower than average required return because its risk is highly specific and associated with the luck of making a strike, rather than with the ups and downs of the market (ie, it has a high total risk but a low systematic risk).

6.7.3 Logic behind use of CAPM

It is important to follow the logic behind the use of the CAPM in this way:

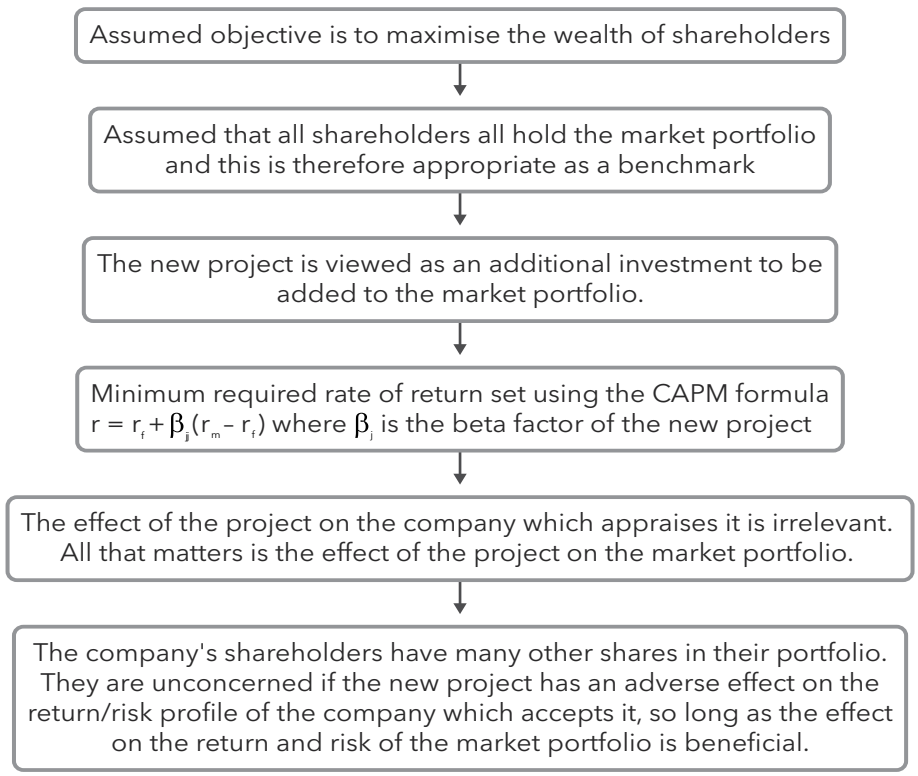


Figure 3.12: Logic of CAPM

It is important to note that there are two major weaknesses with the assumptions:

Diversification	The company's shareholders **may not be diversified**. Particularly in smaller companies they may have invested most of their assets in this one company. In this case the CAPM approach to deciding the cost of capital for investment appraisal is inappropriate.
Stakeholders	Even in the case of larger companies the **shareholders are not the only participants** in the firm. It is difficult to persuade directors and employees that the effect of a project on the fortunes of their company is irrelevant. After all, they cannot diversify their job and are exposed to both the systematic and specific risks of the business ie, total risk. Thus, managers may try to diversify, even though shareholders are better placed to do so, in order to protect their jobs. This is another example of agency cost.
Perfect capital market	In addition to these weaknesses, there is the problem that the CAPM depends on a perfect capital market; for the purposes of the examination, however, this may be ignored. There is also the obvious practical difficulty of estimating the beta of a new investment project.

6.8 Valuation models beyond the CAPM

6.8.1 Problems with applying the CAPM in practice

(a) The need to **determine** the **excess return** ($r_m - r_f$). Expected, rather than historical, returns should be used, although historical returns are often used in practice as a guide to what is expected.

(b) The need to **determine** the **risk-free rate**. A risk-free investment might be a government security. However, interest rates vary with the term of the lending.

(c) **Errors** in the **statistical analysis used** to calculate values. Betas may also **change** over time.

(d) The CAPM is also **unable to forecast accurately returns** for companies with **low price/earnings** ratios and to take account of seasonal 'month-of-the-year' effects and 'day-of-the-week' effects that appear to influence returns on some shares.

6.8.2 Alpha values

The **alpha value** can be seen as a measure of how wrong the CAPM is. It may be thought of as the difference between the expected return on a security or investment, given its systematic risk, and the actual return.

Alpha values:

(a) reflect only temporary, abnormal returns, if CAPM is a realistic model;

(b) can be positive or negative;

(c) over time, will tend towards zero for any individual share, and for a well-diversified portfolio taken as a whole will be zero; and

(d) may exist due to the inaccuracies and limitations of the CAPM.

(e) over time, will tend towards zero for any individual share, and for a well-diversified portfolio taken as a whole will be zero; and

(f) may exist due to the inaccuracies and limitations of the CAPM.

If the **alpha value** is **positive**, investors who don't hold shares will be tempted to buy them (to take advantage of the abnormal return), and investors who do hold shares will want to hold on to them so share prices will rise. If the **alpha value** is **negative**, investors won't want to buy them, and current holders will want to sell them, so share prices will fall.

For example, ABC plc's shares have a beta value of 1.2 and an alpha value of +2%. The market return is 10% and the risk-free rate of return is 6%.

The required return is 6% + (10% – 6%) × 1.2 = 10.8%
The current return = expected return ± alpha value = 10.8% + 2% = 12.8%

6.8.3 Alternatives to the CAPM

The CAPM specifies that the only risk factor that should be taken into account is the premium for market risk. Subsequent empirical research has shown that there may be other factors in addition to the market risk premium that explain differences in investment returns, such as **interest rates** and **industrial production**.

Unlike the CAPM, which analyses the returns on a share as a function of a single factor – the return on the market portfolio, the arbitrage pricing model (APM) assumes that the return on each security is based on a number of **independent factors**. The actual return r on any security is shown as:

$r = E(r_j) + ß_1F_1 + ß_2F_2 \ldots + e$ Where:

$E(r_j)$ is the expected return on the security $ß_1$ is the sensitivity to changes in factor 1

F_1 is the difference between actual and expected values of factor 1 $ß_2$ is the sensitivity to changes in factor 2

F_2 is the difference between actual and expected values of factor 2 e is a random term

Factor analysis is used to ascertain the factors to which security returns are sensitive. Four key factors

identified by researchers have been:

- Unanticipated inflation
- Changes in the expected level of industrial production
- Changes in the risk premium on bonds (debentures)
- Unanticipated changes in the term structure of interest rates

Arbitrage Pricing Theory (APT) works in a similar way to the CAPM in that it assumes that investors are fully diversified, so only systematic risks influence the returns. However, unlike CAPM, the possible systematic factors are numerous and vary in each particular case. The general APT model for the return of a security has been formulated as follows.

$$E(r_j) = r_f + (E(r_A) - r_f)ß_A + (E(r_B) - r_f)ß_B + \ldots\ldots\ldots + (E(r_M) - r_f)ß_M + \ldots\ldots$$

Where

$(E(r_A) - r_f)ß_A$ is the risk premium on factor A

$(E(r_B) - r_f)ß_B$ is the risk premium on factor B and so on

Arbitrage Pricing Theory does not specify what the systematic risk factors are, or whether the various betas will be positive or negative. Research suggests that the risk factors tend to be linked to changes in the macroeconomic environment such as inflation, interest rates and production and consumption levels. Some companies will be more sensitive to changes in these factors and these will be measured by the relevant beta factor.

Fama and French (1993) identified **two factors** in addition to the **market portfolio** that explain company returns, namely, **size** and **ratio of book value to market value**.

The **size factor** is measured as the difference in return between a portfolio of the smallest stocks and a portfolio of the largest stocks. The average small stock is thought to be riskier than the average large stock and therefore there is an additional risk premium.

The **value factor** is proxied by the difference in return between a portfolio of the highest book-to- market value stocks and portfolio of the lowest book-to-market value stocks. A share with a high equity (book) value per share when compared to the market share price (a so-called **value stock**) is observed as having a higher return generally than a share with a low ratio of book value to market value.

The Fama and French three-factor model is as follows:

$E(r_j) = r_f + ß_{i,m} (E(r_m) - r_f) + ß_{i,S}$ SIZE + $ß_{i,v}$ VALUE where

$ß_{i,m}$ is the stock's beta

$ß_{i,S}$ is beta with respect to size

$ß_{i,v}$ is the stock's beta with respect to value

Unlike the CAPM, these factors are to be determined empirically.

The Fama and French model has been augmented with the addition of a fourth factor, which is momentum. The **momentum factor** is based on the concept that a share that has been increasing in price will continue to perform well and a share that has been dropping in value will continue to perform badly. It is measured by the difference in return between a portfolio of shares that have increased in value and a portfolio of shares that have fallen in value.

6.8.4 Bond-yield-plus premium approach

The bond-yield-plus model is based on the empirical observation that the return on equities is higher than the yield on bonds. Since equities are riskier than bonds, the difference between the two is a reward the investor requires in order to invest in the riskier asset. Now if this equity market premium was constant, then the required rate of return for equity could simply be calculated by looking at the bond yields and then adding the fixed premium.

6.8.5 Fundamental beta

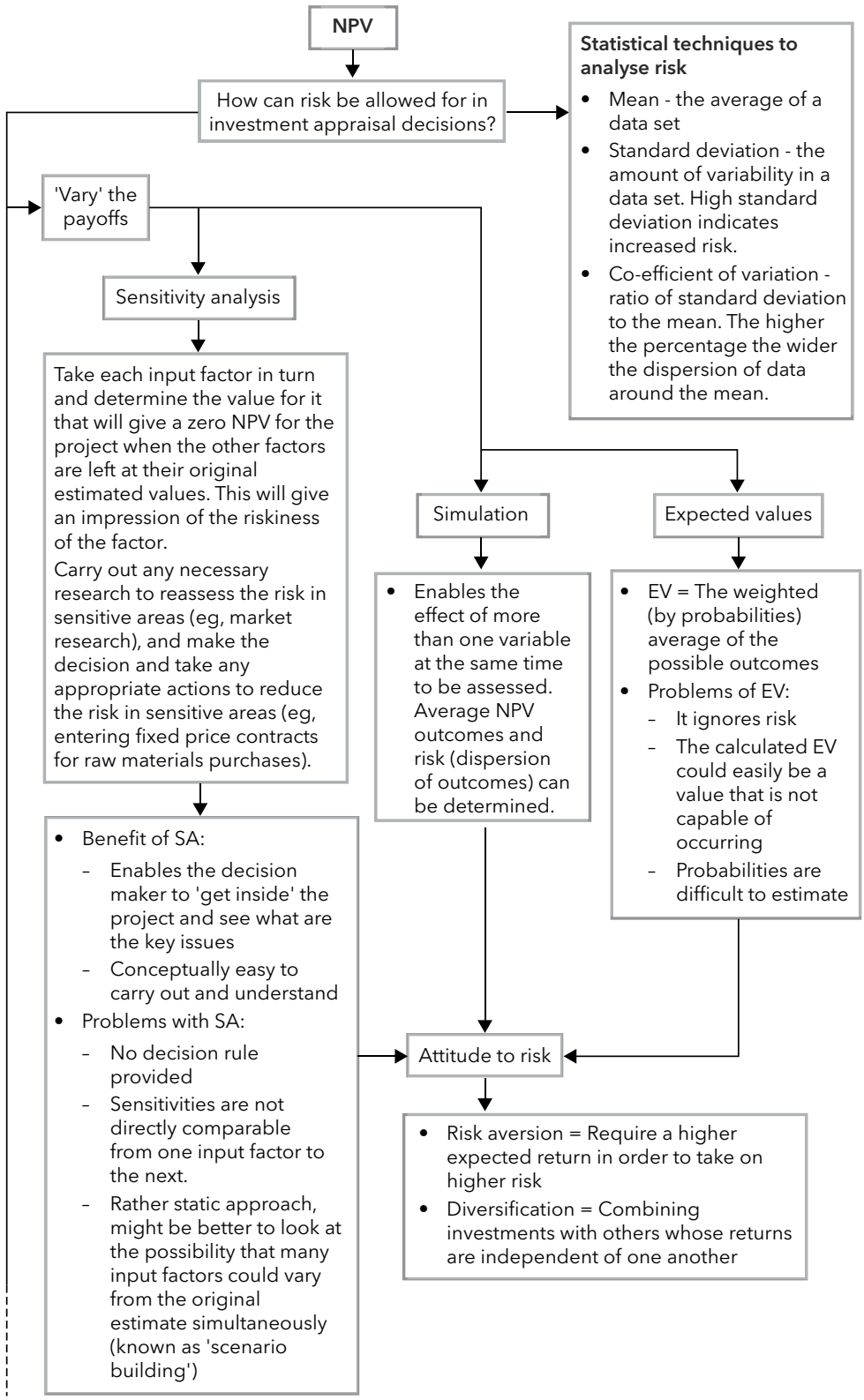
A CAPM-calculated beta factor is based on historical data. Many analysts and business managers have moved to calculating a **fundamental beta**. This is a beta which is based on the basic notion of the risk-return relationship; ie, where a company's cash flows are subject to greater risk, then the required return should be higher.

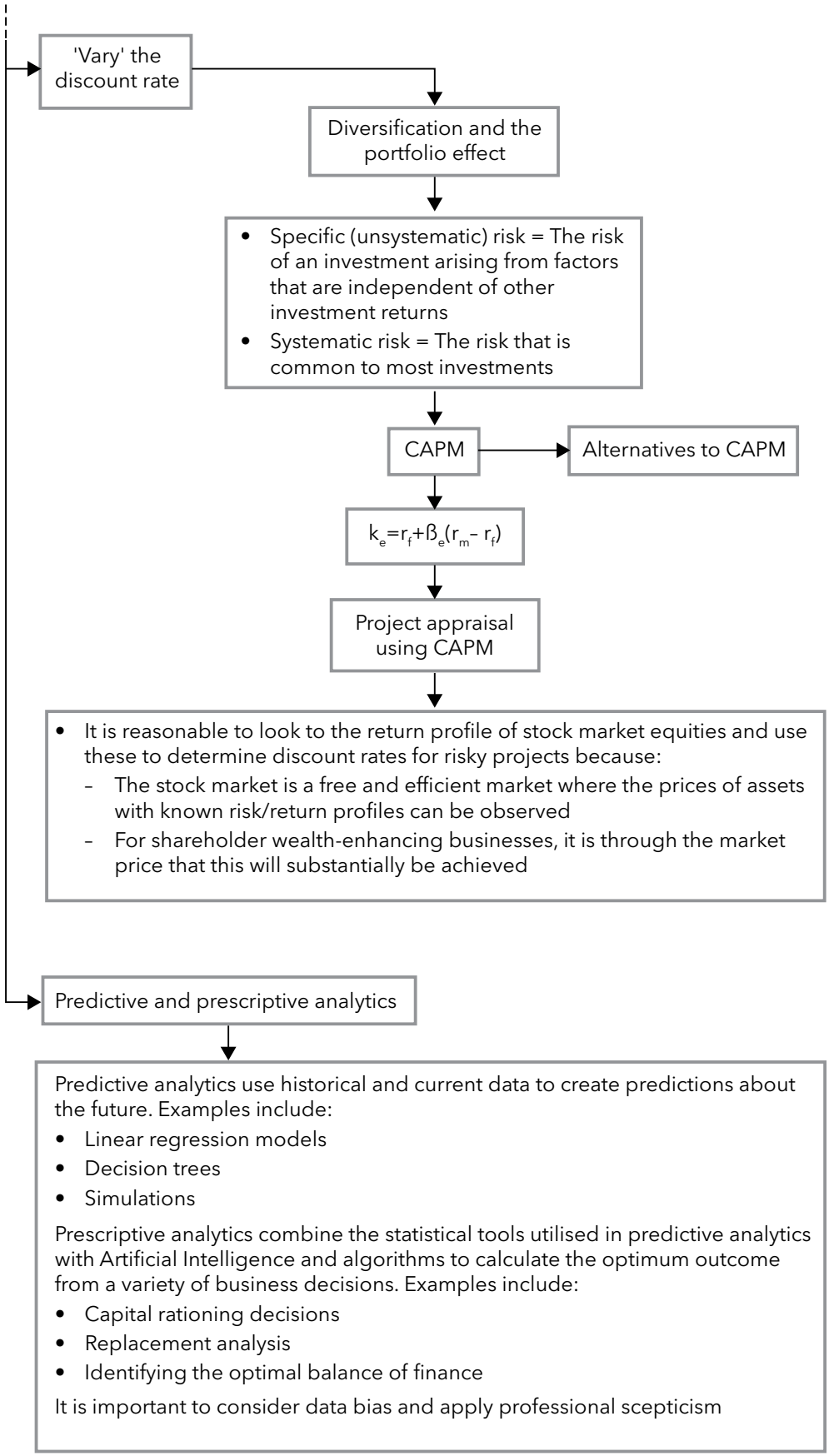
Greater risk is caused by three different factors:

- The nature of the business operations
- The level of operating gearing
- The level of financial gearing

The major disadvantage to this approach is that the adjustment up or down to the required return is subjective and lacks precision. However, it allows a common-sense valuation based on the risk that the valuer sees in the future cash flows.

Summary


NPV
How can risk be allowed for in investment appraisal decisions?
Statistical techniques to analyse risk
• Mean - the average of a data set
• Standard deviation - the amount of variability in a data set. High standard deviation indicates increased risk.
• Co-efficient of variation - ratio of standard deviation to the mean. The higher the percentage the wider the dispersion of data around the mean.
'Vary' the payoffs
Sensitivity analysis
Take each input factor in turn and determine the value for it that will give a zero NPV for the project when the other factors are left at their original estimated values. This will give an impression of the riskiness of the factor.
Carry out any necessary research to reassess the risk in sensitive areas (eg, market research), and make the decision and take any appropriate actions to reduce the risk in sensitive areas (eg, entering fixed price contracts for raw materials purchases).
• Benefit of SA:
– Enables the decision maker to 'get inside' the project and see what are the key issues
– Conceptually easy to carry out and understand
• Problems with SA:
– No decision rule provided
– Sensitivities are not directly comparable from one input factor to the next.
– Rather static approach, might be better to look at the possibility that many input factors could vary from the original estimate simultaneously (known as 'scenario building')
Simulation
• Enables the effect of more than one variable at the same time to be assessed. Average NPV outcomes and risk (dispersion of outcomes) can be determined.
Expected values
• EV = The weighted (by probabilities) average of the possible outcomes
• Problems of EV:
– It ignores risk
– The calculated EV could easily be a value that is not capable of occurring
– Probabilities are difficult to estimate
Attitude to risk
• Risk aversion = Require a higher expected return in order to take on higher risk
• Diversification = Combining investments with others whose returns are independent of one another


'Vary' the discount rate
Diversification and the portfolio effect
• Specific (unsystematic) risk = The risk of an investment arising from factors that are independent of other investment returns
• Systematic risk = The risk that is common to most investments
CAPM
Alternatives to CAPM
$k_e=r_f+\beta_e(r_m-r_f)$
Project appraisal using CAPM
• It is reasonable to look to the return profile of stock market equities and use these to determine discount rates for risky projects because:
– The stock market is a free and efficient market where the prices of assets with known risk/return profiles can be observed
– For shareholder wealth-enhancing businesses, it is through the market price that this will substantially be achieved
Predictive and prescriptive analytics
Predictive analytics use historical and current data to create predictions about the future. Examples include:
• Linear regression models
• Decision trees
• Simulations
Prescriptive analytics combine the statistical tools utilised in predictive analytics with Artificial Intelligence and algorithms to calculate the optimum outcome from a variety of business decisions. Examples include:
• Capital rationing decisions
• Replacement analysis
• Identifying the optimal balance of finance
It is important to consider data bias and apply professional scepticism

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Can you distinguish between risk and uncertainty? (Topic 1)
2.	Do you know how to perform sensitivity analysis on an NPV? (Topic 2)
3.	Can you explain the concept of simulation? (Topic 3)
4.	Can you calculate the expected value of a cash flow to use in an NPV? (Topic 4)
5.	Can you distinguish between systematic and unsystematic risk? (Topic 5)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
2 Senator Terry Trufo	This is a good introductory question covering a revision of the basic techniques of investment appraisal and the application of sensitivity analysis.
3 Comfifeet plc	This is a good question to text your understanding of applying expected values within an NPV calculation.
5 Ocean Train plc	This exam standard question includes a detailed calculation of NPV and sensitivity analysis and concludes with a discussion of simulation and real options.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the learning in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Technical reference

a, E. F.; French, K. R. (2012). "Size, value, and momentum in international stock returns". Journal of Financial Economics.

Self-test questions

Answer the following questions.

1 Strathburn Ltd

Strathburn Ltd is a family-owned medium-sized company specialising in the distribution of office stationery. It is currently reviewing its investment plans for the future and has under consideration three projects to be funded out of £2 million of investments which have been specially set aside.

The projects and their respective cash flows and probabilities are as follows.

Project	Initial cost	PV of net earnings	Probability
	£m	£m	
LMT	2.0	7.0	0.417
		1.0	0.583
GTV	1.0	3.5	0.5
		0.5	0.5
CUJ	1.0	3.0	0.5
		0	0.5

Requirements

1.1 Compare the outcomes of investing all the funds in project LMT with that of sharing them between projects GTV and CUJ (round to nearest £5,000).

(4 marks)

Answer the following.

(8 marks)

(a) On the basis of the expected values calculated, in which project(s) would you invest?

(b) What are the weaknesses inherent in this approach to decision-making?

(c) What other factors should be considered in making this decision?

Total: 12 marks

2 Senator Terry Trufo

Senator Terry Trufo's firm, TT Bonus Inc, has undertaken some legal and academic research at a cost of £4,000 into the possibilities of selling university degrees. The firm is unsure of the outcome of such a venture but feels that there is a 60% chance of annual income of £70,000 and a 40% chance of annual income of £40,000.

Printing machinery would need to be bought at a cost of some £40,000 payable in two equal annual instalments, one immediately and one in one year's time if the equipment had been operating correctly for a year. The equipment would be depreciated on a straight-line basis by £3,500 per annum for 10 years and then sold. Use would also be made of some existing equipment which originally cost £6,000, has a book value of £1,000, and would cost £9,000 to replace, though the firm is considering selling it for £2,000.

Production and labour costs in the first year would amount to £55,000 payable in one year's time, though the next nine years' costs would fall to £30,000 if demand were low in the first year. Revenue would first be receivable in two years' time and for the following nine years. Fixed costs of £5,000 per annum would be reallocated to the degree project.

Requirements

Calculate the following:

2.1 Accounting rate of return by expressing:

- average annual pre-tax accounting profit on the project as a percentage of the book value of the initial investment
- the same profit as a percentage of the average book value of the investment
- total accounting profit as a percentage of the initial investment

(2 marks)

2.1 Payback period.

(2 marks)

2.1 Internal rate of return of the project.

(2 marks)

2.1 Net present value of the project at the company's required rate of return of 8%.

(2 marks)

2.1 The sensitivity of your result in 2.4 to the estimates of:

(6 marks)

(a) The required rate of return;

(b) Sales revenue; and

(c) Life of the project.

Note: Requirements 2.1–2.3 are revision of basic techniques.

Total: 14 marks

3 Comfifeet plc

Comfifeet plc, a footwear manufacturer, has a factory in Hampshire that it rents on a lease due to expire at the end of December 20X4. The factory is entirely devoted to making Old Faithful carpet slippers (OFs). The market for the slippers has been declining and a decision had been taken two years ago not to seek to renew the lease in 20X4, but to close down OF manufacture when the lease expires. At a recent meeting of the company's board of directors the question was raised as to whether it might be more beneficial to close at the end of December 20X1, three years earlier than had originally been decided. As a member of the company's finance staff, you have been asked to look into this question.

Sales of OFs are projected to be as follows for the next three years.

Year	£'000
20X2	10,000
20X3	7,500
20X4	5,000

The marketing director believes that these figures could be increased if an advertising campaign were to be undertaken. Such a campaign would involve cash outlays of £1 million on 31 December in each of 20X1, 20X2 and 20X3. The marketing director acknowledges that the results of the advertising campaign are uncertain, but she believes that there would be at least a 10% increase in sales on the projected figures and the increase could be as high as 25%. To ease assessment, it has been agreed that it is reasonable to assume that the increase will be either 10% with a probability of 40%, or 25% with a probability of 60%. If the advertising were to be undertaken, the expenditure would be available for tax relief in the accounting year in which it would be incurred.

The variable costs of manufacture of OFs are estimated at 30% of the selling price. The rent of the factory is £5 million a year, payable on 1 January. The owner of the factory will not agree to an early termination of the lease, but the company has the right to sublet the factory. The directors are confident of finding a subtenant who would pay £4 million on 1 January in each of the three relevant years.

The plant used in the factory was all bought in January 20W8 for £2,000,000. Were the factory to close in 20X1, it would be sold in December for £1,000,000, but if it were retained until 20X4 it would be sold in December of that year for an estimated £200,000. For the purposes of the present

analysis, treat the plant as if it had been excluded from the general pool. This means that it attracts 18% (reducing balance) tax allowances in the year of its acquisition and in every subsequent year of its being owned by the company except the last year. In the last year, the difference between the plant's written down value for tax purposes and its disposal proceeds will either be allowed to the company as an additional tax relief if the disposal proceeds are less than the written down value, or be charged to the company if the disposal proceeds are more than the tax written down value.

Apart from rent and depreciation, fixed costs are estimated to be £1,000,000 each year, including a

£300,000 allocation of head office costs.

When the factory closes certain staff would be entitled to redundancy payments. These would total

£400,000 if closure were to take place in 20X1, but rise to £450,000 if closure were in 20X4. In either case the payment would be made on the day of closure and be fully allowable for corporation tax for the year concerned.

Production of OFs gives rise to a working capital requirement of an amount equal to 5% of the sales value. This needs to be in place by the beginning of each year concerned. By the end of the production period all of the working capital will have been released. Closure on either date is not expected to have any effect on any of the company's other activities. It is estimated that the appropriate cost of capital is 10% per annum.

The company's accounting year is to 31 December and the corporation tax rate of 17% is payable at the end of the year to which it relates.

Requirements

3.1 Determine, on the basis of net present value (NPV), whether the advertising should be undertaken, assuming that closure is delayed until 20X4.

(6 marks)

3.2 Taking account of your conclusion from 3.1 determine, on the basis of NPV, whether the company should close the factory in 20X1 or in 20X4.

(12 marks)

Total: 18 marks

4 GFL

George, Skinner and Fleet plc (GFL) is a large construction company and has a financial year end of 31 December. It has been invited to bid, via a tender contract, for a major piece of ground preparation work for a London development site. You have been asked by GFL's senior management to advise them.

You have the following information and estimates to aid your decision:

(1) The work would take two years to complete and would start in January 20X7.

(2) The successful bidder for the contract would receive an advance payment of £2 million in January 20X7 and the balance is receivable in early January 20X9.

(3) Materials to be used on the work would cost £820,000 (20X7) and £930,000 (20X8).

(4) The company would need to transfer 20 of its highly skilled employees from other GFL construction sites in London for the last 18 months of the contract (ie, from July 20X7). The current average annual wage of these employees is £23,000, but they will each be paid a premium of 15% above this figure for working on the development site. They will be replaced at their existing sites by new workers, who because of their comparative lack of experience will receive an average annual wage of £19,000.

(5) To supplement the transfers in (4) above, GFL would employ 45 new workers at a total cost of £830,000 per annum on the development site for the whole two years (20X7 and 20X8).

(6) GFL will also need to hire additional site management staff for the duration of the contract at an average annual total cost of £420,000.

(7) To aid the ground preparation work, GFL will make use of one of its biggest earth removing machines. This cost £3.2 million when purchased in 20X4, but it is currently under-utilised because of the changing characteristics of GFL's work. As a result, GFL was planning to sell it by the end of 20X6 and has received a firm offer of £1.1 million from Tideford Construction Limited.

GFL's management consider that the machine, if it is employed on the development site, will be worth, at most, £200,000 by the end of the contract.

The earth moving machine attracts capital allowances, but is excluded from the general pool. This means that it attracts 18% (reducing balance) tax allowances in the year of expenditure and in every subsequent year of being owned by the company, except the last year. In the last year, the difference between the machinery's written down value for tax purposes and its disposal proceeds will be either:

- Allowed to the company as an additional tax relief, if the disposal proceeds are less than the tax written down value;
- Charged to the company, if the disposal proceeds are more than the tax written down value;

The materials and labour costs outlined in (3) to (6) above are all stated at December 20X6 price levels. It is expected that these costs will inflate at the estimated annual general rate of inflation, which is 2% for 20X7 and 3% in subsequent years.

Unless otherwise stated, you can assume that all cash flows take place at the end of the year in question.

The corporation tax rate is 17% per annum and is payable in the same year as the investment/income/costs to which it relates.

GFL's management is aware that this will be a very competitive bidding process. At the company's most recent board meeting, it was agreed that a total tender price of £7 million for the contract would be reasonable, but that, if there was a danger of being outbid, a lower price would be considered as long as the 'figures added up'. GFL has of late used a post-tax money cost of capital of 9% to appraise its investments.

One of GFL's directors has made the point that were the company to be successful with this bid, there is a possibility that it might be asked to tender again for further contracts, which are likely to be held in either Africa or South America. GFL has not to date undertaken any contracts abroad.

Requirements

4.1 Advise, with supporting calculations, GFL's senior management as to whether tendering for the contract at a total price of £7 million would enhance shareholder value.

(15 marks)

4.2 Calculate the minimum total contract price that GFL should set that would be neutral in terms of shareholder value.

(5 marks)

4.3 Advise GFL's senior management as to the key areas of risk (excluding the management of foreign exchange risk) that could arise if GFL was to undertake investments abroad.

(5 marks)

4.4 Discuss how data analytics could be used by the senior management team to understand how GFL may be affected by future events.

(5 marks)

Total: 30 marks

5 Ocean Train plc

Ocean Train plc (Ocean) is considering establishing a premium, high-speed ferry service between Liverpool and the Isle of Man, which lies around 70 miles off the coast of the UK.

Ocean has been researching the viability of this new service with a consultancy firm, Skudder Brothers (SB). The service would be branded the 'Manx Link' and would commence on 1 January 20X3. SB has advised Ocean to appraise the project over a three-year investment horizon.

SB has drawn up the following estimates for the new ferry service:

	Year to **31/12/20X3**	Year to **31/12/20X4**	Year to **31/12/20X5**
Total number of ferry crossings	540	720	720

Average number of passengers per ferry

	Year to 31/12/20X3	Year to 31/12/20X4	Year to 31/12/20X5
crossing	100	125	150

SB has also made the following estimates at 31 December 20X2 prices:

- The average ticket price per passenger will be £90
- There will be port charges of £1,100 per ferry crossing
- Administration costs will be £2 per passenger
- Labour costs for all on-board and port employees will be £600,000 pa
- Ocean will have to spend £120,000 pa advertising the 'Manx Link' service
- Ocean will have to spend £100,000 pa on servicing and maintenance

Given the environmentally-friendly nature of sea travel relative to air travel, the UK government has stated that it would subsidise Ocean's proposed service from its launch date by making a payment to Ocean of 5% of annual sales revenue at the end of each calendar year. However, this subsidy will only cover the first two years of the service. The subsidy will have no tax impact.

To operate the service, Ocean would need to purchase a new ship from an Italian firm which has confirmed that delivery could be made in time to start the service on 1 January 20X3. The purchase price would be £8 million, payable on 31 December 20X2.

SB has looked into the likely residual value of the ship and feels that Ocean could expect to realise

£4 million on 31 December 20X5 if it were to sell the ship at that time.

Ocean's directors believe that the ship will attract full capital allowances at 18% pa on a reducing balance basis commencing in the year of purchase and continuing throughout Ocean's ownership of the ship, except in the year of disposal when either a balancing charge or allowance will arise. They also believe that Ocean would pay UK corporation tax at a rate of 17%, payable at the end of the year to which profits relate.

Ocean's finance director has estimated that loan interest charges of £168,000 pa will be incurred by the company as a direct result of the 'Manx Link' investment and has also advised Ocean's board of directors that SB's consultancy fee of £36,000 will be payable on 31 December 20X2 whether or not Ocean decides to proceed with the investment.

Ocean's directors currently use a real discount rate of 10% for investment appraisal. It can be assumed that, unless otherwise stated, all cash flows take place on the last day of Ocean's accounting year (31 December).

Except for the purchase price and anticipated residual value of the ship, all costs and revenues are expected to be subject to an annual inflation rate of 3%.

One director has requested that the sensitivity of the project's net present value be investigated in respect of two key variables – sales revenue and the residual value of the new ship. However, another director has suggested that simulation would be a much better way of appraising whether the company should proceed with the 'Manx Link' investment.

Requirements

5.1 Calculate the net present value of the 'Manx Link' proposal at 31 December 20X2 and advise Ocean's board of directors whether it should proceed with the investment.

(17 marks)

5.2 Advise Ocean's board of directors of the sensitivity of the net present value of the 'Manx Link' investment to:

(a) Changes in sales revenue; and

(3 marks)

(b) Changes in the residual value of the new ship.

(3 marks)

5.3 Explain the advantages and limitations of using simulation to appraise an investment such as that being undertaken by Ocean.

(5 marks)

5.4 Identify and explain the real options which may be present in the 'Manx Link' proposal.

(7 marks)

Total: 35 marks

6 Roberto plc

Roberto plc has £6 million investment finance available. Four possible projects have been identified. Each involves an immediate outflow of cash and is seen as having two possible outcomes as regards the net present value (NPV). The required initial investment, possible NPVs and their probabilities areas follows.

Investment	Initial outlay	NPV	Probability
	£m	£m	
A	6.0	3.0 (positive)	0.5
		1.5 (negative)	0.5
B	2.0	1.0 (positive)	0.5
		0.5 (negative)	0.5
C	2.0	1.0 (positive)	0.5
		0.5 (negative)	0.5
D	2.0	1.0 (positive)	0.5
		0.5 (negative)	0.5

The outcomes of each project are completely uncorrelated.

Requirements

6.1 Compare the results of an investment in project A alone with an investment in all three of projects B, C and D.

(5 marks)

6.2 Answer the following.

(11 marks)

(a) State, with reasons, which of the two investment strategies you would recommend to the directors.

(b) State and explain the assumptions which you have made about the company, the directors and the shareholders in making your recommendation.

Total: 16 marks

7 Beaters Ltd

Beaters Ltd makes plastic kits for building model sailing ships. The company's designer has just developed a new product, a kit for making a model of the **Golden Hind**, the ship in which Drake circumnavigated the world. To make the kits a new plastic moulding machine will have to be bought for £50,000.

A net present value appraisal has been carried out that indicates a positive net present value (NPV) of

£2,983. This appraisal was followed up with an assessment of the riskiness of the project. This was achieved by taking each of the input factors in turn and estimating the value for it at which the project would have a zero NPV. In looking at each input factor it was assumed that the other factors would be as originally estimated.

Data on the original estimates and on the values of each of them that generate a zero NPV are as follows.

	Original estimate	Value to generate a zero NPV
Cost of moulding machine	£50,000	£52,983
Selling price (per unit)	£20	£19.60
Material cost (per unit)	£6	£6.40
Labour cost (per unit)	£5	£5.40
Variable overheads (per unit)	£2	£2.40
Sales life	6 years	5.5 years

The above assessment is based on the assumptions of a discount rate of 15% and of constant sales of 2,000 units per annum. It has been reliably established that the new production would not affect fixed costs or working capital to any significant extent. There are no other input factors for the decision.

The risk-free rate of interest over the six years has been estimated to be 6%.

Requirements

7.1 To generate a zero NPV estimate the values for:

(5 marks)

(a) The discount rate.

(b) The annual sales volume.

7.2 Comment on the results of both the NPV appraisal and the subsequent quantitative analysis. Discuss how the managers might proceed to put themselves in a position to reach a decision on whether to go ahead with the new product. Your discussion should include some consideration of the usefulness of the quantitative analysis already undertaken and how this might usefully be extended.

Note: Ignore taxation and inflation.

(11 marks)
Total: 16 marks

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

Answers to Interactive questions

Answer to Interactive question 1

NPV = –125,000 + [(100 – 30) 2,000 – 100,000] × 3.791

= £26,640

Sensitivity to

- **Selling price**

  125,000 = [(P – 30) 2,000 – 100,000] × 3.791

  32,973 = 2,000P – 60,000 – 100,000

  P = 96.49

  Alternatively, £26,640/(2,000 × £100 × 3.791) ie, fall of 3.51% before NPV is zero.

- **Variable costs**

  125,000 = [(100 – V) 2,000 – 100,000] × 3.791

  32,973 = 200,000 – 2,000V – 100,000

  V = 33.51

  Alternatively, £26,640/(2,000 × £30 × 3.791) ie, increase of 11.7% before NPV is zero.

- **Volume**

  125,000 = [(100 – 30) q – 100,000] × 3.791

  32,973 = 70q – 100,000

  q = 1,900

  Alternatively, £26,640/(2,000 × (£100 – £30) × 3.791) ie, fall of 5% before NPV is zero.

- **Initial cost**

  £(125,000 + 26,640) = £151,640

  Alternatively, £26,640/£125,000

  ie, increase of 21% before NPV is zero.

- **Fixed costs**

  125,000 = [(100 – 30) 2,000 – F] × 3.791

  32,973 = 140,000 – F

  F = 107,027

  Alternatively, £26,640/£100,000 × 3.791 ie, an increase of 7% before NPV is zero.

- **Life**

  125,000 = 40,000 × AFn @ 10%

  3.125 = AFn @ 10%

AF for 4 years at 10% is 3.17

ie, life can fall to approximately 4 years before NPV is zero.

- **Discount rate**

  3.125 = AF for 5 years @ x %

  From tables AF for 5 years @ 15% is 3.352, so x is more than 15%Try 20%

  NPV = (125,000) + 40,000 × 2.991 = (5,360)

  $$\text{IRR} = 10\% + \frac{26,640}{26,640 + 5,360} \times (20\% - 10\%) = 18\%$$

  ie, an increase of 80% before NPV is zero.

Answer to Interactive question 2

2.1 NPV

=NPV(0.1,C8:D8)

	A	B	C	D
1		t_0	t_1	t_2
2		£	£	£
3	Sales – current values inflated @ 6%		53,000	56,180
4	Costs – current values inflated @ 4%		(31,200)	(34,611)
5			21,800	21,569
6	Tax @ 17%		(3,706)	(3,667)
7	Investment	(20,000)		
8	Net cash flow	(20,000)	18,094	17,902
9	PV@10% T1–2	31,244		
10	Less investment @T0	(20,000)		
11	NPV	11,244		

2.2 Sensitivity

Let R = revenue at t_1 and t_2 in current terms.

		£	Time	DF	PV
Investment		(20,000)	t_0	1	(20,000)
After tax revenue	0.83 ×	1.06R	t_1	0.909	0.800R
After tax revenue	0.83 ×	1.06^2R	t_2	0.826	0.770R
After tax costs	0.83 ×	(31,200)	t_1	0.909	(23,539)
After tax costs	0.83 ×	(34,611)	t_2	0.826	(23,729)
					1.57R – 67,268

If 1.57R – 67,268 = 0, then R = £42,846.

This is £7,154 less than the £50,000 estimated. £7,154 is 14.3% of £50,000, so Revenue can fall by 14.3% before the NPV becomes zero.

Alternatively

PV of revenue

=NPV(0.1,B5:C5)

	A	B	C
1		t_1	t_2
2		£	£
3	Revenue	53,000	56,180
4	Tax effect	(9,010)	(9,551)
5		43,990	46,629
6	PV@10% using NPV function	78,527	

Sensitivity = NPV/PV of CFs affected × 100%

= £11,244/£78,527 × 100%

= 14.3%

Answer to Interactive question 3

Project 1 Expected value = (£100 × 0.4) + (£200 × 0.3) + (£1,000 × 0.3) = £400m Project 2 Expected value = (0 × 0.4) + (£500 × 0.3) + (£600 × 0.3) = £330m Project 3 Expected value = (£180 × 0.4) + (£190 × 0.3) + (£200 × 0.3) = £189m Therefore, based on expected values, Project 1 should be selected.

Answer to Interactive question 4

Year 1 Expected sales

= (10,000 × 0.3) + (15,000 × 0.7)

= 13,500

Year 2 Expected sales

= (0.3 (8,000 × 0.2 + 10,000 × 0.8)) + (0.7 (20,000 × 0.6 + 10,000 × 0.4))

= 14,080

Answer to Interactive question 5

=NPV(0.1,B1:C1)

	A	B	C
1	Contribution £	135,000 [1]	140,800 [2]
2	PV contribution @10%	239,091	
3	Less outlay @T0 £	(230,000)	
4	NPV £	9,091	

1 (13,500 × £10)

2 (14,080 × £10)

Answer to Interactive question 6

The odds are the same as in the previous game, but the sums of money involved are much larger and the game will not be repeated. If you lose, you do not have a chance of winning back your money.

Whether or not you accept this gamble depends on much more than the expected value of £1,000.You would somehow be weighing up the following factors in your mind:

- The chances of winning £5,000
- How much you would enjoy winning £5,000 (the level of satisfaction is often referred to as 'utility')
- The chances of losing £3,000
- How much you would dislike losing £3,000
- How much you like or dislike taking risks
- How much you trust me!

For most people the unacceptability of incurring a loss of £3,000 would prevent them playing, even though the game has a positive expected value. They are risk averse.

Answer to Interactive question 7

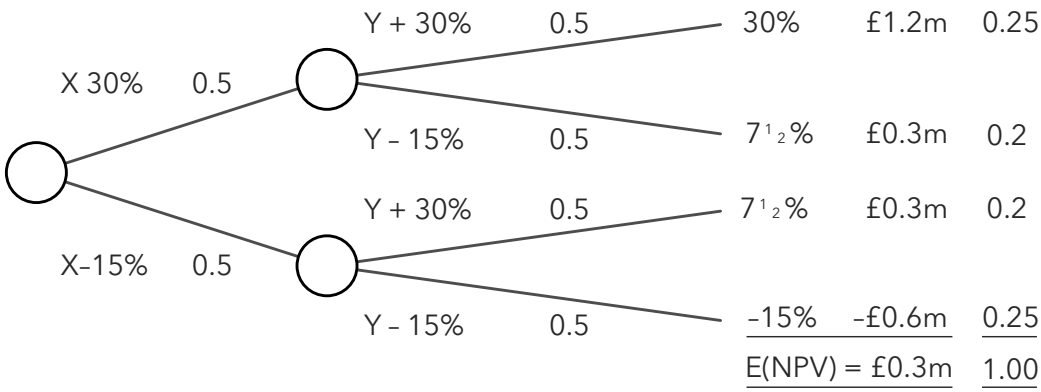
7.1 All £4m in X.

Expected outcome = (0.5 × 30%) + (0.5 × –15%) = 7.5%

So, 7.5% × £4m = £300,000 NPV

(Best outcome 30% × £4m = £1.2m; worst outcome – 15% × £4m = – £0.6m) All £4m in Y – as X above.

7.2



Now there is less chance of the extremes occurring (£1.2 million had a 50% chance before, similarly – £0.6 million). Chance of either extreme is now 0.25 and a 0.5 chance of £0.3 million (no chance of this before). Therefore, risk is reduced.

Answer to Interactive question 8

Sector	Likely beta	Performance
Supermarkets Pharmaceuticals	Beta < 1	Food retailers and drug companies tend to be recession-proof due to selling necessities. Their fortunes, however, do not lift significantly when economic prosperity arrives.
Construction Airlines Car manufacturing	Beta > 1	Industries involved in capital goods, or which make and sell non-essential goods and services eg, air travel, will show a high degree of systematic risk.

Answers to Self-test questions

1 Strathburn Ltd

1.1 Outcomes

Project	Initial cost	PV of earnings	NPV	Probability (NPV)	EV
	£m	£m	£m		£m
LMT	2.0	7.0	5.0	0.417	2.085
	2.0	1.0	(1.0)	0.583	(0.583)
					1.502
				or (rounding)	1.5
GTV	1.0	3.5	2.5	0.5	1.25
	1.0	0.5	(0.5)	0.5	(0.25)
CUJ	1.0	3.0	2.0	0.5	1.0
	1.0	0	(1.0)	0.5	(0.5)

Possible outcomes of projects Option 1 Project LMT Expected value = £1.5 million

Possible values = £5.0 million or –£1.0 million

Option 2 Projects GTV and CUJ

Expected values	GTV NPV	CUJ NPV	Combined NPV	Probability	EV
	£m	£m	£m		£m
	2.5	2.0	4.5	0.5 × 0.5	1.125
	2.5	(1.0)	1.5	0.5 × 0.5	0.375
	(0.5)	2.0	1.5	0.5 × 0.5	0.375
	(0.5)	(1.0)	(1.5)	0.5 × 0.5	(0.375)
					1.5

1.2 Answers are as follows.

(a) If there were no restriction on funds and assuming that shareholder wealth maximisation is the prime objective, then it would be in the interest of Strathburn Ltd to adopt all three projects, since they have positive NPVs.

Given that the available capital funds are limited to £2 million, it is not possible to invest in all projects and so a choice needs to be made. The fact that the same expected NPV (£1.5 million) is achieved under options 1 and 2 means that either option can be selected.

(b) The limitations of applying expected value analysis are clearly highlighted by Strathburn Ltd's dilemma.

- Expected value analysis is only appropriate where an activity or process will recur frequently. It is particularly inappropriate where a company's management are considering a one-off decision such as this.
- Expected values take no account of the risks involved in an investment ie, the range or variability of possible outcomes. For example, in Strathburn Ltd's case the first option has a maximum value of £5 million and a low of –£1 million. Option 2 results in outcomes which are less widely dispersed with a high of £2.5 million and a low of –£1 million.
- Expected values ignore the investors' attitude to risk. This can be measured by the use of indifference curves.
- Expected values will frequently not produce a value which corresponds with a possible outcome. This is the case for option 1, although in the case of option 2 the expected value of £1.5 million can in fact occur.

The fact that Strathburn Ltd is having to use probabilities in association with NPVs raises problems, in that the probabilities are estimates and could be difficult to calculate. A particular example is illustrated in the probabilities associated with project LMT.

(c) Other factors that merit consideration are as follows.

- How well diversified are the shareholders of Strathburn Ltd?

  Well diversified under portfolio theory/CAPM requires investors to hold 15–20 well-chosen shares. This will allow shareholders to diversify away any unsystematic risk.

  Since Strathburn Ltd is a family-owned business, the owners are less likely to be fully diversified and so they should select option 2 which spreads their investment across two projects, rather than investment returns totally dependent on project LMT.
- Assuming shareholders are risk-averse, the fact that option 2 has only a 25% chance of making a negative NPV while option 1 has a 58% chance would lend support to the selection of projects GTV and CUJ.
- If the shareholders are well diversified, then the criteria for selecting a project or not should be guided by the 'systematic risk' (market risk) carried by the investment ie, the extent to which the investment earnings are sensitive to changes in the macro economy.
- The choice of discount rate for the projects will need to take full account of the business and finance risks associated with each.

2 Senator Terry Trufo

2.1 Calculations of cash flows

Average annual revenue

= 0.6 × £70,000 + 0.4 × £40,000

= £58,000

Post-first year annual costs

= 0.6 × £55,000 + 0.4 × £30,000

= £45,000

First year's costs

= £55,000

Accounting rate of return

	£
Initial investment	
Legal costs	4,000
Machinery	40,000

Existing equipment	1,000
	45,000

Final book value

	£
Machinery	5,000
Total depreciation (45,000 – 5,000)	40,000
Total production and labour costs (average) (9 × 45,000 + 55,000)	460,000
Total reallocated fixed costs	50,000
	550,000
Total revenue (average)	580,000
Total profit	30,000
Average annual profit	3,000

- ARR based on average profit and the initial investment = 3,000/45,000 × 100 = $6^{2}/_{3}$%
- ARR based on average profit and average investment = 3,000/0.5(45,000 + 5,000) × 100 =12%
- ARR based on total profit and initial investment = 30,000/45,000 × 100 = $66^{2}/_{3}$%

2.2 Payback

Payback is a measure based on relevant cash flows, which are as follows.

Time	**Cash** flow	**Narrative**
	£	
0	(20,000)	First instalment on printing machinery
0	(2,000)	Opportunity cost of existing plant
1	(20,000)	Second instalment on printing machinery
1	(55,000)	First year's labour and production cost
2–10	13,000	Net cash inflows from project
10	5,000	Scrap proceeds of plant
11	58,000	Final year's revenue

Notes

1 The legal and academic research has already been done, and the cost of it is not saved if the project does not proceed. It is a sunk cost.

2 Fixed costs reallocated to the project are not cash flows. The cash outflows at times 0 and 1 (total £97,000) are recouped at a rate of £13,000 per year and hence are repaid in 7.46 years. Since cash inflows start at time 2, payback is in 8.46 years or nine years if receipts are assumed to arise at year-ends.

2.3 Internal rate of return

=IRR(B2:M2)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Time		1	2	3	4	5	6	7	8	9	10	11
2	CF £'000	(22)	(75)	13	13	13	13	13	13	13	13	18	58
3	IRR	10%											

2.4 Net present value

Time	Cash flows £'000	Discount factor @ 8%	Present value @ 8% £'000
0	(22)	1	(22.000)
1	(75)	0.926	(69.450)
2–10	13	5.784 (W1)	75.192
10	5	0.463	2.315
11	58	0.429 (W2)	24.882
			10.939

WORKINGS

(1) Annuity **factors**

AF(2 – 10) = AF(1 – 10) – DF(1)

At 8% AF(2 – 10) = 6.71 – 0.926 = 5.784

At 12% AF(2 – 10) = 5.65 – 0.893 = 4.757

(2) Discount **factors**

DF(11) = $1/(1+r)^{11}$

At 8% DF(11) = $1/1.08^{11}$ = 0.429 At 12% DF(11) = $1/1.12^{11}$ = 0.287

2.5

(a) Required rate of return

As shown in 2.3 the project has an IRR of 10%; therefore, the required rate of return can rise from 8% to 10% before the investment decision would change. This represents a rise of 2 percentage points or:

2/8 × 100 = 25%

(b) Sales revenue

Present value of sales revenue is AF (2 – 11 @ 8%) × £58,000

= (5.784 + 0.429) × £58,000

= £360,354

The percentage change in sales revenue required to change the decision is given by 10,939/360,354 × 100% = 3.04%

(c) Life of project

If project were shortened by one year the NPV would fall by:DF(11 @ 8%) × 58,000 – DF(10 @ 8%) × 45,000

= 0.429 × 58,000 – 0.463 × 45,000

= £4,047

Shorten the project by a further year and the NPV falls by:DF(10 @ 8%) × 58,000 – DF(9 @ 8%) × 45,000

= 0.463 × 58,000 – 0.500 × 45,000

= £4,354

The NPV of the project is thus reduced to 10,939 – 4,047 – 4,354 = £2,538.PV of cash flows of the eighth year are:

DF(9 @ 8%) × 58,000 – DF(8 @ 8%) × 45,000

= 0.50 × 58,000 – 0.54 × 45,000

= £4,700

This is sufficient to change the positive NPV (£2,538) into a negative and hence alter the initial decision to go ahead.

Sensitivity = 3 years/10 years, or 30%

Note: The effect of receiving the sale proceeds of plant earlier is small and has been ignored.

3 Comfifeet plc

3.1 Determination of the benefit of advertising

Assessment of the advertising decision

=NPV(0.1,C8:E8)

	A	B	C	D	E
1		20X1	20X2	20X3	20X4
2		£m	£m	£m	£m
3	Additional contributions (W1)		1.330	0.998	0.665
4	Tax thereon		(0.226)	(0.170)	(0.113)
5	Working capital (W2)	(0.095)	0.024	0.024	0.047
6	Advertising	(1.000)	(1.000)	(1.000)	
7	Tax thereon	0.170	0.170	0.170	
8		(0.925)	0.298	0.022	0.599
9	PV @10% T1–3	0.739			
10	Less outflow @T0	(0.925)			
11	NPV	(0.186)			

NPV = £(0.186)m
Therefore, do not advertise.

WORKINGS

(1) **Additional contributions**

		£m
20X2	£10m ((0.25 × 0.60) + (0.10 × 0.40)) × 0.70	1.330
20X3	£7.5m ((0.25 × 0.60) + (0.10 × 0.40)) × 0.70	0.998
20X4	£5m ((0.25 × 0.60) + (0.10 × 0.40)) × 0.70	0.665

(2) **Working capital on additional sales**

		£m
20X1	1.900 × 0.05	(0.095)
20X2	(1.900 – 1.425) × 0.05	0.024
20X3	(1.425 – 0.950) × 0.05	0.024
		£m
20X4	0.950 × 0.05	0.047

3.2 Determination of the factory closure date

Assessment of the closure decision

=NPV(0.1,C15:E15)

	A	B	C	D	E
1		**20X1**	**20X2**	**20X3**	**20X4**
2		£m	£m	£m	£m
3	Contributions (sales × 0.70)		7.000	5.250	3.500
4	Tax thereon		(1.190)	(0.893)	(0.595)
5	Rent	(4.000)	(4.000)	(4.000)	
6	Tax thereon		0.680	0.680	0.680
7	Plant	(1.000)			0.200
8	Capital allowances (W3)	0.034	0.028	0.023	0.069
9		(0.018)			
10	Fixed costs		(0.700)	(0.700)	(0.700)
11	Tax thereon		0.119	0.119	0.119
12	Redundancy payments	0.400			(0.450)
13	Tax thereon	(0.068)			0.077
14	Working capital (W4)	(0.500)	0.125	0.125	0.250
15	Net cash flow	(5.152)	2.062	0.604	3.150
16	PV@10% T1–3	4.74			
17	Less outflow @T0	(5.152)			
18	NPV	(0.412)			

NPV = £(0.412)m

Therefore close the factory in 20X1.

WORKINGS

(1) Capital allowances

			£m	£m
20W8		Cost	2.000	
		WDA	0.360	
			1.640	
20W9		WDA	0.295	
			1.345	
20X0		WDA	(0.242)	

either			£m		£m
			1.103		
20X1	Disposal		1.000		
	Balancing allowance		0.103	@ 17%	0.018

or

20X1		WDA	0.199	@ 17%	0.034
			0.904		
20X2		WDA	0.163	@ 17%	0.028
			0.741		
20X3		WDA	0.133	@ 17%	0.023
			0.608		
20X4		Disposal	0.200		

Balancing allowance 0.408 @ 17% 0.069

Working capital on basic **sales**

		£m
20X1	10.000 × 0.05	(0.500)
20X2	(10.000 – 7.500) × 0.05	0.125
20X3	(7.500 – 5.000) × 0.05	0.125
20X4	5.000 × 0.05	0.250

4 GFL

4.1

=NPV(0.09,C15:E15)

	A	B	C	D	E
1		**20X6**	**20X7**	**20X8**	**20X9**
2		**Y0**	**Y1**	**Y2**	**Y3**
3		£'000	£'000	£'000	£'000
4	Machine sale foregone	(1,100.000)			
5	Tax on machine sale foregone (W1)	(178.786)			
6	Revised machine sale			200.000	
7	Revised machine tax savings (W2)	65.841	53.990	211.954	
8					
9	Contract price	2,000.000		5,000.000	

	A	B	C	D	E
10	Tax on contract		(340.000)		(850)
11					
12	Materials (W3)		(836.400)	(977.058)	
13	Labour (W3)		(1,503.990)	(1,784.969)	
14	Tax saved on Mats/Lab		397.866	469.545	
15	Total cash flow	787.055	(2,228.534)	3,119.472	(850)
16	PV@9% T1–3	(75.29)			
17	Add net inflow @T0	787.055			
18	NPV	711.765			

Thus the NPV is positive with a total project price of £7 million and should be accepted.

WORKINGS

(1) **Machine – sell**	£'000
Cost	3,200.000
WDA X4	576.000
WDV X4	2,624.000
WDA X5	472.320
WDV X5	2,151.680
Bal Adj X6	1,051.680
sale X6	1,100.000
Tax on Bal all @ 17%	178.786

(2) Machine – carry on

	20X6	20X7	20X8
	£'000	£'000	£'000
WDV b/f	2,151.680	1,764.378	1,446.790
WDA	387.302	317.588	1,246.790
WDV/sale	1,764.378	1,446.790	200.000
Tax on WDA	65.841	53.990	211.954

(3) **Labour**

		1.02	1.03
Materials	Real	£'000	£'000
		–820.000	–930.000
	Money	–836.400	–977.058

		1.02	1.03
Labour t/f Y1 – 6 months (premium)	Real	£'000	£'000
		–34.500	
Labour t/f Y2 (premium)	Real		–69.000
Labour new Y1 – 6 months	RealReal	–190.000	–380.000
Labour new Y2			
Supplementary workers	Real	–830.000	–830.000
Extra management	Real	–420.000	–420.000
Total wages	Real	–1,474.500	–1,699.000
	Money	–1,503.990	–1,784.969

4.2 Break even project price:

y = reduction in income in year 2. 0.842y – 0.17y × 0.772 = £711,765

(0.842 is the year 2 DF @ 9%, 0.772 is the year 3 DF @ 9%) 0.71076y = £711,765

y = £1,001,414

Thus, breakeven income in year 2 = £5,000,000 – £1,001,414 = £3,998,586 Total project price = £5,998,586

4.3 Possible risks with overseas investment (excluding forex) are as follows:

- Financing eg, borrow locally to offset political risk?
- Political risk eg, mild political interference or more severe?
- Business risk eg, level of systematic business risk abroad and discount rate?
- Tax eg, corporation tax rate, capital allowances, tax treaties?
- Remitting funds back to UK eg, dividends, royalties, management charges?
- Culture eg, different business practices?

4.4 The senior management team could make use of both predictive and prescriptive analytics to help understand how GFL may be affected by future events.

Predictive analytics

The increasing use of Big Data within organisations has created new forms of data that can be used to create predictions and opportunities for identifying new types of trends to understand how the organisation may be affected by future events. GFL could use the following examples of predictive analysis:

Linear regression

Linear regression is a statistical technique that attempts to identify the key factors, called independent variables, associated with changes in the value of something a business is trying to predict, which is called the dependent variable. Linear regression then quantifies a linear relationship between the dependent variable and independent variables.

A simple example of how regression analysis could be applied here is quantifying how material costs (the dependent variable) have increased over time (the independent variable) in order to forecast how material costs may be expected to increase in the future. GFL could therefore use regression analysis to accurately forecast the cost of materials needed to fulfil the contract. While GFL are keen to win the contract with a competitive bid, it is important that they do not underestimate the increased cost of materials needed over the duration of the contract as this could result in submitting a tender bid that results in a loss-making contract.

Decislon trees

Decision trees are a predictive analytics technique that can be used to identify the impact of different decisions and variables on the outcome of an investment. Decision trees can be used to consider multiple decisions plus the impact of real options such as follow-on decisions. This is important to GFL given that if it is successful with this bid, there is a possibility that the company might be asked to tender again for further contracts, which are likely to be held in either Africa or South America. GFL has not previously undertaken any contracts abroad therefore this follow on option could be hugely valuable to the company.

Past data on projects could be analysed to predict the likelihood, ie, the probabilities, of further follow-on projects being awarded for clients of this type.

Simulation

One weakness of sensitivity analysis is that only one factor at a time is changed eg, material cost. For GFL's contract it is likely that more than one factor will change at the same time.

Simulation is a technique which allows the effect of more than one variable changing at the same time to be assessed. The senior management team could therefore assess the impact on the contract if both material and labour costs increase at the same time.

Prescriptive analytics

By combining the statistical tools utilised in predictive analytics with Artificial Intelligence and algorithms, prescriptive analytics software can be used to calculate the optimum outcome from a variety of business decisions.

For GFL, this could include identifying the optimal price to offer, bearing in mind the risk faced in this project, including the risk of non-financial external factors such as climatic conditions or the risk of delays due to planning difficulties.

5 Ocean Train plc

5.1

=NPV(0.133,C14:E14)

	A	B	C	D	E
1		**20X2**	**20X3**	**20X4**	**20X5**
2		£	£	£	£
3	Revenue (W1)		5,005,800	8,593,290	10,621,306
4	Port charges		(611,820)	(840,233)	(865,440)
5	Administration costs		(111,240)	(190,962)	(236,029)
6	Labour costs		(618,000)	(636,540)	(655,636)
7	Advertising		(123,600)	(127,308)	(131,127)
8	Servicing/maintenance		(103,000)	(106,090)	(109,273)
9	Pre-tax net cash flow		3,438,140	6,692,157	8,623,801
10	Tax (17%)		(584,484)	(1,137,667)	(1,466,046)
11	Subsidy		250,290	429,665	
12	Ferry purchase/disposal	(8,000,000)			4,000,000
13	Capital allowances (W2)	244,800	200,736	164,604	69,860
14	Post-tax net cash flow	(7,755,200)	3,304,682	6,148,759	11,227,615
15	PV @13.3% T1–3 (1.10 × 1.03)	15,426,320			
16	Less outflow @T0	(7,755,200)			
17	NPV	7,671,120			

Omission of the £168,000 annual interest charges (finance charges are not relevant cash flows for investment appraisal) Omission of the £36,000 consultancy fee (a sunk cost; therefore, not relevant) Positive NPV, therefore accept the project

WORKINGS

(1) Sales revenue

20X3: 540 × 100 × 90 = £4,860,000 × 1.03

20X4: 720 × 125 × 90 = £8,100,000 × 1.03^2

20X5: 720 × 150 × 90 = £9,720,000 × 1.03^3

(2) Capital allowances

20X2: 8,000,000

WDA 1,440,000 (18%) Tax saving (17%) £244,800

20X3: 6,560,000

WDA 1,180,800 (18%) Tax saving (17%) £200,736

20X4: 5,379,200

WDA 968,256 (18%) Tax saving (17%) £164,604
20X5: 4,410,944
Proceeds 4,000,000 Balancing allowance £410,944 Tax saving (17%) £69,860

5.2

(a) PV of sales revenue:

=NPV(0.133,B5:D5)

	A	B	C	D
1		**20X3**	**20X4**	**20X5**
2	Revenue	5,005,800	8,593,290	10,621,306
3	Tax at 17%	(850,986)	(1,460,859)	(1,805,622)
4	Subsidy	250,290	429,665	
5	Net cash flow	4,405,104	7,562,096	8,815,684
6	PV@13.3%	15,840,217		

Sensitivity = Project NPV/PV of the uncertain cash flow × 100 Sensitivity = 7,671,120/15,840,217 × 100 = **48.4%**

The PV of sales revenue could fall by 48.4% before the NPV = 0

(a) Even if the residual value of the ship fell to zero (its maximum possible fall – which would reduce the project's NPV by {0.6875 × £4m} alongside which there would be an increase in the balancing allowance of £0.68m) the project would still retain a positive NPV.

The NPV is, therefore, not at all sensitive to changes in the residual value of the new ship.

5.3 Advantages:

- It enables any number of variables to be amended simultaneously, unlike sensitivity analysis which changes just one variable at a time.
- It gives more information about the possible outcomes and their relative probabilities.
- It is useful for problems which cannot be solved analytically (ie, those that cannot be reduced to a precise mathematical solution).

Limitations:

- It is not a technique for making a decision, only for obtaining more information about the possible outcomes.
- It can be expensive and very time-consuming even with a computer.
- Some simulations depend on assumptions regarding probability distributions and the relationships between variables that may not be appropriate in a given scenario.
- It is difficult in practice to implement.

5.4 Follow-on

Launching the ferry service would give Ocean Train an opportunity to launch further services ata later date. By investing in this first service, Ocean Train effectively has the right to 'follow-on'. It is a call option.

Abandonment

Ocean Train has budgeted to sell the ship for £4 million in December 20X5. It may be that the three-year project does not go as well as hoped and the company might then wish to abandon it and sell the ship earlier than anticipated. This would be a put option.

Timing option

It may be possible to delay the introduction of the ferry service, particularly if the demand estimates are uncertain, effectively a call option. The longer the possible delay, the more valuable the option. The risk with this delay is that a competitor may decide to set up a service during this time.

Growth option

If the ferry service is more successful than envisaged, Ocean Train have the (call) option to expand the number of services ie, the opposite of the abandonment option.

These real options could be taken account of by Ocean Train's management and would affect their decision regarding the project, which is otherwise only appraised by calculating its NPV.

6 Roberto plc

6.1 NPVs of project – using expected values

Investment	Working	(NPV) EV
		£m
A	(3m × 0.5) + (– 1.5m × 0.5)	0.75
B	(1m × 0.5) + (– 0.5m × 0.5)	0.25
C	(1m × 0.5) + (– 0.5m × 0.5)	0.25
D	(1m × 0.5) + (– 0.5m × 0.5)	0.25

Results of investments Project A (alone)

	£m	Probability
Expected value	0.75	
Possible outcomes	3.00	0.5
	(1.50)	0.5
		1.0

Projects B, C and D

		£m	Probability
Expected values	(0.25 + 0.25 + 0.25)	0.75	
Possible outcomes	(1m + 1m + 1m)	3.00	0.125
	(– 0.5m + – 0.5m + – 0.5m)	(1.50)	0.125
	(1m + 1m – 0.5m)	1.50	0.375
	(1m – 0.5m – 0.5m)	Nil	0.375
			1.000

6.2

(a) Recommendation to directors

Assuming that the objective of the company is to maximise shareholders' wealth, all four projects should be taken on if cash were not restrained, since the expected NPVs of all projects are positive when using expected values.

However, as the company can only afford strategy 1 or strategy 2 (investments B, C + D), then the preferred strategy will be decided by the directors' attitude to risk, since both strategies have the same expected values, maximum possible outcomes and minimum outcomes.

Using expected values as a sole criterion for choice would leave the directors indifferent between the two strategies. However, the use of expected values is inappropriate for a one-off decision such as this, where the expected outcomes of each strategy are not even possible.

The use of expected values ignores the attitudes of investors to risk.

The directors will need to consider the extent to which the activities of the company are diversified.

On the assumption that the directors are risk averse and wish to minimise risk for a given return, the second strategy is recommended. There is only a 12.5% chance of making a loss under strategy 2, against a 50% chance under strategy 1.

(b) Assumptions made

The company

Overall objective is to maximise shareholders' wealth.

The NPVs of the projects have been identified by discounting the cash flows with a discount rate which reflects the levels of business and financial risk involved.

Additional funds are not available elsewhere, otherwise all four projects should be considered.

The market value of the shares will rise by the NPVs of the projects undertaken.

Directors

The NPVs of the projects should have been computed using a suitably risk-adjusted discount rate.

Shareholders

It is assumed they are risk averse and wish to maximise returns for a given level of risk.

If the major shareholders are not the directors, their preferred strategy will be dependent upon whether or not they are well diversified.

Where directors are not shareholders it is possible for a conflict of interest to arise.

> **Tutorial Note**
>
> Suitable references to CAPM and systematic risk could also have been made.

7 Beaters Ltd

7.1 Estimation of the sensitivities of other factors

(a) Discount rate

NPV – 50,000 + [2,000 (20 – 6 – 5 – 2)]AF = 0

(Where AF = annuity factor for zero NPV)AF = 50,000/(7 × 2,000) = 3.571

Looking at the annuity table for six years, 3.571 falls almost exactly halfway between 15%and 20% ie, about 17.5%.

(b) Annual volume

NPV – 50,000 + [V (20 – 6 – 5 – 2)]3.784 = 0

(Where V = annual volume for zero NPV)

V = 50,000/(7 × 3.784) = 1,888 units per annum

7.2 Comments on the NPV and the sensitivity analysis

It would be helpful to look at the sensitivities expressed as a percentage of the original estimate.

Difference expressed as a percentage

		of the original estimate
Cost of machine	(52,938 – 50,000)/50,000	5.9
Selling price	(20.00 – 19.60)/20.00	2.0
Material cost	(6.40 – 6.00)/6.00	6.7
Labour cost	(5.40 – 5.00)/5.00	8.0
Variable overheads	(2.40 – 2.00)/2.00	20.0
Sales life	(6.00 – 5.50)/6.00	8.3
Discount rate	(17.50 – 15.00)/15.00	16.7
Annual sales volume	(2,000 – 1,888)/2,000	5.6

This is clearly a risky project: the NPV is positive but it is relatively small (less than 6% of the initial investment). Though in theory an NPV above zero is enough to justify taking on the investment, particularly when the discount rate already allows for risk, it looks particularly risky. The length of the project (six years) raises problems of predicting cash flows in later years.

Taking each input factor in turn:

Cost of machine
Though this looks to be one of the most risky factors, in fact it is relatively risk free. If the price of the machine were to rise above the estimate, this fact would be known before the company need commit itself to the project.

Selling price and sales volume
The project seems very vulnerable to either or both of these turning out to be lower than estimated, particularly sales volume. This is a luxury product and may well be one subject to the vagaries of taste and fashion. Management may believe that it should carefully re-examine the premises on which the price and volume estimates were made. It might be worth undertaking some further market research to assess the reliability of the estimates.

Material and labour costs
The project also looks vulnerable to these two factors. Again, the basis of the estimates could be re-examined. Each of these costs involves a financial rate and a quantity of usage (eg, grams of material, minutes of labour). Both of these could be looked at again. In theory, it might be possible to determine one of these variables by buying call options on the raw material or agreeing future contracts with the supplier. This will increase costs since the counter party to the option or the supplier will take on the risk and will require an incentive to do so.

Variable overheads These look fairly safe.Discount rate

There is a reasonable margin of safety here, though real financing costs over six years could vary.

Sales life

Again a small safety margin, particularly when looking more than five years into the future.

Annual sales volume

Yet another high-risk area.

Sensitivity analysis (SA) has the advantage of enabling the decision-maker to gain good insights to the project and what could cause it to fail. It suffers from two weaknesses as a decision-making tool. It gives the decision-maker no clear guidelines on how to proceed; andit considers only one variable at a time.

Scenario building takes SA a stage further by considering various plausible outcomes for each input factor in combination.

The fact that the rate used to discount the projected cash flows has a significant risk premium attached to it, implies that the riskiness of the individual factors has already been accounted for. The risk of a project is the risk that estimates used in the assessment of the project prove not to be as accurate.

Chapter 4
Sources of finance

Introduction

Learning outcomes

Students will be able to identify capital requirements of businesses and assess financing options.This will involve being able to:

- explain the roles played by different stakeholders, advisors and financial institutions in the financial strategy selected by a business and identify possible conflicts of objectives;
- evaluate the ethical implications of an entity's financial strategy (including those for the organisation, individuals and other stakeholders) and recommend appropriate courses of action to resolve any ethical dilemmas that may arise;
- describe and analyse the impact of financial markets (including the extent to which they are efficient) and other external factors on a business's financial strategy;
- explain the implications of terms included in loan agreements in a given scenario (eg, representations and warranties; covenants; guarantees);
- identify the significance and effect of developing technologies on financing decisions;
- compare the features of different means of making returns to lenders and owners (including dividend policy), explain their effects on the business and its stakeholders, and recommend appropriate options in a given scenario; and
- forecast the capital requirements for a business taking into account current and planned activities and/or assess the suitability of different financing options (including green finance) to meet those requirements, comparing the financing costs and benefits, referring to levels of uncertainty and making reasonable assumptions which are consistent with the situation.

Syllabus links

The implications of a financing decision will be seen in **Financial Accounting and Reporting**, Business Planning: Taxation & Compliance and **Audit and Assurance**. It will be explored further at Advanced Level and in the final Case Study, as it is one of the most important decisions a business will take.

Examination context

This chapter examines the sources of finance available to a business, and looks at how the markets for these sources of finance operate. The type of finance used by a commercial organisation – whatever market is utilised – ultimately takes the form of debt capital or equity capital (also known as ordinary share capital). The key characteristic that distinguishes these types of finance is that they have different levels of risk. There are Islamic sources of finance apart from usual conventional ones which has now flourished significantly in the world including in Bangladesh. Section on sources of Islamic finance has been added to this chapter first time. Candidate should expect question covering this area as well in the exam.

Exam questions will not only require the candidate to be aware of practical sources of finance, but also to be able to assess their suitability to given situations given their differing risk levels.

Ethics is an important topic that is often examined.

Capital market efficiency and behavioural finance can also feature regularly in exam questions.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**Capital markets, risk and return** There are many ways in which firms can access funds. Businesses have an ongoing capital requirement if they are to continue to meet the shareholders' objective of maximising wealth. The implicit growth agenda that this creates means companies need access to sources of finance.	**Approach** Chapter 4 is a very practical chapter. Ensure you are aware of the characteristics of different types of finance that make them suitable to different circumstances. Be prepared to apply them to situations in the exam. **Stop and think** Where does a business get its long-term finance from?	Exam questions will not only require you to be aware of practical sources of finance but also your ability to assess their suitability to given situations.	
2	**Sources of equity** finance Equity finance helps businesses to achieve their growth objectives by raising capital from external investors in return for a share in the company.	**Approach** Read through this section and ensure you are aware of the main methods of raising equity finance. Pay particular attention to rights issues and make sure you are comfortable with the calculations. **Stop and think** What are the main methods of raising equity finance?	Exam questions could ask you to discuss the various ways of raising equity finance and also to perform calculations in relation to a rights issue.	**IQ1: Rights issue** This question demonstrates some of the key calculations needed to deal with an exam question on rights issues.
3	**Sources of debt** finance Debt can be raised from banks or capital markets. Most companies view direct borrowing from a bank as more restrictive and expensive than selling bonds on the capital markets.	**Approach** Straightforward sources of debt finance, such as term loans and loan stock, were covered in the Business, Technology and Finance exam. When reviewing this chapter pay	In the exam you could be asked to describe the implications of terms included in loan agreements in a given scenario (eg, representations and warranties; covenants; guarantees)	**IQ3: Funding a business through its growth phase** This useful question asks you to consider the appropriate sources of

Topic	Practical significance	Study approach	Exam approach	Interactive questions
		particular attention to convertible debt and loan covenants. **Stop and think** What are the benefits to a company of issuing convertible debt finance?		finance to use during different stages of growth.
4	**International money markets** The international money and capital markets provide various possibilities for raising capital in the form of financial instruments, which the treasurers of large companies may use for borrowing or for financial investment.	**Approach** Read through this section and make sure you are aware of the factors to consider when choosing between borrowing on the international markets or through the domestic system.	In the exam you could be asked to suggest the use of the international bond market to raise finance.	
5	**Green** finance In response to the global change, ICAB has incorporated Green Finance Education to ensure that today's accountants are fully versed in green finance and are able to consider and report on the impact that strategic decisions may have on the environment.	**Approach** The table at the end of this section detailing the different methods of accessing green finance is particularly useful.	You could be asked to suggest sources of green finance.	
6	**Ethics** The ICAB provides ethical guidance that will ensure that recipients of corporate finance advice can rely on the objectivity and integrity of the advice given to them by members.	**Approach** Read through each of the fundamental principles and think about how you could apply them to your Financial Management exam. **Stop and think** What are the five fundamental principles included in the ICAB ethical	The implications of financial strategy for all stakeholders must be evaluated and any ethical dilemmas resolved. In the exam you will be expected to apply professional scepticism and critical thinking when making all judgements.	

Topic	Practical significance	Study approach	Exam approach	Interactive questions
		guidance?		
7	**Capital market efficiency** Investors will be keen to get a fair price for selling their investments. Prices on the market are fair if the market is efficient, so that the price reflects all known information about the company, its business and its prospects.	**Approach** The efficient market hypothesis is a key area of Financial Management, therefore pay particular attention to this section. **Stop and think** What are the three different forms of efficiency and what information do they reflect?	In the exam you could be asked to describe the impact of financial markets (including their efficiency) and other external factors on a business's financial strategy, using appropriate examples to illustrate the impacts.	
8	**Behavioural** finance Investors are subject to a number of behavioural tendencies that can lead to decisions that are not rational. These behavioural tendencies impact investors' decisions which questions the validity of the efficient market hypothesis.	**Approach** When reading this section, make sure you understand how bias, emotions and different attitudes affect investors decisions. **Stop and think** Why are some investor decisions not made on a rational basis?	In an exam question you may need to describe the impact of behavioural finance on an investor's decision.	
9	**Islamic Finance** There are increased awareness among various stakeholders including investors, governments, employees who wants to operate their businesses following the Shariah rules and regulations introduced by Islamic Finance due to the unique nature of this system. The resiliency of Islamic Finance is already well proved.	**Approach** When you read through this section try to understand the uniqueness of the Islamic Finance System and how the different modes of Islamic Finance works. You should know the suitability of different modes of Islamic Finance to a given scenario. **Stop and think** Why Islamic Financial Institutes (IFI) offer a particular mode of Finance when you approach to them for your specific financing requirement? Is there any other alternative(s) to what is offered by them? Which option is more beneficial in a given scenario and how you can choose for the best alternatives for your business?	In exam you might be asked to find out best alternatives source of finance in a given condition. You may need to compare the pros and cons of each of the options available before final recommendation considering appetite for compliance with Shariah etc.	

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1 Capital markets, risk and return

Section overview

Capital markets provide a source of funds for companies and an exit route for investors.

- Risk and return go hand in hand, and companies need to bear in mind the risk-return trade-off of investors.
- The main sources of finance raised by issuing securities are
  - Equity, or ordinary share capital
  - Preference shares
  - Loan stocks or debentures (bonds)

1.1 Capital market

The market for funds is wide and crosses national boundaries. It is wrong to talk about a single capital market. There are many ways in which firms can access funds, including:

National stock markets	In Bangladesh this includes Dhaka Stock Exchange and Chittagong Stock Exchange (Combinedly "the Stock Exchange") which not only act as markets for 'second-hand' securities such as shares, but also act as a primary source of new funds, via new share issues.
The banking system	This can be split between the retail market and the wholesale market, which service individuals/small businesses and large companies respectively.
Bond (debt) markets	Generally, the province of very large organisations, typically raising large amounts of money.
Leasing	This is a very important source of capital finance for many companies.
Debt factoring	Normally used by smaller organisations to help finance their working capital requirements.
Government and European Union grants	This type of assistance promotes development of industry in underdeveloped areas or in overseas markets.
International markets	Mainly available to larger companies, these markets allow funds to be raised in different currencies, typically in very large amounts.
Crowdfunding	The use of internet-based platforms to match companies with investors (usually a large number of investors), a recent innovation in business finance.
Peer to peer lending	The use of internet-based platforms to match lenders with borrowers, another recent innovation.
Islamic Finance	In Bangladesh there are number of Islamic Banks and Non-Bank Financial Institutions from where you can raise financing for your business complying with Shariah principals.

1.2 Risk and return

The key characteristic that distinguishes different types of finance is that they have different levels of risk.

Debt holders face lower risk than shareholders. They receive interest before shareholders receive any dividends, and in the event of company failure, the debt holders rank higher than the equity holders. This means that any capital amounts due to the debt holders will be repaid before the shareholders receive anything.

The debt holders have a price to pay for this lower risk however; they will receive a lower rate of return on their capital.

The shareholders' position is more risky – they will suffer the downside of any loss or fall in profits. Correspondingly, they will expect a higher rate of return. Any profits go to the shareholders, not the debt holders.

There are different varieties of capital within this framework – for example, preference shares will usually have a risk somewhere between debt and ordinary shares.

In summary, risk and return go hand in hand. Therefore, in structuring its capital and selecting its sources of finance, a company must have regard to the risk return trade-off desired by potential investors.

1.3 Issued capital

The following sections explore the key characteristics of equity, preference shares and debt capital, and examine the factors which need to be considered when businesses and investors come to choose between them. These forms of capital invariably involve issuing securities (ie, shares or bonds).

Definitions

Equity: The **ordinary shares** in the business. Equity shareholders are the owners of the business and through their voting rights exercise ultimate control.

Preference shares: These form part of the risk-bearing ownership of the business but, since they are entitled to their dividends before ordinary shareholders, they carry less risk. As their return is usually a fixed amount of dividend, they are similar in many ways to debt.

Loan stocks and debentures: Typically fixed interest rate borrowings with a set repayment date. Many are secured on specific assets or assets in general, so that lenders are protected (in repayment terms) above unsecured creditors in a liquidation.

A table summarising and contrasting the main features of these general forms of finance follows.

			Debt	
Type of capital	**Ordinary shares (equity)**	**Preference shares (normally cumulative)**	**Secured debentures and loan stock**	**Unsecured debentures and loan stock**
Security of investor in terms of repayment of capital	Rank after creditors/ payables and preference shares in liquidation	Rank after all creditors/ payables but usually before ordinary shareholders in a liquidation	Secured on one or more specific assets, usually land and buildings, which are mortgaged, or over assets generally. On default the assets are sold; a surplus over the debenture/ loan adds to the assets of the company available for creditors – the other assets of the company are liable for deficit.	None; holders have the same rights as ordinary creditors/ payable
Voting rights of investor	Usually have voting rights in general meetings of the company	Right to vote at a general meeting only when dividend is in arrears or when it is proposed to change the legal rights of the shares	No voting rights	No voting rights
Income payment obligation of company	Dividends payable at the discretion of the directors (subject to sanction by shareholders) out of undistributed profits remaining after senior claims eg, interest and preference dividends, have been met	A fixed maximum amount per year at the discretion of the directors (subject to sanction of shareholders) and in accordance with rules regarding the dividends; arrears accumulate and must be paid before a dividend on ordinary shares	A fixed annual amount of interest, usually expressed as a percentage of nominal value (often referred to as the coupon rate)	

			Debt	
Type of capital	**Ordinary shares (equity)**	**Preference shares (normally cumulative)**	**Secured debentures and loan stock**	**Unsecured debentures and loan stock**
Obligation to return capital and amount	No obligation unless/ until liquidated. The right to all surplus funds after prior claims have been met.	A fixed amount per share where expressly redeemable, otherwise similar to ordinary shares	A fixed amount per unit of loan stock or debenture, usually on a fixed date. Can be avoided by company buying loan stock or debentures in the open market and cancelling	
Corporation tax	Dividends not tax deductible	Dividends not tax deductible	Interest is tax deductible, reducing effective cost for company	
Issue costs (ie, the administrative and legal costs associated with raising the finance)	Up to 15% of finance raised depending on method used. Covered in more detail in a later section	As equity	Relatively cheap compared to equity	
Degree of control exercised by existing shareholders	Retained earnings and rights issues tend to maintain the existing balance of control. Issues to new shareholders can shift the balance	On change in degree of control, unless dividends are in arrears (see above)	Control can be impeded by need to meet interest and capital payments and keep within any covenants imposed by lender	
	away from existing shareholders.			
Liquidation of investment (ie, can investor get out easily?)	Depends on whether the shares are traded on a stock exchange. Lack of marketability is likely to push up investors' required return.	If redeemable, then this gives one way out (but probably on a fixed date). Otherwise as ordinary shares.	As preference shares	

			Debt	
Type of capital	**Ordinary shares (equity)**	**Preference shares (normally cumulative)**	**Secured debentures and loan stock**	**Unsecured debentures and loan stock**
Personal tax position of investor	Resident and Non-resident individuals (Bangladeshi) for sale of shares other than listed companies Dividends are subject to income tax at marginal tes depending on income level ranges from normal slab rate to 30%. Capital gains are taxed at 0%, 15% or normal slab rate depending on scenario. Resident and Non-resident individuals (Bangladeshi) for sale of shares of listed companies Dividends are subject to income tax at marginal rates depending on income level ranges from normal slab rate to 30%. Capital gains are taxed at 0%. For Nonresident individuals (Foreigner) If there is no DTAA the Dividends are subject to income tax at rate 30% but having DTAA the tax rate ranges from 10-15%. Capital gains are taxed at 15%.	As ordinary shares	As ordinary shares	
Risk/ reward	Both high	Both lower	Both lowest	

Professional skills focus: Concluding, recommending and communicating

You may be asked to consider a number of different sources of finance in the exam and make a recommendation. It is important that you apply your technical knowledge to support your reasoning and formulate your conclusion based on valid information presented in the scenario, and your analysis of this.

2 Sources of equity finance

Section overview

- **Retained earnings**

  This is the main source of new finance for most companies.

- **Rights issues**

  The law protects shareholders by requiring that any new share issues are first offered to the existing shareholders.

- **New issues**

  These are used by large companies looking to raise typically large amounts in a high profile (but expensive) manner.

There are broadly three methods of raising equity:

Method	Real world use
Retentions ie, retaining profits, rather than paying them out as dividends	By far and away the most important source of new equity
Rights issues ie, an issue of new shares to existing shareholders	The next most important source
New issues to the public ie, an issue of new shares to new shareholders	The least important source of new equity – common in Initial Public Offerings (IPOs), when companies bring their shares to the stock market for the first time

2.1 Retained earnings

The profits earned by a business can either be paid out to shareholders in the form of dividends or reinvested in the business. There is sometimes a misconception that because no new shares are being sold, using retained profits has no cost.

There may be no issue costs, but shareholders will still expect a return on the funds re-invested in the business ie, they will expect the funds to be invested in projects that will increase their wealth. Hence there is a cost.

Retentions (strictly pre-depreciation which is not a cash flow) represent a very easy and important source of finance, particularly for young growing businesses where there may be a continual need for funds but where it is impractical to keep raising them using rights/new issues (and raising new debt).

Chapter 7 on equity sources and dividend policy considers whether it matters, in terms of shareholder wealth, which source of equity finance is used.

2.2 Rights issues

Definition

Rights issue: An issue of new shares for cash to existing shareholders in proportion to their existing holdings.

Legally existing shareholders have rights of first refusal (pre-emption rights) on a new issue of shares and can, by taking them up, maintain their existing percentage holding in the company. However, shareholders can, and often do, waive these rights, by selling them to others. Shareholders can vote to rescind their pre-emption rights, enabling companies to issue new shares to other investors, without first offering them to existing shareholders.

2.3 Impact of a rights issue

The price at which the new shares are issued in a rights issue is generally much less than the current market price for the shares. This is to make the offer relatively attractive to shareholders and encourage them either to take up their rights or sell them, so that the issue is fully subscribed. It also acts as a safeguard should the market price of the company's shares fall before the issue is completed. If the price were to fall below the rights price, the issue would not be a success.

The cum-rights price of a share is its market value when the shareholder has the right to subscribe for new shares in the rights issue.

After the share issue, the share price should be expected to fall because the new shares are issued at less than the cum-rights price.

The ex-rights price is the price at which the shares settle after the rights issue has been made. In theory the ex-rights price can be predicted, as follows (assuming that the rights proceeds are invested in a new project):

Ex-rights price = (Market value of shares pre-right issue + rights proceeds + project NPV)/ Number of shares ex-rights

= PV of new total dividends/Number of shares ex-rights

If an examination question does not give the NPV of the project in which the funds are invested, assume it is nil.

The actual ex-rights price may differ from the theoretical ex-rights price.

Worked example: Theoretical ex-rights price

A company has 150,000 shares in issue with a current market price of £2 each.

It announces an increase in share capital to be achieved by a rights issue of one new share for every three existing shares. The rights price is £1 per new share, thus raising £50,000 for investment in the new project.

Requirements

1 Calculate the theoretical ex-rights price.

2 Calculate the value of the right to subscribe for each new share.

Solution

1

			Each shareholder		Company as a whole
Value of existing shares	3	at £2 =	£6	150,000 at £2 =	£300,000
Value of capital injected by rights issue	1	at £1 =	£1	50,000 at £1 =	£50,000
	4	shares	£7	200,000	£350,000

Theoretical ex-rights price = £7/4 shares (or £350,000/200,000 shares) = £1.75 per share

2 Value of the right to subscribe for each new share

= ex rights price – subscription price

= £1.75 – £1

= 75p

Value of a right per existing share = 75p/3 = 25p

2.4 Impact of a rights issue on shareholder wealth

Does it make any difference to the wealth of an existing shareholder, whether they sell the rights, exercise the rights or simply do nothing?

Worked example: Impact of a rights issue on shareholder wealth

Assume a shareholder owns 3,000 shares in the company whose share value was described above.

- Pre-rights price = £2
- Ex-rights price = £1.75
- Subscription price = £1
- A 1 for 3 rights issue

Requirements

Show the shareholder's position if:

1 he takes up his rights;

2 he sells his rights for 75p per new share;

3 he does nothing.

Solution

In principle, the rights issue has no impact on shareholder wealth, unless the shareholder does nothing at all. This example is, however, simplified as companies do not usually have

rights issues unless they need the capital for some good reason – such as an investment project – which should have the effect of increasing the ex-rights price via a positive NPV.

1 Takes up rights		£
Step 1: Wealth prior to rights issue	3,000 × £2	6,000
Step 2: Wealth post rights issue		
Shares	4,000 × £1.75	7,000
Less rights cost	1000 × £1	(1,000)
∴ No change		6,000

2 Sells rights		£
Step 1: Wealth prior to rights issue	3,000 × £2	6,000
Step 2: Wealth post rights issue		
Shares	3,000 × £1.75	5,250
Sale of rights	1,000 × £0.75	750
∴ No change		6,000

3 Does nothing		£
Step 1: Wealth prior to rights issue	3,000 × £2	6,000
Step 2: Wealth post rights issue	3,000 × £1,75	5,250
∴ Loss of £750		

Interactive question 1: Rights issue to finance a project

The above company raises the £50,000 in order to take on a project with an expected NPV of £25,000.

Summary of data:

- Current market price is £2 per share
- 100,000 shares currently in issue
- A 1 for 2 rights issue at £1 will raise the £50,000

Requirements

1.1 What is the value of the company after the new project and the new issue?

1.2 What is the ex-rights price per share and the value of the right?

1.3 Assume a shareholder owns 1,000 shares. What is the effect on the shareholder's wealth if he:

(a) takes up his rights;

(b) sells his rights;

(c) does nothing.

See **Answer** at the end of this chapter.

2.5 Changing the terms

In the above example, the terms of the issue were one new share (at a price of £1) for every two shares currently held.

What difference would it make to shareholders' wealth if the terms were altered? The following Interactive question addresses this question.

Interactive question 2: Changing the terms

The company in Interactive question 1 raises the required £50,000 by issuing new shares on a one-for-one basis at 50p per new share.

Requirements

Show what would happen to the shareholder's wealth (from the worked example) if he:

1.1 takes up his rights;

1.2 sells his rights.

See **Answer** at the end of this chapter.

2.6 Factors to be considered when making rights issues

- Issue costs – these have been estimated at around 4% on £2 million raised but, as many of the issue costs are fixed, the percentage falls as the sum raised increases.
- Shareholder reactions – shareholders may react badly to firms continually making rights issues as they are forced either to take up their rights or sell them (doing nothing decreases their wealth, as in the worked example above). They may sell their shares in the company, driving down the market price.
- Control – unless large numbers of existing shareholders sell their rights to new shareholders there should be little impact in terms of control of the business by existing shareholders.
- Unlisted companies – these often find rights issues difficult to use, because shareholders unable to raise sufficient funds to take up their rights may not have available the alternative of selling them, since the firm's shares are not listed. This could mean that the firm is forced to use retained profits or obtain new loans to raise capital.

Professional skills focus: Assimilating and using information

When considering a rights issue calculation, it is important to review and reflect on all of the information available and determine how it fits into the different components of the rights issue calculation.

2.7 New issues

New issues are often large in terms of the amount raised. They are often used at the time a firm obtains a listing on the Stock Exchange for its shares, and wants to raise a large amount of new capital in the Initial Public Offering (IPO).

There are two methods of making an IPO, and they are best illustrated diagrammatically:

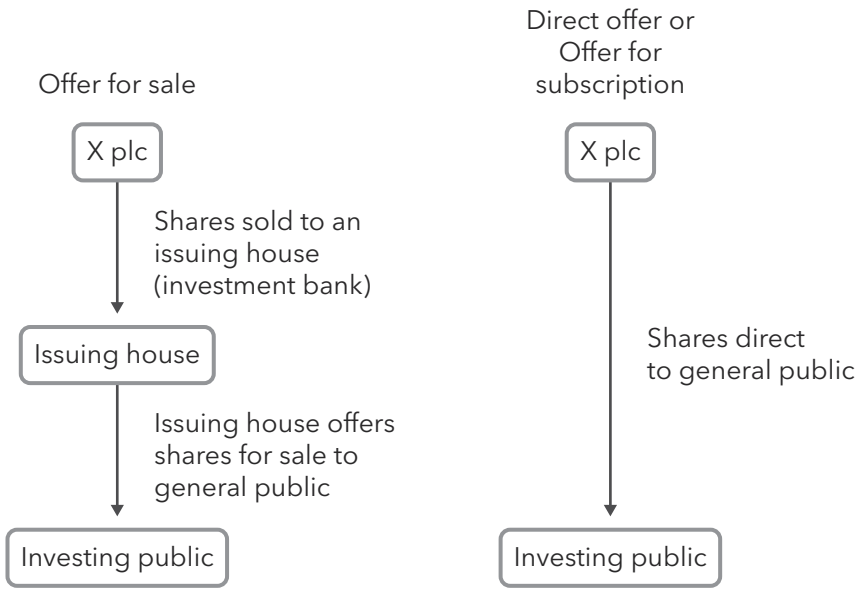


Figure 4.1: Two methods of making an IPO

Both methods use very similar procedures. These include advertising, eg, in newspapers, following the legal requirements, and Stock Exchange regulations in terms of the large volumes of information that must be provided (listing particulars, prospectus etc). Great expense is incurred in providing this information, as it requires the involvement of lawyers, accountants and other advisors.

In practice, an offer for sale is more common; the issuing house may be an investment bank. With either method the issue is likely to be underwritten (see below). In theory, there is no restriction on the amount of new equity capital raised in an IPO.

2.8 Underwriting

Definition

Underwriting: The process whereby in exchange for a fixed fee, usually 1%–2% of the total finance to be raised, an institution or group of institutions will undertake to purchase any securities not subscribed for by the public.

In issues of shares where the investing public is invited to subscribe, there is a possibility that there will be insufficient demand for all the securities in the issue. The risk of under-subscription for a new share issue is an especially important consideration when a fixed issue price must be set in advance of the issue date and the market is volatile – in such cases there is a danger that market movements will make an offer unattractive at the time of its public announcement, even though it may have appeared attractive when being arranged.

Unless a new issue is underwritten, a company may have to cancel its plans for the issue in these circumstances.

Failure to sell all securities offered may undermine a firm's investment plans, especially where these concern a large, indivisible investment. Hence, underwriting is a form of insurance which ensures that all securities are sold and the firm can be certain of obtaining the funds required.

The main disadvantage of underwriting is its cost. The cost depends upon the characteristics of the company issuing the security and the state of the market. The cost is payable even if the underwriter is not called upon to take up any securities. Hence underwriting increases the cost of raising finance. A second problem is that if the underwriters are required to buy the shares that other investors do not want, they will 'hang over' the market, and the underwriters will probably try to sell their unwanted shares as soon as there is any pick-up in demand. As a result, the share price is likely to remain depressed for some time, until the underwriters have sold all the shares they do not want to keep.

2.8.1 Venture capital

Definition

Venture capital: Venture capital is risk capital, normally provided by a venture capital firm or individual venture capitalist, in return for an equity stake.

Venture capitalists seek to invest cash in return for shares (and sometimes debt) in private companies with high growth potential. They seek a high return, which is often realised through a stock market listing, and accept that this will mean that the investments are often high risk.

Venture capitalists often invest in small companies that already have a track record of business development and which need additional finance to grow, or in start-up companies with innovative technologies and high growth potential.

Venture capital can be distinguished from other forms of equity finance because:

- it is more participatory (they usually expect 20% to 49.9% of the shares of a company, large enough to allow the venture capitalists to exert some control over the running of the business, but not so large that they become majority shareholders);
- it is provided with regard more for the long term than the short term, although the actual involvement by the VC is unlikely to extend beyond the medium term;
- the investor provides advice and is able to influence management, but does not take on the running of the business themselves;
- much of the return from providing the capital is in the form of capital gains after three to five years rather than steadily from the beginning, since by their nature companies needing venture capital will not be able to pay cash dividends in the early years; and
- a key issue is the VC's exit route, ie, how the VC can liquidate the investment. This is often achieved by selling the VC's shares to another company (a trade sale) or by a stock market flotation.

Failure to hit targets set by the venture capitalist can lead to extra shares being transferred to their ownership at no additional cost. This is called an equity ratchet.

Over the past decade, many venture capitals have focused on investing heavily in the Artificial Intelligence (AI) sector, often in start-up ventures. For example, in 2019 IQ Capital, a UK venture capitalist which targets early stage start-ups working on technologies from advanced speech and sound recognition to data privacy, raised $300 million for investments in AI.

There are some concerns over the price being paid for such investments in technology companies, this is considered further in Chapter 8.

2.9 Crowdfunding

Crowdfunding allows a company to access finance by using an online crowdfunding platform to pitch for finance from a large number of investors who choose whether or not to invest.

A successful crowdfunding pitch will be based on an attractive business plan that reassures prospective investors about the prospects for the proposed product or service, and also about the quality of the management team (ie, their skills and experience). A business might also include a short video summarising the plan.

The use of crowdfunding by companies looking to raise equity finance is becoming increasingly common and is closely tied to growth of internet technology, which enables millions of potential investors to be accessed.

Advantages of crowdfunding

- Crowdfunding is a type of finance that is available to start-up companies who often struggle to secure more regular sources of finance due to their lack of trading history.
- By involving a large number of investors, crowdfunding helps to attract customers and to build awareness of the company.
- Crowdfunding can be a quick process eg, 30 days.

A company is likely to consider a crowdfunding platform that has experience in the company's industry as this will be more likely to attract investors with an interest in the company's proposal.

Companies are also more likely to want to choose a crowdfunding platform that is regulated by the Financial Conduct Authority which will provide assurance to investors that the information the business produces is clear and reasonable. The UK Crowdfunding Association website gives details of a range of platforms available.

Costs of crowdfunding

- A fee is payable to the crowdfunding site.
- There are legal / advisory costs.
- The administrative cost of dealing with investor requests for more information.

Crowdfunding sites can be seen as an example of technology reducing barriers to international capital flows eg, Kickstarter, a UK crowdfunding site, accepts money from international investors(although whether foreign investors can participate can depends on local regulatory rules).

Some crowdfunding platforms offer both equity and debt finance (also called peer to peer lending, and covered in section 3).

2.10 Initial coin offering (ICO)

Though ICO is not available in Bangladesh it is important for ICAB students to gain some understandings about global practices and changes. Students should be cautions that some of the instruments may be restricted or prohibited in Bangladesh by regulators.

Like an Initial Public Offering (IPO), an ICO raises finance from investors. However, there are two key differences:

(a) An investor receives a token, this might be for a share or it might be a utility token that gives an entitlement to use a product or service; eg, when Filecoin raised over $250 million in 2017, its tokens enabled access to its decentralised cloud storage service.

(b) Payment is made in a cryptocurrency such as bitcoin (this is covered in Chapter 10). Note that it is illegal in Bangladesh as per Bangladesh Bank.

Initially one of the attractions of an ICO was its simplicity. The issuer raises money simply by issuing a '**white paper**' providing details of the concept that the venture intends to build, and details of the tokens that will be issued in exchange for cryptocurrency. The white paper is available via the venture's website, which also provides the mechanism for payment of cryptocurrency to the venture's account (typically bitcoin or ether).

However, increasingly regulators are viewing ICOs as offering **future income streams** and are therefore **judging them to be securities.** This means that ICOs are likely to have to fulfil the related regulatory criteria for an issue of securities (eg, production of a full prospectus). This has led to a moderation in the use of ICOs.

ICO's are basically blockchain crowd sales, the cryptocurrency version of crowdfunding. They would normally be used to raise finance for a new, promising project.

The other key risk of an ICO to an issuing company is the value of cryptocurrency, which is highly volatile eg, the value of Bitcoin fell by over 50% between mid-December 2017 and early Feb 2018.

3 Sources of debt finance

Section overview

Convertibles – debt with an equity 'kicker' making borrowing easier to secure.

- Leasing – a major source of funding for capital expenditure.
- Other forms of debt – relevant to a variety of organisations depending on the context.

Straightforward sources of debt finance, such as term loans and loan stock, were covered in the **Business, Technology and Finance** exam.

3.1 Convertible loans

Definition

Convertible loans: Fixed return securities – either secured or unsecured – which may be converted, at the option of the holder, into ordinary shares in the same company at a future date (or on any of a

series of future dates). Prior to conversion the holders have creditor status, although their rights may be subordinated to those of trade payables.

The interest rate (coupon) on convertible loans is lower than on comparable conventional fixed rate bonds, because of the value of the conversion rights.

3.1.1 Conversion rights

Conversion rights are stated in terms of:

- a conversion ratio (ie, the number of ordinary shares into which £100 of stock may be converted);or
- a conversion price (ie, the right to convert into ordinary shares at a price of X per share).

For example, '£100 of stock may be converted into 25 ordinary shares' is a conversion ratio; 'Stock may be converted into shares at a value of 400p per share' is the equivalent conversion price.

Sometimes the conversion price increases during the period of convertibility – this is done to stimulate early conversion. Another variation is to issue partly-convertible stocks whereby only a portion of the stock – perhaps 50% – may be converted. Conversion rights usually cater for an adjustment to those rights in the event of a bonus issue, rights issues and so on.

From the investor's point of view, convertible stocks are a low-risk security with the added advantage of an opportunity to profit from any increase in the market price of the share above the conversion price in the period up to the date for exercising the conversion rights.

3.1.2 Issuing company benefits

The issuing company benefits by:

- obtaining finance at a lower rate of interest than on ordinary debentures (provided that prospects for the company are good);
- encouraging possible investors with the prospect of a future share in profits;
- introducing an element of short-term gearing (covered in greater detail in Chapter 6);
- avoiding redemption problems if the debt is converted into equity; and
- being able to issue equity cheaply (if converted).

3.2 Loan stock with warrants

These are loan stocks which cannot themselves be converted into equity but give the holder the right to subscribe at fixed future dates for ordinary shares at a predetermined price. The subscription rights are issued with the loan stock and are known as warrants.

The loan stock investors can 'detach' their warrants from the loan stock and sell them, at any time up to the date when the warrants can be exercised to buy new shares in the company. Alternatively, the investors can hold on to their warrants and retain the option to subscribe for new shares at a future date.

A difference between a loan stock with warrants and a convertible debenture is that with warrants, the loan stock itself is not converted into equity. Instead, investors exercise the warrants and pay a fixed price to buy new shares in the company. They retain their loan stock as a separate investment. This means that the loan stock will continue in existence until it is redeemed.

Warrants have value when the market price of shares rises above the price specified in the warrant. They are used as a 'sweetener' for debt issues, allowing the firm to place a low interest rate on the loan.

The cost to the firm is the right given to holders to buy equity at a (possibly) reduced price at the exercise date.

Warrants are similar in many respects to share options.

3.3 Loan documentation

3.3.1 Introduction

In section 1 it was explained that a risk-return trade-off is faced by shareholders and debt holders. Debt holders will typically face less risk, for which they expect a lower return.

How do they ensure that their position is low risk? To achieve this, they ensure there is adequate loan documentation.

3.3.2 Representations and warranties

Before a loan is made, a lender will want the borrower to give representations and warranties about its ability to borrow and repay any loan.

The borrower will therefore typically be required to answer questions (make representations) on a number of areas, including the following.

Legality of borrowing	• Is the company incorporated? • Is the company legally allowed to borrow? • Is the signatory to the loan authorised to sign? • Is the loan within the provisions of the company's constitution and Articles of Association)? • Does the new loan breach any existing loan agreements?
Financial condition	• Do the accounts show a true and fair view etc? • Are there any impending court cases which would affect the company's financial position?

In the event that the borrower is found to be in breach of warranty in one of these areas, this is usually categorised as a default on the loan, which would normally trigger a demand for full repayment.

3.3.3 Guarantees

If the ability of the borrower to repay a loan is considered to be in doubt, the lender will require a guarantee. Any default would mean the lender could seek repayment from the guarantor.

Examples include:

- A parent company guaranteeing the loans of a subsidiary
- A subsidiary guaranteeing the loans of a parent: this **upstream guarantee** would be necessary if the parent has little or no trade but is simply a holding company. The subsidiaries have the ability to generate cash flows and they own the assets which can be used as security
- Members of a joint venture becoming guarantors for one another

3.3.4 Covenants

The borrower will need to commit to doing, or refrain from doing, various things in order to protect the lender's position. Undertakings by the borrower are known as covenants.

Providing information	This can include an undertaking to provide the lender (or the lenders' representatives) with financial statements, interim accounts, quarterly or monthly management accounts.

Negative pledge	The borrower pledges not to use its assets as security for other borrowings such that the position of other lenders would be improved at the expense of this lender.
Financial covenants	Financial covenants set financial limits within which the borrower must trade. Examples include a maximum gearing ratio, a minimum interest cover ratio and a minimum net worth of the business. The loan documentation would need to define precisely how these limits are to be calculated.
Restrictions	Restrictive covenants limit the ability of the borrower to take actions which might damage the lender's position. They include restrictions on taking on more debt, paying dividends and making significant investments. These are explored further in Chapter 6.

Compliance by the borrower with covenants is tested periodically, such as when the borrower's annual financial statements are produced. However, the lender may want information more frequently than once a year, in order to be alerted to any issues that may be developing or breaches of covenant that may have occurred.

Emerging technologies, such as machine learning (ML) and blockchain can be used by banks to monitor covenants and take real-time action to deal with any borrowers who do not meet the agreed standards.

ML algorithms can identify covenants from loan contracts, create summary checklists and generate timely alerts on when these items are due for review. This can result in significant cost savings for banks as traditionally staff were required to manually monitor and review the covenants attached to loan contracts, which was a time consuming, expensive and labour-intensive process.

New technology also allows financial information to be pulled directly from the borrowers' accounting software package or use optical character recognition (OCR) technology to read financial statements and the accompanying notes. This can assist in identifying if loan covenants have been breached.

Interactive question 3: Funding a business through its growth phase

Ian's Sandwich Empire

This one-person business starts up selling sandwiches from home and develops into a national business over time.

Requirement

Given the characteristics at each stage, suggest possible sources of funds.

Stage	Characteristics	Possible sources of funds
Start-up	Very small scale Make at home Deliver by car to local customers (offices, trading estates etc)	
Growth to £100,000 revenue pa	Need small premises and a van	

(Organic) growth to £500,000 revenue pa	Need new larger premises with refrigeration and refrigerated vans	
Growth to £2 million revenue pa by acquisition	Established a brand/ name/ reputation and wants to expand regionally	
Growth to £5 million revenue	Want to use brand/ name/ reputation	
pa	more widely – sell ready-made sandwiches to local independent retail outlets and local branches of national retail chains (using their brand) on credit	
Growth to £50 million revenue pa	Expand to national scale, by combination of organic growth and acquisition	

See **Answer** at the end of this chapter.

3.4 Peer to peer lending

Though Peer-to-peer (or P2P) lending is not available in Bangladesh it is important for ICAB students to gain some understandings about global practices and changes. Students should be cautions that some of the instruments may be restricted or prohibited in Bangladesh by regulators.

Peer-to-peer (or P2P) lending connects established businesses looking to borrow with investors who want to lend, usually via an online platform.

P2P lending is potentially available for any type of lending, whether short- or long-term or secured or unsecured, but is not normally available to start-up companies because investors require an established trading history.

Platforms usually require borrowers to have a trading track record, to submit financial accounts, and will perform credit checks as part of the credit assessment. Platforms offer either a fixed rate or, in some cases, lenders bid for loans by offering an interest rate at which they would lend.

P2P lending also allows customers and family/friends to share in the returns of the business. Investors can lend small parts of individual loans which encourages a wide range of lenders to participate.

However, P2P loans can also be for large loans of several million pounds.

The P2P website (www.p2pfa.intro) gives details of a range of platforms available, most are regulated by the FCA.

Advantages of P2P lending compared to traditional bank lending

- P2P loans usually come with lower interest rates due to greater competition between lenders and lower origination fees.
- P2P loans can be quicker to arrange than a bank loan because the process can be initiated and processed outside normal bank opening hours and because the procedures used to evaluate loans are more streamlined than those used by banks.

- For some borrowers, P2P lending is a more accessible source of funding than conventional loans due to the low credit rating of the borrower.

The use of P2P lending has grown rapidly over the past decade.

4 International money markets

Section overview

The **international money and capital markets** provide various possibilities for raising capital in the form of financial instruments, which the treasurers of large companies may use for borrowing or for financial investment.

- These instruments include **eurocurrency loans** and **international bonds (eurobonds)**.
- When deciding where to borrow, companies will consider **interest rates available**, the **amount of** finance that can be raised, and the **security** (if any) that has to be offered.

4.1 International financial markets

4.1.1 Who uses them?

Small and medium-sized companies and other enterprises are usually limited in their sources of finance to their domestic markets. Larger companies are able to seek funds in international financial markets. Funds are not only sought on these global markets by multinationals: funds from overseas might be used by larger companies to finance non-current asset acquisitions or working capital in domestic business operations.

4.1.2 What are they?

International money markets, previously sometimes called Euro markets, refer to lending and depositing funds in a foreign currency, outside the country of the currency's origin; for example, raising a short-term US dollar loan from a London bank.

The term 'euro' is sometimes used because initially these markets developed in Europe. The main currency traded in these markets is the US dollar ('euro dollar'). Other currencies are also deposited and lent internationally outside their domestic systems, hence markets exist for 'Euro-Yen', 'Euro- Sterling', etc.

The prefix 'Euro' refers to currencies traded outside their natural domestic market. It is a misleading term, as eurocurrencies should not be confused with the euro, which is a currency in its own right. To avoid any confusion, the prefix 'euro' is now rarely used for these international money markets.

4.2 International finance

Forms of finance available

The international financial markets are wholesale markets, for raising capital and investing on a large scale.

Eurocurrency market	Normally refers to short-term borrowing and lending by banks in currencies other than that of the country in which the bank is based. These are typically only available in major currencies such as US dollars or euros, for which active markets exist.
International bond market	This is a market in which bonds are issued by large companies and other organisations, including sovereign governments, and are sold to international investors. The bonds may be denominated in any freely-convertible currency, but most international bonds are denominated in US dollar, euros and yen. International bonds are issued on behalf of companies by investment banks, and these banks operate a secondary market in bonds after they have been issued. The main banks operating in the international bond markets are now large US banks. Companies that issue international bonds may list the bonds on a stock market, because international investors may be required to invest most of their funds in listed securities. However, the international bond markets operate outside the stock markets and very little trading in international bonds is done through stock markets.
International syndicated loans market	This is a market for medium- to long-term loans. The loans are created when a syndicate of international banks lend money to a borrower. Some of the loan may then be marketed, enabling other investors to acquire an interest. Syndicated loans spread the credit risk among the participating lenders and are arranged when a company wants a very large loan. The syndicated loans market, unlike the international bond market, involves banks as lenders (in the international bond markets they act as the 'go between' dealers between bond issuers and bond investors).

4.3 Factors to consider

The factors which are relevant to choosing between borrowing on the international markets or through the domestic system are as follows:

(a) **Eurocurrency** loans generally **require no security**, while borrowing on domestic markets is quite likely to involve fixed or floating charges on assets as security.

(b) **International bonds are attractive** to **investors** as interest is paid **gross** without the deduction of withholding tax, which occurs in many domestic bond markets. Also, international bonds securities **can usually be sold fairly easily on the secondary market**.

(c) It is often **easier** for a large multinational to **raise very large sums** quickly on the international **markets** than in a **domestic** financial **market**, because there are more potential large investors.

Professional skills focus: Structuring problems and solutions

From the information provided in a question it may not be initially obvious which source of finance is most appropriate. Look for information in the scenario on areas such as shareholder reaction, issue costs, servicing costs, impact on control and access to particular capital markets. This will help you to identify a solution to the directors of the company on the most appropriate source of finance to use.

5 Green finance

Section overview

Green finance can refer to financial investments in environmental goods and services, for example, the protection of biodiversity.

- It can also refer to schemes that encourage sustainability, such as policies to encourage investment in renewable energies.
- Green finance can also specifically relate to the financial systems that deal with green investments,which are known as green bonds and green funds.

Protection of the environment is becoming increasingly important for firms due to the pressure to act ethically in relation to the impact they have on the environment. In Chapter 1 we discussed the importance of companies taking account of sustainability in their decisions and actions. In this section we will discuss the emergence of green finance and its importance in promoting and supporting sustainability through both the financing and investment decisions taken by an entity.

Green finance is increasingly becoming an important part of a company's overall financial strategy and the achievement of its objectives. Companies that fail to consider appropriate sustainability will face increasing cost of capital, for equity and debt, and in some cases, capital constraints arising from the inability to raise capital.

Green finance has many different definitions but can be thought of as the financing of investments that provide environmental benefits, as part of a broader context of encouraging environmentally sustainable development. This could include green crowdfunding for small-scale, community schemes or green bond issuance for major infrastructure projects.

When the UK government launched its Green Finance Strategy in July 2019, it described this strategy as aiming 'to align investment and cashflows generated by the private sector with sustainable growth' (Great Britain Department for Business, Energy and Industrial Strategy (BEIS), 2019, p.4).

Additionally, the Government (BEIS) and the Green Finance Institute developed a Green Finance Charter, which ICAEW has signed up to. Financial markets will play a key role in incentivising and enabling Green initiatives and in constraining decisions with adverse climate change effects.

Some areas are usually accepted as 'green' with little argument. These include renewable energy, energy efficiency in construction, green transport, recycling, pollution prevention and water conservation. Other areas are more controversial such as nuclear energy and fossil fuel efficiency.

5.1 Greening finance

In the UK government's Green Finance Strategy, a key strategic pillar of green finance is to ensure 'financial risks and opportunities from climate and environmental factors are integrated into mainstream financial decision making, and that markets for green financial products are robust in nature' (Great Britain Department for Business, Energy and Industrial strategy, 2019, p.4). This was considered in more detail in Chapter 3 through the use of simulation and scenario planning.

This aspect of green finance shows that it needs to be a whole-organisation approach, driving strategy, culture and business processes throughout a firm. This is often tied to an environmentally- focused corporate mission.

This is being driven by increasing pressure from governments and regulators for listed companies to internalise consideration of the impact of their activities on global warming, as a normal part of their decision making. The intention of this is to encourage businesses to come up with plans to become carbon neutral or "net zero".

In the UK, the TCFD (Task Force on Climate-related Financial Disclosures), which has the backing of companies with balance sheets worth a total of $135 trillion does not oblige business leaders to come up with plans to go net zero, but if a company is not taking much action, that fact will be exposed to public gaze. The UK government has set out its expectations that listed companies in the UK complies with the disclosure requirements of the TCFD.

5.2 Financing green

Another key strategic pillar of the UK government's Green Finance Strategy is to accelerate 'finance to support the delivery of the UK's carbon targets and clean growth, resilience and environmental ambitions…' (Great Britain Department for Business, Energy and Industrial strategy, 2019, p.4).

This aspect of green finance shows that it requires support in terms of the provision of finance. This could include innovations such as green loans, green bonds and green funds.

Methods of 'financing green'	
Green loans	Some banks, often with government backing, specialise in financing green projects. For example, in the UK the Green Investment Bank (GIB) was launched in 2012 to finance investment in a project that has a specific green purpose such as reducing greenhouse gas emissions, promoting efficiency in the use of natural resources, protection of the environment, and promoting environmental sustainability. The GIB was privatised in 2017, but retains the same goals. The market for green loans is growing rapidly, and often lenders offer better loan terms to borrowers that can show they are reducing their environmental impact. The Green Loan Principles (GLP) set out a clear framework, enabling all market participants to clearly understand the characteristics of a green loan. This is discussed in more detail below.
Sustainability linked loans	Sustainability Linked Loans (SLLs) are not the same thing as green loans. They are loans for any purpose (whether 'green' or not), but with an in-built pricing mechanism, meaning that the loan is cheaper if the borrower achieves certain sustainable or ESG (environmental, social and governance) related targets. The use of SLLs is growing rapidly.

Methods of 'financing green'	
Green bonds	A green bond is a type of fixed-interest bond used to raise money for climate and environmental projects. These bonds are typically secured and have the same credit rating as a company's other debt obligations. Green bonds may come with tax incentives to enhance their attractiveness to investors. Over the past decade green bonds have increased in popularity dramatically. To qualify for green bond status, they are often verified by a third party such as the Climate Bonds Standard Board, which certifies that the bond will channel finance to environmentally-beneficial projects.
Green funds	Many stock markets produce an index of firms that satisfy social and environmental criteria. For example, in the UK the London Stock Market have the FTSE4 Good index. Companies are excluded if, for example, they are involved in production of tobacco, weapons or coal power industry. To be included in the FTSE4 Good Indexes, companies must, for example, support human rights, make progress to become environmentally sustainable, and ensure good labour standards for their own company and for companies that supply them as well. This helps investors to target investments in companies with higher standards of behaviour in terms of social responsibility.

5.2.1 Green Loan Principles

In 2018, the Green Loan Principles (GLP) were developed by an experienced working party drawn from leading lenders in the green-loan market with a view to promoting the development and integrity of the green loan product.

The GLP set out a clear framework, enabling all market participants to clearly understand the characteristics of a green loan, based around the following four core components:

(a) **Use of proceeds** – The key determinant of a green loan is the utilisation of the loan proceeds for green projects. All designated green projects should provide clear environmental benefits, which should be quantified, measured and reported by the borrower.

(b) **Process for project evaluation and selection** – The borrower of a green loan should clearly communicate the following to its lenders:

- its environmental sustainability objectives;
- the process by which it appraises and selects its environmental projects; and
- the related eligibility criteria and how it identifies and manages material environmental risks associated with the proposed projects.

(c) **Management of proceeds** – The proceeds of a green loan should be credited to a dedicated account or otherwise tracked by the borrower in an appropriate manner. Borrowers are encouraged to establish an internal governance process through which they can track the allocation of funds towards green projects.

(d) **Reporting** – Borrowers should make and keep readily available up to date information on the use of proceeds. This should include a list of the green projects to which the green loan proceeds have been allocated and a brief description of the projects including their expected environmental impact.

The GLPs do not propose specific consequences of non-compliance, however these are likely to be insisted on by a lender and a breach could result in penalties or could even result in the lender having the right to demand repayment of the loan.

6 Ethics

What are the ethical requirements when working in corporate finance?

6.1 Introduction

When raising funds there are many advisors to whom a business can turn. These include the following:

- **Accountants** – most medium- and large-sized accountancy firms have their own corporate finance departments. An obvious lead into this form of advice is to be audited by a firm with a corporate finance specialisation.
- **High street banks** – most of these have corporate finance departments.
- **Investment banks** – these specialise in helping businesses to obtain finance.
- **Solicitors/ Lawyers** – these provide advice on the legal aspects of fund-raising.

6.2 ICAB ethical guidance for accountants undertaking corporate finance work

6.2.1 Fundamental principles

The ICAB provides ethical guidance that will ensure that recipients of corporate finance advice can rely on the objectivity and integrity of the advice given to them by members. The guidance is dealt with in the professional stage **Audit and Assurance** syllabus.

The guidance is applicable to both members in practice and members in business (eg, accountants working for institutions providing funds for businesses).

Fundamental Principle 1 – 'Integrity'

A member should behave with integrity in all professional and business relationships.

Integrity implies not only honesty but fair dealing, truthfulness and being straightforward. A member's advice and work must be uncorrupted by self-interest and not be influenced by the interests of other parties. A member should not be associated with information that is false or misleading or supplied recklessly.

Fundamental Principle 2 – 'Objectivity'

A member should strive for objectivity in all professional and business judgements.

Objectivity is the state of mind which has regard to all considerations relevant to the task in hand but no other. There should be no bias, conflict of interest or undue influence of others.

Fundamental Principle 3 – 'Professional competence and due care'

When providing professional services 'professional competence and due care' mean:

- having appropriate professional knowledge and skill;

- having a continuing awareness and an understanding of relevant technical, professional and business developments;
- exercising sound and independent judgement;
- acting diligently, that is:
  - carefully;
  - thoroughly;
  - on a timely basis; and
  - in accordance with the requirements of an assignment;
- acting in accordance with applicable technical and professional standards; and
- distinguishing clearly between an expression of opinion and an assertion of fact.

Fundamental Principle 4 – 'Confidentiality'

The professional accountant should assume that all unpublished information about a prospective, current or previous client's or employer's affairs, however gained, is confidential. Information should then:

- be kept confidential (confidentiality should be actively preserved);
- not be disclosed, even inadvertently such as in a social environment; and
- not be used to obtain personal advantage.

Fundamental Principle 5 – 'Professional behaviour'

Behaving professionally means:

- complying with relevant laws and regulations;
- avoiding any action that discredits the profession (the standard to be applied is that of a reasonable and informed third party with knowledge of all relevant information); and
- conducting oneself with:
  - courtesy; and
  - consideration.

When marketing themselves and their work, professional accountants should:

- be honest and truthful;
- avoid making exaggerated claims about:
  - what they can do; and
  - what qualifications and experience they possess; and
- avoid making disparaging references to the work of others.

Activity categories

Categories of activity covered by the guidance are as follows:

- General corporate finance advice
- Acting as adviser in relation to takeovers and mergers
- Underwriting and marketing or placing securities on behalf of a client
- Acting as sponsor or nominated adviser under the Listing Rules and the AIM Rules respectively

6.2.2 General principles applicable to all professional accountants (in practice and in business) Statutory and other regulatory requirements

- Professional accountants must be aware of and comply with current legislative and regulatory measures and professional guidance governing corporate finance assignments.
- Professional accountants are required to comply with the City Code on Takeovers and Mergers.
- At the outset professional accountants should draw attention to the legislative and regulatory responsibilities which will apply to the client or his employer.
- The professional accountant should also draw attention to his own responsibilities under professional ethical guidance.

Interests of shareholders and owners

Professional accountants should have regard to the interests of all shareholders and owners unless they are specifically acting for a single or defined group thereof. This is particularly so when advising on a proposal which is stated to be agreed by directors and/or majority shareholders or owners.

Preparation of documents

- Any document should be prepared in accordance with normal professional standards of integrity and objectivity and with a proper degree of care.
- In order to differentiate the roles and responsibilities of the various advisers, professional accountants should ensure that these roles and responsibilities are clearly described in all public documents and circulars and that each adviser is named.

6.2.3 General corporate finance advice applicable to professional accountants in public practice Corporate finance advice

The nature of corporate finance activities is so wide-ranging that all the threats to objectivity can arise when professional accountants in public practice provide corporate finance advice to both assurance and non-assurance clients: the self-interest threat, the self-review threat, the advocacy threat, the familiarity or trust threat and the intimidation threat.

When advising a **non-assurance** client there can be no objection to professional accountants in public practice accepting an engagement which is designed primarily with a view to advancing that client's case, though the professional accountant in public practice should be aware that the self- interest threat could arise.

Where a **non-assurance** client has received advice over a period of time on a series of related or unrelated transactions it is likely that, additionally, the familiarity or trust threats may exist. But where a professional accountant in public practice advises an **assurance** client which is subject to a takeover bid or where a professional accountant in public practice acts as sponsor or nominated adviser to an assurance client involved in the issue of securities, the self-interest threat will become more acute and the advocacy threat will arise.

Some corporate finance activities such as marketing or underwriting of securities contain so strong an element of advocacy as to be incompatible with the objectivity required for the reporting roles of an auditor or reporting accountant. Even where the activities of an auditor or reporting accountant are restricted to ensuring their clients' compliance with the Listing Rules or the AIM Rules, it is likely that a self-review threat could arise.

It may be in the best interests of a company for corporate finance advice to be provided by its auditor and there is nothing improper in the professional accountant in public practice supporting an assurance client in this way.

A professional accountant in public practice's objectivity may be seriously threatened if their role involves undertaking the management responsibilities of an assurance client. Accordingly, the professional accountant in public practice firm should ensure that the client takes full responsibility for the final decisions arising from any such negotiations.

Conflict of interest

Professional accountants in public practice shall be aware of the danger of a conflict of interest arising. All reasonable steps should be taken to ascertain whether a conflict of interest exists or is likely to arise in the future between a professional accountant in public practice and his clients, both with regard to new clients and to the changing circumstances of existing clients, and including any implications arising from the possession of confidential information.

Where a professional accountant in public practice acts or continues to act for two or more clients having obtained consent, safeguards will need to be implemented to manage any conflict which arises. The safeguards may include:

(a) the use of different partners and teams for different clients, each having separate internal reporting lines;

(b) all necessary steps being taken to prevent the leakage of confidential information between different teams and sections within the firm;

(c) regular review of the situation by a senior partner or compliance officer not personally involved with either client; and/or

(d) advising the clients to seek additional independent advice, where it is appropriate.

Any decision on the part of a sole practitioner should take account of the fact that the safeguards at (a) to (c) of the above paragraph will not be available to him. Similar consideration apply to small firms where the number of partners is insufficient to spread the work as indicated above.

Where a conflict of interest is so fundamental that it cannot be managed effectively by the implementation of appropriate safeguards and is likely seriously to prejudice the interests of a client,the engagement should not be accepted or continued even if all relevant clients consent to the engagement.

Where a professional accountant in public practice is required for any reason to disengage from an existing client, the professional accountant in public practice shall do so as speedily as practicable having regard to the interest of the client.

Documents for client and public use

In the case of a document prepared solely for the client and its professional advisers, it should be a condition of the engagement that the document should not be disclosed to any third party without the firm's prior written consent.

A professional accountant in public practice must take responsibility for anything published under their name, provided they consented to such publication, and the published document should make clear the client for whom the professional accountant in public practice is acting.

Underwriting and marketing of shares

A professional accountant in public practice who is an auditor or reporting accountant shall not deal in, underwrite or promote shares for their client. Involvement of this kind would give rise to an advocacy threat, self-review threat and self-interest threat such that the professional accountant in public practice's objectivity and independence would be threatened.

Sponsors and nominated advisers

Considerable care needs to be taken if a professional accountant in public practice is also to act as sponsor or nominated adviser to an assurance client. A threat to the objectivity of the auditor or reporting accountant can arise as the duties of a sponsor or nominated adviser are different from those of an auditor or reporting accountant and are owed to a different party. Although it is quite possible that no conflict will arise between the two roles, professional accountants in public practice need to recognise the possibility of conflicts arising, particularly if the role of sponsor or nominated adviser is to include any advocacy of the directors' views or if the transaction is to involve any issue of securities. To comply with the requirements above, where there is an issue of securities associated with such a transaction, a separate broker should be appointed to take responsibility for any underwriting or marketing of the company's shares.

7 Capital market efficiency

Section overview

- How does the stock exchange work?
- The emergence of electronic share trading platforms.
- What is the efficient market hypothesis?
- What are the implications of market efficiency?

7.1 Introduction

The Stock Exchange (DSE & CSE) provides access not only to new funds but also act as a market for dealing in 'second-hand' securities, mainly equity shares. This secondary market function enables investors to liquidate their investments in ordinary shares and (where these are quoted on the market) their preference shares and debentures. This makes investment more of an attractive proposition for investors and keeps down the cost to the company of such finance.

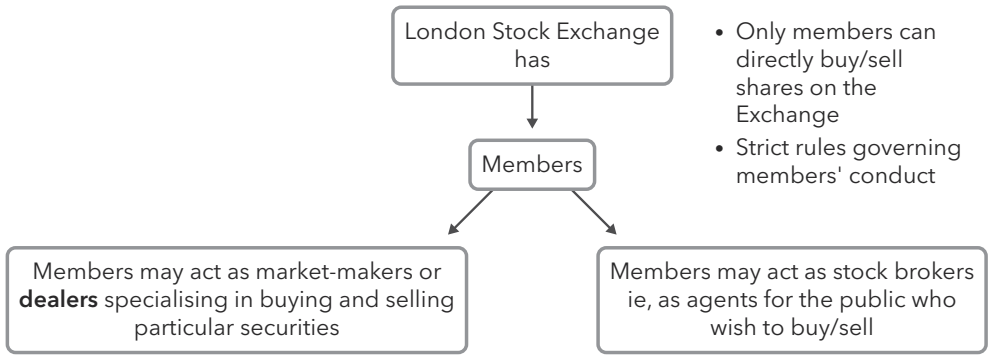
Investors will be keen to get a fair price for selling their investments. Prices on the market are fair if the market is efficient, so that the price reflects all known information about the company, its business and its prospects.

This section briefly looks at how the Stock Exchange operates and the emergence of electronic share dealing platforms before considering the efficiency of the market.

7.2 Workings of the Stock Exchange

The Stock Exchange (DSE & CSE) are, above all else, a business. Its primary objective is to establish and run a marketplace in securities. In any economy there are savers and borrowers.

The exchange acts as a place in which they can meet. Initially, the companies (the borrowers) issue shares to the investing public (the savers). This is known as the primary market. The main role of the Stock Exchange's primary market is to enable a company to issue shares. Investors would not be willing to invest their money unless they could see some way of releasing it in the future. Consequently, the exchange must also offer a secondary market trading in second-hand shares; this allows the investor to convert the shares into cash. The workings of the Stock Exchange are summarised in the following diagram.



- They offer continuous two-way pricing (for buying and selling) in selected securities
- Will buy or sell irrespective of whether they actually have the securities
- They therefore create a highly liquid market in these securities
- Hold a trading stock of the securities in which they deal
  - Positive stock = bull position (positive because dealers have bought securities they are yet to sell)
  - (Negative stock = bear position/ short selling (negative because dealers have sold securities they are yet to buy)
- Buying and selling effected through computerised systems
- Client contacts stockbroker with buy or sell orders
- Stockbroker/client determines best buy or sell price from the quoted prices
- Orders effected through system. Commission charged to the client)

Figure 4.2: Workings on the DSE & CSE

Traditionally trading in shares would be carried out by members of the exchange. However, the emergence of electronic share dealing platforms has made it easier for investors to research different companies and to trade directly in shares.

7.3 Electronic share dealing platforms

An electronic share dealing platform is a computer software programme that can be used to buy and sell shares (or currencies or derivatives) over a network with a financial intermediary or directly between the participants of the trading platform. Such platforms are in contrast to traditional floor trading and telephone-based trading as they allow electronic trading to be carried out by users from any location. Electronic trading platforms provide a share dealing app to allow mobile share trading, and are generally mobile-friendly. Individuals can access financial markets through specifically designed platforms that could previously only be accessed by specialist trading firms. There are numerous different trading platforms in developed countries eg, TDA meritrade, Robinhood, MT4/MT5. Bangladesh Government has already taken initiatives to develop/acquire electronic platform/app to facilitate remote and user-friendly trading including short selling.

Some electronic trading platforms allow traders to develop automatic or algorithmic trading systems. Automatic trading enables rapid share trading in response to events such as price movements using pre-set rules (defined by the investor or by the trading platform).

Automatic trading is extremely common and can lead to stock market volatility if news released to the market leads to a number of algorithms all taking the decision to buy (or sell) shares at the same time. The resulting volatility can reduce the efficiency of the stock market in terms of its ability to price shares accurately.

7.4 Efficient market hypothesis

Introduction

- Efficient markets are assumed to exist by most of the theoretical models described in this workbook , such as the dividend valuation model, Modigliani and Miller's (M&M) capital structure theory (1958, 1963) and dividend policy irrelevance theory.
- The efficient market hypothesis is concerned with the information-processing efficiency of stock markets – particularly with the processing efficiency of the stock market in terms of share prices.
- An efficient market is a market where shares cannot be bought 'on the cheap' and sold on immediately at a profit. All share prices are 'fair' and investment returns are those expected for the risks undertaken. Information is rapidly and accurately incorporated into share values.
- The efficient market hypothesis (EMH) is tested by considering three forms of efficiency – weak, semi-strong and strong – the difference being in terms of what information is reflected in share prices. The forms of efficiency are cumulative: if the market is semi-strong, it is also weak, and if it is strong, it is also semi-strong and weak.

Form one

Weak form efficiency

How much information?

When a stock market has weak form efficiency, share prices reflect information about past price movements. Past price movements do not help investors to identify profitable trading strategies. Trading rules such as 'buy after three days of price falls' and 'sell after five days of price rises' should not work.

Share prices follow a random walk. This does not mean that prices go up and down arbitrarily. It means that share prices rise with good news and fall with bad news. The next movement depends on the next item of news – not on past price movements or patterns. The next item could be good or bad with a 50:50 chance ie, random.

Tests

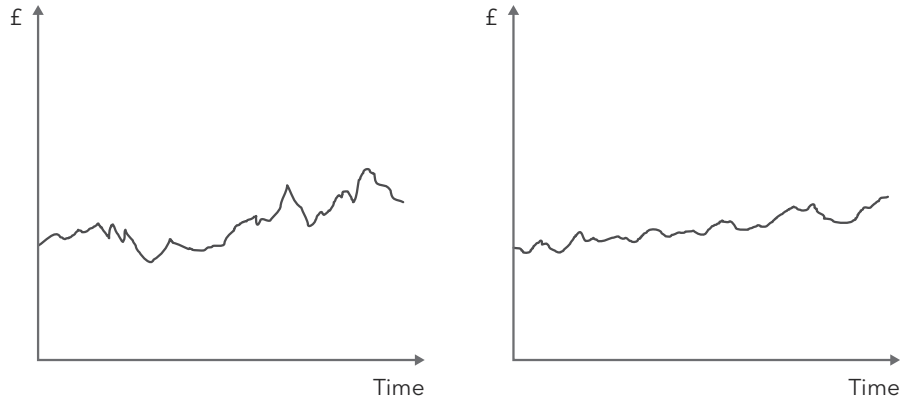
Tests indicate that 0.1% of a share price change on a particular day can be predicted with knowledge of the price change of the previous day. The remaining 99.9% is explained by other information (sometimes referred to as 'random walk research').

Implications if the market is weak form efficient

Future price movements cannot be predicted from past price movements. Chartists/ technical analysts are incorrect in their belief that they can draw pictures and identify patterns of historical price movements that can be used to predict future price movements.

Context example: Weak form efficiency

Here are two graphs:



One graph represents an experiment. You start with £100. You toss a coin. Heads wins you £20, tails loses you £15. You toss the coin many times recording your change in wealth over time. Knowledge of how the coin has landed in the past will not help you predict what will happen in the on the next toss. The next move in wealth is either up or down, with a 50:50 chance of heads or tails.

The other graph is what happens to your wealth if you invest £100 in the FTSE all-share index. Which is which?

Are you sure?

The fact that the two diagrams are so similar indicates that you cannot identify patterns, and you cannot predict future movements from past movements.

Form two

Semi-strong form efficiency How much information?

When a stock market is semi-strong form efficient, share prices incorporate all publicly available information (published accounts, press releases about earnings, dividends, new products, government economic data, etc).

Once the information has been published or has appeared in the media, nothing can be done to trade in the shares at a profit because the share price will have already reacted to the new information! News is very rapidly reflected in share prices.

Tests

Many of the tests have looked at individual share price returns around news release dates relative to the rest of the market returns. For example, the effect of dividend announcements which were better/worse than expected could be examined. Evidence suggests the stock market immediately and rationally incorporates such news in share prices ('immediately' means within 5–10 minutes).

Implications if the market is weak form and semi-strong form efficient

The market cannot be beaten by examining publicly available information – it will already be incorporated in share prices.

The market can only be beaten if an investor has inside information.

Form three

Strong form efficiency How much information?

When a stock market has strong form efficiency, share prices reflect all available information, whether or not it has been published. No investor can beat the market by having superior information, as it does not exist.

Tests

Company managers and other insiders have information they could trade on before it becomes public. In theory, publication would not affect the share price in a strong-form market, as the information is already incorporated in the share price. In reality individuals in the UK and US have been imprisoned and/or fined for insider dealing ie, they have exploited confidential and unpublished information which is not reflected in the share price, negating the idea that markets are strong form efficient.

More importantly – can professional investors such as investment fund managers consistently beat the market by exploiting their (better) contacts with companies (particularly their Finance Directors) which average investors do not have? This has been tested by throwing 30 darts at the FT share listings and comparing the performance with 30 fund managers. Half the time the darts win (!). This and many other tests indicate that there is no evidence that 'professional' investors consistently have access to better inside information.

Implications if the market is efficient in all three forms

Investors cannot consistently beat the market but if it is not strong form efficient, then they can make money from insider dealing – and there is much evidence to suggest that the stock market is not strong form efficient.

7.5 Overall

The stock exchanges of all developed nations are regarded as having at least semi-strong form efficiency for the shares that are traded actively in those markets.

Lessons of market efficiency Markets have no memory

'Only issue shares when the share price is at a high' implies a pattern to price movements which can be used to time the issue of new shares ie, weak form efficiency does not hold. In fact, as has been seen, the past is no guide to the future. Managers can time issues in relation to share price by using inside information (ie, release good news, share price rises, issue new shares) but this relates to the future not past information.

Trust market prices

In an efficient market prices are fair – and cost of equity, debt etc, calculations will produce a 'fair' result.

There are no financial illusions

Firms cannot fool the market! The market is concerned with company cash flows. Thus, manipulating accounting policies (such as depreciation rates) to boost reported earnings, will not improve the share price (cash flows unchanged).

DIY alternative

In efficient markets investors will not pay companies for what they can do themselves. This means that if one firm takes over another, there will not be an increase in share price merely because of this transaction – the shareholders could have bought shares in the other company and achieved the same result for their investment.

Shares are close substitutes

It should not be necessary to make new share issues at a substantial discount to the existing market price as long as the return offered is commensurate with the risk undertaken by the investor.

Reading the entrails

Share prices are a better guide to performance than published financial statements. This brings into question the value of financial ratio analysis.

Value of investment advice

As the stock market is often considered to be semi-strong efficient, then:

- technical analysis (Chartism) – attempting to predict future price changes from historical patterns of price movements – appears to be a waste of time; and
- fundamental analysis, involving the examination of newly-published accounts and press releases etc, makes the market semi-strong efficient by affecting share prices for a very short time after the new information is published. However, any more analysis after the information has been incorporated into share prices is 'worthless' in the sense that it will not enable the analyst to predict further price movements.

7.6 Practical observations about beating the market

If an investor thinks they can beat the market by:	The investor must be assuming that the market:
• analysis of past price movement (Chartism)	is not efficient at all
• gathering forecasts and watching a company's actions (investment banks and brokers analysts)	is (at most) weak form efficient
• insider dealing	is (at most) semi-strong efficient
• purely and only luck – there is no regular way to beat the market	is strong form efficient

7.7 Investor relations

Semi-strong efficiency depends upon both the quantity and quality of publicly-available information. Companies that willingly make information available to investors may be valued more highly than those that do not, and may consequently have a lower cost of capital because they are perceived to be less risky (cost of capital is covered in Chapter 5).

Pressure from investors as well as government, accountancy bodies and the Stock Exchange may 'encourage' those less willing to improve the flow of information disclosures.

8 Behavioural finance

Section overview

Why are some decisions not made on a rational basis?

- How do bias, emotions and different attitudes affect investors?

Introduction

Behavioural finance is an alternative view to the efficient market hypothesis. It attempts to explain the market implications of the psychological factors behind investor decisions and suggests that irrational investor behaviour may significantly affect share price movements. These factors may explain why share prices appear sometimes to overreact to past price changes.

Investors are subject to a number of behavioural tendencies that can lead to decisions that are not rational. These behavioural tendencies impact investors' decisions which questions the validity of the efficient market hypothesis.

8.1 Overconfidence

Investors tend to overestimate their trading abilities and gloss over the areas in which they lack knowledge. This can lead to them making bad investments. They are also likely to over-estimate the accuracy of their forecasts, such as predicted earnings. Investors may then be surprised by (for example) earnings announcements, because their predictions were overambitious.

Over-confidence can be linked to self-attribution bias. This means that investors will attribute their successes to their own skills, but their failures will have been caused by bad luck rather than themselves. Over-confidence leads investors to think they can beat the market.

8.2 Representativeness

Representativeness occurs when judgements are based too heavily on a representative observation and do not take into account numerous other factors, such as statistical evidence. As an example, when there is a sharp decline in the stock market there will be articles showing that the fall in the index level is similar to that of the Wall Street crash of 1929. Although this statistic may be accurate, it may mislead investors to believe that there will be a repeat of the Great Depression of the 1930s. The fundamental economic differences between the two situations are overlooked in favour of the one similarity.

Representativeness can also explain why some investors think that past performance can be used to indicate future performance, when in reality the link is generally a poor one.

8.3 Narrow framing

Investors can suffer from 'narrow framing' if they are unable to look at the broader picture For example, an investor can focus on the price movement of a single share instead of looking at the whole portfolio. Similarly, investors may worry about short-term performance when their goal is to fund long-term retirement savings. Looking at the broader picture, it

should be seen that in the long run, a well-diversified portfolio should grow in value, despite some short-term fluctuations.

8.4 Miscalculation of probabilities

Research has shown that investors attach too low a probability to likely outcomes and too high a probability to unlikely outcomes. This can help to explain stock market bubbles such as the 'dotcom' bubble as investors overestimated the potential of the internet start-ups and their ability to dominate their market segments.

8.5 Ambiguity aversion

Investors are afraid of areas where they do not have much information and instead they prefer the familiar, which they believe they know well. This can help to explain why investors avoid overseas shares when, rationally, international diversification brings benefits to the investor.

8.6 Positive feedback and extrapolative expectations

Positive feedback investors buy shares after their prices have risen and sell them after prices fall. They build extrapolative expectations about the share prices, expecting prices to continue rising (or falling). Some informed traders use this behavioural tendency to their advantage by joining in and pushing rising prices higher and then selling at a profit before the price falls. This creates instability in the market and means the share price has diverged from its realistic value. This behaviour can create stock market bubbles.

8.7 Cognitive dissonance

If an investor has a long-held belief, they will continue to hold it even if evidence completely contradicts this belief. This can lead to investors holding shares that they believe will increase in value when the evidence overwhelmingly suggests otherwise.

This tendency contributes towards an effect known as 'post-earnings announcement drift' which shows that the reaction to unexpectedly good or bad earnings figures is slower than suggested by the efficient market hypothesis.

8.8 Availability bias

Individuals may pay particular attention to one fact or event because it is freshest or most prominent in their mind. The bigger picture is ignored, even though it is likely to be based on sound probabilities, and instead the investor is influenced by the emotion attached to the one fact or event. For example, if some high-profile companies in the nuclear energy sector produce some poor results, then investors might abandon the entire sector and ignore the potential that there are some good companies available in the sector at attractive share prices.

8.9 Conservatism

Investors tend to be naturally conservative and resistant to changing an opinion. As a result, if profits turn out to be higher than expected, they will under-react and not adjust subsequent profits expectations. This means that one profits announcement surprise is followed by another.

8.10 Overall

Despite these behavioural tendencies, investors tend to be viewed as flawed rational thinkers rather than as completely irrational. Investors attempt to be rational, but have limitations in their memory, emotion and cognitive functions which lead them to repeat mistakes.

Professional skills focus: Applying judgement

Remember, share prices change for a number of different reasons. When analysing share price movements in the exam, it is important to apply professional scepticism and critical thinking.

9 Sources of Islamic Finance

Section overview

- Key Principles of Islamic Finance
- What are the different mechanisms of Islamic Finance including various type of Sukuk as source of finance?
- What is Takaful and how it works?

9.1 Introduction

We have learnt about all the conventional sources of finance in this chapter already. Now we are delving into Islamic Finance as a unique and ethical source of funding for Business. Rooted in Sharia principles, Islamic Finance stands out for its unwavering commitment to ethical considerations and adherence to moral values, offering a distinctive perspective on economic well-being and social justice. The ethical and moral considerations are also called as "maqasid" (objectives), which serve as guiding principles for Islamic Finance.

Islamic finance, a rapidly growing segment within global finance, caters to individuals guided by Islamic principles (Sharia'ah). In just four decades, it has emerged as a significant force with a global asset base of $4.5 trillion, concentrated in the Gulf Cooperation Council, Southeast Asia, and the Middle East & South Asia. Key features include risk-sharing, inclusivity, and real asset-backed transactions.

Bangladesh actively participates in this market, with the first Sharia'ah-based bank established in 1983. Currently, Islamic banks hold a substantial share (around 30%) of the Bangladeshi banking industry, especially in deposits, investments, and remittances. Despite challenges, Islamic banking's popularity continues to rise due to its ethical and Sharia'ah-compliant operations. Both stock exchanges now offer Sharia'ah-compliant indexes, and the central bank has introduced various Sharia'ah-compliant products. This trend suggests Islamic finance may become a viable alternative to conventional finance in the future.

9.2 Key principles of Islamic Finance

9.2.1 Prohibition of Interest (Riba)

"Riba" literally means "excess, expansion, increase, addition or growth". Riba, in Islamic finance and jurisprudence, refers to the prohibition of interest or usury. It encompasses any form of excess or unjust gain in financial transactions, where a lender receives more than the principal amount lent or agreed upon, regardless of whether the increase is in monetary terms or other goods/services. Riba is considered exploitative and is prohibited in Islam to ensure fairness, justice, and the equitable distribution of wealth.

Why is Riba prohibited?

The Holy Quran and teachings of Prophet Muhammad (PBUH) condemn Riba as exploitative and unjust. Major reasons are:

- **Exploitation:** Fixed interest charges are seen as an unfair transfer of wealth from borrower to lender, regardless of the borrower›s situation or the outcome of the investment.
- **Unearned Income:** Lenders receive guaranteed returns without sharing the risk or contributing any effort.
- **Discouragement of Productive Activity:** Focus on fixed returns could discourage investment in productive ventures and hinder economic growth.

Islamic Finance staunchly opposes the payment or receipt of interest (riba), a principle deeply embedded in the Holy Quran. Islamic finance avoids transactions that involve fixed predetermined gains based on the loan amount. Instead, it focuses on profit-sharing or risk-sharing models, where both parties share the benefits and burdens of an investment.

Types of Riba

Islamic scholars have categorized Riba primarily into two types:

1. **Riba al-Nasiah:** This refers to the classic definition of usury - fixed interest charged on a loan. The borrower is obligated to repay the principal amount plus the predetermined interest, regardless of the outcome of the loan.

   Some forms of this type of Riba are –

   - A loan is given on predetermined interest rate for a defined period; the principal along with the interest is to be repaid at the end of the term;
   - The creditor would charge a monthly interest from the debtor while the principal would remain intact upto the day of maturity; or
   - If the borrower could not pay at the end of the term, the lender would allow more time against additional interest.

2. **Riba al-Fadl:** This translates to unequal exchange of commodities of the same type. For example, trading 2 kg of rice for 3 kg of rice later would be considered Riba al-Fadl because the delayed exchange favors the recipient of the larger quantity later.

9.2.2 Avoidance of Uncertainty (Gharar)

"Gharar" is an Arabic term used in Islamic finance to refer to "uncertainty, ambiguity, or excessive risk" in a contract or transaction. In Islamic jurisprudence, engaging in transactions involving gharar is discouraged or prohibited because it may lead to exploitation or unfairness. Gharar can arise from lack of clarity about the subject matter, terms, or conditions of a contract, which may result in disputes or harm to one party.

Why is Gharar prohibited?

Islamic finance emphasizes fairness and transparency in financial dealings. Gharar can lead to disputes, exploitation, and unforeseen losses. By prohibiting Gharar, Islamic finance aims to:

- Protect participants from unfair or misleading contracts;
- Promote clarity and transparency in financial transactions; and
- Encourage responsible risk-taking and discourage excessive speculation;

Examples of Gharar:

- Selling something that doesn't exist yet (e.g., promising future profits without a clear underlying asset).
- Selling something with unknown characteristics (e.g., a box of electronics without specifying the contents).
- Contracts with vague or ambiguous terms that could lead to misunderstandings.

Examples of conventional instruments or transactions involving Gharar are mentioned below:

- Combination of contracts (e.g. conventional finance lease in which sale and lease are combined);
- Derivatives – forward, futures, options, swaps;
- Short selling in stock and commodity markets;
- Day-trading;
- Bill discounting;
- Sale of debt (e.g. sale of mortgage portfolio, trading in bonds); and
- Conventional insurance.

Gharar can be excessive, medium or minor. Excessive Gharar can nullify a transaction but medium or minor Gharar are typically acceptable and have no effect on the transaction.

9.2.3 Prohibition of Gambling or Game of Chance (Maysir or Qimar)

"Maisir" and "Qimar" refer to "gambling" or "games of chance". "Maisir" refers to easily available wealth or acquisition of wealth by chance, whether or not it deprives the other's right. "Qimar" means the games of chance in which one gains at the cost of the other(s).

Maysir and Qimar are often used interchangeably in Islamic finance. Both terms translate roughly to gambling, games of chance, or activities that generate wealth through mere luck or speculation.

Why is Maysir or Qimar prohibited?

Islamic finance emphasizes ethical wealth creation through effort, risk-sharing, and productive activities. Maysir and Qimar are prohibited because:

- **Unjust enrichment:** Wealth is gained without contributing any value or effort.
- **Discourages hard work:** Gambling and dependence on chance rather than effort and skill and hence it can discourage hard work and responsible financial planning.
- **Potential for addiction and financial loss:** Gambling can be addictive and lead to significant financial hardship.

Examples of Maysir and Qimar:

- Casino games
- Lotteries
- Speculative financial instruments (options, futures contracts) used for pure gambling without underlying value

Not all risk-taking is prohibited. Islamic finance allows for calculated risks in business ventures where there's a potential for both profit and loss.

9.2.4 Prohibition of Impermissible (Haram) Goods and Services

One of the very important characteristics in Islamic Finance is that the subject matter of the transaction must be always permissible one as per Islamic Shariah, no impermissible (Haram) goods and services can be the subject matter of Islamic Finance Contract in any case.

Examples of prohibited goods and services include, among others:

- Non-halal foods (such as pork, non-slaughtered animals or animals which were not slaughtered according to Islamic principles)
- Intoxicating drinks
- Non-halal entertainment
- Pornography
- Tobacco-related products
- Conventional financial services
- Weapons

9.2.5 Risk Sharing

Islamic Finance places a strong emphasis on profit-and-loss sharing arrangements, fostering a sense of partnership and cooperation. "There is no return without risk/liability" – this is a well-established principle in Islamic jurisprudence which negates the concept of shifting the entire risk to the other party in a commercial transaction while still benefiting from the return. In other words, riskless profit has no place in Islamic finance. It is a primary reason why conventional insurance which works on the principle of risk transfer (as opposed to risk sharing) is not allowed in Shari'ah.

9.2.6 Asset-Backed Financing

At the core of Islamic Finance lies the principle of asset-backed financing, grounding transactions in tangible assets or services. In other words, all Islamic Finance contracts must be backed by underlying real economic activities. In Islamic Finance Money has the potential for growth when it joins hands with entrepreneurship or is used in an economic activity. In itself, money is not recognized as capital entailing intrinsic value and therefore cannot earn a return.

9.2.7 Shariah (Islamic Law) Compliance

Adherence to Shariah is at the center of Islamic Finance. Without ensuring compliance to Islamic Law not Islamic Finance contract in essence can be considered as an activity of Islamic Finance. Some basic Shariah compliance issues relating to Islamic Finance already discussed above. Besides to deal with contemporary issues there might have separate Shariah Supervisory Board at individual Company or Islamic Financial Institution Level as well as Country level.

9.2.8 Maqasid al-Shariah

Maqasid al-Shariah, often translated as the "ultimate objectives" or "objectives of Islamic law," are the core principles and goals that underpin Islamic finance. These principles aim to promote the well-being of humanity in both this world and the hereafter. Here's how Maqasid al-Shariah shapes Islamic finance:

- **Preservation of Faith (Hifz ad-Din):** Islamic financial products and services should not encourage activities that could harm a person›s faith or moral values. This aligns with the avoidance of Riba, Maysir, and Gharar.
- **Preservation of Life (Hifz an-Nafs):** Financial practices should not endanger human life. This can involve responsible lending practices and avoiding financing activities that could lead to harm.
- **Preservation of Intellect (Hifz al-Aql):** Islamic finance discourages activities that could cloud judgment or lead to addictive behaviors, such as excessive debt or speculation.
- **Preservation of Lineage (Hifz an-Nasl):** Financial products should not promote practices that could harm families or societal structures.
- **Preservation of Wealth (Hifz al-Mal):** Islamic finance encourages responsible financial management and discourages wasteful spending or excessive risk-taking. It promotes wealth creation and distribution through ethical means.

Maqasid al-Shariah also emphasizes broader societal benefits:

- **Social Justice (Adl):** Islamic finance promotes fair and equitable financial practices. This includes ensuring access to financial services for all and avoiding predatory lending practices.
- **Public Interest (Maslahah Ammah):** Financial activities should benefit the community as a whole. This can involve supporting infrastructure development, small businesses, and charitable causes.

Following Maqasid al-Shariah helps Islamic finance achieve:

- **Ethical and fair financial dealings:** Avoiding Riba, Gharar, and Maysir promotes transparency and discourages exploitation.
- **Balanced risk-sharing:** Profit-and-loss sharing models encourage responsible risk-taking and shared benefits.
- **Sustainable economic development:** Focus on ethical investments and social responsibility fosters a more just and stable economy.

By adhering to Maqasid al-Shariah, Islamic finance aims to create a financial system that promotes not just financial well-being, but also overall social and spiritual well-being.

9.3 Different mechanisms of Islamic Finance

By now you all know the key principles of Islamic Finance. Now we are diving into the different mechanisms of Islamic Finance. Understanding of these mechanisms will help you to choose the correct source of financing as per your organizational short-, medium- and long-term business needs in different circumstances.

9.3.1 Profit-sharing and loss-bearing contracts

9.3.1.1 Mudaraba

Mudaraba, also known as Qirad, is a type of profit-sharing and loss-bearing partnership contract in Islamic finance. In other words, Mudaraba is a partnership where one party

(investor) provides capital and another (entrepreneur) manages it, sharing profits according to a predetermined ratio while bearing losses by the investor.

It involves two parties:

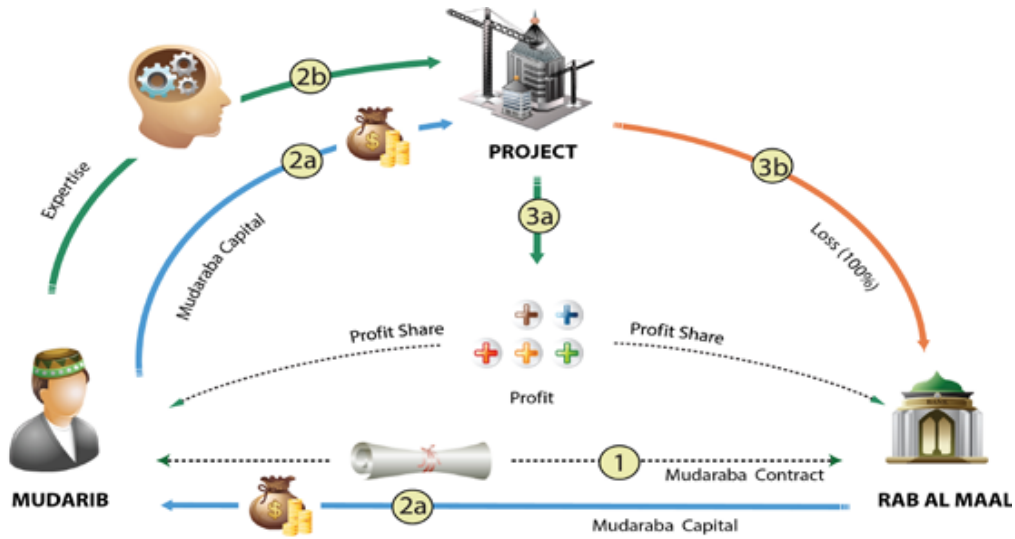
1. **Rab al-Mal or Investor:** This is the capital provider, who invests funds or assets into the venture.

   They are essentially the passive partner.

2. **Mudarib or Entrepreneur:** This is the entrepreneur or manager who uses the capital to undertake a business activity. They are the active partner who contributes their expertise and effort.

   Here's how it works:

- **Capital and Management:** The Rab al-Mal provides the capital for the venture, while the Mudarib contributes their management skills and expertise to run the business.
- **Profit Sharing:** Any profits generated from the venture are shared between the Rab al-Mal and the Mudarib according to a pre-agreed ratio. This ratio is flexible and can be negotiated based on factors like the amount of capital provided, the level of risk involved, and the expertise of the Mudarib.
- **Loss Bearing:** Unlike conventional loans, the Rab al-Mal bears all the losses incurred by the venture. The Mudarib, however, does not lose any personal wealth but may lose their potential profit share. This incentivizes the Mudarib to manage the business responsibly.
- **Transparency and Trust:** Mudaraba relies heavily on transparency and trust between the parties. The Rab al-Mal has the right to know how the funds are being used and the Mudarib must act in good faith and follow Sharia principles.



MUDARABA FINANCING

Here are some key features of Mudaraba:

- **Risk and reward sharing:** Both parties share the risks and rewards of the venture, fostering a collaborative and mutually beneficial relationship.
- **Compliance with Sharia principles:** Mudaraba avoids interest-based transactions and promotes ethical and responsible business practices.

- **Flexibility:** The terms of the agreement can be tailored to specific needs and situations.

Example of typical Mudaraba:

Scenario 1:

- Investor (Rab al-Mal) provides a capital of **100,000 taka**.
- Entrepreneur (Mudarib) manages the investment with their skills and effort.
- Profit-sharing ratio is agreed upon as **60% for Investor, 40% for Entrepreneur**.

Investment Period: 1 year

Investment Outcome:

- After one year, the investment generates a profit of **30,000 taka**.

Profit Distribution:

- Investor receives 60% of the profit: (30,000 taka) x (60%) = **18,000 taka**
- Entrepreneur receives 40% of the profit: (30,000 taka) x (40%) = **12,000 taka**

Now we will look into a different scenario when the investment generates a loss instead of profit.

Scenario 2:

- Investor (Rab al-Mal) provides a capital of **100,000 taka**.
- Entrepreneur (Mudarib) manages the investment with their skills and effort.
- Profit-sharing ratio is agreed upon as **60% for Investor, 40% for Entrepreneur**.

Investment Period: 1 year

Investment Outcome:

- Unfortunately, after one year, the investment incurs a loss of **20,000 taka**.

Loss Distribution:

- Since the Mudaraba agreement likely stipulates the investor bears the loss up to their capital contribution, the entire loss of 20,000 taka falls on the investor.
- The entrepreneur does not receive any profit share and doesn't contribute to the loss, as long as they managed the investment according to the agreement and the loss wasn't due to their negligence.

It's important to note the following relating to Mudarba financing:

- **Limited Appeal for Entrepreneurs:** Entrepreneurs might find Mudaraba arrangements less attractive compared to traditional loans.
    - **Profit Sharing:** Entrepreneurs may prefer a fixed income structure offered by conventional loans, rather than sharing a potentially higher profit but also risking sharing any losses.

- **Profit Verification:** The process of verifying profits for profit-sharing can be complex and require transparency from both parties.

- **Investor Dependence on Entrepreneur Skills:** The success of a Mudaraba heavily relies on the entrepreneur's skills and experience. Investors may have limited control over the management decisions and rely solely on the entrepreneur's expertise.
- **Finding a Suitable Entrepreneur:** Identifying a trustworthy and skilled entrepreneur who aligns with the investor's goals can be challenging. Due diligence on the entrepreneur's capabilities and track record becomes crucial.
- **Limited Availability of Expertise:** The availability of Sharia-compliant financial institutions and experts who can structure and manage Mudaraba agreements effectively might be limited in some regions.
- **Standardization and Regulation:** Mudaraba agreements can be complex and vary depending on individual interpretations. Standardization of Mudaraba contracts and clearer regulations could facilitate wider adoption.
- **Scalability for Large Projects:** Mudaraba might not be suitable for very large-scale projects due to the complexities of structuring profit-sharing agreements and identifying qualified entrepreneurs to manage such ventures.

Overall, Mudaraba is a unique and versatile financing tool that can offer a viable alternative to conventional options for those seeking Sharia-compliant investments and partnerships.

9.3.1.2 Musharaka

Musharaka, which translates to "partnership" in Arabic, is another fundamental type of Islamic finance contract similar to Mudaraba. While Mudaraba involves a capital provider and a manager/entrepreneur, Musharaka is a form of partnership in Islamic finance where two or more parties contribute capital to a joint venture. Profits generated from the venture are shared among the partners based on an **agreed-upon ratio**, while **losses are shared according to the proportion of capital contributed.**

However, the profit sharing ratio is not necessarily tied to the capital contribution ratio. Partners may agree to distribute profits in a manner that reflects factors other than just the amount of capital contributed. These factors could include the level of expertise, effort, or resources contributed by each partner, as well as the perceived value of their respective contributions to the success of the venture.

For example, one partner may contribute a larger portion of the capital but have less involvement in the day-to-day operations of the business. Meanwhile, another partner who contributes less capital may play a more active role in managing the venture or bringing valuable skills and expertise to the partnership. In such cases, the profit sharing ratio could be adjusted to reflect the respective contributions and responsibilities of each partner.

Ultimately, the profit sharing ratio in a Musharaka agreement is determined through mutual agreement between the partners and should be based on principles of fairness and equity.

Unlike Mudaraba, in Musharaka both parties contribute capital and **actively participate** in the management and running of the business.

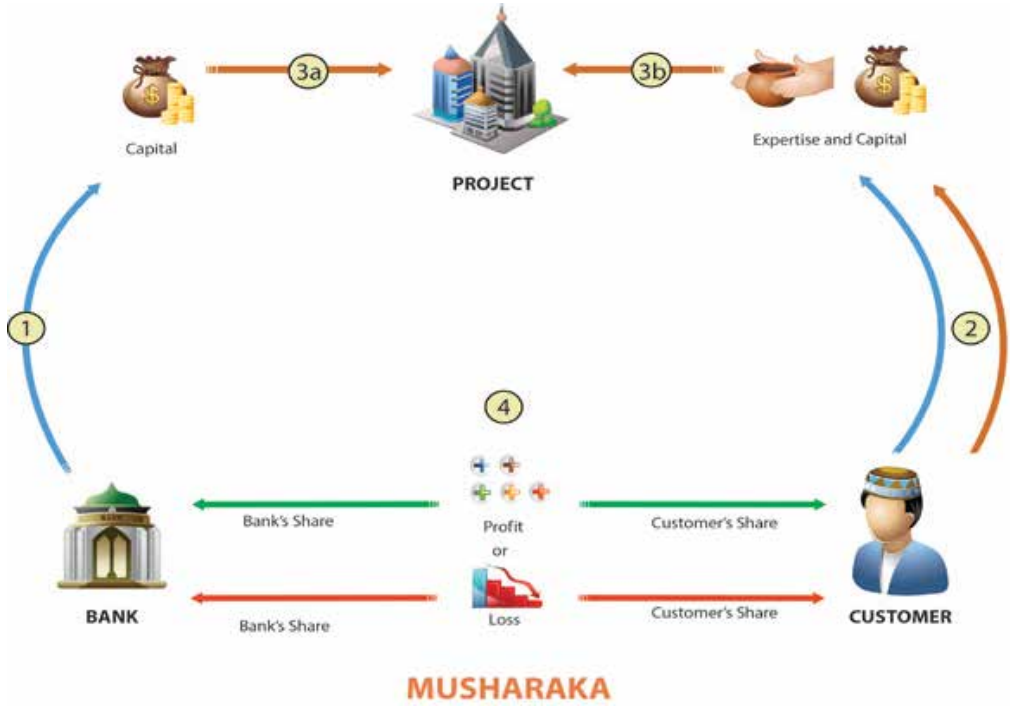
Here's what defines Musharaka:

Shared Capital and Management: Both partners contribute capital to the venture and actively engage in its management and decision-making. This fosters shared responsibility and encourages collaboration.

Profit and Loss Sharing: Profits generated from the business are shared between the partners **as per pre-agreed ratio**. Conversely, losses are also borne proportionately, reflecting the shared risk and reward nature of the partnership.

Transparency and Communication: Open communication and transparency are crucial, as each partner needs to be aware of the venture's performance and decisions made.

Agreement and Flexibility: The terms of the partnership, including profit-sharing ratios, management responsibilities, and dispute resolution mechanisms, are outlined in a formal agreement tailored to the specific venture and partner contributions.



Key Features:

- **Joint ownership and responsibility:** Both partners own the business and actively participate, fostering shared commitment and accountability.
- **Risk and reward sharing:** Proportional sharing of profits and losses aligns interests and motivates both partners.
- **Flexible structure:** The agreement can be customized to suit various business models and partner dynamics.

Example of a Musharaka

Scenario:

- Investor (Rab al-Mal) contributes **700,000 taka** towards the capital of a project.
- Entrepreneur (Mudarib) contributes **300,000 taka** (including their own investment and potentially sweat equity in terms of initial setup and expertise).
- Profit-sharing ratio is agreed upon as **60% for Investor, 40% for Entrepreneur.**

Project Timeline:

- The project is expected to operate for 2 years.

Profit and Loss Sharing:

- **Year 1:** The project generates a profit of **200,000 taka**.
  - Investor receives 60% of the profit: (200,000 taka) x (60%) = **120,000 taka**
  - Entrepreneur receives 40% of the profit: (200,000 taka) x (40%) = **80,000 taka**
- **Year 2:** The restaurant experiences a loss of **100,000 taka**.

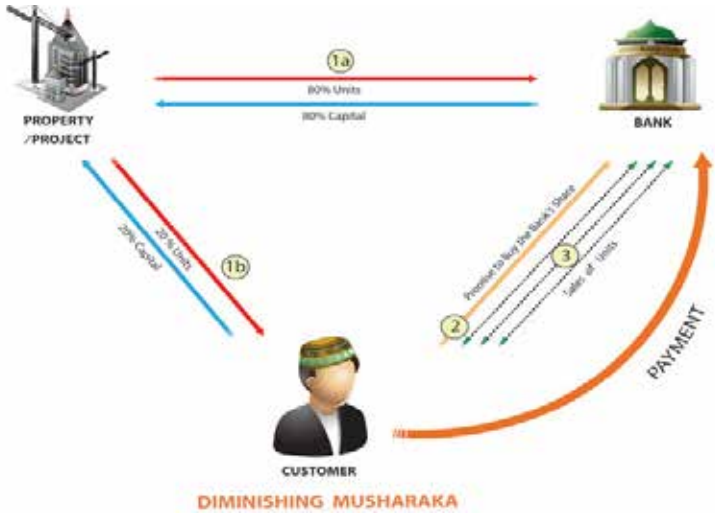
Loss Sharing:

- In Musharaka whatever be the pre-agreed profit-sharing ratio, the loss is to be shared proportionally as per the initial capital contributed, no change can be done in terms of this loss sharing ratio.
  - Investor bears 70% of the loss: (100,000 taka) x (70%) = **70,000 taka**
  - Entrepreneur bears 30% of the loss: (100,000 taka) x (30%) = **30,000 taka**

Different forms of Musharaka

Musharaka itself isn't a monolithic concept and has different variations depending on the specific partnership structure. Here are some of the common forms of Musharaka:

1. **Musharaka al-Milkiyah/Sharika -ul – Milk (Holding Partnership/Co-owner):** This is the most basic form of Musharaka, representing a **partnership with ownership**. Partners contribute capital to co-own an asset, such as a building or equipment. Profits and losses are shared based on the pre-agreed ratio reflecting their capital contribution.
2. **Musharaka al-Aqd (Contract Partnership):** This form emphasizes a **partnership based on a contract**. Partners contribute different resources, not necessarily just capital. This could involve one partner contributing money, another contributing expertise or labor, and the profit/loss sharing ratio reflecting the value of each contribution. Contract partnership may further be of different type like –
   - Partnership of Capital
   - Partnership of Work or Labour
   - Partnership of Reputation/Goodwill
3. **Diminishing Musharaka:** This is a unique structure where ownership progressively transfers between partners. There are two main forms:
   - **Consecutive Partnership:** Partners maintain their ownership percentages throughout the project, but upon exit, one partner might have the right to purchase the other's share gradually.
   - **Declining Balance Partnership:** One partner, typically the financier, gradually sells their ownership share to the other partner over a set period. This allows the other partner to eventually gain full ownership.



4. **Mudarabah-Musharaka Mix:** This combines elements of both Mudarabah (profit-sharing) and Musharaka (partnership). One partner might contribute capital and share ownership (Musharaka element), while the other partner manages the business and receives a share of the profit (Mudarabah element).

The choice of Musharaka form depends on the specific needs of the partnership. Considering factors like capital contribution, risk tolerance, and exit strategy helps determine the most suitable structure for a successful Musharaka venture.

Points to Consider:

Musharaka, a partnership financing structure in Islamic finance, offers a collaborative approach to investment but has some points to consider as follows:

- **Potential disagreements:** Shared management can lead to disagreements, requiring effective communication and conflict resolution mechanisms.
- **Profit allocation disputes:** Determining fair profit distribution based on individual contributions, especially when roles differ, can be challenging.
- **Exit strategy clarity:** A clear exit strategy outlining how partners can leave the venture or dissolve the partnership is essential.

Musharaka offers an attractive option for entrepreneurs seeking shared investment and active partners while adhering to Sharia principles. However, careful planning, clear communication, and a well-defined agreement are crucial for a successful and sustainable partnership.

9.3.2 Asset-backed financing

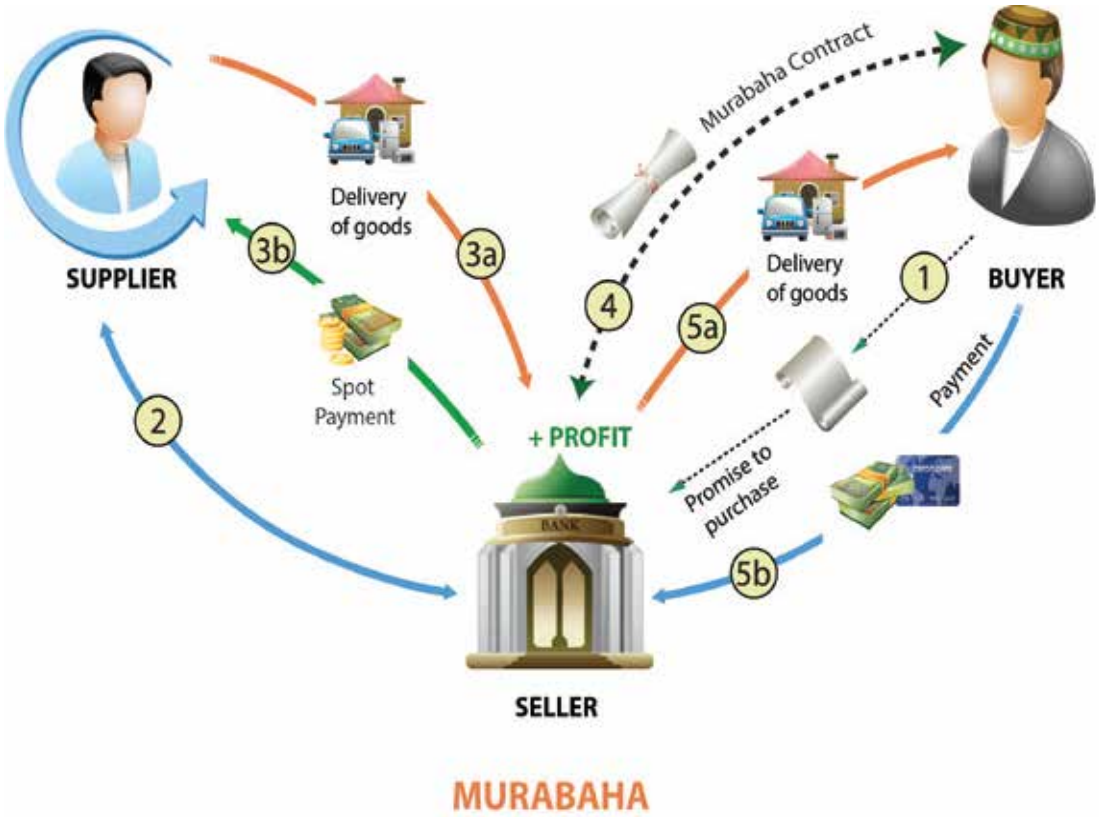
9.3.2.1 Murabaha

Murabaha, meaning "profit" in Arabic, is a fundamental financing instrument in Islamic finance. Unlike conventional loans with interest, Murabaha operates on a **cost-plus profit** model, adhering to Sharia principles. This model of financing is mostly used by Islamic Bank or similar Islamic Financial Institutions (IFI).

Here's how it works:

The Process:

1. **Customer Request:** A customer approaches an Islamic bank or financial institution with a specific need, such as purchasing a car or equipment.
2. **Islamic Bank or IFI Acts as Purchaser:** The Islamic bank or financial institution acts as the customer's agent and purchases the desired asset on their behalf.
3. **Cost Disclosure and Markup:** The Islamic bank or IFI transparently discloses the asset's purchase price and adds a pre-agreed markup to cover its profit. This markup replaces interest and is clearly communicated to the customer.
4. **Customer Repayment:** The customer then repays the Islamic bank or IFI the total amount (cost + profit) in installments over a fixed period.



Key Features:

- **Transparency and Avoidance of Interest:** The cost price and profit are clearly disclosed, ensuring transparency and avoiding riba (interest), which is prohibited in Islam.
- **Fixed Profit:** The profit margin is agreed upon upfront and remains fixed throughout the repayment period, providing predictability and stability for both parties.
- **Flexibility:** Murabaha can be used to finance various assets, making it a versatile tool for individuals and businesses.

Example of a Murabaha

Here's an example of a Murabaha transaction in Islamic finance:

Scenario:

- You (the customer) need a new car and want financing that complies with Islamic principles.
- You approach an Islamic bank offering Murabaha financing.
- You choose a car priced at **2,000,000 taka** from a dealership.

The Murabaha Agreement:

1. The bank purchases the car from the dealership for 2,000,000 taka.
2. **The bank then sells the car to you at a pre-agreed markup price.** This markup price represents the bank's profit for financing the car.
3. **You agree to purchase the car from the bank for a total price of 2,200,000 taka (2,000,000 taka cost price + 200,000 taka profit for the bank).**
4. **You can choose a repayment plan** that suits your budget, such as paying in monthly installments over a period of 3 years.

Key Points:

- The bank acts as a facilitator, purchasing the car upfront and then selling it to you with a profit margin.
- You know the total price you will pay for the car upfront, including the bank's profit.
- The agreement is transparent, avoiding Riba (interest) by clearly separating the cost of the car from the bank's profit.

Additional Notes:

- The profit amount (200,000 taka in this example) can be negotiated between you and the bank.
- The Murabaha agreement may include specific terms regarding late payments or early settlement of the loan.
- Islamic banks may offer different Murabaha variations, such as Murabaha for imported goods or Murabaha for used cars.

Overall, Murabaha offers a Sharia-compliant financing option for acquiring assets.

9.3.2.2 Commodity Murabaha

Commodity Murabaha, also referred to as "Commodity Trade Financing," is a financing arrangement within Islamic finance that utilizes **buying and selling commodities to provide working capital or financing for an asset acquisition**. It adheres to Sharia principles by **avoiding interest-based transactions** and employing a cost-plus profit structure. This is also widely used by Islamic Banks or Islamic financial institutions (IFI).

Here's how Commodity Murabaha works:

The Process:

1. **Customer Needs Financing:** A customer (individual or business) requires working capital or funding for an asset purchase.

2. **Bank Acts as Buyer:** The Islamic bank or IFI acts as the customer's agent, purchasing a specific commodity (e.g., gold, oil, agricultural products) on their behalf.
3. **Cost Disclosure and Markup:** The bank or IFI transparently discloses the purchase price of the commodity and adds a pre-agreed markup to cover its profit.
4. **Customer Repurchase:** The customer then repurchases the commodity from the bank or IFI at the marked-up price, essentially obtaining the desired financing.
5. **Commodity Sale or Utilization:** The customer sells the commodity on the open market or uses it for their business operations, generating funds to repay the bank or IFI.

Key Features:

- **Working Capital Access:** Offers a Sharia-compliant way to obtain financing for various business needs.
- **Flexibility:** Can be used for diverse commodities based on availability and market conditions.
- **Transparency and Cost Knowledge:** The customer clearly understands the cost of financing involved.

Things to Consider:

- **Potential Price Fluctuations:** Commodity prices can fluctuate, leading to higher or lower returns than anticipated.
- **Operational Complexity:** Requires managing the purchase, storage, and sale of the commodity, which can involve logistical challenges.
- **Limited Risk-Sharing:** The customer primarily bears the risks associated with commodity price movements.

Example of commodity Murabaha

Here's an example of a Commodity Murabaha transaction in Islamic finance:

Scenario:

- A textile factory (the customer) needs **100,000 meters of raw cotton** to manufacture clothes.
- The factory approaches an Islamic bank for financing that complies with Sharia principles.
- Current market price of raw cotton is **50 taka per meter**.

The Commodity Murabaha Agreement:

1. The Islamic bank identifies a supplier of raw cotton.
2. **The bank purchases the 100,000 meters of cotton from the supplier at the market price, totaling 5,000,000 taka (100,000 meters x 50 taka/meter).**
3. **The bank then sells the cotton to the textile factory at a pre-agreed markup price.** This markup represents the bank's profit for financing the cotton purchase.
4. **The factory agrees to purchase the cotton from the bank for a total price of 5,500,000 taka (500,000 taka cost price + 50,000 taka profit for the bank).**
5. **The factory can choose a repayment plan** that fits their cash flow, such as paying in installments over a specific period.

Key Points:

- Similar to Murabaha for a car, the bank acts as a facilitator, purchasing the commodity (cotton) upfront and then selling it with a profit margin.
- The transaction is transparent, separating the cost of the cotton from the bank's profit.
- The factory avoids Riba (interest) and fulfills its need for raw materials.

Additional Notes:

- The profit amount (50,000 taka in this example) is negotiated between the bank and the factory.
- The agreement may include specific terms regarding late payments or early settlement.
- Commodity Murabaha can be used to finance various tradable commodities, not just raw materials.

Overall, Commodity Murabaha offers a unique financing option for individuals and businesses seeking Sharia-compliant solutions. However, understanding the potential risks, price fluctuations, and operational complexities is crucial before entering such arrangements.

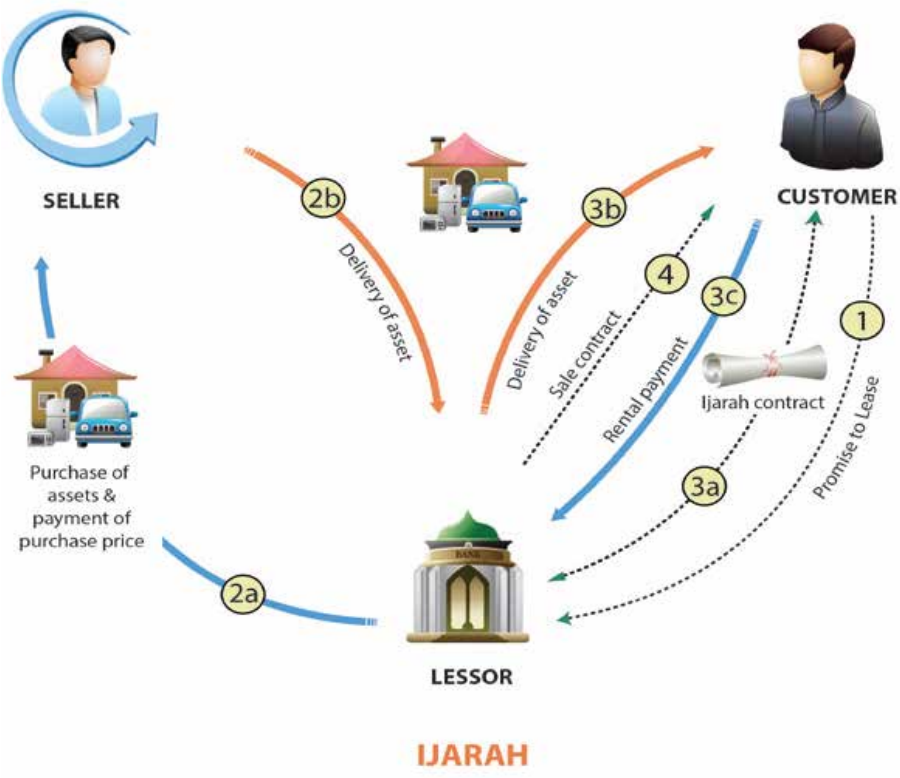
9.3.2.3 Ijarah

Ijarah, meaning "rent" or "hire" in Arabic, is a popular financing tool in Islamic finance that operates on the principle of **leasing an asset with the potential for eventual ownership**. This differentiates it from conventional leasing structures where ownership generally remains with the lessor.

This financing model widely used by Islamic Bank or Islamic Financial Institutions.

Here's how Ijarah works:

1. **Asset Acquisition:** The Islamic bank or IFI (lessor) acquires the desired asset (e.g., car, equipment, property) on behalf of the customer (lessee).
2. **Lease Agreement:** Both parties agree on a fixed rental payment schedule over a predetermined period.
3. **Ownership Transfer (Optional):** In some Ijarah agreements, the lessee has the option to purchase the asset at the end of the lease term for a predetermined residual value, essentially acquiring ownership.



Key Features:

- **Sharia-compliant:** Avoids riba (interest) by replacing it with fixed rental payments.
- **Ownership potential:** Offers a pathway to asset ownership while spreading the payment over time.
- **Multiple structures:** Can be tailored to various needs, with or without an ownership option.

Example of Ijarah

Let's illustrate Ijarah (Islamic lease) with an example of financing your dream home:

Scenario:

- You are interested in leasing a new apartment but want to avoid conventional mortgages with interest.
- You approach an Islamic bank that offers Ijarah financing.
- You find a suitable apartment with a market value of **5,000,000 taka**.

The Ijarah Agreement:

1. The Islamic bank identifies a suitable property that meets your requirements.
2. **The bank purchases the house for 5,000,000 taka.**
3. **The bank then leases the house to you for a pre-determined period**, such as 20 years.

4. **You agree to pay a fixed monthly rent** to the bank throughout the lease term. This rent payment covers two components:
    - A portion representing the **usufruct** (right to use and benefit from the property).
    - A portion representing the **gradual transfer of ownership** to you over time.

Benefits and Considerations:

- **Gradual Ownership:** With each rental payment, you gain a greater ownership stake in the property. At the end of the lease term, you may have the option to purchase the house for a predetermined residual value, effectively owning the house.
- **Transparent Pricing:** The total cost of financing, including the bank's profit, is reflected in the fixed monthly rent. There are no hidden interest charges.
- **Long-term Planning:** The fixed rental payments provide predictability for budgeting throughout the lease term.

Additional Notes:

- Ijarah agreements can be structured differently. Some may include a down payment from you, reducing the overall rental amount.
- The agreement may specify maintenance responsibilities for the property during the lease.
- Ijarah can be used to finance various assets, not just houses, such as cars or equipment.

Ijarah vs. Conventional Mortgage:

Ijarah differs from a conventional mortgage in a few key ways:

- **Ownership Transfer:** In Ijarah, ownership gradually transfers to you over time. In a mortgage, you own the house from the beginning, but the bank holds the title until the loan is paid off.
- **Interest:** Ijarah avoids Riba (interest) by separating the rental fee into usufruct and ownership transfer components. A conventional mortgage involves interest payments on the loan amount.

By utilizing Ijarah, you can finance your dream home while adhering to Islamic financial principles. It provides a way to own a property gradually through transparent rental payments and eventual ownership transfer.

Overall, Ijarah provides a unique financing option for those seeking to rent an asset with the potential for future ownership while adhering to Sharia principles. However, understanding the potential costs, limitations, and different structures is crucial before entering such agreements.

9.3.3 Other Sharia-compliant contracts

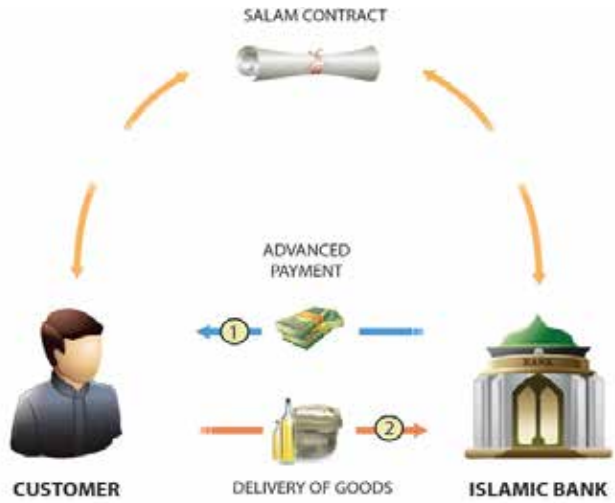
9.3.3.1 Salam

Salam, meaning "peace" or "advance" in Arabic, is a unique forward financing arrangement in Islamic finance. It allows **purchasers to acquire goods (commodities, equipment, etc.) before delivery by paying the full price upfront**. In essence, Salam is a "Forward Sale" but with a "deferred delivery" model. This helps businesses secure funding for production or purchase needed assets early on, while investors benefit from a potential profit upon delivery.

Here's how it works:

The Process:

1. **Buyer Needs Financing:** A business or individual (buyer) needs financing to purchase specific goods in the future (e.g., agricultural products, raw materials, equipment).
2. **Agreement with Seller:** The buyer approaches a seller willing to enter a Salam agreement. They agree on the type, quantity, quality, and delivery date of the goods, along with the total price.
3. **Full Price Payment:** The buyer pays the entire agreed-upon price upfront to the seller. This is crucial for it to be considered a valid Salam contract.
4. **Seller Produces or Acquires:** The seller uses the received funds to produce or acquire the specified goods according to the agreement.
5. **Delivery and Ownership:** On the agreed-upon delivery date, the seller delivers the goods to the buyer, who becomes the rightful owner.



SALAM FINANCING

Key Features:

- **Pre-financing:** Provides businesses with upfront capital to initiate operations or secure resources.
- **Profit for Investor:** The seller earns a profit from the price difference between the upfront payment and their cost of production/acquisition.
- **Sharia Compliance:** Avoids riba (interest) by structuring the transaction as a sale with deferred delivery.

Example of a Salam financing

Here's an example of a Salam contract in Islamic finance, illustrating a prepayment agreement for an upcoming rice harvest:

Scenario:

- You are a grocery store owner and want to secure a supply of rice for your store at a predictable price.
- You approach local farmers who are known for their high-quality rice.
- The harvest season for rice is still 3 months away.

The Salam Agreement:

1. **You (the customer) agree to pay the farmers a fixed sum of money upfront** for their rice harvest. This prepayment is called the "ra's al-mal" which translates to "capital amount".
2. **The farmers agree to deliver a specific quantity and quality of rice** to you at the pre-determined harvest time (3 months from now). The contract clearly specifies the type, quantity, and quality of rice being purchased.
3. **The price of the rice is negotiated and agreed upon** in advance, considering both the current market price and the benefit of early payment for the farmers.

Benefits and Considerations:

- **For you (the customer):** You secure a steady supply of rice at a predetermined price, potentially lower than fluctuating market prices closer to harvest.
- **For the farmers (the seller):** They receive immediate financial security through the upfront payment. This can help them cover planting costs, invest in equipment, or manage their cash flow.
- **Sharia Compliance:** The prepayment provides clear ownership transfer of the rice to you upon payment. The farmers essentially sell the rice to you at an agreed-upon price with deferred delivery, avoiding Riba (interest).

Important Note:

- The success of a Salam contract hinges on the farmers' ability to deliver the promised rice. The contract should include mechanisms to mitigate risk, such as:
    - **Security deposit:** The farmers might be required to place a security deposit with the bank to guarantee delivery. If they fail to deliver, the deposit can be used to compensate you.
    - **Third-party guarantees:** A guarantor, such as an agricultural cooperative, can provide assurance that the farmers will fulfill their obligations.

This example showcases how Salam contracts facilitate trade and financing in the agricultural sector while adhering to Islamic principles. It benefits both buyers who secure supplies and farmers who receive early funding for their crops. Islamic Banks and IFIs offer this financing option to businesses at a very large scale.

Other examples of Salam financing

Salam contracts can be applied to various scenarios beyond agriculture, as long as the core principles of a forward sale with a deferred delivery are met. Here are a few examples:

1. Financing for Manufacturers:

- A toy manufacturer needs upfront capital to purchase raw materials for producing a new line of toys for the holiday season.
- The manufacturer can enter a Salam contract with an Islamic bank.
- The bank agrees to pay a pre-determined price for a specific quantity of finished toys to be delivered before the holiday season.
- This provides the manufacturer with working capital to start production while the bank secures a supply of toys it can sell during the peak demand period.

2. Pre-selling Properties under Construction:

- A real estate developer is building a new apartment complex.
- The developer can use a Salam structure to pre-sell some apartments to potential buyers.
- Buyers enter a Salam contract, paying a pre-determined price for their chosen apartment upon completion (deferred delivery).
- This infuses the project with upfront capital for construction, and buyers secure their desired apartment at a fixed price.

3. Financing for Fashion Brands:

- A clothing brand needs capital to purchase fabric and begin production for their new season's collection.
- The brand can enter a Salam contract with a retailer.
- The retailer agrees to pay a pre-determined price in advance for a specific quantity of garments from the new collection (to be delivered before the season launch).
- This provides the brand with capital to manufacture clothing, and the retailer secures inventory for the upcoming season.

These examples highlight the versatility of Salam contracts in Islamic finance. They can be adapted to various industries, supporting businesses by providing upfront capital while adhering to Sharia principles regarding deferred sales and avoiding interest-based transactions.

Overall, Salam offers a unique way to finance future needs while adhering to Sharia principles. However, carefully evaluating the risks, price fluctuations, and contractual requirements is crucial before entering such an agreement.

9.3.3.2 Parallel Salaam

Parallel Salam is a financial instrument used in Islamic banking that facilitates trade financing while adhering to Sharia principles.

Here's how it works:

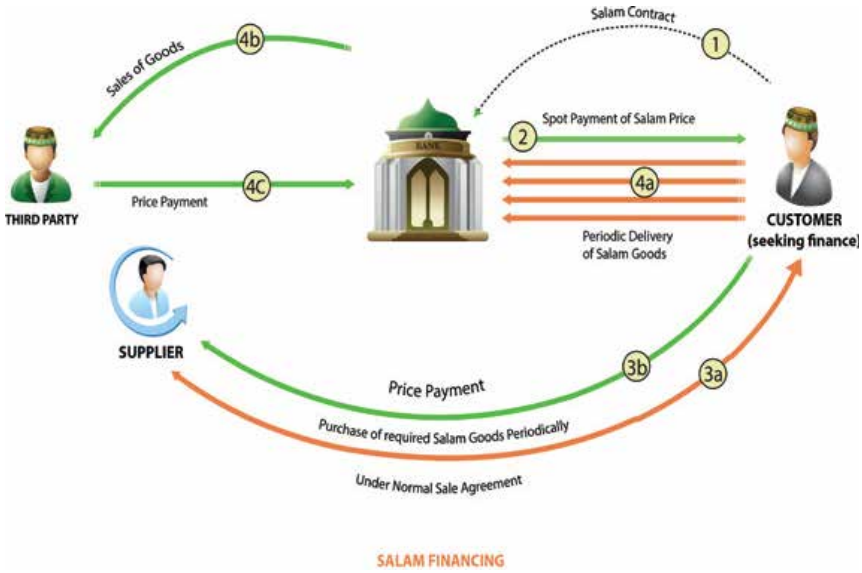
The Players/parties

- **Islamic Bank:** The financial institution acting as an intermediary between the other two parties.
- **Seller:** The party who provides a commodity (e.g., crops, raw materials) in advance.
- **Buyer:** The party who wants to purchase the commodity but needs upfront financing.

The Process:

1. **Salam Contract (Bank & Seller):** The Islamic bank enters into a Salam contract with the seller. The bank agrees to purchase a specific commodity at a predetermined price with immediate payment.
2. **Parallel Salam Contract (Bank & Buyer):** The bank then initiates a separate Salam contract with the buyer. The buyer agrees to purchase the same commodity from the bank at a slightly higher price (including the bank's profit) at a future date.
3. **Delivery:** The seller delivers the commodity to the Islamic bank upon the fulfillment of their contract.

4. **Resale to Buyer:** Once the buyer fulfills their payment obligations, the bank delivers the commodity to them.



SALAM FINANCING

Key Points:

- **Independent Contracts:** The two Salam contracts are independent. The bank fulfills its obligation to the seller regardless of whether the buyer completes their purchase.
- **Financing for Buyer:** The buyer receives upfront financing for the commodity through the bank's initial purchase from the seller.
- **Profit for Bank:** The bank's profit comes from the difference in price between the two Salam contracts they establish.

Benefits:

- **Sharia-compliant financing:** Parallel Salam allows buyers to acquire commodities without incurring interest charges, which are prohibited in Islamic finance.
- **Working Capital for Businesses:** Sellers can receive immediate payment for their goods, improving their cash flow.
- **Facilitates Trade:** Parallel Salam helps smoothen trade by providing financing for buyers and ensuring timely payments for sellers.

Parallel Salam can be a useful tool in Islamic banking for various trade financing scenarios. Here are a few examples:

1. Farmers and Agricultural Products:

- A farmer harvests a crop of wheat. They need immediate cash to cover expenses for the next planting season but can't wait for the market to sell their harvest.
- The farmer enters a Parallel Salam agreement with an Islamic bank. The bank agrees to purchase the wheat harvest at a predetermined price upfront (providing immediate cash flow for the farmer).
- The bank then establishes a separate Parallel Salam contract with a flour mill or a food distributor. This contract involves selling the wheat at a slightly higher price (including the bank's profit) with delivery scheduled for a future date (when the buyer typically needs the wheat).

2. Businesses and Raw Materials:

- A manufacturing company requires a specific quantity of steel for production but lacks the upfront capital to purchase it.
- The company approaches an Islamic bank for Parallel Salam financing. The bank agrees to purchase the steel from a supplier with immediate payment.
- The bank then establishes a separate Parallel Salam contract with the manufacturing company. They sell the steel at a marked-up price with a delivery date aligned with the company's production schedule.

3. Wholesalers and Retail Goods:

- A wholesaler wants to purchase a large quantity of clothing items for the upcoming season but needs financing to secure them from a manufacturer.
- The wholesaler enters a Parallel Salam agreement with an Islamic bank. The bank purchases the clothing from the manufacturer upfront.
- The bank establishes a separate Parallel Salam contract with the wholesaler, selling the clothes at a profit-adjusted price with delivery scheduled before the season starts (when the wholesaler expects to sell the items to retailers).

Overall, Parallel Salam is a financing mechanism that benefits various players in the trade cycle. It provides working capital for sellers, allows buyers to finance purchases without interest, and facilitates a smooth flow of goods by bridging the gap between immediate needs and future payments.

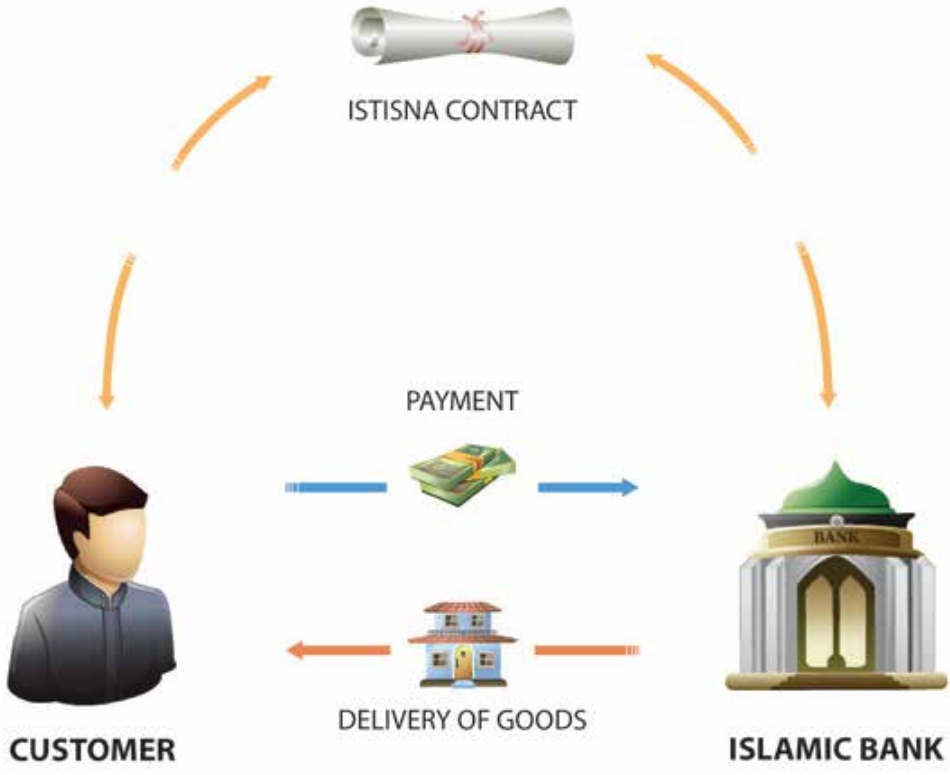
9.3.3.3 Istisna

Istisna'a, meaning "making" or "manufacturing" in Arabic, is a financing agreement in Islamic finance used to **fund the manufacturing of a specific asset according to your specifications**. Unlike conventional loans, it avoids interest-based transactions and adheres to Sharia principles. Istisna is very common financing contract offered by Islamic banks and other Islamic Financial Institutions (IFI).

Here's how it works:

The Process:

1. **Client Request:** You approach an Islamic bank with a specific need for a manufactured item, like a house, machinery, or equipment.
2. **Agreement on Specifications:** You and the bank agree on the exact details of the desired asset, including materials, quality, and delivery deadline.
3. **Bank Acts as Agent:** The bank acts as your agent, purchasing the necessary materials and hiring manufacturers to build the asset according to your specifications.
4. **Stage-Wise Payments:** You pay the bank in installments throughout the manufacturing process, aligning payments with progress made. This reduces risk for both parties.
5. **Asset Delivery and Ownership:** Upon completion, the bank delivers the finished asset to you, and you become the rightful owner.



ISTISNA

Key Features:

- **Customization:** You have control over the asset's specifications, ensuring it meets your precise needs.
- **Risk Mitigation:** Stage-wise payments align your financial involvement with the progress of the project, minimizing risk.
- **Sharia Compliance:** Avoids riba (interest) through a sale contract, adhering to Islamic principles.

Example of Istisna

Here's an example of an Istisna'a (manufacturing sale) contract in Islamic finance, showcasing how it can be used to finance the construction of a new school:

Scenario:

- A local community needs a new school but lacks the funds to cover construction costs.
- A donor or charity organization wants to support the project but adheres to Islamic financing principles.

The Istisna'a Agreement:

1. **The donor enters into an Istisna'a contract with the school board or a designated project manager.**

2. **The contract clearly specifies the desired outcome:** construction of a new school building with specific features (e.g., number of classrooms, library, playground).
3. **The donor agrees to pay the contractor a pre-determined price** upon completion and satisfactory delivery of the finished school building.
4. **The school board or project manager then selects a qualified contractor** through a fair bidding process.
5. **The contractor constructs the school building according to the specifications outlined in the Istisna'a contract.**

Benefits:

- **For the Community:** They receive a new school building without incurring debt with interest payments.
- **For the Donor:** They fulfill their charitable goals while ensuring the funds are used for a specific purpose (building the school).

Key Points:

- Istisna'a facilitates financing for the construction or manufacturing of assets based on a pre-agreed price and specifications.
- The donor does not take ownership of the land or the building during construction. They acquire ownership only upon completion and delivery of the finished school.
- This financing structure avoids Riba (interest) by focusing on a sale transaction with deferred delivery of the completed building.

Additional Notes:

- The Istisna'a contract should clearly define the payment schedule linked to construction milestones.
- The donor may appoint a supervisor to monitor the construction progress and ensure compliance with the agreed-upon specifications.

This example demonstrates how Istisna'a financing can be used for infrastructure development projects. It provides a Sharia-compliant solution for donors to support such initiatives and allows communities to acquire essential facilities without conventional loans and interest payments.

Istisna'a financing can be applied in various scenarios beyond construction projects. Islamic Banks or Islamic Financial Institutions (IFI)s follows this form of financing contract on a regular basis. Here are a few examples that showcase its versatility:

1. Manufacturing Machinery:

- A factory needs new machinery to expand its production capacity.
- The factory can enter an Istisna'a agreement with an Islamic bank or IFI.
- The bank or IFI agrees to finance the manufacturing of the specific machinery according to agreed-upon specifications (e.g., model, functionality).
- Upon completion and delivery of the machinery by the manufacturer, the bank or IFI then sells it to the factory at a pre-determined price.
- This provides the factory with the necessary equipment while the bank earns a profit from the financing arrangement.

2. Shipbuilding for a Shipping Company:

- A shipping company needs a new vessel to expand its fleet.
- The company can use Istisna'a financing by contracting an Islamic bank or IFI.
- The bank or IFI enters into an Istisna'a agreement, specifying the desired ship characteristics (size, cargo capacity).
- The bank or IFI then appoints a qualified shipyard to construct the vessel based on the agreed-upon specifications.
- Once completed and delivered, the bank or IFI sells the ship to the shipping company at a pre-determined price.

3. Developing Software for a Tech Startup:

- A tech startup needs funding to develop a custom software application for their business.
- The startup can approach an Islamic bank or IFI offering Istisna'a financing for such projects.
- The bank or IFI enters an Istisna'a agreement with the startup, specifying the desired functionalities and features of the software.
- The bank or IFI then contracts a software development company to build the application according to the agreed upon specifications.
- Upon completion and successful testing of the software, the bank or IFI sells the ownership rights to the startup at a pre-determined price.

These examples highlight that Istisna'a goes beyond just physical construction projects. It can be a valuable tool in Islamic finance to facilitate the acquisition of various assets through manufacturing or development based on pre-agreed specifications and deferred payment structures that comply with Sharia principles.

Overall, Istisna'a offers a flexible and Sharia-compliant way to finance the creation of specific assets. However, understanding the process, limitations, and communication channels is crucial before entering such an agreement.

9.3.3.4 Parallel Istisna

Parallel Istisna is a concept in Islamic finance where two separate Istisna contracts are initiated simultaneously between three parties: the financier, the manufacturer, and the end purchaser. Istisna is a contractual agreement for manufacturing goods and commodities, where the manufacturer agrees to produce specific items according to agreed-upon specifications.

In a parallel Istisna arrangement, the financier (such as an Islamic bank or an investor) enters into an Istisna contract with the manufacturer to produce certain goods. Simultaneously, the financier enters into another Istisna contract with the end purchaser, who agrees to purchase the goods once they are manufactured.

This arrangement allows the financier to effectively act as an intermediary between the manufacturer and the end purchaser, providing financing for the production process while ensuring that the goods meet the specifications required by the end purchaser. It is a commonly used structure in Islamic finance for financing large projects, such as construction or infrastructure development, where goods need to be manufactured according to specific requirements.

Here's how a parallel Istisna works:

The Players/parties:

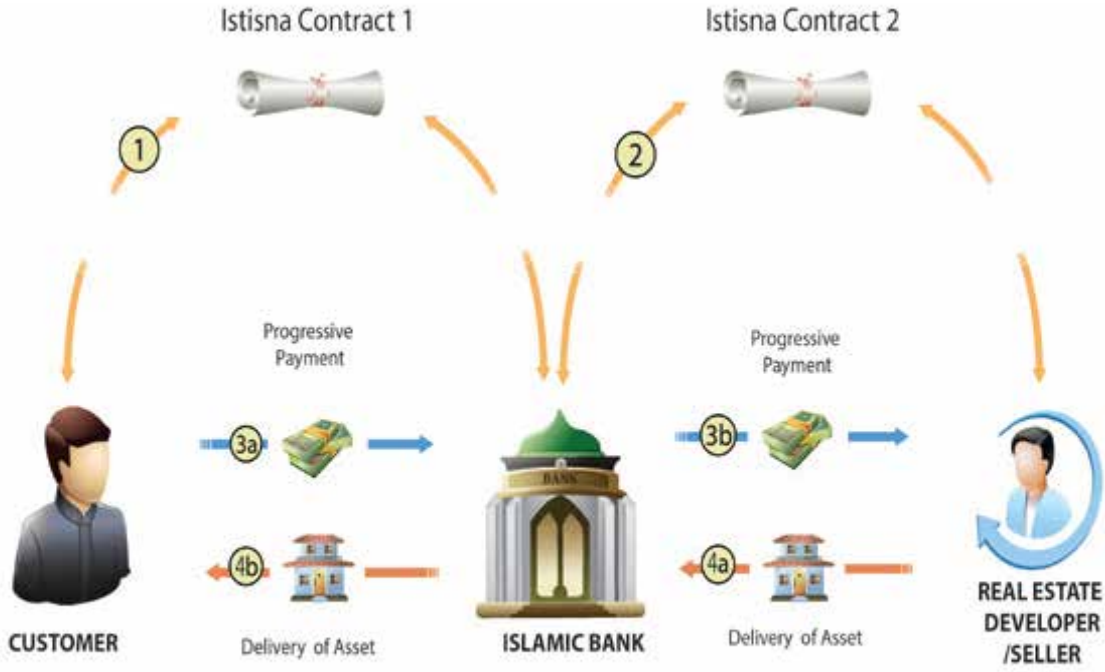
- **Customer:** The individual who wants to acquire a good (e.g., car, house, machinery) but lacks the upfront capital.
- **Islamic Bank or IFI:** The financial institution that facilitates the transaction.
- **Manufacturer:** The company that will produce the good according to the customer's specifications.

The Steps:

1. **Customer approaches Islamic Bank/IFI:** The customer expresses their desire to purchase a specific good and inquires about financing options.
2. **Two Istisna Contracts:** The Islamic bank/IFI establishes two independent Istisna contracts:

- **Contract 1: Bank & Manufacturer:**
  - The bank acts as the **buyer**.
  - They sign a contract with the manufacturer outlining the good's specifications (model, features, quantity) and delivery timeline.
  - The bank agrees to pay the manufacturer the cost of production **upon completion**.
- **Contract 2: Bank & Customer:**
  - The bank acts as the **seller**.
  - They sign a contract with the customer specifying the good's details (same as with the manufacturer) and the total price (including the bank's profit).
  - This contract also outlines the customer's **payment plan** (installments, duration) and the **delivery date**.

3. **Financing & Manufacturing:**
   - The bank pays the manufacturer for the good **once it's completed**.
   - The customer starts making their **agreed-upon installment payments** to the bank.
4. **Delivery:**
   - The manufacturer delivers the finished good to the bank (assuming the bank takes temporary ownership).
   - The bank then delivers the good to the customer **upon full payment** of the installments.



PARALLEL ISTISNA

Key Points:

- **Independent Contracts:** The two Istisna contracts are separate agreements. Even if the manufacturer experiences a delay, the customer's obligation to make payments to the bank remains as per their contract.
- **Bank's Risk Management:** During the period between purchasing from the manufacturer and selling to the customer, the bank assumes ownership risk for the good. Islamic insurance (Takaful) can be used to mitigate this risk.
- **Profit for Bank:** The bank's profit is built into the total price the customer pays in the second Istisna contract. This profit replaces interest that would be charged in a conventional loan.

Benefits of Parallel Istisna:

- **Sharia-compliant financing** for customers seeking alternatives to interest-based loans.
- Allows customers to acquire desired goods through **deferred payments**.
- Islamic banks benefit from **facilitating transactions** and earning a profit.

Parallel Istisna'a can be used in a wide variety of real life scenarios. Here are a couple of other examples where it can be used for financing:

1. **Home Construction:** Imagine Omar wants to build a house on a plot of land he already owns. He can approach an Islamic bank for financing through parallel Istisna'a.

The bank would:

- Enter a contract with Omar outlining the construction specifications, total cost (including bank's profit), and installment plan.

- Sign a separate Istisna'a contract with a construction company, specifying the house design, materials, and completion date. The bank would pay the contractor upon completion.
- Once Omar completes his payments, the bank would essentially have "sold" him the finished house.

2. **Industrial Equipment:** A growing company might need new machinery but lack the funds for a one-time purchase. Parallel Istisna'a can help:
   - The company would approach the Islamic bank for financing the specific equipment.
   - The bank would then contract with a machinery manufacturer, outlining the equipment details, price, and delivery timeframe.
   - The bank would buy the equipment from the manufacturer and enter a separate Istisna'a agreement with the company. This agreement would detail the selling price (including profit), installment plan, and equipment delivery upon completion of payments.

Remember, these are just a couple of examples. Parallel Istisna'a can be applied to any situation where a good needs to be manufactured or constructed based on specific requirements, and financing is required under Sharia-compliant terms.

9.3.3.4.1 Difference between Parallel Salam and Parallel Istisna:

We have discussed about both Parallel Salam and Parallel Istisna above. Now let's see the basic differences between these two in the following table:

Feature	Parallel Salam	Parallel Istisna'a
Underlying Asset	Pre-existing commodity (crops, raw materials)	Good requiring manufacturing (houses, machinery)
Bank's Role	Financier	Financier & Temporary Owner
Seller's Obligation	Deliver commodity upon bank purchase	Manufacture good according to specifications
Buyer's Obligation	Purchase commodity at future date	Make installment payments
Delivery Timeline	Seller delivers to bank immediately	Bank delivers to buyer after full payment
Contracts	Two independent Salam contracts	Two independent Istisna contracts
Risk	Bank assumes risk of price fluctuations for commodity	Bank assumes risk of ownership and potential delays
Profit for Bank	Price difference between buying from seller and selling to buyer	Profit built into selling price to customer

In simpler terms:

- **Parallel Salam** is like buying something with cash upfront (the Islamic bank/IFI) and then selling it to someone else for a profit later (the buyer). It's ideal for pre-existing commodities.
- **Parallel Istisna** is like commissioning someone to build something you'll eventually own (the bank) and then selling it to someone else with a profit once it's complete (the buyer). It's suited for goods that require manufacturing.

9.3.3.5 Sukuk

Sukuk, meaning "instruments" or "certificates" in Arabic, are Islamic financial instruments that function similarly to conventional bonds but adhere to Sharia principles. The key distinction lies in the underlying structure: **Sukuk represent ownership certificates in assets or projects, enabling investors to share in the profits generated rather than receiving interest.**

Here's how Sukuk work:

1. **Sukuk Issuance:** An institution (e.g., government, corporation) issues Sukuk, essentially selling ownership certificates in an underlying asset or project.
2. **Investor Purchase:** Investors purchase these certificates, becoming partial owners of the asset or project.
3. **Profit Distribution:** Profits generated by the underlying asset or project are distributed proportionally to Sukuk holders, similar to dividends for shareholders.
4. **Maturity and Redemption:** Upon maturity, investors receive their initial investment amount back, potentially along with any remaining profit or asset value.

Key Features:

- **Sharia-compliance:** Avoids riba (interest) by focusing on shared ownership and profit distribution.
- **Diversification:** Offers a variety of Sukuk structures based on different assets and projects, catering to diverse investment needs.
- **Transparency:** The underlying asset or project and its financial performance are typically disclosed to investors.

Points to Consider:

- **Complexity:** The structures and underlying assets can be complex, requiring careful evaluation and understanding.
- **Lower liquidity:** Compared to conventional bonds, Sukuk markets may be less liquid, making it harder to quickly sell certificates before maturity.
- **Potential risks:** Investors share risks associated with the underlying asset or project, unlike conventional bonds with fixed interest payments.

Overall, Sukuk offer a Sharia-compliant alternative to conventional bonds, enabling investors to participate in various projects and assets while seeking potential returns. However, understanding the complexities, risks, and limitations is crucial before investing in Sukuk.

9.3.3.5.1 Difference between Bond and Sukuk

Aspect	Bond	Sukuk
Underlying Asset	Not necessarily linked to a tangible asset; represents debt obligation	Must be linked to tangible assets or specific projects
Compliance	Generally follows conventional financial principles	Must comply with Islamic Shariah principles

Ownership	Represents a debt owed by the issuer to the bondholder	Represents partial ownership in the underlying asset or project
Returns	Interest (fixed or variable)	Profit-sharing or rental income; returns based on asset performance
Risk Sharing	Risk primarily borne by the issuer	Risk is shared between issuer and Sukuk holders
Structure	Debt instrument with fixed interest payments	Asset-backed or asset-based instrument with returns tied to asset performance
Types	Various types, including government, corporate, and municipal bonds	Various structures, including Ijarah (leasing), Murabaha (cost-plus financing), and Musharakah (partnership)
Legal Framework	Governed by conventional financial regulations and laws	Governed by Shariah law and relevant financial regulations
Default Consequences	Bondholders have a claim on the issuer's assets in case of default	Sukuk holders have a claim on the underlying asset in case of default
Tradability	Widely traded in conventional markets	Tradability depends on the type of Sukuk and adherence to Shariah principles
Purpose	Used for raising capital for general or specific purposes	Used for raising capital specifically for Shariah-compliant projects
Issuance Process	Simpler (creditworthiness, interest rates)	More complex (Sharia compliance, contracts)

9.3.3.5.2 Various Form of Sukuk

Sukuk comes in various forms, each catering to different investment needs and adhering to Sharia principles. Here are some common types of Sukuk with examples:

9.3.3.5.2.1 Asset-backed Sukuk

1) **Ijarah Sukuk:** Similar to lease financing, investors own undivided shares in leased assets like buildings, airplanes, or power plants. They receive rental income based on the asset's performance. (Example: Financing a hospital through Sukuk and receiving a share of rental income generated by patient fees)

   Let's look at an example of an Ijara Sukuk, a common type of Sukuk based on the Islamic financing concept of Ijara (leasing).

Scenario: A government wants to build a new public hospital. They can't raise funds through conventional bonds (which involve interest), so they decide to issue an Ijara Sukuk.

The Players involved:

- **Government (Sukuk Issuer):** The entity raising funds for the hospital project (in this case, the government).
- **Special Purpose Vehicle (SPV):** A legal entity established specifically for this Sukuk issuance. It will hold the ownership of the hospital asset.
- **Investors:** Individuals or institutions who purchase the Sukuk certificates.
- **Bank (Optional):** An Islamic bank can act as a facilitator, managing the Sukuk issuance process.

The Process:

1. **Establishment of SPV:** The government creates an SPV to act as a separate legal entity. This SPV will own the hospital building once constructed.
2. **Sukuk Issuance:** The government, through the SPV, issues Sukuk certificates. These certificates represent undivided ownership units in the hospital asset.
3. **Investor Purchase:** Investors purchase the Sukuk certificates, essentially providing the funds for the hospital construction.
4. **Construction & Leaseback:** The SPV, using the funds raised from Sukuk issuance, commissions the construction of the hospital. Once complete, the SPV leases the hospital back to the government for a pre-determined period.
5. **Rental Payments:** During the leaseback period, the government makes periodic rental payments to the SPV. These rental payments represent the investors' returns on their Sukuk investment.
6. **Sukuk Maturity:** Upon Sukuk maturity (end of the leaseback period), the government has a few options:

- **Purchase the hospital:** They can purchase the hospital from the SPV at a pre-agreed price.
- **Extend the lease:** The lease agreement might allow for an extension at a mutually agreed price.
- **Sell the hospital:** The SPV could sell the hospital to a third party, with the proceeds distributed to Sukuk holders.

Key Points about Ijara Sukuk:

- **Underlying Asset:** The Sukuk represents ownership in a tangible asset (the hospital building)
- **Investor Returns:** Returns come from rental payments made by the lessee (government) during the leaseback period.
- **Sharia-compliant:** Ijara Sukuk avoids interest-based transactions. Investors share in the profits and risks associated with owning the asset.

Benefits of Ijara Sukuk:

- **Government Funding:** Provides Sharia-compliant financing for government infrastructure projects.
- **Investor Opportunity:** Offers investors a chance to participate in real asset ownership and earn rental income.
- **Economic Growth:** Contributes to economic development by funding essential public projects.

This is a simplified example, but it illustrates how Ijara Sukuk functions as an Islamic alternative to conventional bond financing.

2) **Commodity Sukuk:** Backed by physical commodities like gold, oil, or agricultural products. Investors share in the price appreciation and rental income generated from storing or trading the commodities. (Example: Holding Sukuk linked to a gold reserve, earning returns based on gold price fluctuations and storage fees)

3) **Murabaha Sukuk: Investors own undivided shares in assets purchased through a Murabaha** transaction (cost-plus profit markup). They receive a periodic return based on the asset's sale or lease. (Example: Investing in Sukuk backed by the purchase of equipment for a factory, receiving profits from lease payments made by the factory)

9.3.3.5.2.2 Equity-based Sukuk

1) **Musharaka Sukuk:** Represent ownership shares in a project or business venture. Investors share both profits and losses proportionally to their investment. (Example: Holding Sukuk in a real estate development project, sharing profits from rental income or property sales)

Here's an example of a Musharaka Sukuk, a type of Sukuk based on the Islamic financing concept of Musharaka (partnership):

Scenario: A developer wants to build a new eco-friendly residential complex but lacks all the upfront capital. They can issue a Musharaka Sukuk to raise funds.

The Players Involved:

- **Developer (Sukuk Issuer):** The entity undertaking the project (the residential complex) and raising funds (the developer).
- **Investors:** Individuals or institutions who purchase the Sukuk certificates.
- **Bank (Optional):** An Islamic bank can act as a facilitator, managing the Sukuk issuance process and potentially contributing capital as well.

The Process:

1. **Musharaka Agreement:** The developer establishes a Musharaka agreement with the Sukuk holders. This agreement outlines the project details, profit-sharing ratio, and risk allocation between the developer and investors.
2. **Sukuk Issuance:** The developer issues Sukuk certificates. These certificates represent units of ownership in the Musharaka partnership for the project.
3. **Investor Purchase:** Investors purchase the Sukuk certificates, providing the capital needed for the project's development.
4. **Project Development & Management:** The developer, along with the investors' capital, builds the eco-friendly residential complex. Profits or losses from the project's operation will be shared according to the pre-defined profit-sharing ratio in the Musharaka agreement.
5. **Profit Sharing:** Once the residential complex is operational and generates income (e.g., from rent), the profits are distributed among the developer and Sukuk holders based on the agreed-upon ratio. Losses, if any, would also be shared proportionally.
6. **Exit Strategy:** The Musharaka agreement might specify an exit strategy for Sukuk holders. This could involve:
    - **Selling their Sukuk units to other investors** in a secondary market.
    - **Holding the Sukuk units until project maturity**, at which point the assets might be sold, and proceeds distributed based on the profit-sharing ratio.

Key Points about Musharaka Sukuk:

- **Partnership Structure:** Investors become partners in the project alongside the developer.

- **Profit & Loss Sharing:** Returns are based on the project's performance, not fixed interest payments. Investors share both potential profits and risks.
- **Sharia-compliant:** Musharaka Sukuk avoids predetermined interest and promotes shared responsibility for the project's outcome.

Benefits of Musharaka Sukuk:

- **Project Funding:** Provides Sharia-compliant financing for real estate development projects.
- **Investor Participation:** Offers investors the opportunity to benefit from project profits while sharing risks.
- **Economic Development:** Contributes to economic growth by financing infrastructure and development projects.

This is a simplified example, but it demonstrates the core concept of Musharaka Sukuk, where investors become partners in a venture and share profits and losses proportionally.

2) **Mudarabah Sukuk:** Similar to a limited partnership, investors provide capital to an entrepreneur (Mudarib) who manages the investment. Profits are shared according to a pre-agreed ratio, and investors bear losses up to their invested capital. (Example: Investing in Sukuk financing a technology startup, sharing potential profits generated by the company)

9.3.3.5.2.3 Hybrid Sukuk

1) **Wakala Sukuk:** Investors appoint the Sukuk issuer as their agent to invest their funds in Sharia-compliant activities. Profits are distributed after deducting management fees. (Example: Investing in Sukuk managed by a bank according to your risk tolerance and investment objectives)
2) **Salam Sukuk:** Investors pay the full price upfront for goods to be delivered later. The Sukuk issuer uses the funds to acquire or produce the goods and distributes the profit upon delivery. (Example: Investing in Sukuk financing the purchase of agricultural products for future delivery, benefiting from potential price appreciation)

Please keep in mind that this is not an exhaustive list, and new Sukuk structures are constantly evolving.

9.3.3.5.3 Sukuk in Bangladesh

Sukuk, Islamic certificates, represent a significant development in Islamic finance. While Sukuk issuance is more complex than bonds due to Sharia'ah compliance involving multiple parties and contracts, it offers an attractive fundraising tool for various projects including asset acquisition, business expansion, construction, and infrastructure development. Let's see some example of Sukuk issued by Government and Corporates in Bangladesh:

i. **Bangladesh Government Sukuk Issuances:**

- **First Bangladesh Government Investment Sukuk (BGIS) - December 2020:**
  - Purpose: Develop water infrastructure for improved public health and living standards.
  - Amount: BDT 8,000 crore (issued in two tranches)
  - Sharia'ah Principle: Ijarah (lease-to-own)

- **Second Bangladesh Government Investment Sukuk (BGIS) - December 2021:**
    - Purpose: Need-based infrastructure development for government primary schools.
    - Amount: BDT 5,000 crore
    - Sharia'ah Principle: Ijarah (lease-to-own)
- **Third Bangladesh Government Investment Sukuk (BGIS) - April 2022:**
    - Purpose: Important rural infrastructure development project.
    - Amount: BDT 5,000 crore
    - Sharia'ah Principle: Istisna (manufacturing)

Issuance Structure:

- Special Purpose Vehicle (SPV)/Issuing Authority & Trustee: Bangladesh Bank
- Originator: Finance Division, Ministry of Finance
- Sharia'ah Advisory Committee: Established by Bangladesh Bank

ii. **Corporate Sukuk Issuances:**

First Bangladeshi Corporate Sukuk:

- **BEXIMCO GREEN-SUKUK AL ISTISNA'A - August 2021:**
    - Issuer: BEXIMCO
    - Amount: BDT 3,000 crore
    - Purpose: Purchase machinery for solar project and business expansion
    - Sharia'ah Principle: Istisna (manufacturing)
    - Key Parties: Issuer, SPV, Originator, Beneficiaries, Trustee, Issue Manager, Rating Agency, Sharia'ah Advisory Board (all performing designated roles)

Second Bangladeshi Corporate Sukuk:

- **BBML Sukuk Al Ijarah - Issuance Date Unknown:**
    - Issuer: BBML
    - Amount: BDT 300 crore
    - Purpose: Refinance and procure new machinery for business expansion
    - Sharia'ah Principle: Ijarah (lease-to-own)

Regulatory Framework:

Issuance of Sukuk in Bangladesh adheres to relevant gazette notifications and regulations established by the government and the Bangladesh Securities and Exchange Commission (BSEC).

9.3.4 Takaful

Takaful, also referred to as Islamic insurance, is a Sharia-compliant alternative to conventional insurance. It operates on the principles of mutual cooperation and shared responsibility among members. Here's a breakdown of the key points:

- **Core Concept:** Unlike conventional insurance where policyholders pay premiums to a company in exchange for coverage, Takaful participants contribute money into a common pool. This pool is used to compensate members who suffer a covered loss.
- **Sharia Compliance:** Takaful avoids features that conventional insurance might have that are not allowed under Islamic law, such as interest (riba) and excessive uncertainty (gharar).
- **Profit Sharing:** Profits generated from the takaful pool, after administrative costs are deducted, may be shared among policyholders according to a pre-defined profit-sharing ratios.

Here's a simplified analogy:

Imagine a group of friends or neighbors who agree to contribute money to a common fund every month. If someone in the group experiences an unfortunate event covered by the agreement (e.g., accident, illness), they can receive financial assistance from the pool.

Key Features of Takaful:

- **Mutual Cooperation:** Members participate in a risk-sharing arrangement based on solidarity.
- **Sharia-compliant Operations:** Takaful contracts are structured to avoid riba and gharar.
- **Potential Profit Sharing:** Policyholders may benefit from any surplus funds in the takaful pool.

Types of Takaful:

- **Family Takaful:** Provides coverage for death, disability, or critical illness of the insured.
- **General Takaful:** Covers property damage, loss of business income, or medical expenses.

Overall, Takaful offers a financial safety net for participants while adhering to Islamic principles.

Now let's see how Takaful process works -

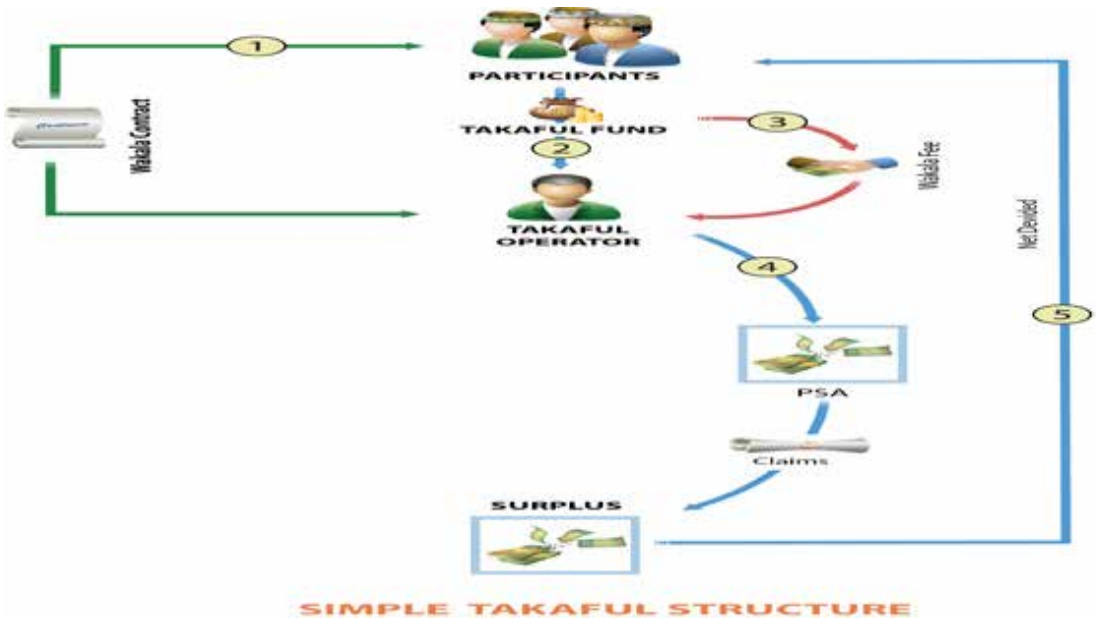
The Participants:

- **Omar:** A business owner who owns a cafe.
- **Takaful Operator:** A Sharia-compliant insurance company that manages the Takaful pool.

The Process:

1. **Plan Selection:** Omar chooses a general Takaful plan offered by the Takaful operator. This plan outlines covered events (e.g., fire, theft, business interruption) and the maximum payout amount for property damage or loss of income.
2. **Contribution Payments:** Omar starts making regular contributions (similar to premiums) to the Takaful pool. These contributions are used to cover claims and operational costs of the Takaful operator.

3. **Sharia-compliant Structure:** The Takaful contract avoids features like guaranteed returns or interest-bearing accounts, ensuring it adheres to Islamic principles.
4. **Loss Event (Example):** There's a fire in Omar's cafe, damaging the kitchen equipment and causing some structural damage.
5. **Claim Process:** Omar files a claim with the Takaful operator, providing necessary documentation (e.g., police report, photos of the damage). The operator assesses the claim based on the Takaful plan's terms and conditions.
6. **Payout from the Pool:** Assuming the claim is approved, the Takaful operator uses funds from the common pool to compensate Omar for the covered losses. This payout might cover the cost of repairing the cafe's structure, replacing damaged equipment, and potentially even lost income due to the temporary closure. This financial assistance helps Omar get his business back on track after the fire.
7. **Potential Profit Sharing:** At the end of the Takaful period (e.g., a year), if there's a surplus in the pool after claims and operational costs are deducted, it might be shared among participants like Omar. This profit sharing reflects the cooperative nature of Takaful.



SIMPLE TAKAFUL STRUCTURE

Important points to remember:

- The financial health of the Takaful pool depends on the contributions of all participants.
- Not all claims will be automatically approved. Each claim is assessed based on the plan's terms and exclusions.
- Profit sharing is not guaranteed and depends on the Takaful operator's performance.

This example demonstrates how general Takaful helps businesses like Omar's cafe recover from unforeseen events. By contributing to the Takaful pool, Omar can share the risk of property damage or business disruptions with other participants, ensuring financial support when needed.

Takaful serves several key purposes within Islamic finance, providing Sharia-compliant financial protection for individuals and businesses:

1. **Risk Mitigation:** The primary function of Takaful in Islamic finance is to offer risk mitigation tools that comply with Sharia principles. Conventional insurance might involve elements like interest (riba) and excessive uncertainty (gharar), which Takaful avoids. Participants contribute to a common pool to share the financial burden of covered losses experienced by members. This provides financial protection against unforeseen events like accidents, illnesses, property damage, or business disruptions.
2. **Sharia-compliant Protection:** Takaful caters to the growing demand for financial products and services that adhere to Islamic law. The structures of Takaful contracts are meticulously designed to eliminate elements like riba and gharar. This allows Muslims to participate in risk-sharing mechanisms without compromising their religious beliefs.
3. **Financial Safety Net:** Takaful offers a financial safety net for individuals and businesses. By contributing to the Takaful pool, participants can protect themselves from potential financial hardship caused by covered events. This financial safety net can provide peace of mind and allow individuals and businesses to plan for the future with more confidence.
4. **Promotes Saving Habits:** Takaful plans often involve regular contributions from participants. This can encourage healthy saving habits, as participants consistently set aside money towards potential future needs.
5. **Ethical Investment Potential:** Some Takaful operators invest the Takaful funds according to Islamic investment principles. This ensures the funds are invested in activities that are deemed ethical and socially responsible under Islamic law.
6. **Strengthens Islamic Financial System:** The growth of Takaful contributes to the overall strength and depth of the Islamic financial system. It provides a wider range of Sharia-compliant financial instruments for individuals and businesses, fostering a more robust Islamic finance sector.

In conclusion, Takaful plays a vital role in Islamic finance by offering Sharia-compliant risk-sharing mechanisms, promoting financial security, and encouraging ethical investment practices.

9.4 Global Standards of Islamic Finance

The Islamic finance industry has grown tremendously in recent years, and with that growth comes the increasing need for global standards. Here's a breakdown of the key players and initiatives promoting these standards:

9.4.1 Standard-Setting Organizations:

1) **The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI):** This organization focuses on developing and issuing Sharia-compliant accounting and auditing standards for Islamic financial institutions. These standards aim to ensure transparency, consistency, and proper financial reporting within the Islamic finance sector. For further information about standards and other activities of AAOIFI you can visit here: https://aaoifi.com/?lang=en

2) **Islamic Financial Services Board (IFSB):** This international standard-setting body is a crucial player in developing and issuing global prudential standards and guiding principles for the Islamic financial services industry. They cover areas like risk management, capital adequacy, corporate governance, and Sharia compliance. Details you can find here: https://www.ifsb.org/

Importance of Global Standards:

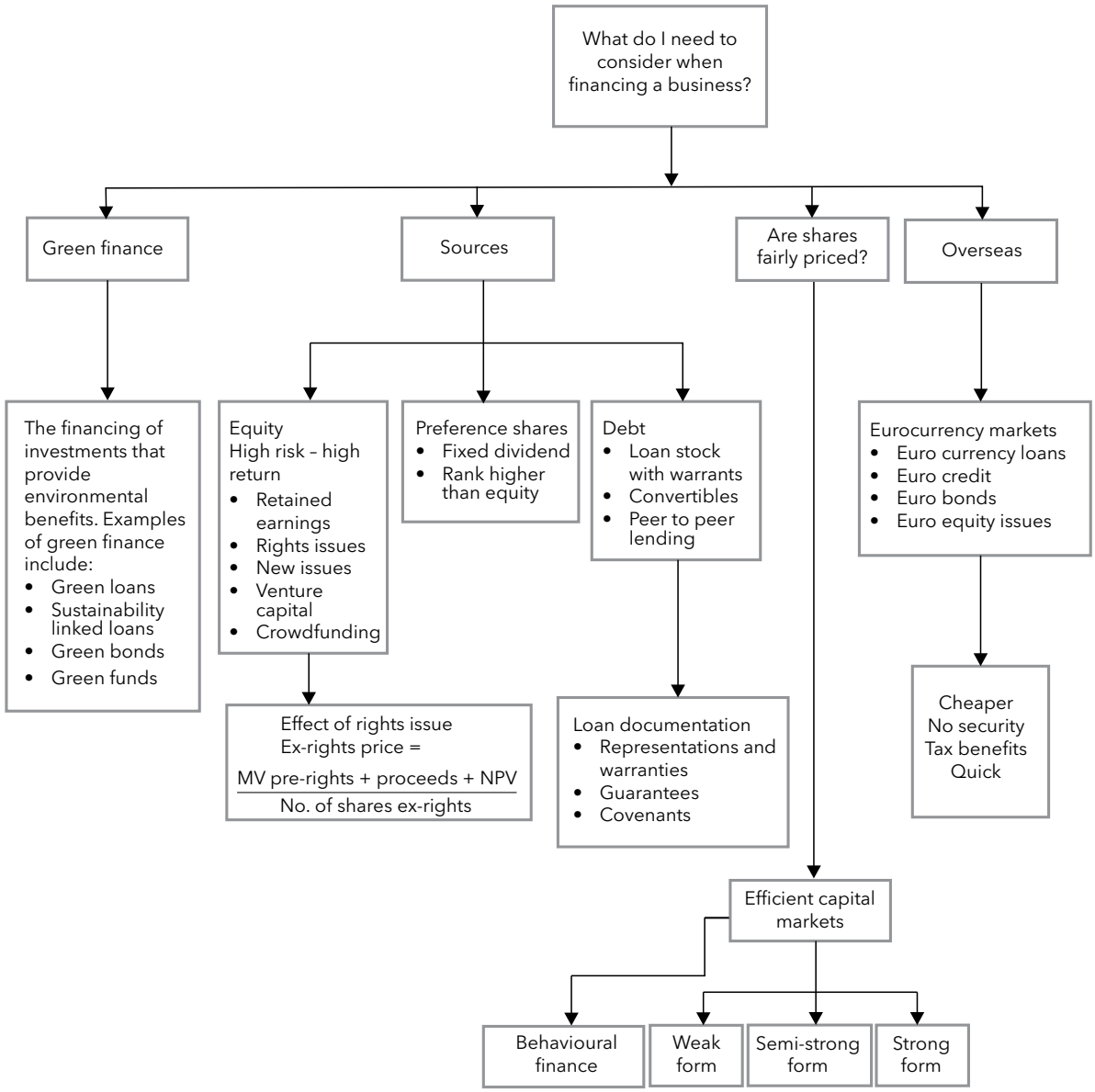
- **Harmonization of Practices:** Global standards help promote consistency in Islamic finance practices across different countries. This fosters a more level playing field for institutions and investors.
- **Enhanced Sharia Compliance:** Standardized guidelines ensure a stronger foundation for Sharia-compliant financial products and services. This builds trust and confidence among stakeholders.
- **Risk Management & Stability:** Robust standards contribute to better risk management practices within Islamic financial institutions, leading to a more stable and resilient Islamic financial system.
- **Investor Protection:** Standardized practices help protect investors by promoting transparency and fair disclosure of information.

Challenges and Considerations:

- **Diversity of Practices:** The global Islamic finance market encompasses a wide range of countries with varying legal and economic systems. Implementing a single set of standards across all these contexts can be challenging.
- **Continuous Development:** The Islamic finance industry is constantly evolving, so standards need to be adaptable and updated regularly to address emerging trends and complexities.
- **Enforcement Mechanisms:** The effectiveness of global standards depends on having strong enforcement mechanisms in place at the national level. Regulatory bodies in different countries need to adopt and implement these standards effectively.

Overall, the development and implementation of global standards are essential for the continued growth and stability of the Islamic finance industry. The efforts of organizations like the IFSB and AAOIFI play a vital role in promoting harmonization, Sharia compliance, and best practices across the Islamic finance landscape.

Summary



CHAPTER 4

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Can you calculate the theoretical ex rights price of a share? (Topic 2)
2.	Can you explain how improvements in technology have helped companies access a wider platform to raise finance? (Topic 4)
3.	Can you list the five fundamental principles from ICAB's ethical guidance? (Topic 6)
4.	Can you explain the three forms of market efficiency? (Topic 7)
5.	Do you understand what behavioural finance is? (Topic 8)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
Moorgate	This is a good question to consolidate your knowledge on rights issues. It includes a good mix of calculations and written requirements.
Easterways	This question will test your understanding of sources of finance and of the efficient market hypothesis.
Philpot	This question combines both rights issues and market efficiency. It is a good introduction to the type of question that you could see in your exam.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the learning in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Technical reference

Great Britain. Department for Business, Energy and Industrial strategy., (2019). Green Finance Strategy. Transforming Finance for a Greener Future. London: HMSO.

Pike, R, Neale B and Linsley P, (2012). Corporate finance and investment 7th edition. London, Pearson Education Limited.

Self-test questions

Answer the following questions.

1 Moorgate Company

The Moorgate Company has issued 100,000 £1 equity shares which are at present selling for £3 per share. The company has plans to issue rights to purchase one new equity share at a price of £2 per share for every four shares.

Requirements

1.1 Calculate the theoretical ex-rights price of Moorgate's equity shares.

(5 marks)

1.2 Calculate the theoretical value of a Moorgate right before the shares sell ex-rights.

(5 marks)

1.3 The chairman of the company receives a telephone call from an angry shareholder who owns 1,000 shares. The shareholder argues that he will suffer a loss in his personal wealth due to this rights issue, because the new shares are being offered at a price lower than the current market value.

The chairman assures him that his wealth will not be reduced because of the rights issue, as long as the shareholder takes appropriate action.

- Is the chairman correct?
- What should the shareholder do?

Requirements

Prepare a statement showing the effect of the rights issue on this particular shareholder's wealth, assuming:

- he sells all the rights;
- he exercises half the rights and sells the other half; and
- he does nothing at all.

(10 marks)

1.4 Are there any real circumstances which might lend support to the shareholder's claim? Explain.

(5 marks)

Total: 25 marks

2 Easterways plc

Easterways plc is a listed company involved in the tourist trade. The company wishes to make an offer for a smaller rival business, Tinytours Ltd. Since it is believed that the Tinytours Ltd shareholders would only accept cash, a relatively large amount of cash will have to be raised.

A share issue seems a realistic possibility for achieving this. The directors are undecided between making a public issue or a rights issue of shares. They are also unsure about the price at which shares should be issued.

One of the directors has suggested that a convertible loan stock issue might be worth considering. The directors are adamant that a conventional loan is out of the question.

Requirement

Prepare a report for the directors explaining the major factors that relate to their decision, including the points about which the directors are uncertain.

Total: 11 marks

3 Stock market efficiency

3.1 The following statement contains several errors with reference to the three levels of market efficiency.

'According to the efficient market hypothesis all share prices are correct at all times. This is achieved by prices moving randomly when new information is publicly announced. New information from published accounts is the only determinant of the random movements in share price.

Fundamental and technical analysis of the stock market serves no function in making the market efficient and cannot predict future share prices. Corporate financial managers are also unable to predict future share prices.'

Requirements

Explain the errors in the above statement.

(10 marks)

3.2 Discuss how the emergence of electronic share trading platforms has impacted on market efficiency.

(3 marks)

Total: 13 marks

4 Market statements

The statements shown below have been made in respect of the Stock Exchange or of particular securities traded in that market.

Requirements

Critically comment on each of the following three statements, clearly explaining any technical terms contained within them or used by you.

4.1 'In view of the fact that the market is efficient in the semi-strong form, financial information released by companies is of no value to investors, because the information is already included in share prices before it is released'.

(4 marks)

4.2 'If an investor holds shares in about 20 different companies all of the risk is eliminated and the portfolio will give a return equal to the risk-free rate'.

(5 marks)

4.3 'A graph of the daily price of a share looks similar to that which would be obtained by plotting a series of cumulative random numbers. This shows clearly that share prices move randomly at the whim of investors, indicating that the market is not price efficient.'

(3 marks)

Total: 12 marks

5 Philpot plc

Philpot plc is a large, listed manufacturing company that is currently considering how best to raise new equity finance. One option is to undertake a public issue of new shares, a course of action that was recently approved by shareholders. Alternatively, the company is considering a 1 for 4 rights issue at a 10% discount to the current market price of £5.00 per share.

The company has spoken to a number of investment banks regarding the potential new rights issue and public issue. During these discussions one investment bank has stated that whilst, in their opinion, the precise timing of a rights issue would be of no consequence, they are adamant that a public issue of new shares should not be undertaken at the present time. The bank has recommended that if the company wishes to pursue a public issue then it should be deferred for a minimum of six months. The bank has explained that it feels that at the present time the stock market is significantly undervaluing the company's shares and, as a result, the company would have to issue far more shares to raise the required amount of finance than it would have to do in six months.

The finance director of Philpot plc, however, is uncertain about this and at a recent board meeting when these matters were being discussed she made the following statement:

According to the efficient market hypothesis all share prices are correct at all times, with prices moving randomly when new information is publicly announced. The analysts at investment banks are unable to predict future share prices.

Requirements

5.1 Calculate the theoretical ex-rights price per share and the value of the rights per existing share should the company choose this option.

(2 marks)

5.2 Discuss the alternative courses of action open to the owner of 500 shares in Philpot plc as regards the rights issue, in each case determining the effect on the wealth of the investor.

(4 marks)

5.3 Discuss the factors that will influence the actual ex-rights price per share.

(4 marks)

5.4 Discuss the meaning and significance of the three forms of the efficient market hypothesis and, with specific reference to these, discuss both the recommendation that the company waits for six months before undertaking a public issue and the finance director's statement.

(8 marks)

Total: 18 marks

6 Nash Telecom

An uncle of yours, who has a comparatively small holding of shares in Nash Telecom, has sent you a newspaper report that contains the following commentary.

Nash Telecom raised a record €9 billion after the banks underwrote a rights issue intended to resolve concerns about the €40 billion debt mountain. Shareholders will be able to buy 16 new Nash Telecom shares at €15.5 each for every 20 existing Nash Telecom shares held.

Nash Telecom's share price fell 1.5% to €20. Shares will start trading on an ex-rights basis today with a theoretical ex-rights price of €18.

Requirements

6.1 Explain the terms 'rights issue', 'ex-rights' and 'underwriting'.

(3 marks)

6.2 Explain how the 'theoretical ex-rights price of €18' is calculated and why the actual price might be different.

6.3 Explain to your uncle the effect on his wealth of:

(4 marks)

- subscribing; or
- not subscribing for the rights issue.

(4 marks)

6.4 Explain to your uncle two other ways in which Nash Telecom might raise money in order to reduce its debt mountain, setting out the differing impacts on the shareholders and debt holders involved.

(5 marks)

6.5 Discuss the possible effects on Nash Telecom's weighted average cost of capital of increasing equity and reducing borrowings in this way.

(3 marks)

Total: 19 marks

7 Active Hydro

Active Hydro is an unquoted company based in the UK. Active Hydro manufactures and sells a range of sports energy drinks for endurance athletes. The company was founded five years ago by Scott Nicole. Scott is an elite ultra-runner; he was frustrated by the lack of good quality sports drinks available for endurance athletes and decided to incorporate Active Hydro after taking early retirement and investing his redundancy money in opening Active Hydro's manufacturing plant in Glasgow.

Revenue has increased significantly over the last five years due to the introduction of a range of new products that have been hugely popular with endurance athletes. Active Hydro is now one of the leading sports drinks used in the UK.

Scott would now like to expand the business by selling Active Hydro's products worldwide. To be able to do this, the company will need to open another manufacturing plant overseas and raise additional finance to support the business. His aim is to establish Active Hydro as the world's leading supplier of sports energy drinks. Scott has recently heard about 'Alternative finance platforms' such as crowdfunding and peer-to-peer (P2P) lending and is keen to find out more about these platforms and bypass the traditional banking system.

Requirement

Explain what is meant by crowdfunding and peer-to-peer lending and how such alternative finance platforms can be used to help companies like Active Hydro finance future growth and development.

Total: 10 marks

8 Pure Food plc

Pure Food plc (PF) is a listed UK bioscience company. PF develops natural solutions for the food, beverage, pharmaceutical and agricultural industries. PF uses 'good bacteria', also known as probiotics, to ensure that food stays fresh as it moves from farm to market. When applied correctly, good bacteria can help to address some of the major challenges facing the global food system, helping to keep food fresh and safe, reduce waste and provide alternatives to preservatives and artificial ingredients.

To date the company has increased in size and value by organic growth. PF's board is now investigating the acquisition of 100% of the share capital of SHE Health Care Ltd (SHE), a company specialising in probiotics for women's health. Women's health is a high-growth segment where innovation is becoming increasingly important. The acquisition of SHE would therefore compliment PF's existing product range and align with the company's objectives given that SHE focuses on the use of natural resources and promoting environmental sustainability.

You are a member of PF's finance team and the company's finance director has sent an email to you; an extract from the email is shown below:

Extract from email

If the acquisition of SHE goes ahead it would cost in the region of £30 million. PF would need to borrow to raise this amount and our bankers are willing to lend us that sum at an interest rate of 9% pa. I think this is very expensive. I am therefore keen to use green finance to fund the acquisition, as I believe we could access a lower rate of interest. I am conscious that some board members are unaware of the concept of green finance, in addition, I am keen to use sources of debt finance that complement SHE's social and environmental objectives. I'd therefore like you to prepare a briefing note covering the main concepts of green finance.

Requirements

8.1 Explain what is meant by green finance and suggest two sources of green finance that could be used by PF to finance the proposed acquisition of SHE.

(7 marks)

8.2 Explain the ethical implications for you, as AB Chartered Accountant, of having knowledge of potentially price-sensitive information about PF's proposed acquisition plans.

(3 marks)

Total: 10 marks

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

9 Ijara (Leasing)

A local hospital with annual revenue of 20 million taka needs new MRI equipment costing 750,000 taka. They cannot afford the upfront cost but plan to lease the equipment for 7 years. The Islamic bank requires a profit of 8% per year on the equipment cost.

Requirement

i. What are some key factors the hospital should consider before entering into an Ijara agreement?

ii. Considering the bank's profit and a fixed annual payment structure, what would be the estimated annual lease payment for the hospital?

Total: 5 (2+3) marks

10 Murabaha (Cost-Plus Financing)

You plan to open a restaurant and need to purchase kitchen equipment for 30,000 taka and furniture for 25,000 taka. You approach an Islamic bank for Murabaha financing with a profit margin of 6%.

Requirement

i. What information will the Islamic bank typically request from you before approving the Murabaha financing?

ii. After negotiating with the bank, you agree to a repayment term of 3 years with equal monthly installments. What will be the total amount you repay to the bank?

Total: 5 (2+3) marks

11 Musharaka (Partnership)

A group of entrepreneurs plan to develop a sustainable co-working space project with an estimated total cost of $3 million. They decide to issue a Musharaka Sukuk, aiming to raise 60% of the capital from investors.

Requirement

i. What are some advantages and disadvantages for the entrepreneurs of using a Musharaka Sukuk compared to seeking a conventional bank loan?

ii. Assuming they successfully raise 60% of the capital through the Sukuk, how much of their own funds will the entrepreneurs need to contribute to the project?

Total: 4 (2+2) marks

12 Sukuk (Islamic Bonds)

A government wants to raise 200 million taka for a renewable energy infrastructure project through a Sukuk issuance. They decide on an Ijarah Sukuk structure, where the Sukuk represents ownership in the completed project leased back to the government for 15 years with semi-annual rental payments.

Requirement

What are some factors to consider when determining the Sukuk's profit rate (rental payments) offered to investors?

Total: 2 marks

13 Sukuk Structuring

A real estate developer plans to issue a Sukuk to finance the construction of a high-end residential complex. They're considering an Ijara Sukuk structure but are also exploring Sukuk structures with profit-sharing elements.

Requirement

i. What are some alternative Sukuk structures the developer could consider besides a straight Ijara Sukuk, and how might these structures differ in terms of risk and return for investors?

ii. What factors should the developer consider when choosing the most suitable Sukuk structure for this project?

Total: 4 (2+2) marks

14 Choosing Between Ijara and Murabaha (Equipment Financing)

You are opening a bakery and need to purchase industrial ovens for 400,000 taka. You approach an Islamic bank for financing options.

- Option 1: Ijara: The bank offers an Ijara agreement where they purchase the ovens for 400,000 and lease them back to you for 5 years with equal annual payments. The bank's profit is estimated at 5% per year on the equipment cost.
- Option 2: Murabaha: The bank offers Murabaha financing where they purchase the ovens and sell them to you at a cost price of $400,000 with a profit markup of 10%. You will repay the total cost in equal monthly installments over 3 years.

Requirement

Describe the pros and cons of each of the options and then recommend which option is more financially beneficial.

Total: 5 marks

15 Sukuk vs. Conventional Bond (Real Estate Investment)

You have $100,000 to invest and are considering two options:

- Option 1: Sukuk: A real estate investment Sukuk with a projected annual profit rate of 6%. You will receive periodic profit distributions based on the underlying property's performance.
- Option 2: Conventional Bond: A corporate bond issued by a well-established company with a fixed annual interest rate of 5%. You will receive fixed interest payments throughout the bond's term.

Requirement

Describe the pros and cons of each of the options

Total: 4 (2+2) marks

16 Musharaka vs. Ijara (Business Expansion)

You own a successful clothing store and want to expand to a new location. You need 2,000,000 taka for the project. You're considering two financing options offered by an Islamic bank:

Question:

Option 1: Ijara: The Islamic bank offers to purchase the new store location for 2,000,000 taka and lease it back to you for 10 years with fixed annual payments. The bank's profit is estimated at 8% per year on the property cost.

Option 2: Musharaka: The bank proposes a Musharaka partnership where they contribute 1,000,000 taka (50% of the project cost). You will contribute the remaining 1,000,000 taka. Profits or losses from the new store's operation will be shared according to a pre-defined profit-sharing ratio based on your respective capital contributions (50% for you and 50% for the bank).

Requirement

Describe the pros and cons of each of the options and then recommend which option should be chosen.

Total: 5 marks

17 Investment in Manufacturing Equipment (Ijara vs. Murabaha)

You're starting a furniture manufacturing business and need to purchase specialized equipment for 700,000 taka. The Islamic bank offers two financing options:

Option 1: Ijara: The bank will purchase the equipment and lease it to you for 7 years with equal annual payments. Their profit margin is 5% of the equipment cost per year.

Option 2: Murabaha: The bank will purchase the equipment and sell it to you with a profit markup of 10% on the cost price. You can repay the total amount in equal monthly installments over 5 years.

Requirement

Which option might be more financially beneficial, considering the annual payments and ownership of the equipment?

Total: 5 marks

18 Financing a Medical Clinic (Istisna vs. Ijara)

You're a doctor planning to open a new medical clinic and need specialized medical equipment costing 5,000,000 taka. The Islamic bank offers two financing structures:

Option 1: Istisna: The bank acts as a mediator, contracting with a manufacturer to build the equipment based on your specifications. You pay the bank installments as the equipment is manufactured, with an additional bank profit for facilitating the transaction.

Option 2: Ijara: The bank purchases the completed equipment and leases it back to you for a fixed term with pre-determined rental payments that include the bank's profit.

Requirement

Which option offers more control over the equipment and potentially lower financing costs?

Total: 2 marks

19 Sukuk vs. Conventional Bond

You have 2,000,000 taka to invest and are considering two options:

- **Option 1: Sukuk:** A Sukuk issued by a reputable real estate investment company with a projected annual profit rate of 7%. The Sukuk represents ownership in a portfolio of income-generating properties. You will receive periodic profit distributions based on the underlying properties' rental income.
- **Option 2: Conventional Bond:** A corporate bond issued by a well-established company with a fixed annual interest rate of 6%. You will receive fixed interest payments throughout the bond's term.

Requirement

Which option should you choose considering pros and cons of each of the options?

Total: 7 marks

20 ABC Composite Limited (Murabaha – Trade Finance)

ABC Composite Limited is a 100% cotton spinning mill engaged with manufacturing of different color of yarn. Recently the company approaches to an Islamic Bank for importing raw cotton from India. The Islamic Bank approves the investment facility for importing raw cotton under the working capital limit. The Islamic Bank will open an L/C for Importing 500 tons of raw cotton at an invoice price of Tk. 100,000 per ton, freight and insurance Tk.150 per ton, landing charge is 1% of CIF value, custom duty 20% of CIF value, VAT 15% and let's assume tax is exempted. It was also agreed that rate of profit will be 10% on the amount of investment. After receiving goods with proper import documents, the Bank will make payment to the exporter by creating investment in the name of ABC Composite Limited.

Requirement

You work as a financial management expert of ABC Composite Limited and you also know how the different modes of Islamic Finance works. The management of ABC Composite Limited wants to know the following from you -

i. What's the applicable mode of Islamic finance that suits to the above scenario?

ii. Can you briefly explain to the management of ABC Composite Limited about how that mode of financing works summarizing the process?

iii. Can you help calculating the pricing of investment and bank's profit on that investment?

Total: 10 (2+3+5) marks

21 Mizan Bank Limited (Mudaraba Financing)

Mizan Bank Limited, a Sharia-compliant Islamic bank acting as Rab-al-mal (provider of capital), has agreed to invest Tk. 500,000 in a potential business venture. The project's owner and Mudarib (entrepreneur managing the enterprise), Mr. Afeef, will also inject Tk. 200,000 of his own capital. The profit-sharing ratio for the project is established at 65/35, for the profit attributable to the fund provided by Rab al maal.

The Mudarabah project operated for three years with the following performance:

Year 1: Profit Tk. 70,000

Year 2: Profit Tk. 140,000

Year 3: Loss Tk. 25,000

Out of the total loss, Tk. 10,000 loss is attributed to negligence on the part of the Mudarib at year 3.

Requirement

i. Explain the profit and loss sharing mechanism in a Mudaraba business structure.

ii. Calculate the profit entitlement of Rab-al-mal for each year (Years 1, 2, and 3) based on the agreed-upon profit-sharing ratio.

iii. Determine the Mudarib's profit or loss for Year 3.

Total: 6 (2+3+1) marks

22 Salam Financing for Cozy Clothes

A clothing manufacturer, "Cozy Clothes," anticipates needing Tk. 200,000 to purchase materials for their winter jacket production. They expect high demand and want to ensure enough stock before the season starts. However, Cozy Clothes prefers Sharia-compliant financing and avoids interest-based loans.

Requirement

i. Explain how Salam financing can be used by Cozy Clothes to address their funding needs while adhering to Islamic financing principles. Be sure to include the roles of the parties involved and the key features of a Salam contract.

ii. Suppose Cozy Clothes enters a Salam agreement with Islamic Bank. They agree to deliver 200 winter jackets (of a specific design and quality) six months from now. Islamic Bank agrees to pay Tk. 200,000 upfront in exchange for the jackets upon delivery.

Calculate the profit rate for Islamic Bank if the market price of each jacket at the delivery time is expected to be Tk. 1,200.

Total: 6 (3+3) marks

23 Sharia-compliant Financing for Abrar Textile Weavers: Parallel Istisna

A manufacturing company, "Abrar Textile Weavers," requires ten industrial looms for Tk. 1,000,000 each. Mr. Abrar, the owner of Abrar Textile Weavers recently joined in a business meeting with other players in the same industry and came to to know that a significant number of businesses already prefers Islamic financing over conventional one and already using it for last couple of years. You are the consultant for "Abrar Textile Weavers". Mr. Abrar contacted you and shares his desire to switch to Shariah compliant financing but unsure about how it works. They prefer Sharia-compliant financing for their next Tk. 10,000,000 project.

Requirement

i. Explain Mr. Abrar how a Parallel Istisna structure can be utilized to finance their Tk. 10,000,000 project by Islamic Bank.

ii. Discuss the potential benefits and considerations for all parties involved.

Total: 10 (6+4) marks

Answers to Interactive questions

Answer to Interactive question 1

1.1

	£
Value of the company now is 100,000 × £2	200,000
Increase in value due to new shares being sold	50,000
Impact of new project being taken on = NPV	25,000
Value of company after issue and project	275,000

1.2 Ex-rights price = (MV of shares × pre-rights issue + rights proceeds + project NPV)/Number of shares ex-rights

= ((100,000 × £2) + (50,000 × £1) + £25,000)/(100,000 + 50,000)

= £1.83$^{1}/_{3}$

Value of the right = £1.83$^{1}/_{3}$ – £1.00 = £0.83$^{1}/_{3}$

Note: If the market price of the existing shares had been given post the announcement of the project, then the project NPV of £25,000 would already be included in the MV of the old shares (see market efficiency).

1.3 Answers are as follows.

(a) **Takes up rights**	1,000 × £2	£
Step 1: Wealth prior to rights issue		2,000
Step 2: Wealth post rights issue	1,500 × £1.83$^{1}/_{3}$	2,750
Less Rights cost	500 × £1	(500)
∴ £250 better off		2,250

(b) **Sells rights**

		£
Step 1: Wealth prior to rights issue	£1,000 × £2	2,000
Step 2: Wealth post rights issue Shares	1,000 × £1.83$^{1}/_{3}$	1,833$^{1}/_{3}$
Sale of rights	500 × £0.83$^{1}/_{3}$	416$^{2}/_{3}$
∴ £250 better off		2,250

(c) **Does nothing**

		£
Step 1: Wealth prior to rights issue	£1,000 × £2	2,000
Step 2: Wealth post rights issue	1,000 × £1.83$^{1}/_{3}$	1,833$^{1}/_{3}$
∴ Loss of £166$^{2}/_{3}$		

Answer to Interactive question 2

The terms and price do not affect shareholders who take up or sell their rights – they gain the same amount.

1.1 Number of shares issued = 100,000 Amount raised = 100,000 × 50p = £50,000

Ex-rights price = ((100,000 × £2) + (100,000 × £0.50) + £25,000)/(100,000 + 100,000)

= £1.375

Value of the right = £1.375 – £0.5 = 87.5p

Take up rights

		£
Wealth prior to rights issue	1,000 × £2	2,000
Wealth post rights issue	2,000 × £1.375	2,750
Less rights cost	1,000 × 50p	(500)
		2,250

∴ £250 better off

1.2 Sells rights

		£
Wealth prior to rights issue	1,000 × £2	2,000
Wealth post rights issue		
Shares	1,000 × £1.375	1,375
Sale of rights	1,000 × £0.875	875
		2,250

∴ £250 better off

Answer to Interactive question 3

Stage	Characteristics	Possible sources of funds
Start-up	Very small scale Make at home Deliver by car to local customers (offices, trading estates etc)	Savings, or a second mortgage on home. Borrow from family and friends (no security or past record, so bank will be reluctant to lend).
Growth to £100,000 revenue pa	Need small premises and a van	Borrowing from bank to purchase premises and van (secured by premises and personal guarantees), or rent premises. Possibly a government grant, but unlikely (as not innovating or employing people in an area of high unemployment or manufacturing).

(Organic) growth to £500,000 revenue pa	Need new larger premises with refrigeration and refrigerated vans	Borrowings from bank secured by premises or lease Become a limited company (Ltd) and bring in new shareholders/money Possibly grant, as it may be possible to site the new premises in an area offering grants to create employment
Growth to £2 million revenue pa by acquisition	Established a brand/ name/ reputation and wants to expand regionally	(Secured) bank borrowings remain. Acquisition is higher risk; main possibilities: • issue more shares • venture capital or business angels (although they tend to prefer bigger deals than this) • loans (at higher interest than bank, acknowledging the higher risk and lack of security)
Growth to £5 million revenue pa	Want to use brand/ name/reputati on more widely – sell ready-made sandwiches to local independent retail outlets and local branches of national retail chains (using their brand) on credit	Main sources likely to be: • continuing bank borrowings (secured) • venture capital or business angels (Now at a viable size for this) • Loans/private issue of debentures (eg, to venture capitalists) • Invoice discounting (now they have receivables and they are reputable)
Growth to £50 million revenue pa	Expand to national scale, by combination of organic growth and acquisition	Convert to plc and float on Stock Exchange (AIM or full listing)

Answers to Self-test questions

1 Moorgate Company

1.1 Ex-rights price

	£
4 existing shares × £3.00	12.00
1 rights share × £2.00	2.00
	14.00

The theoretical value of Moorgate's shares ex-rights is £14.00 ÷ 5 = £2.80

1.2 Value of right

Value of a right = £(2.80 – 2.00)

= £0.80

One right enables a holder to buy a share at £2.00 which will eventually sell for £2.80. The value of the right to buy one share is, therefore, £0.80. Four existing shares are needed to buyone additional share. Therefore, the theoretical value of the rights attached to each existing share is £0.20.

1.3 Chairman's views

The chairman is correct. The shareholder should either exercise the rights or sell them (subject to 1.4 below).

If he sells all rights

	£
Wealth before rights issue	
Value of shares 1,000 × £3.00	3,000
Wealth after rights issue	
Value of shares 1,000 × £2.80	2,800
Plus cash from sale of rights 1,000 × £0.20	200
	3,000

If he exercises one half of his rights and sells the other half

	£
Wealth before rights issue	
Value of shares 1,000 × £3.00	3,000
Wealth after rights issue	
Value of old shares 1,000 × £2.80	2,800
Value of new shares (500 ÷ 4) × £2.80	350

Cash from sale of rights 500 × £0.20	100
	3,250
Less cost of purchasing new shares 125 × £2	(250)
	3,000

If he does nothing Wealth before rights issue	£
Value of shares 1,000 × £3.00	3,000
Wealth after rights issue	
Value of shares 1,000 × £2.80	(2,800)
Reduction in wealth	200

1.4 Shareholder wealth

It is possible that the shareholder, even though exercising the rights or selling them, will suffer a reduction in wealth.

The above analysis is based on the assumption that the funds raised will be invested in the business to earn a rate of return comparable to the return on the existing funds. The stock market, in valuing the shares of Moorgate after the rights issue, has to make some assumptions as to how profitably the new funds are to be used.

If the proceeds are to be used to finance a highly profitable investment and the stock market does not initially appreciate this, then the market will be undervaluing the share. When the true earning potential of the company is realised, the share price will rise. However, by then it might be too late for the shareholder referred to in the question.

If the shareholder exercises the rights in the circumstances just described, he will not lose. When the shares rise in price he will benefit. However, if at the time of the rights issue he decides to sell the shares, he will lose. The person who exercises the rights later will benefit, when the shares rise in price above that expected at the time of issue.

Tutorial Note
No mention is made of the use to which the funds will be put. It can only be assumed therefore that they will earn the same return as the firm's existing operations and hence each new share will increase the value of the firm by £2.00. This is a good demonstration of the old examination adage – 'if in doubt assume the simplest'!

2 Easterways plc

To: The Board of Easterways plc

From: Financial consultant

Date: 12 September 20X0

Subject: Report: Financing the Tinytours Ltd takeover

Terms of reference

To advise the board on various approaches to raising equity finance for the takeover of Tinytours Ltd.

For the purposes of this report it is assumed that neither retained earnings nor a conventional loan is a possible means of raising the necessary cash.

A public issue of equity

This amounts to the company selling shares to the general investing public. This is a relatively rare event, except when a newly-listed business is seeking a wider ownership for its shares. Once listed, companies tend not to use public issues for several reasons:

Public issues are expensive. The issue costs (legal, administrative etc) can be very high – 10% or more of the value of the funds raised.

- Setting the issue price is important, but difficult. Even if the price is set at a realistic level, there is still the possibility that there will be insufficient demand and the company will fall short of its target funds. This is particularly the case when markets are volatile. Underwriting is an option to ensure that all shares are sold, but this is very expensive.
- Control of the company could pass from the existing shareholders.

  Since existing shareholders have the right to be offered shares first, those shareholders can, in effect, block a public issue in favour of a rights issue.

Rights issues

A rights issue is one where existing shareholders are given the 'right' to take up a number of new shares in proportion to their existing holding. Shareholders who do not wish to take up their rights can usually sell the right to another investor. For a listed company, rights issues are much more popular for the following reasons:

- Rights issues are relatively cheap, perhaps less than half the cost of a public issue.
- The issue price is relatively unimportant. Since all existing shareholders benefit from the cheap price in proportion to their shareholding, there is no disproportionate gain. There is pressure on shareholders to take up the shares or to sell them. Thus rights issue tend not to fail.
- Control tends to stay with the existing shareholders.

  It seems as if a rights issue would provide a cheaper and more practical way for the company to raise the funds for the Tinytours takeover than would a public issue.

  Convertible loan stock issue

  Convertibles are a mixture of loan and equity financing. They are issued as loan stock, with the right to convert them into equity shares at a pre-determined rate and date.

  From the investors' point of view, they are relatively safe, in that there is a an almost guaranteed interest payment, and a right to convert to equity if it is beneficial to do so.

  From the company's viewpoint they are attractive because:

- they are cheap to issue;
- loan finance is relatively cheap to service because of the tax-deductibility of interest; and
- they are self-liquidating; provided the holders convert, the loan liquidates itself through an equity issue, which saves the company the problem of raising the cash.

Disadvantages of any type of loan financing include:

- the likely need to provide security; and
- the possibility that lenders will impose covenants, for example restricting the level of dividends and/or insisting on a minimum liquidity ratio.

Raising finance, unless it is from a mixture of debt and equity, will affect the level of gearing, with implications for the risk/return profile and the cost of capital.

3 Stock market efficiency

3.1 The efficient market hypothesis is often considered in terms of three levels of market efficiency.

(1) Weak form efficiency

(2) Semi-strong form efficiency

(3) Strong form efficiency

The accuracy of the statement in the question depends partly on which form of market efficiency is being considered. The first sentence states that all share prices are correct at all times. If 'correct' means that prices reflect true values (the true value being a price which incorporates all relevant information that exists at a particular point in time), then strong form efficiency does suggest that prices are always correct.

Weak and semi-strong form prices are not likely to be correct as they do not fully consider all information. Semi-strong form efficiency, for example, does not include inside information.

It might be argued that even strong form efficiency does not lead to correct prices at all times as, although an efficient market will react quickly to new information, that reaction is not instant.

The second sentence in the statement suggests that prices move randomly when new information is publicly announced, but this is not the case. Prices may follow a random walk, in that successive price changes are independent of each other, but prices will move to reflect accurately any new relevant information that is announced: moving up when the information is favourable, and down when unfavourable.

If strong form efficiency exists, prices might not move at all when new information is announced, as the market will already be aware of it.

Information from published accounts is only one possible determinant of share price movement. Others include the announcement of investment plans, dividend announcements, government changes in monetary and fiscal policies, inflation levels, and exchange rates.

Analysts play an important role in producing market efficiency. An efficient market requires competition among a large number of analysts to achieve 'correct' share prices, and the information disseminated by analysts helps to ensure that information is widely and cheaply available.

An efficient market implies that there is no way for investors or analysts to achieve consistently superior rates of return. This does not say that analysts cannot accurately predict future share prices. By pure chance some analysts will do so, but not on a consistent basis.

The same argument may be used for corporate financial managers. If, however, the market is only semi-strong efficient, then it is possible that financial managers, having inside information, would be able to produce a superior estimate of the future share price of their own companies and that, if analysts have access to inside information, they could earn superior returns.

> **Tutorial Note**
> Stock market efficiency is a very broad concept. In questions, it is sensible to 'pin down' the levels of efficiency you are discussing. After that it is merely a matter of challenging each phrase.

3.2 The ability of investors to research different companies and to trade in shares has been made easier by the emergence of electronic share trading platforms.

Investors can buy and sell shares via a mobile app which offers real-time prices and regular updates on selected companies and market movements overall. Automatic trading enables rapid share trading in response to events alerted to the investor via their chosen trading app.

The emergence of electronic share trading platforms can lead to stock market volatility if news leads to a number of investors all taking the decision to buy (or sell) shares at the same time. The resulting volatility can reduce the efficiency of the stock market in terms of its ability to price shares accurately.

4 Market statements

4.1 A stock market is described as efficient when the price of a particular security is adjusted instantly by the market to take account of new information. There are three grades of efficiency currently used.

- If a stock market has weak form efficiency, then only past information is currently reflected in share prices.
- The semi-strong form states that the market price of a security already reflects all relevant public information about the company.
- The strong form includes private information as well.

It is generally held that the Stock Exchange is approximately semi-strong. As new information becomes available to investors, the price will change as judgements are made on whether the security is under or overpriced.

The second part of the quote in the question implies strong form efficiency and is contrary to semi-strong efficiency (where information is of value to investors) – with strong form efficiency, information is already included in share prices when it is released.

4.2 It is possible for an investor to pick about 20 investments in different sections of the stock market and maintain a well-diversified portfolio. It is important that the investments are carefully chosen from different sectors.

A well-diversified portfolio means a collection of shares which, together, roughly resemble in their returns and risks the whole stock market. Risk means the possible fluctuations in return on an investment around the average. By putting together a portfolio, with returns which do not move in the same way, it is possible to reduce the risk below that associated with a single investment.

The remaining risk is called the market or systematic risk. It is not true to say all the risk is eliminated, because only unsystematic risk (that is, the risk associated with the company or industry you invest in) will be eliminated in the portfolio.

As there is still some risk, it is also incorrect to say that the portfolio will give a return equal to the risk-free rate (the return expected from an investment with no risk, such as short-term government gilts); the return will be substantially higher than the risk-free rate to compensate for the risk of investing in the stock market in the first place.

4.3 The concept of price efficiency and the efficient market hypothesis have been explained in 4.1. It would be true to say that, in general, the daily price movements of a share look random in relation to each other, and no relationship can be deduced. This does not, however, mean that share prices are random in relation to the information released to the market, and a clear connection can be deduced between the information released and the direction and size of the change in the share price.

If the stock market is semi-strong efficient, the share price movements will still appear random but will react in a predictable manner to any new information becoming public.

An investor holding information which is not yet public, or guessing at it, would therefore be able to predict a future share price movement when that information becomes public.

5 Philpot plc

5.1

The rights issue price	= £5.00 × 0.90 = £4.50
The theoretical ex-rights price	= [(4 × £5.00) + (1 × £4.50)]/5 = £4.90
The value of the rights per existing share	= (4.90 – 4.50)/4 = £0.10

5.2

The value of 625 shares after the rights issue	= 625 × £4.90 = £3,062.50
The value of 500 shares before the rights issue	= 500 × £5.00 = £2,500.00
The value of 500 shares after the rights issue	= 500 × £4.90 = £2,450.00
The amount of cash subscribed for the new shares	= 125 × £4.50 = £562.50
The amount of cash raised from the sale of rights	= 500 × £0.10 = £50.00

The shareholder could do nothing, take up the rights or sell the rights (or any combination of these).

The effect on the shareholder's wealth depends on the action taken:

(1) If the shareholder takes up the rights, the rights issue will have a neutral effect on his wealth. As an owner of 500 shares, he will purchase an additional 125 shares and the value of the total 625 shares (£3,062.50) will be the same as the value of 500 shares before the rights issue (£2,500.00) plus the cash subscribed for the new shares (£562.50). The make- up of the shareholder's wealth will have changed (less cash, more shares), but not his total wealth.

(2) If the shareholder sells his rights, the rights issue will also have a neutral effect on his wealth. The value of 500 shares after the rights issue (£2,450.00) plus the cash received from selling the rights (£50.00) equals the value of 500 shares before the rights issue (£2,500.00). Again, the make-up of the shareholder's wealth will have changed (more cash, less shares), but not his total wealth.

(3) If the shareholder neither takes up the rights nor sells the rights, a loss of wealth of £50 will occur, representing the difference between the value of 500 shares before the rights issue (£2,500.00) and the value of 500 shares after the rights issue (£2,450.00).

5.3 Factors that may influence the actual share price following the rights issue

(1) The expectations of investors/the stock market regarding the company's future.

(2) The level of take-up of the rights issue – if the issue was not fully taken up, for example, the share price might fall.

(3) Information regarding the use to which the proceeds will be put and the market's reaction to that information – possibly being used to restructure finances in a way that affects the company's cost of capital; or being used in a project with a positive net present value.

(4) General stock market conditions/sentiment at the time of the issue, or within the company's particular sector of the stock market.

(5) The existence of specific information (positive or negative) regarding the company or its sector at the time of the issue.

(6) It is assumed that the details of any new investment/strategy are communicated to, and believed by, the stock market, but if this is not the case then the share price will differ from the theoretical ex-rights price. In other words, the degree of efficiency of the market could impact on the actual share price.

5.4 The three forms of theoretical stock market efficiency are weak, semi-strong and strong.

If a stock market has **weak form efficiency** then only past information is currently reflected in share prices. Investors cannot make abnormal gains by studying and acting upon past information.

If a stock market has **semi-strong form efficiency** then all past and all publicly available current information (eg, financial statements, press reports) is reflected in share prices. Investors cannot make abnormal gains by studying and acting upon such information.

If a stock market has **strong form efficiency** then all past, current publicly-available information and all relevant private information (eg, board minutes) is reflected in share prices. Investors cannot make abnormal gains by acting upon information of any sort.

The implication of all this is that if the stock market is efficient in all three forms, investors cannot beat the market by having superior information as it does not exist. However, if the stock market is not strong form efficient then abnormal gains can be made from possession of private (insider) information.

Discussion

Evidence suggests that stock markets are not strong form efficient, so the bank's claim appears misguided. There is evidence, however, that stock markets are semi-strong efficient and so it is unlikely that the company's shares are undervalued to an extent that would justify deferring a public issue.

Regarding the finance director's statement, its accuracy depends in part on which form of market efficiency is evident. Strong form efficiency does suggest that share prices are 'correct' at all times, while the other forms of efficiency would not generate 'correct' share prices as they do not fully consider all information. However, even with a strong form efficient market there may be a time lag between the emergence of new, relevant information and the market reaction to it.

Finally, as regards the ability of analysts to predict future share prices, if the stock market is strong form efficient then analysts will be unable to achieve consistently superior rates of return. But that does not mean they cannot predict share prices – by chance they may do so on occasions. However, if the market is only semi-strong form efficient, then if the analysts have access to any private information then they may be able to predict the future share price and make superior rates of return.

6 Nash Telecom

6.1 Rights issues

A rights issue is an issue of new shares for cash to existing shareholders in proportion to their existing holdings.

The ex-rights price is the price at which the shares will settle after the rights issue has been made.

Underwriting is the process whereby, in exchange for a fee, an institution or group of institutions will undertake to purchase at the issue price any securities not subscribed for by the public.

6.2 Theoretical ex-rights price

The theoretical ex-rights price = (Market value of shares pre-rights issue + rights proceeds)/Number of shares ex-rights

Calculation of the theoretical ex-rights price

		€
Current holding	20 shares at €20 each	400
Rights issue	16 shares at €15.5 each	248
Total new holding	36 shares worth	648

So theoretical ex-rights price = €18 (€648 ÷ 36) as stated in the newspaper.

However, it is possible that the actual price may be higher or lower than the theoretical figure, depending on market expectations about the prospects for the business.

6.3 Effect on wealth

You should consider a number of factors in deciding whether to take up the rights issue.

- Whether you wish to continue in the company for the long term (as its recent performance has been poor and it has run up a debt mountain).
- Whether you want to maintain your holding at the same proportionate level. (If you give up your rights, you will effectively have half the proportionate holding.)
- Whether you have the money to subscribe for the rights issue.
- The market price for selling the rights.

In theory, this is the financial effect on your uncle of subscribing or not subscribing for the rights issue.

	€	€
Uncle's current holding (say 200 shares) is worth (200 × €20)		4,000
(1) If uncle takes up the rights		

New holding is worth ((200 + 160) × €18)	6,480	
Less cost of new shares (160 × €15.5)	(2,480)	
Net effect		4,000
(2) If uncle sells the rights		
Holding is now worth (200 × €18)	3,600	
Plus sale of rights (160 × (€18 – €15.5))	400	
Net effect		4,000
(3) If uncle does nothing		
Holding is now worth (200 × €18)		3,600

Thus in situations (1) and (2) above, uncle 'breaks even' ie, his wealth remains the same (€4,000). If he chooses to do nothing (situation (3)), however, he will lose €400 (€4,000 – €3,600).

However, in practice the company might well sell the rights on your uncle's behalf and reimburse him with the difference (€400).

6.4 Reducing debts

Nash Telecom seems to have considered debt-based options. Other possibilities might include the following:

- Make a public issue of shares – this would dilute the control of existing shareholders. It would also be expensive. However, existing lenders would be encouraged, as gearing will be declining.
- Negotiate the conversion of (substantial) loans into equity – this dilutes existing shareholders' interests and eliminates right of lenders to repayment.
- Seek to be taken over by a large company with limited debts to produce a combined company with a reasonable debt to equity ratio – this reduces risks for existing shareholders and for employees.
- Seek a venture capitalist investment – this dilutes the existing shareholders' interests; and there is continuing uncertainty about long-term ownership for both employees and shareholders.
- Divestment ie, sell off assets and raise cash to reduce debt. The lack of assets might affect the company's future performance, and a sale and lease back arrangement might be preferred.
- Seek government finance to re-structure the company and/or to support specific operations.

6.5 WACC

The cost of equity is generally deemed to be greater than that for debt. This is not least because of the tax advantages of debt. In addition, debt holders normally require a lower rate of return, as the level of return is fixed and the company is obliged to pay.

So, it is probable that the weighted average cost of capital would increase with the shift from debt to equity, but it would depend on whether the company is close to (or even above) its optimal level of gearing.

Interest rates are currently relatively low, but Nash Telecom would need to pay higher than market rates due to its high level of debt.

However, Modigliani and Miller (1958) originally concluded that a company's weighted

average cost of capital should not be affected by its capital structure. They argued that, as a company's level of debt increased the cost of equity would increase in direct proportion, thus cancelling out the effect of the cheaper debt. Subsequently (1963) they developed their theory to show that in the presence of corporation tax it is advantageous to issue debt (Pike, Neale & Linsley, 2012).

7 Active Hydro

Crowdfunding allows a company to access finance by using an online crowdfunding platform to pitch for finance from a large number of investors.

A successful crowdfunding pitch requires an attractive business plan that reassures prospective investors about the prospects for the proposed product, and also about the quality of the management team (ie, their skills and experience). Active Hydro has had an initial five-year successful trading history and is now one of the UK's leading sports drinks; it appears to be in a strong position to expand and should be able to formulate a strong business plan. Crowdfunding could be a suitable source of finance to fund its proposed international expansion although investors may be concerned about whether the current management team has the skills and experience of international retailing required to make a success of this move. Active Hydro could approach its key corporate customers within the ultra-running community to gauge if they would be interested in investing in the company. By involving a large number of investors, crowdfunding could also help Active Hydro to attract new customers and to build awareness of the company. Crowdfunding sites

can be seen as an example of technology reducing barriers to international capital flows, this could therefore assist Active Hydro in establishing an international investor and customer base.

Peer-to-peer (P2P) lending connects businesses like Active Hydro, who are looking to borrow, with investors who want to lend, usually via an online platform.

Platforms usually require borrowers to have a trading track record, to submit financial accounts, and will perform credit checks as part of the credit assessment. Given that Active Hydro has a successful trading history over the last five years, it would appear to be an attractive investment.

P2P lending would also allow Active Hydro's customers and Scott's family or friends to share in the returns of the business. Investors can lend small parts of individual loans which encourages a wide range of lenders to participate in multiple loans. However, P2P loans can also be for large loans of several million pounds.

P2P lending can be cheaper than obtaining a traditional bank loan because the lender is not having to support the cost of maintaining a bank branch network. It can also be quicker to arrange than a bank loan because the process can be initiated and processed outside normal bank opening hours and because the procedures used to evaluate loans are more streamlined than those used by banks.

8 Pure Food plc

8.1 Green finance refers to financial investments into environmentally-friendly goods and services, for example the protection of biodiversity. It also refers to schemes to encourage sustainability, such as policies to encourage investment in waste reduction. Green finance also specifically relates to the financial systems that deal with green investments; green debt finance includes green bonds and green funds.

PF could use the following sources of green finance to fund the acquisition of SHE:

Sources of green finance	
Green loans	Some banks, often with government backing, specialise in financing green projects. PF could approach the Green Investment Bank (GIB) in the UK to request £30 million to fund the acquisition. The proposed acquisition would be aligned with the objectives of the GIB given that SHE focuses on the use of natural resources and promoting environmental sustainability. It is possible that the cost of a green loan may be cheaper than the rate that has been quoted of 9%. This can happen, although is not guaranteed, if banks assess that companies with a focus on financially material sustainability or socio-economic issues outperform others and should therefore represent a lower credit risk. Banks also sometimes see a company's focus on sustainability performance can be a measure of innovation as well as an indicator of good management, which again is seen as a positive sign.
Green bonds	A green bond is a type of fixed-interest bond used to raise money for climate and environmental projects. These bonds would be secured and have the same credit rating as PF's other debt obligations. Green bonds often come with tax incentives to enhance their attractiveness to investors. To qualify for green bond status, green bonds are often verified by a third party such as the Climate Bonds Standard Board, which certifies that the bond will channel finance to environmentally-beneficial projects. The acquisition of SHE would satisfy these criteria.

You are employed by PF and are party to confidential information which, if made public, could influence the market price of PF's shares.

AB Chartered Accountant should assume that all unpublished information about a prospective, current or previous client's or employer's affairs, however gained, is confidential.

That information should then:

- be kept confidential;
- not disclosed, even inadvertently such as in a social environment; and
- not be used to gain personal advantage.

In addition, a Chartered Accountant should act with integrity, ie, avoid self-interest and be aware of his/her professional behaviour – comply with laws and not damage the reputation of the profession.

9 Ijara (Leasing)

i. Before entering the Ijara agreement, the hospital should consider factors like:

Impact on Cash Flow: Ijara payments will be an added expense for the hospital. They need to assess if their cash flow can comfortably handle these payments alongside existing operational costs.

Renewal Options: The hospital should check if the Ijara agreement allows for renewing the lease at the end of the term and potentially purchasing the equipment at a fair market value.

Maintenance Responsibilities: Clarifying who is responsible for equipment maintenance and repairs during the lease period is crucial.

ii. The bank's annual profit would be 8% of 750,000 taka, which is 60,000 taka. To calculate the annual lease payment, we can use the following formula (considering a fixed payment structure over 7 years):

Annual Lease Payment = (Equipment Cost + Total Profit) / Lease Term Annual Lease Payment = (750,000 + (60,000 x 7)) / 7 years Annual Lease Payment ≈ 138,571.43 taka

10 Murabaha (Cost-Plus Financing)

i. The Islamic bank might request the following information:

Business Plan: A detailed business plan outlining your restaurant concept, projected revenue, and financial needs.

Collateral: The bank might require collateral (e.g., property) to secure the financing, especially for larger amounts.

Financial Statements: If you have any existing business ventures, the bank might request your financial statements to assess your ability to repay the financing.

ii. The total cost of the equipment is 30,000 + 25,000 = 55,000 taka. The bank's profit will be 6% of 55,000 taka, which is 3,300 taka. Therefore, the total cost you will repay is 55,000 + 3,300 = 58,300.

To calculate the monthly payment amount, we can use the following formula (assuming equal monthly installments over 3 years):

Monthly Payment = Total Cost / (Number of Months x 12) Monthly Payment = 58,300 taka / (3 years x 12) Monthly Payment ≈ 1,622.22 taka

11 Musharaka (Partnership)

i.

Advantages:

Profit Sharing: Entrepreneurs share potential project profits with Sukuk holders, promoting a risk-sharing partnership and potentially higher returns if the project is successful.

Alignment with Islamic Principles: Musharaka Sukuk adheres to Sharia principles by avoiding interest-based debt.

Disadvantages:

Profit Sharing with Investors: Entrepreneurs relinquish some control over potential project profits by sharing them with Sukuk holders.

Profit & Loss Sharing: Entrepreneurs also share any potential losses with Sukuk holders, increasing their financial risk.

ii. The total project cost is 3 million taka. If the Sukuk raises 60% of the capital, investors will contribute 3 million x 60% = 1.8 million taka. Therefore, the entrepreneurs will need to contribute the remaining amount: 3 million total cost - 1.8 million from Sukuk = 1.2 million.

12 Sukuk (Islamic Bonds)

Several factors influence the Sukuk's profit rate:

Market Interest Rates: The Sukuk's profit rate needs to be competitive with prevailing market interest rates on conventional bonds to attract investors.

Project Risk: The risk associated with the project (e.g., potential cost overruns) might influence the offered profit rate. Higher risk projects might require a higher profit rate to compensate investors.

Government Creditworthiness: A government with a strong credit rating can offer a lower profit rate on the Sukuk due to lower perceived risk for investors.

13 Sukuk Structuring

i. The developer could consider alternative structures like:
   a) Musharaka Sukuk: Investors become partners in the project, sharing profits and losses based on a pre-defined ratio. This offers investors the potential for higher returns but also exposes them to greater risk.
   b) Mudarabah Sukuk: The developer acts as the Mudarib (entrepreneur) managing the project, while investors are Rabb al-Mal (capital providers). Investors receive a pre-defined profit share from the project's income, but they bear the risk of losses if the project generates no profit.

ii. The developer should consider factors like:
   a) Risk Tolerance of Investors: The chosen Sukuk structure should align with the risk appetite of the target investor pool.
   b) Project Cash Flow Projections: The structure should be compatible with the project's expected cash flow generation. For example, profit-sharing structures might be suitable for projects with high potential returns.
   c) Regulatory Environment: The developer needs to ensure the chosen Sukuk structure complies with relevant regulations governing Sukuk issuance.

14 Choosing Between Ijara and Murabaha (Equipment Financing)

Analysis:

Ijara:

Pros:

- Fixed annual payments for budgeting purposes.
- Ownership of the equipment may be transferred to you at the end of the lease term (depending on the agreement).

Cons:

- Potentially higher overall cost due to the bank's profit calculated over the entire lease period.

Murabaha:

Pros:

- You own the equipment immediately upon purchase.
- Potentially lower overall cost compared to Ijara due to a one-time profit markup.

Cons:

- Higher monthly payments due to the shorter repayment term (3 years vs. 5 years).

Calculation:

Ijara:

- Bank's annual profit = 400,000 x 5% = 20,000 taka
- Total Ijara payments (assuming equal annual payments over 5 years) = (400,000 + (20,000 x 5)) = 500,000 taka
- Annual Ijara payment = 500,000 / 5 years = 100,000 taka

Murabaha:

- Bank's profit = 400,000 x 10% = 40,000 taka
- Total Murabaha cost = 400,000 + 40,000 = 440,000 taka
- Monthly Murabaha payment (assuming equal monthly installments over 3 years) = 440,000 / (3 years x 12 months) = 12,222.22 taka

Recommendation:

In this scenario, Murabaha might be the more financially beneficial option due to the potentially lower overall cost and immediate ownership of the equipment. However, if you prefer fixed annual payments and potentially owning the equipment after 5 years, Ijara could be a suitable choice.

15 Sukuk vs. Conventional Bond (Real Estate Investment)

Analysis:

Sukuk:

Pros:

- Sharia-compliant investment adhering to Islamic principles.
- Potential for higher returns if the underlying property performs well (profit rate may fluctuate).

Cons:

- Profit rate not guaranteed; returns can vary depending on the property's performance.
- Subject to market risks associated with real estate.

Conventional Bond:

Pros:

- Fixed and predictable interest rate for the entire bond term.
- Lower risk compared to Sukuk as interest payments are typically guaranteed by the issuer.

Cons:

- Not Sharia-compliant due to the presence of interest (riba).

While we cannot determine an exact recommendation without additional information (risk tolerance, investment goals, preference to Shariah), however this scenario highlights the key differences.

16 Musharaka vs. Ijara (Business Expansion)

Analysis:

Ijara:

Pros:

- Fixed annual payments for budgeting purposes.
- No need to share potential profits with the bank.

Cons:

- You don't own the property after the lease term.
- Potentially higher overall cost due to the bank's profit calculated over the entire lease period.

Musharaka:

Pros:

- Shared ownership of the property after the project is complete (50% ownership for you).
- Potential for higher profits if the new store performs well (you keep 50% of the profits).

Cons:

- Profits are shared with the bank (50% goes to the bank).
- Potential for losses if the store doesn't perform well (you share 50% of the losses).

Calculation:

Ijara:

- Bank's annual profit = 2,000,000 x 8% = 160,000
- Total Ijara payments (assuming equal annual payments over 10 years) = (2,000,000 + (160,000 x 10)) = 3,600,000
- Annual Ijara payment = 3,600,000 / 10 years = 360,000

Recommendation:

This decision depends on your risk tolerance and ownership preferences. Here's a breakdown:

- Choose Ijara if: You prefer fixed annual payments and don't mind not owning the property after the lease.
- Choose Musharaka if: You want to share ownership of the property and potentially earn higher profits if the store thrives, but you're also willing to share any potential losses.

17 Investment in Manufacturing Equipment (Ijara vs. Murabaha)

Here's a breakdown of both options:

Ijara:

- Bank's annual profit = 700,000 x 5% = 35,000 taka
- Total Ijara payments (assuming equal annual payments over 7 years) = (700,000 + (35,000 x 7)) = 945,000 taka
- Estimated annual Ijara payment = 945,000 / 7 years ≈ 135,000 taka

Murabaha:

- Bank's profit = 700,000 x 10% = 70,000 taka
- Total Murabaha cost = 700,000 + 70,000 = 770,000 taka
- Monthly Murabaha payment (assuming equal monthly installments over 5 years) = 770,000 / (5 years x 12 months) ≈ 12,833.33 taka (Annual 154,000 taka)

Recommendation: Based on the calculations, Murabaha appears to be the more cost-effective option due to lower monthly payments and potentially lower overall cost. However, with Ijara, you might gain ownership of the equipment at the end of the lease term (depending on the agreement).

18 Financing a Medical Clinic (Istisna vs. Ijara)

Here's a comparison of the options:

Istisna:

- **Pros:** More control over equipment specifications during manufacturing.
- **Cons:** Financing cost might be higher due to potential profit margins on each installment paid to the bank.

Ijara:

- **Pros:** Fixed rental payments for budgeting purposes.
- **Cons:** Less control over equipment specifications as you're leasing pre-built equipment.

Choosing Istisna might give you more control, but the overall cost could be higher. Ijara might be suitable if you prefer a fixed payment structure and don't need as much customization.

19 Sukuk vs. Conventional Bond

Analysis:

Sukuk:

Pros: Sharia-compliant investment adhering to Islamic principles. Potential for higher returns if the underlying properties perform well (profit rate may fluctuate based on rental income).

Cons: Profit rate not guaranteed. Returns can vary depending on the performance of the real estate portfolio. Subject to market risks associated with real estate.

Conventional Bond:

Pros: Fixed and predictable interest rate for the entire bond term. Lower risk compared to Sukuk as interest payments are typically guaranteed by the issuer.

Cons: Not Sharia-compliant due to the presence of interest (riba).

Let's consider the potential differences in returns:

Assumptions:

- Investment amount: 2,000,000 taka
- Investment term: 5 years

Sukuk:

Scenario 1:

Strong Property Performance: Average annual rental income from the underlying properties generates a 7% profit on your investment (as projected).

Annual Profit: 2,000,000 x 7% = 140,000 taka

Total Profit over 5 years: 140,000/year x 5 years = 700,000 taka

Scenario 2:

Average Property Performance: Let's assume that average annual rental income generates a 5% profit on your investment.

Annual Profit: 2,000,000 x 5% = 100,000 taka

Total Profit over 5 years: 100,000/year x 5 years = 500,000 taka

Conventional Bond:

Fixed Annual Interest: 2,000,000 x 6% = 120,000 taka

Total Interest Earned over 5 years: 120,000/year x 5 years = 600,000 taka

Analysis of Returns:

- In the strong property performance scenario (7% profit), Sukuk offers a higher total return (700,000 taka) compared to the conventional bond (600,000 taka).
- However, in the average property performance scenario (5% profit), Sukuk offers a lower total return (500,000 taka) compared to the bond.
- The Sukuk investment is exposed to market fluctuations in real estate, potentially leading to higher or lower returns than projected. The conventional bond offers a guaranteed fixed return throughout the term.

Conclusion:

The choice between Sukuk and a conventional bond depends on your risk tolerance and investment goals. Sukuk offers the potential for higher returns but carries more risk due to its dependence on the underlying assets' performance. Conventional bonds offer predictability and guaranteed returns but are not Sharia-compliant.

20 ABC Composite Limited (Murabaha – Trade Finance)

i. **Applicable Mode of Financing:**

ABC Composite Limited here is looking for working capital financing to run day to day operations of the business from the Islamic Bank. Total invoice price of the goods, other direct and indirect cost is fixed and known to both parties of the contract. Profit / mark-up on the cost is also agreed between parties. Here the goods will be purchased by the bank and after adding the mark-up (profit of the Bank) it will be sold to ABC. Considering these factors "Murabaha" is the right mode of that suits to this scenario.

ii. **Murabaha Financing Explained:**

Murabaha is a Sharia-compliant financing arrangement where the Islamic Bank acts as a facilitator for your import transaction. Here's a simplified explanation of the process:

1. **Needs Assessment and Application:** You, ABC Composite Limited, approach the Islamic Bank requesting Murabaha financing to import 500 tons of raw cotton. You provide details about the import cost, purpose (yarn manufacturing), and desired repayment terms.
2. **Sharia Compliance Review:** The Islamic Bank assesses the request to ensure it complies with Sharia principles. Importing raw cotton for yarn production is generally considered permissible.
3. **Negotiation and Agreement:**
    - If approved, the bank negotiates the Murabaha profit rate with you. In this case, it's 10% on the investment amount.
    - Both parties agree on the Murabaha selling price, which includes the total cost of the import (invoice price, freight, insurance, etc.) and the bank's profit.
4. **Purchase and Sale:**
    - The Islamic Bank uses its funds to purchase the raw cotton from the Indian supplier based on the invoice price, freight, and insurance.
    - The bank then sells the cotton to you at the pre-determined Murabaha selling price.
    - In some circumstances the bank may assign (via written agreement) the customer as 'agent' of the bank for receiving the goods on behalf of bank before selling it to customer.
5. **Repayment:**
    - You repay the Islamic Bank the total Murabaha selling price according to the agreed-upon installment plan.

iii. **Calculating Pricing and Bank's Profit:**

Here's the calculation of the total investment cost and the bank's profit:

Cost Calculations:

- **CIF value per ton:** Tk. 100,000 (invoice price) + Tk. 150 (freight & insurance) = Tk. 100,150
- **Total CIF value (500 tons):** Tk. 100,150/ton x 500 tons = Tk. 50,075,000
- **Landing charge:** Tk. 50,075,000 (CIF value) x 1% = Tk. 500,750
- **Assessable value:** Tk. 50,075,000 (CIF) + Tk. 500,750 (landing charge) = Tk. 50,575,750
- **Customs duty:** Tk. 50,575,750 (assessable value) x 20% = Tk. 10,115,150
- **Total cost excluding VAT and bank's profit:** Tk. 50,575,750 (Assessable value) + Tk. 10,115,150 (customs duty) = Tk. 60,690,900
- **VAT:** Tk. 60,690,900 x 15% = Tk. 9,103,635

Total Investment Cost:

- Tk. 60,690,900 (cost excluding bank's profit) + Tk. 9,103,635 (VAT) = Tk. 69,794,535

Bank's Profit:

- Tk. 69,794,535 (total investment cost) x 10% = Tk. 6,979,453.5

Therefore:

- The total investment cost for ABC Composite Limited is approximately Tk. 69,794,535.
- The Islamic Bank's profit on this transaction is approximately Tk. 6,979,453.5.

21 Mizan Bank Limited (Mudaraba Financing)

i. Profit and Loss Sharing Mechanism in a Mudaraba

A Mudaraba is an Islamic financing partnership where:

- **Rab-al-mal (Investor):** Provides capital for a business venture.
- **Mudarib (Entrepreneur):** Manages the business venture with their expertise.

Profits are shared according to a pre-agreed ratio, but losses are handled differently:

- **Profits:** Split based on the agreed ratio (e.g., 65/35).
- **Losses:** Borne only by the Rab-al-mal (up to their capital contribution). The Mudarib loses their time and effort invested.

ii. Rab-al-mal's Profit Entitlement (Years 1, 2, and 3)

Here's the calculation of Mizan Bank's (Rab-al-mal) profit entitlement for each year based on the **proportionally attributable profit** to their capital contribution:

1. **Calculate Proportion of Rab-al-mal Capital:** Divide Rab-al-mal capital by total capital (500,000 / 700,000) = 5/7.
2. **Calculate Attributable Profit for Rab-al-mal:** Multiply the total profit by the proportion of Rab-al-mal capital (Total Profit * (5/7)).
3. **Apply Profit Sharing Ratio:** Multiply the attributable profit by the profit-sharing ratio (65%).

Year 1:

1. Attributable Profit: 70,000 * (5/7) = Tk. 50,000
2. Rab-al-mal Profit: 50,000 * (65/100) = Tk. 32,500

Year 2:

1. Attributable Profit: 140,000 * (5/7) = Tk. 100,000
2. Rab-al-mal Profit: 100,000 * (65/100) = Tk. 65,000

Year 3 (Loss Scenario):

In Mudarab any loss due to negligence of the Mudarib will be borne by Mudarib. Other than that any loss is to be borne by Rab-al-mal up to the amount of capital contribution by Rab-al-mal.

So, at year 3, except Tk.10,000 rest Tk. 15,000 will be borne by Mizan Bank Limited. In other words **they will not have any profit entitlement for Year 3.**

iii. Mudarib's Profit/Loss in Year 3 (Considering Negligence)

The Mudarib typically doesn't share in losses unless negligence is involved. **Therefore, the Mudarib Mr. Afeef incurs a loss of Tk. 10,000 in Year 3 due to their negligence.**

Key takeaway:

The profit-sharing ratio (65%) applies to the **proportionally attributable profit** to Rab-al-mal's capital contribution, not directly to the total profit. In a loss scenario, Rab-al-mal absorbs losses up to their capital contribution unless any loss is directly attributable to the negligence of Mudarib.

22 Salam Financing for Cozy Clothes

i. Salam financing, also known as Bai Salam, is a Sharia-compliant financing tool that can address Cozy Clothes' needs. Here's how:

Parties Involved:

- **Seller:** Cozy Clothes (acting as the Mudarib) - They will supply the winter jackets.
- **Buyer:** Islamic Bank (acting as the Rab-al-mal) - They will provide the upfront financing.

Key Features of Salam Contract:

- **Predetermined Price and Quantity:** The contract specifies the exact number (200) and quality of winter jackets to be delivered. The price (Tk. 200,000) is also fixed at the beginning.
- **Upfront Payment:** Islamic Bank pays the entire amount (Tk. 200,000) to Cozy Clothes upfront.
- **Deferred Delivery:** Cozy Clothes has a set time frame (six months) to deliver the agreed-upon jackets.
- **Ownership Transfer:** Ownership of the money transfers to Cozy Clothes immediately, while ownership of the jackets remains with Islamic Bank until delivery.

Benefits for Cozy Clothes:

Access to Funding: Cozy Clothes receives the necessary funds (Tk. 200,000) upfront to purchase materials and begin production.

Sharia-Compliance: The transaction adheres to Islamic financing principles by avoiding interest-based loans.

ii. Calculating Islamic Bank's Profit Rate:

Here, Islamic Bank pays a fixed amount (Tk. 200,000) upfront and receives 200 jackets after six months. We can't calculate a traditional interest rate because interest is not involved in Salam financing. However, we can determine the **implicit profit rate** for Islamic Bank based on the market price of the jackets at delivery.

1. **Expected Total Revenue for Islamic Bank:** 200 jackets * Tk. 1,200/jacket = Tk. 240,000
2. **Profit for Islamic Bank:** Tk. 240,000 (revenue) - Tk. 200,000 (initial payment) = Tk. 40,000
3. **Implicit Profit Rate:** (Profit / Initial Payment) * 100 = (Tk. 40,000 / Tk. 200,000) * 100 = 20%

Therefore, while Islamic Bank doesn't earn interest, they expect a 20% profit on their investment through the difference between the upfront payment and the sale price of the jackets at the delivery time.

23 Sharia-compliant Financing for Abrar Textile Weavers: Parallel Istisna'a

i. Understanding Islamic Financing:

Congratulations, Mr. Abrar, on your decision to explore Sharia-compliant financing! As your consultant, I can explain how Islamic finance differs from conventional financing and introduce a specific option - Parallel Istisna - that can be used for your Tk. 10,000,000 project to acquire ten industrial looms.

In conventional financing, banks lend money and charge interest for the time value of money. Islamic finance, however, prohibits interest. Instead, it focuses on asset-based financing and profit-sharing.

Parallel Istisna for Loom Procurement:

Parallel Istisna is a Sharia-compliant financing structure that can help you acquire the looms you need. Here's how it works:

1. Initial Agreement:

- You (Abrar Textile Weavers) approach Islamic Bank, expressing your desire to purchase ten industrial looms for Tk. 1,000,000 each (Tk. 10,000,000 total).
- Islamic Bank agrees to participate in a parallel Istisna structure.

2. Two Istisna Contracts:

Contract 1 (Islamic Bank & Machinery Corp.):

- Islamic Bank acts as the Rab-al-mal (financier) and signs a contract with Machinery Corp., a reputable machinery supplier.
- The contract outlines the specifications, quantity (10 looms), and delivery timeline for the looms.
- Islamic Bank agrees to pay Machinery Corp. Tk. 10,000,000 upon completion of the looms.

Contract 2 (Islamic Bank & Abrar Textile Weavers):

- Islamic Bank acts as the seller and signs a separate Istisna contract with you (Abrar Textile Weavers).
- This contract details the same loom specifications, quantity, and a slightly higher total price (e.g., Tk. 10,500,000) incorporating Islamic Bank's profit.
- The contract also outlines your payment plan (installments, duration) and the delivery date for the looms.

3. Financing & Manufacturing:

- Once both contracts are signed, Islamic Bank pays Machinery Corp. Tk. 10,000,000 to begin construction of the looms.
- Machinery Corp. manufactures the ten industrial looms based on the agreed-upon specifications.

4. Delivery:

- Upon completion, Machinery Corp. delivers the finished looms to Islamic Bank (assuming temporary ownership).
- You (Abrar Textile Weavers) continue making your agreed-upon installment payments

(Tk. 10,500,000) to Islamic Bank.

- Once you fulfill your payment obligations, Islamic Bank delivers the ten looms to you.

ii. Benefits and Considerations:

Abrar Textile Weavers (You):

- **Benefits:**
  - Access Sharia-compliant financing for acquiring essential equipment.
  - Gain ownership of the looms after completing the payment plan.
- **Considerations:**
  - The total cost is slightly higher than the base manufacturing price due to Islamic Bank's profit margin in Contract 2.

Islamic Bank:

- **Benefits:**
  - Earns an early profit from the price markup in Contract 2.
- **Considerations:**
  - Needs to carefully calculate the profit margin in Contract 2 to remain competitive and attractive to Machinery Corp. for early delivery.

Machinery Corp.:

- **Benefits:**
  - Receives upfront payment from Islamic Bank upon completion, facilitating their production cycle.
- **Considerations:**
  - Needs to prioritize early completion of the looms as per Contract 1 to avoid delays impacting your (Abrar Textile Weavers) payment obligations to Islamic Bank.

Additional Notes:

- The success of parallel Istisna hinges on negotiating competitive pricing in both contracts.
- Market demand for industrial looms can influence the feasibility of this structure.

Next Steps:

I can assist you further by:

- Helping you find a reputable Islamic Bank offering Parallel Istisna.
- Negotiating the terms of the Istisna contracts with Islamic Bank on your behalf.

By embracing Sharia-compliant financing options like Parallel Istisna, you can fulfill your business needs while adhering to your Islamic principles.

Chapter 5

Cost of capital

Introduction

Learning outcomes

Students will be able to identify capital requirements of businesses and assess financing options. This will involve being able to:

- calculate and interpret the costs of different sources of finance (before and after tax) and the weighted average cost of capital; and
- calculate and justify an appropriate discount rate for use in an investment appraisal taking account of both the risk of the investment and its financing.
- organise, structure and assimilate data in appropriate ways, using available statistical tools, data analysis and spreadsheets, to support business decisions.

Syllabus links

Cost of capital extends the basic ideas of return on capital employed introduced in **Business, Technology & Finance** at Certificate level. This topic combines with basic investment appraisal from **Management Information** to allow both financing and investment decisions to be explored simultaneously.

There is further technical development of the topic at Advanced Level in **Strategic Business Management & Leadership**.

Finally, the Case Study may require analysis which utilises a cost of capital in determining answers to business issues.

Examination context

The general approach to establishing a company's cost of capital is to calculate the cost of each source of finance, then to weight these according to their importance in the financing mix.

As you can see, the method of calculation of the WACC will often form the basis for further discussion of a business situation, perhaps exploring weaknesses of the models or the assumptions that have been made.

Calculation and interpretation of the weighted average cost of capital (WACC) for a business has been examined many times, and so it is vital that you are familiar with the content of this chapter.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**Cost of equity** The cost to a company of each source of long-	**Approach** Practice calculating the cost of equity	Exam questions often ask you to calculate the cost of equity using the capital asset pricing	**IQ4: Estimating growth rates**
	term finance can be equated with the return which the providers of finance expect on their investment. The cost of equity is equivalent to the return required by an equity investor.	using both the dividend valuation model and CAPM. Make sure you can estimate growth using both historical patterns and the Gordon growth model. **Stop and think** What are the limitations of using the dividend valuation model to calculate the cost of equity?	model or the dividend valuation model (or both). Make sure you can use both models.	This question asks you to estimate the growth rate using historical patterns and calculate the cost of equity using the DVM. **IQ5: Applying the Gordon growth model** It is important that you can also calculate the cost of equity applying this model.
2	**Cost of debt** An important aspect in evaluating the cost of debt finance is the effect of tax. Loan interest is an allowable expense for corporation tax, effectively reducing the cost of loan finance to the company.	**Approach** Practice calculating the cost of both irredeemable and redeemable debt. **Stop and think** Do you know how to calculate the cost of convertible loan stock?	As part of the WACC calculation you will need to be able to calculate the cost of debt. The requirement may not specifically ask you to calculate the cost of debt however this is one of the variables needed to be able to calculate a company's WACC.	**IQ9: Loan stock** This question demonstrates how to calculate the cost of debt in the loan stock is convertible. This is often the case in the exam, so it is important you practice this question.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
3	**Combined cost of capital or weighted average cost of capital** The use of discounted cash flow techniques in investment evaluation is increasingly prevalent in the modern business environment. Most businesses will have to make an assessment of their opportunity cost of capital (discount rate) even in the broadest terms, in	**Approach** Work through the Interactive questions in Chapter 5 carefully. This is a topic that requires repeated question practice. **Stop and think** What is the opportunity cost of finance for a business derived	You may be required to calculate a cost of capital (equity, preference shares, debt or an overall weighted average). The basis of the calculation may form a discussion, either on its own or combined with an exploration of business or financial risk. This will involve being able to calculate and interpret the costs of different sources of	**IQ10: Calculating WACC** This is an important question to consolidate your knowledge on calculating WACC.
	order to assess the cost of investments.	from? Also, how would you identify a benchmark rate for evaluating investments?	finance and justify an appropriate discount rate for use in an investment appraisal taking account of both the risk of the investment and its financing.	

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1 Cost of equity

Section overview

- Underlying concept is that risk and return are linked.
- Cost of equity (k_e) for a company is same as the returns required by an equity investor.
- The Dividend Valuation Model (DVM) assumes share price equals the present value of expected future dividends.
- Future growth can be estimated using historical growth rates or retention rates.
- The DVM has weaknesses due to both the assumptions made and the data used.
- The CAPM is an alternative method of estimating k_e.

1.1 Categories of long-term finance

These have already been summarised as:

- equity shares;
- preference shares; and
- debt.

These will be examined in turn so as to establish both a rationale and a procedure for calculating the cost of each source of finance. Subsequently an approach to establishing a combined (weighted average) cost of capital will be examined.

1.2 Calculating returns

The cost to a company of each source of long-term finance can be equated with the return which the providers of finance expect on their investment. The return can be expressed as an interest rate or yield and this will be used as the overall measure of cost ie, the cost of capital is the percentage return a firm needs to pay its investors. Essentially, the calculation is that of an internal rate of return (IRR) where:

Market value of investment = Expected returns on investment discounted at investors' required rate of return.

1.3 Determinants of the cost of finance

The two major determinants of a company's cost of finance are:

(a) the risk-free rate of return or a rate of return that reflects the time value of money; and

(b) the reward for the risk taken by investors in advancing funds to the firm. For example, equity holders take more risks than debt holders, and therefore expect higher rates of return.

1.4 The dividend valuation model

1.4.1 What gives a share value?

The primary financial objective is assumed to be to maximise the wealth of equity shareholders.

If we view wealth as the value of the shares, it is necessary to have a theory as to what determines the value of an ordinary share.

The benefit to shareholders from owning a share takes the form of future dividends and capital gain. It is the present value of these benefits that creates the price today.

Thus:

Price of shares now (P_0) = Present value of future dividends + present value of share price on eventual sale.

1.4.2 What determines the share price on eventual sale?

For an individual to make a capital gain, he must find another investor prepared to buy at the higher price. Why should that other investor be prepared to do so? Obviously only in the expectation of enhanced dividends and a possible capital gain for himself.

However, the second capital gain in turn depends on finding yet another investor prepared to buy at the higher price – and so on. Ultimately it can be seen that capital gains and losses are merely transfers of existing wealth between members of the market. The only addition to the total wealth of the market as a whole, and the only determinant of current value is the dividends paid by the company, including any terminal dividend on liquidation.

Thus the current share price is totally determined by expected future dividends, discounted at the investor's required rate of return (the cost of equity).

P_0 = Present value of future dividends.

1.5 The pattern of future dividends

In order to arrive at a price using the dividend valuation model, we need to estimate the expected future dividends. The most convenient assumptions are that **dividends will either remain constant**, or **will grow at some** fixed **annual rate, g**. It can be shown that the market value of equity (share price × number of shares) can be expressed in relatively straightforward terms. Working from the method of valuing a perpetuity:

Dividends remain constant in perpetuity:

$P_0 = D_0/k_e$ or $k_e = D_0/P_0$

Dividends grow at constant rate, g, in perpetuity:

$$P0 = \frac{D0\ (1 + g)}{ke - g} \text{ or } ke = \frac{D0\ (1 + g)}{P0} + g$$

Where P_0 = ex-dividend (see section 1.6) market value of equity/share price D_0 = dividend paid at time 0

k_e = equity investors' required rate of return

In this model it is assumed that dividends are paid at annual intervals. **Note that one result of this model is that if dividends grow at a rate 'g' per annum then so does the share price**.

There are obvious flaws in such simple models of anticipated dividend behaviour. In particular, note the following points:

- g must be less than k_e. If g equals k_e the share price becomes infinitely high, a nonsense result. However, note that a growth rate this high **to perpetuity** is impossible.
- In practice companies are likely to experience periods of varying growth rates. More sophisticated models have been developed to cope with such forecasts, but they do not need to be considered computationally for the purpose of the exam.

The pattern of future dividends is usually referred to as the **dividend stream**.

Interactive question 1: Dividend valuation model

A company's shares are quoted at £2.50 ex-div. The dividend just paid was 50p. No growth in dividends is expected and dividends are forecast to continue indefinitely.

Requirements

1.1 What rate of return, k_e, do the investors anticipate?

1.2 Using the data above, but with an anticipated annual growth rate in dividends of 10%, what is k_e?

1.3 Investors in a company are known to require a rate of return of 15%. Current dividends are 30p per share, just paid. No increase is anticipated.

Estimate the share price.

1.4 As in 1.3, but dividends are expected to grow at 5% pa. Again, find P_0.

See **Answer** at the end of this chapter.

1.6 Cum-div and ex-div share prices

Dividends are paid periodically on shares. During the period after the announcement of a dividend but prior to its payment, the price rises in anticipation of the payment. At this stage the price is cum- div, meaning that the shareholders are entitled to receive the dividend when it is paid.

The share goes 'ex-div' shortly before the dividend is paid. Any person acquiring the share after this point will not receive the dividend, which will be paid to the previous shareholder. The reason is that it takes time for the company to amend its register of members after a share transfer, so that there needs to be a cut-off point before the dividend is paid.

Thus, when a share is quoted cum-div, the price includes both the underlying ex-div value of the share and the dividend due shortly. When the share becomes 'ex div', the share price will fall by the amount of the dividend soon to be paid. This is shown in the diagram below.

As the dividend valuation model considers the present value of future dividends, the ex-div share price for P_0 must be used.

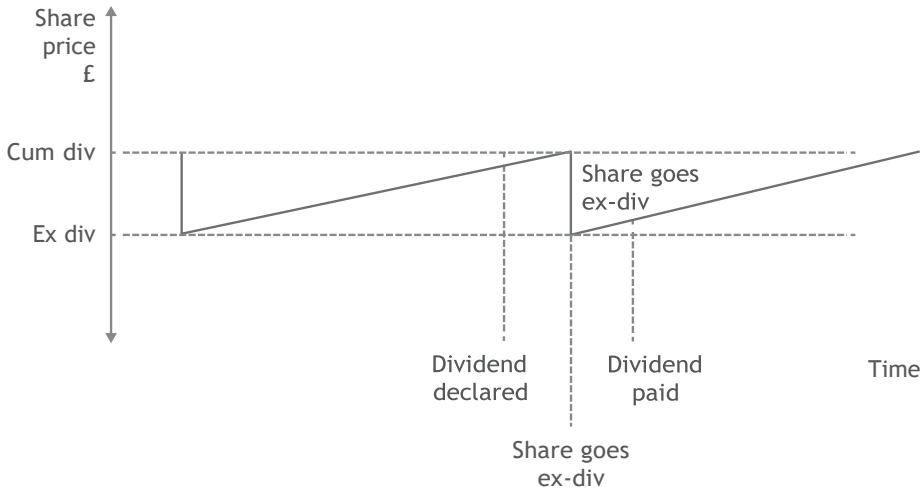


Figure 5.1: Cum-div and ex-div share prices

Interactive question 2: Cost of equity 1

The market value of a company's shares is £2.20. It is about to pay a dividend of 20p, which is expected to remain constant in future.

Requirement

What is the cost of equity?

See **Answer** at the end of this chapter.

Interactive question 3: Cost of equity 2

A company currently pays a dividend of 12p which is expected to grow at 5% per annum. The ex-dividend share price is £1.75.

Requirement

What is the cost of equity?

See **Answer** at the end of this chapter.

1.7 Estimating growth rates

Historical pattern

The anticipated dividend growth rate, g, is an unknown, representing a subjective estimate made by individual investors. It cannot be calculated precisely, but an important factor in investors' estimates will be the historical pattern of growth in dividends. However, the past is often a weak indicator of the future.

Context example: Evaluating future growth based on historic growth

Assume the following data has been assembled concerning the net dividend per share paid in the last five years:

Year	Dividend per share p
20X1	1.00
20X2	1.10
20X3	1.20
20X4	1.34
20X5	1.48

An approximate average period growth rate can be taken by averaging the growth rates of the individual years:

Period

20X1–20X2	1.1/1.0 – 1	=	0.100
20X2–20X3	1.2/1.1 – 1	=	0.091
20X3–20X4	1.34/1.2 – 1	=	0.117
20X4–20X5	1.48/1.34 – 1	=	0.104
			0.412

A more direct compound growth calculation would be:

$1.0 \times (1 + g)^4 = 1.48$

$$(1 + g) = \sqrt[4]{\frac{1.48}{1.0}}$$

$g = 1.103 - 1 = 0.103 = 10.3\%$

The POWER spreadsheet function can also be used for estimating the growth rate. This is explained in detail in Chapter 11, section 1.6.

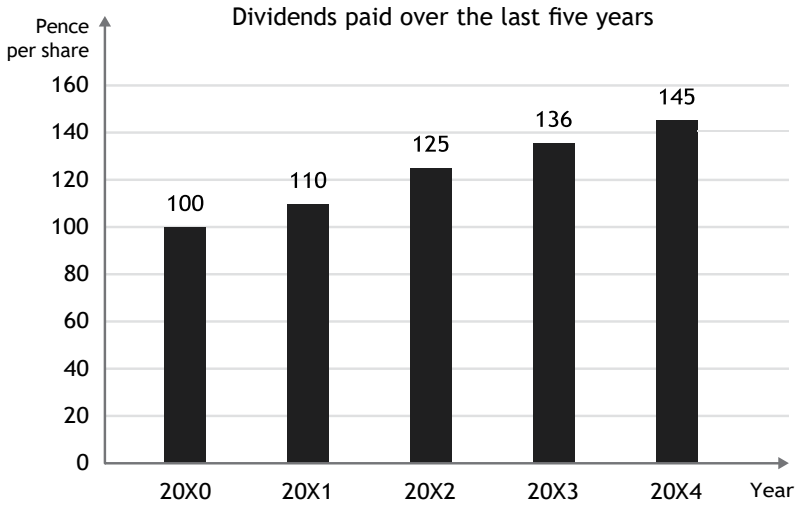
Type **=POWER (**to begin the function entry, then insert the most recent value divided by the oldest value followed by a comma, then insert 1 divided by number of periods of growth, finally insert a closed bracket).

Subtract 1 from this value to obtain the geometric (compound) average growth rate.

	=POWER(B1/B2,1/B3)	
	A	**B**
1	Most recent dividend	1.48
2	Oldest dividend	1.00
3	Time period of growth	4

	=POWER(B1/B2,1/B3)	
	A	**B**
4	POWER function	1.102974
5	Geometric (compound) average growth rate.	10.3% [1]

1 This is (1.102974 – 1) × 100 to show the growth rate as a percentage.



Interactive question 4: Estimating growth rates

A company has paid the following dividends over the last five years:

Requirement

Estimate the growth rate and the cost of equity if the current ex-div market value is £10.50/share.

See **Answer** at the end of this chapter.

Gordon growth model (or earnings retention model)

The Gordon growth model (Gordon and Shapiro, 1956) is similar to the dividend growth model, with the difference that the expected growth in annual dividends is calculated from the proportion of annual earnings that are retained and the rate of return on those retained profits.

The growth estimate is based on the idea that retained profits are the only source of funds. With no re-invested profits, the investment base of the company would not increase. Practically, this means no new funds invested in new products, new markets, new factories, stores and so on. Therefore, profit will not grow, and by implication dividends (taking a long-term view) will not grow.

Growth therefore comes about by **retaining** and reinvesting profits on which a **return** is earned. The relationship between these variables is shown by:

$g = rb$

Where: g = growth in future dividends

r = the current accounting rate of return

b = the proportion of profits (earnings) retained

If all measures are constant, then it may be shown that g, the rate of growth of dividends, is equal to the rate of growth of profits and is equal to the rate of growth in the share price. Given sufficient data, you may be required to estimate a growth rate based on the above model, as illustrated below.

Worked example: Use of Gordon growth model/Earnings retention model

Consider the following summarised financial statements for XZ plc:

Balance sheet as at 31 December 20X1

	£m		£m
Assets	200	Ordinary shares	100
		Reserves	100
	200		200

Profit after tax for the year ended 31 December 20X2: £20m

Dividends (a 40% payout): £8m

Balance sheet as at 31 December 20X2

	£m		£m
Assets	212	Ordinary shares	100
		Reserves £(100 + (20 – 8))	112
	212		212

Requirement

If the company's accounting rate of return and earnings retention rate remain the same, what will be the growth in dividends in the next year?

Solution

> **Tutorial Note**
>
> IAS 1, *Presentation of Financial Statements* changed the titles of financial statements used in IFRSs. Balance sheet became 'statement of financial position', income statement became 'statement of comprehensive income' and cash flow statement became 'statement of cash flows' (para 1.10).
>
> As entities are not required to use the new titles, existing and new names are equally acceptable.

The 20X2 profit after tax as a percentage of opening capital employed = £20m/£200m = 10%.

Applying this to the end-20X2 capital employed (10% × £212m), gives a profit for 20X3 estimated at

£21.20 million.

Therefore, the dividends for 20X3 will be 40% × £21.20m = £8.48 million, representing growth of 6%on the previous year's dividends.

Normally, this is more directly calculated by the following equation:

g = r (= accounting rate of return) × b (= earnings retention rate) = 10% × 60% = 6%

Problems with the Gordon growth model/Earnings retention model

Note that the accounting rate of return is calculated with reference to opening balance sheet values. The major problems with this model are:

- its reliance on accounting profits;
- the assumption that r and b will be constant;
- inflation can substantially distort the accounting rate of return if assets are valued on an historical cost basis; and
- the model also assumes all new finance comes from equity.

Interactive question 5: Applying the Gordon growth/Earnings retention model

A company has 300,000 ordinary shares in issue with an ex-div market value of £1.35 per share. A dividend of £50,000 has just been paid out of post-tax profits of £75,000.

Net assets at the year end were valued at £1.06 million.

Requirement

Estimate the cost of equity.

See **Answer** at the end of this chapter.

Professional skills focus: Structuring problems and solutions

From the information provided it may not be obvious which growth model to apply. If you are given a year on year trend for dividends, this indicates that you should use the historical pattern to predict future growth. If you are provided with net assets you should use the Gordons growth model to calculate the growth rate.

Definition

Cost of equity: The return required by shareholders.

1.8 Shortcomings of the dividend valuation model (DVM)

Whilst the basic premise of the DVM is perhaps reasonable, being that a share is worth more if it is expected to pay out higher future dividends, there are a few problems with the underlying assumptions and with the data used.

- Underlying assumptions:
  - Shares have value because of the dividends. This is not **always** true – some companies have a deliberately low payout policy which can attract investors who prefer capital gains to an income stream. Some companies pay no dividends at all; for example, until some years ago Microsoft paid no dividends but Microsoft shares had a high value.
  - Dividends either do not grow, or grow at a constant rate – the former is unrealistic, the latter is true in the long term if one takes the view we are estimating a long-term average. Nevertheless, short-term variations in expected dividend growth would change the share price.
  - Estimates of future dividends based on historical data, such as historical growth rate and retention rates, implicitly assume dividend patterns will remain unchanged – it would be more useful to consider future market conditions, investor confidence, economic conditions and so on when making the estimate of future dividends.
- Data used:
  - The share price is used in the DVM to help estimate the cost of equity to the company or the required rate of return to the investor.
  - Share prices change on a daily basis, and not always in a perfectly efficient or rational manner.
- The growth in future dividends.

This is perhaps more likely to be linked to the growth in future earnings, than to past dividends. Earnings do not feature as such in the dividend valuation model. However, earnings should be an indicator of the company's long-term ability to pay dividends and therefore, in estimating the rate of growth of future dividends, the rate of growth of the underlying profits must also be considered. For example, if dividends grow at 10% while earnings grow at 5%, before long the firm will run out of funds with which to pay dividends. Similarly, if dividends grow at 5% and profits at 10%, the firm will soon accumulate excess funds.

1.9 Impact of bonus issues and rights issues

Bonus (or scrip or capitalisation) issues raise no new money for a company. Shareholders are given more shares in proportion to their existing holdings. The total value of all the company's shares does not change but the value per share drops in proportion to the additional shares. The fall in price (supposedly) makes the shares more attractive to buy/sell.

Care needs to be taken in estimating dividend growth rates when a bonus issue has taken place.

Context example: Bonus issues

Year	20X1	20X2	20X3
Total dividend (£m)	100	105	111
Total number of shares (m)	50	50	100
Dividend per share (£)	2	2.1	1.11

A 1-for-1 (1:1) bonus issue was made in 20X3.

The dividend per share figures might indicate negative growth in 20X3, but what has happened is that the number of shares has doubled – there is no extra cash to invest in new projects to generate extra dividends.

To calculate growth for the dividend valuation model the simplest thing to do is to go back in time and adjust the number of shares in 20X1 and 20X2 for the bonus issue.

Thus:

Year	20X1	20X2	20X3
Total number of shares (m)	100	100	100
Dividend per share (£)	1	1.05	1.11

To find the growth over the two years:

$1 \times (1 + g)^2 = 1.11$

$(1 + g)^2 = 1.11$

$1 + g = 1.0535$

$g = 5.35\%$

No such adjustment is necessary for rights issues as this does produce an inflow of funds for investment in new projects, increasing future dividends.

1.10 CAPM and the cost of equity

1.10.1 Recap of concept

In Chapter 3, the CAPM was introduced as one way of estimating the required return on a share and thus the cost of equity capital for a company. The basic idea behind the CAPM is to assess how risky the business is, and 'price' that risk accordingly.

The Capital Asset Pricing Model (CAPM) provides a relationship between risk and return: $k_e = r_f + ß_j(r_m - r_f)$

Where: $ß_j$ = the beta which measure a share's (systematic) risk r_m = the return on the market

r_f = the risk-free rate of interest

The CAPM can be used instead of the dividend valuation model to derive the cost of equity (the two models will often produce differing estimates).

Either $ke = \frac{D0\,(1 + g)}{P0} + g$

or

$k_e = r_f + ß_j\,(r_m - r_f)$

Definition

Capital asset pricing model (CAPM): A model for measuring the systematic risk of investments.

Worked example: CAPM

Bloggins plc is an all equity company with an equity beta: $ß_j = 1.10$

The risk-free rate is 4% pa and the return on the market is estimated at 11% pa.

Requirement

Calculate Bloggins' cost of equity.

Solution

$k_e = 4\% + 1.1 (11\% - 4\%)$

$k_e = 11.7\%$

1.10.2 Estimation of the discount rate for a capital investment project

How do we estimate the beta factor of a new capital investment project?

One way to do so is by examining the betas of quoted companies in a similar line of business to the new project.

At first sight this method appears to be easy. For example, a firm wishes to appraise a new project which involves setting up a small chain of retail food shops. Thus, it examines the betas of quoted companies which are involved in food retailing and finds the average to be 0.8. It therefore considers that a suitable beta for the new project is 0.8.

Unfortunately, things are not this simple. The quoted companies the firm examines may be engaged in several lines of business besides food retailing, and may also have a different level of financial gearing. Both these factors affect the beta of a firm's equity. However, there are ways round these problems, and this method remains one of the most practical ways of arriving at a project beta.

Calculations involving different gearing levels are explored in Chapter 6.

1.11 Cost of preference shares

Preference shares usually have a constant dividend. So, using the perpetuity valuation formula: $k_p = D/P_0$

Where: D = constant annual dividend P_0 = ex-div market value

Preference dividends are normally quoted as a percentage. Thus 10% £1 preference shares will provide an annual dividend of 10% of the £1 nominal value (not of the market value).

Interactive question 6: Cost of preference shares

A company has 100,000 12% preference shares in issue, nominal value £1.The current ex-div market value is £1.15/share.

Requirement

What is the cost of the preference shares?

See **Answer** at the end of this chapter.

2 Cost of debt

Section overview

- The cost of irredeemable debt can be assessed using much the same approach as for shares.
- The cost of redeemable debt can be calculated using the RATE spreadsheet function.
- The effect of taxation (tax relief on interest) is to reduce the cost of debt for companies.
- Convertible debt requires an assessment of whether the debt will be converted or redeemed.

2.1 Introduction

The underlying principle of the DVM above was that the value of the investment equaled the present value of the cash flows received.

The same principle is used to identify the cost of debt capital. In simple terms:

$P_0 = D_0/K_e$ – for ordinary shares where dividends are constant $P_0 = D_0/K_p$ – for preference shares

P_0 = Interest/k_d – for bonds Where P_0 = Price of the bond

Interest = Interest paid on the bond

k_d = Required return of debt holder (= cost of debt for the company ignoring tax) This formula assumes that the bond is irredeemable.

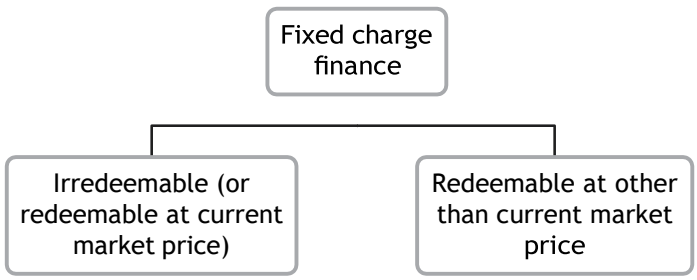
2.1.1 Cum interest and ex interest prices

The ex-interest value of a bond is the value just after the interest has been paid. P_0 should always be the ex-interest value of the bond. If you are given the cum-interest value of the bond, you will need to deduct the next interest payment from the price of the bond to derive its ex-interest value (ie, P_0).

2.2 The two computational problems

Solely from a computational point of view, there are two different aspects to the problem:

Figure 5.2: The two computational problems



The computational problems differ, and are dealt with below. In either case the following point should be borne in mind – the objective is to find the cost of capital in annual compound interest terms.

2.3 Irredeemable securities

If securities are irredeemable, the company does not intend to repay the principal but to pay interest

forever. In this case the present value of a perpetuity equation may be used as introduced above: P_0 = Interest/k_d

Where P_0= Present value

Interest = Annual interest (starting in one year's time)

k_d= Cost of debt (with no tax)

Worked example: Irredeemable debt

Irredeemable debt is quoted at £40% and the coupon (nominal) interest rate is 5%.

Requirement

What is the return on the security?

Solution

- The term '£40%' means that £100 nominal value can be purchased for £40. Bond prices may also be quoted in relation to a par value of £100.00, so that £40.00 means £40 per £100 nominal value of the bonds.
- The nominal or coupon rate of 5% means investors will receive £5 pa for each £100 nominal value of debt security purchased. The return on this investment = £5/£40 = 0.125 or 12.5%
- Put another way if the debt pays £5 pa and investors require a 12.5% return, the debt is worth £5/0.125 = £40
- By paying only £40 for the debt, investors have forced the return up to 12.5%. Presumably they would not pay £100 for this 5% bond as this would then give them a return of only 5%.
- More importantly, if the company were to raise new debt, it would now cost 12.5%. This is the pre- tax cost of the debt.

Context example: Securities redeemable at current market price

If the debt were to be redeemed at £40 in three years' time, what would the investors' return be?

Instead of enjoying a return of £5 from year 4 to infinity, they would receive £40 repayment at year 3. The present value of £5 per year from year 4 to infinity in year 3 terms is:

£5/0.125 = £40 ie, the same as the redemption amount. Therefore, the rate of return is the same – still 12.5%.

Thus, in summary, where either:

(a) The debt is irredeemable; or

(b) The current market price equals the redemption price

then:

Cost to company = return to investor = annual interest payment/market price = Interest/P_0
This ignores taxation. The effect of tax is explored in section 2.6 below.

Note that the redemption price for bonds is usually par value (or an amount close to par value). In the example above, bonds priced at £40 would normally be redeemed at £100, not £40. The current market value of a bond will only be the same as the redemption price when (a) the bond is very close to redemption or (b) when the coupon rate is equal to the required return of the bond investors.

2.4 Securities redeemable at other than current market price

Where there is a difference between the current market price and the redemption price, there are two elements to the cost of that security:

(a) Interest payments ie, an income return

(b) A capital gain or loss represented by the difference between the current market price of the bond and the redemption price

The RATE spreadsheet function is used to calculate the pre-tax yield to maturity on a redeemable bond (ie, the pre-tax cost of redeemable debt), this is also known as the gross redemption yield of the bond. This is covered in Chapter 11 section 1.4.

Worked example: Redeemable debt

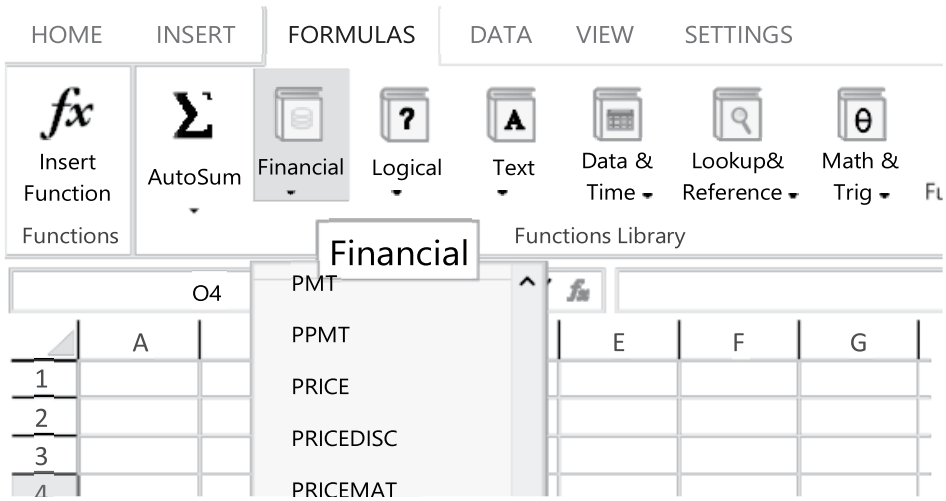
If a company's debenture stock is quoted at £65.75 and coupon interest of 9% pa, payable annually, has just been paid. Redemption is in 10 years' time at par.

Requirement

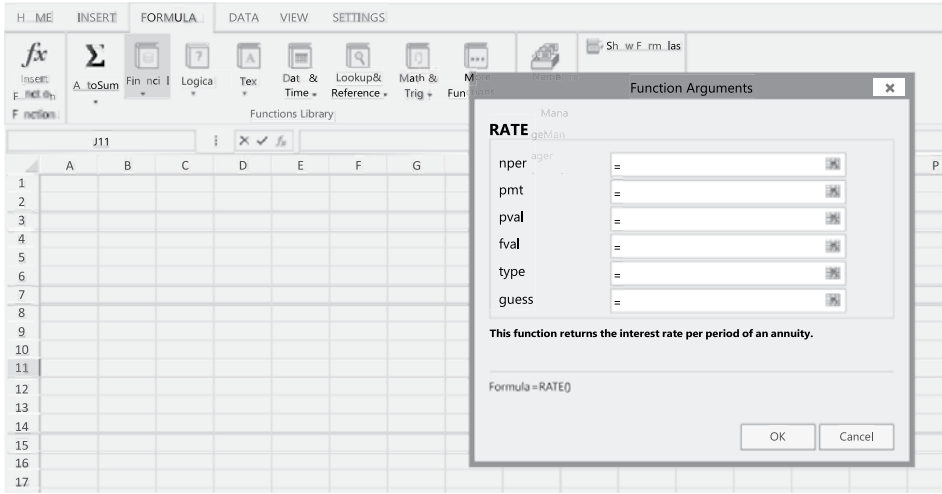
What is the cost of the debt capital?

Use the RATE spreadsheet function to estimate this cost. Ignore taxation.

Solution



After selecting RATE, the following information will need to be input:



To access the RATE formula, select 'formulas' from the toolbar, click on 'financial' and then choose RATE from the dropdown menu as illustrated here:

After selecting RATE, the following information will need to be input:

Nper = the number of periods

Pmt = the amount (of interest) paid in any single period

Pval = the present value of the asset (its market price), **inserted as a negative number**

Fval = the future value (the amount paid at maturity)

This will give the yield to maturity over a given period.

	A	B
1	Nper = the number of periods	10
2	Pmt = the amount (of interest) paid in any single period	9
3	Pval = the present value of the asset (its market price)	-65.75
4	Fval = the future value (the amount paid at maturity)	100
5	**Yield to maturity**	**0.1612**

The cost of debt ignoring tax is 16.12%.

Worked example: Redeemable debt – semi-annual coupon payments

A 6% coupon bond, with semi-annual coupon payments, is redeemable in five years' time at its par value of £100. The current market price of this bond is £105 per £100 nominal value.

Requirement

Calculate the annual yield to maturity of this bond.

Solution

To calculate the annual yield to maturity, the following variables need to be input to the RATE function.

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods	10 [1]
2	Pmt = the amount (of interest) paid in any single period	3 [2]
3	Pval = the present value of the asset (its market price)	–105
4	Fval = the future value (the amount paid at maturity)	100
5	Yield to maturity	0.0243 [3]
6	Annual yield to maturity	0.0486 or 4.86% [4]

1 This is the number of six-month periods over which payments are made (ie, 5 × 2).

2 This is the semi-annual coupon, calculated as £6 divided by 2 = £3.

3 This is the yield expressed in terms of the period assessed, which is six months here.

4 This is the annualised yield to maturity, calculated as 2.43% multiplied by 2.

2.5 The market price of bonds and raising finance

In establishing the gross redemption yield (GRY) investors will take a view on future interest rates and risk. The GRY will determine the price investors are willing to pay for new issues of bonds.

If the GRY is less than the coupon rate on new bonds, the bonds will be issued at a premium on the nominal (par) value and if the GRY is more than the coupon rate, the bonds will be issued at a discount on the nominal (par) value. When the GRY is equal to the coupon, the bonds will be issued at the nominal (par) value.

When raising a set amount of finance, if the bonds are issued at a premium or discount on the nominal value this will affect the **total** nominal value of the bonds to be issued.

Worked example: GRY and issue price

ABC plc wishes to raise £100 million by an issue of three-year 6% coupon bonds that will be redeemed at their nominal value of £100.

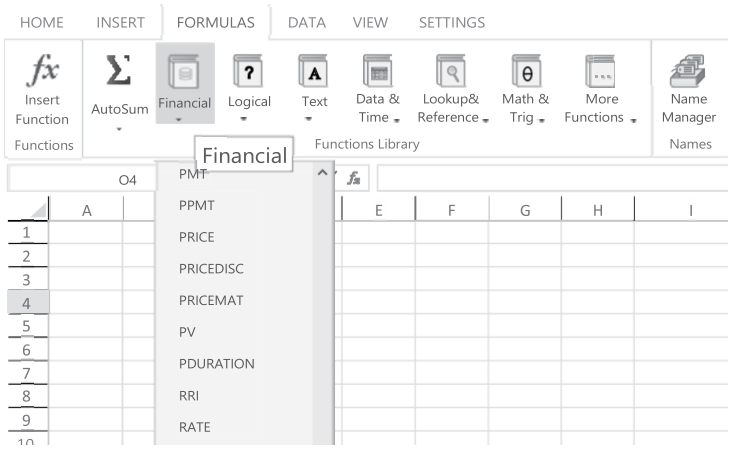
Requirement

Calculate the issue price of the bonds per £100 nominal at GRYs of 5% and 8% and the total nominal value of the bond issue at each issue price.

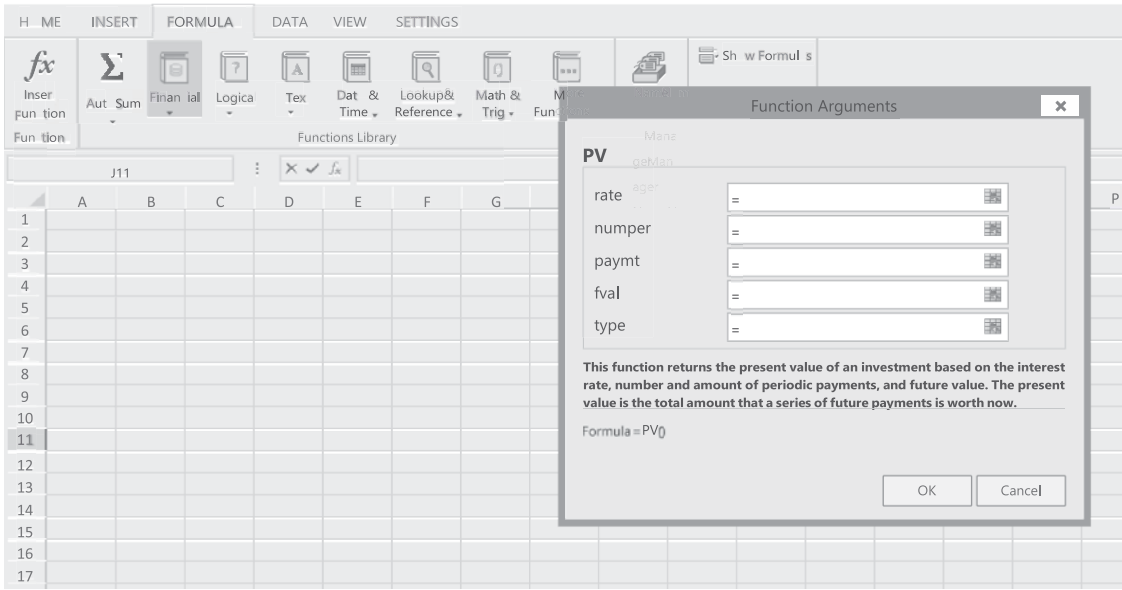
Solution

The issue price of the bonds with a GRY of 5% = £102.72.

To calculate the issue price, the following variables need to be input to the PV function. Using the PV function is explained in more detail in Chapter 11, section 1.5. To access the PV formula, select 'formulas' from the toolbar, click on 'financial' and then choose RATE from the drop-down menu as illustrated here:



After selecting PV, the following information will need to be input:



Rate = the yield to maturity for the period that reflects the frequency of the payments.

Numper = the number of periods

Paymt = the amount (of interest) paid in any single period

Fval = the future value (the amount paid at maturity)

This will give the present value (ex interest) of the asset being assessed (eg, a bond).

=PV(B1,B2,B3,B4)		
	A	**B**
1	Rate of return required over the period	0.05
2	Nper = the number of periods	3
3	Pmt = the amount (of interest) paid in any single period	6
4	Fval = the future value (the amount paid at maturity)	100
5	Present value (issue price)	–102.72

The issue price of the bonds with a GRY of 8% = £94.85

=PV(B1,B2,B3,B4)		
	A	**B**
1	Rate of return required over the period	0.08
2	Nper = the number of periods	3
3	Pmt = the amount (of interest) paid in any single period	6
4	Fval = the future value (the amount paid at maturity)	100
5	Present value (issue price)	–94.85

The total nominal value of the bond issue at the two issue prices will be as follows: Bond issue price £102.72:

The total nominal value of the bond issue to raise £100m = £100m/(£102.72/£100) = £97.35m. This will be 973,500 bonds with a nominal value of £100.

Bond issue price £94.85:

The total nominal value of the bond issue to raise £100m = £100m/(£94.85/£100) = £105.43m. This will be 1,054,300 bonds with a nominal value of £100.

Worked example: Longer term bonds with semi-annual coupon – GRY

KSN's bonds have a coupon of 7% (semi-annual coupon payments), they will be redeemed in 30 years' time at their par value of £100. The current market price of KSN's bond is £110 per £100 nominal value.

Requirement

What is the gross redemption yield of KSN's bond?

Solution

The GRY of KSN's bond can be calculated using the RATE function.

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods	60 [1]
2	Pmt = the amount (of interest) paid in any single period	3.50 [2]
3	Pval = the present value of the asset (its market price)	–110
4	Fval = the future value (the amount paid at maturity)	100
5	Gross redemption yield	0.0313 or 3.13% [3]
6	Annual gross redemption yield	6.26% [4]

1 This is the number of six-month periods over which payments are made (ie, 30 × 2).

2 This is the semi-annual coupon, calculated as £7 divided by 2 = £3.50.

3 This is the yield expressed in terms of the period assessed, which is six months here.

4 This is the annualised yield to maturity, calculated as 3.13% multiplied by two.

Worked example: Longer term bonds with annual coupon – Issue price

KSN wishes to raise £100 million by an issue of 20-year 6% coupon bonds that will be redeemed at their nominal value of £100. The GRY of KSN's existing bonds is 6.26% (see previous Worked example). Investors have indicated that they are willing to accept the same GRY as that generated by KSN's existing bonds.

Requirement

Calculate the issue price of the bonds and the total nominal value of the bond issue.

Solution

To calculate the issue price, the following variables need to be input to the PV function:

=PV(B1,B2,B3,B4)

	A	B
1	Rate of return required over the period	0.0626
2	Nper = the number of periods	20

	=PV(B1,B2,B3,B4)	
	A	**B**
3	Pmt = the amount (of interest) paid in any single period	6
4	Fval = the future value (the amount paid at maturity)	100
5	Present value (issue price)	–97.08

Bond issue price is £97.08.

The total nominal value of the bond issue to raise £100m = £100m/(£97.08/£100) = £103,007,829

This will be 1,030,078 bonds with a nominal value of £100.

2.6 Effect of taxation

An important aspect in evaluating the cost of debt finance is the effect of tax. Loan interest is an allowable expense for corporation tax, effectively reducing the cost of loan finance to the company.

Worked example: Effect of taxation

Consider two companies, A and B, with identical operating profits of £100,000 on which they pay corporation tax at 17%. However, Company B has in issue £50,000 of debentures on which it is paying 20% interest (£10,000 per annum). The debentures have a market value equal to par (£100.00).

Requirement

How does tax influence the cost of debt?

Solution

	Company A	Company B	Difference (A – B)
	£	£	£
Operating profit	100,000	100,000	
Interest		(10,000)	(10,000)
Profit before tax	100,000	90,000	
Tax @ 17%	(17,000)	(15,300)	1,700
Earnings available for equity	83,000	74,700	(8,300)

The effective interest cost to Company B is £8,300. Since the debentures are valued at par their cost is 16.6% of the £50,000 debentures. This may be expressed in a general form, where k_d is the after- tax cost and T the corporation tax rate.

Net of tax cost of debt, k_d = Pre-tax cost of debt (1 – T) In this example k_d = 20% (1 – 0.17) = 16.6% (as above).

The adjustment is only valid for irredeemable loan stocks or those redeemable at current market price, assuming immediate tax relief.

k_d = Interest (1 – T)/P_0

Interactive question 7: Effect of taxation

12% irredeemable debentures with a nominal value of £100 are quoted at £92.00 cum interest. The rate of corporation tax is 17%.

Requirements

7.1 Find the gross return required by the debenture holders.

7.2 Find the net of tax cost to the company.

See **Answer** at the end of this chapter.

2.7 Taxation and premium on redemption

Where there is a premium on redemption, the same RATE spreadsheet function is used to calculate the pre-tax yield to maturity on a redeemable bond. This is also known as the gross redemption yield.

The post-tax cost of debt is then calculated by multiplying the gross redemption yield by (1 – T).

Interactive question 8: Taxation and premium on redemption

A company has 10% debentures in issue quoted at £98.00 ex interest. The debentures will be redeemed in five years at a premium of 5% compared to the nominal value.

Corporation tax rate = 17%

Requirement

What is the cost to the company if interest is paid annually?

See **Answer** at the end of this chapter.

Interactive question 9: Taxation with semi-annual coupon payments

PYL has in issue 5% (semi-annual coupon payments) debentures that are redeemable at par (£100) in 12 years' time and their current market price is £95.5 (cum-interest). The corporation tax rate is 17%.

Requirement

Calculate PYL's after-tax cost of debt.

See **Answer** at the end of this chapter.

2.8 Convertible debentures/loan stock

Convertible debentures/loan stock allow the investor to choose between taking cash at redemption or converting the debentures into a pre-determined number of shares.

Step 1 Calculate the value of the conversion option using available data.

Step 2 Compare the conversion option with the cash option (redemption option). Assume all investors will choose the option with the higher value.

Step 3 Use the RATE spreadsheet function to calculate the pre-tax yield to maturity as for redeemable debentures.

Note: There is no tax effect whichever option is chosen at the conversion date.

Interactive question 10: Loan stock

A company has in issue 8% convertible loan stock currently quoted at £85.00 ex interest. The loan stock is redeemable at a 5% premium in five years' time, or can be converted into 40 ordinary shares at that date.

The current MV ex div of shares is £2/share with a dividend growth of 7%.

Requirement

What is the cost to the company of the loan stock? Corporation tax = 17%.

See **Answer** at the end of this chapter.

3 Combined cost of capital or weighted average cost of capital

Section overview

- The WACC is the cost of the pool of funds – both equity and debt – within a business.
- The weightings should reflect the capital structure of the company.
- The weightings should be based on market values.
- Calculation of the WACC assumes no changes in either the financial risk or systematic risk of the company.

3.1 The concept of a weighted average cost of capital

In the analysis carried out so far, each source of finance has been examined in isolation. However, in practice, funds for businesses come from various sources. There is not normally any separation between funds from different sources and their application to specific projects.

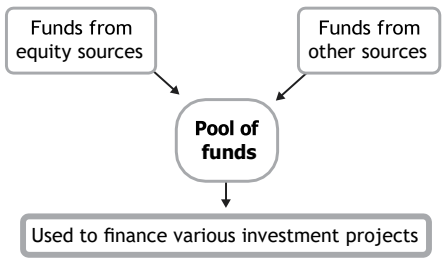


Figure 5.3: Pool of funds

In order to provide a cost of capital (discount rate) for investment appraisal of projects, the cost of the pool of funds is required. The general approach is to calculate the cost of each source of finance, then to weight these according to their importance (relative market value) in the financing mix. This is referred to as the combined or weighted average cost of capital (WACC).

Definition

Weighted average cost of capital (WACC): The cost of the pool of funds, both equity and debt, within a business.

3.2 The choice of weights

The importance of each source of finance in the mix may be measured in various ways.

Weights based on proposed future financing versus historical finance mix

As has already been discussed, the cost of capital should reflect future costs of finance, because in decision-making concern is only with the future. Weights based on the expected future financing mix would therefore seem to be the logical choice. However, caution must be exercised. Consider the following illustration.

Worked example: Weightings in the WACC

Sport plc has traditionally raised funds in the proportion 50% equity : 50% debt. Consultants have estimated from current market data that these sources of finance have the following costs:

Cost of equity	20%
Cost of debt	10%

Sport plc is appraising a new project costing £1 million which it intends to finance entirely by a new issue of debt.

Requirements

1 What discount rate should it use to appraise the project?
2 If 50% equity: 50% debt is considered the best mix, why use just debt for the new project?
3 If just debt is being used, why not discount the project using the cost of debt?
4 What are the likely implications for the cost of equity, and thus the WACC, if the debt increases significantly such that the long-term gearing changes?

Solution

1 This depends upon what is assumed.

The most likely situation is that **in the long run** the firm will maintain **its historical mix** and raise funds in the proportion 50% equity : 50% debt.

In this case the weighted average cost of capital (WACC) will be as follows:

(Proportion of equity funding × cost of equity) + (Proportion of debt funding × cost of debt)

= (0.5 × 20%) + (0.5 × 10%) = 15%

2 If a capital structure of 50% equity and 50% debt has been preferred historically, why is the firm now raising new funds entirely by debt? The most likely answer is that transaction costs would make the issue of small amounts of debt and equity expensive. The firm would therefore raise debt on this occasion, and equity next time, aiming to keep its long-run structure at 50:50. This is a common practice.

3 Discounting using the cost of debt ie, 10%, is inappropriate because this represents the risk to the lenders, and not the risk of the project.

Using specific costs of capital in this way would mean that a project with an IRR of 15% would be accepted if the cash were to come from a new issue of debt, but rejected if from a share issue.

4 If the firm were to change to long-run proportions of finance involving much higher levels of debt, then the underlying costs of funds would probably change. Equity holders would see their position as being much more risky because of the higher gearing (as larger amounts of debt interest would need to be paid) and debt investors would have little security for their loans. Both would ask for higher returns to compensate for the increased risk.

What would be the result?

Suppose that financing the new project entirely by debt signals the firm's intention to change to a new financing mix of 75% debt : 25% equity. Investors react to this change by adjusting their required returns to:

Cost of equity = 22% Cost of debt = 12%

The new combined cost of capital would then be:

(0.25 × 22%) + (0.75 × 12%) = 14.5%

In this case the move has been beneficial, resulting in a lower combined cost of funds. The most important point, however, is that the costs of debt and equity have changed, and the original estimates which were based on the current level of gearing cannot be employed.

Substantial changes in the long-run financing mix can change the costs of funds. This will be investigated in more detail in the next chapter on capital structure.

3.3 Conclusion

The cost of an individual source of finance should not be associated with an individual project. In the above example it would be incorrect to discount project returns at the cost of debt because it was being financed entirely by debt. In the long run the firm would need to raise some equity to balance the debt finance and the cost of the overall pool of funds should be considered, not the costs of individual sources of finance.

The weightings should be based on the long-run proportions in which future funds are to be raised. This is often estimated from the past proportions in which funds were raised, and so it is often assumed that the current financing mix is a good representation of the future financing mix. This approach should be adopted unless there is good evidence that the future mix will change.

If it is known that the future financing mix is to change, the calculations should be based on these new proportions. It should also be noted that if proportions of debt and equity change, their costs could also alter, as will be discussed in the next chapter.

3.4 Market weights or book weights

A weighted average cost of capital could be measured using either book values or market values for debt and equity. Book values normally give a lower cost, as the proportion of equity in the total book value of capital is much smaller than in the total market value of a company's capital. The value of equity in the balance sheet (nominal value plus retained earnings, share premium account, etc) owes much to history eg, when the shares were issued originally and at what price, rather than to the **current** value of those shares. Market weights are far more meaningful.

Whenever possible calculations should be based on market weights, which represent the opportunity cost of finance (at what value it could be redeemed, or the value at which new funds could be raised).

Note that when using market values, reserves (such as share premium and retained earnings) are ignored. They are in effect incorporated in the value of the equity.

If it is known that the future financing mix is to change

Professional skills focus: Applying judgement

Remember, market values change, and risk assessment is only a best estimate, so the calculation of WACC is simply an estimate at a point in time and will change as the underlying variables change. It is important directors do not overly rely on a single calculation but track the WACC regularly and use an average or most frequent position.

3.5 Procedure for calculating WACC

The company's weighted average cost of capital, k, may be calculated as follows, when there is only one debt security, and so just one cost of debt capital:

$$k = \frac{(MVe \times ke) + (MVd \times kd)}{MVe + MVd}$$

Where MV_e = total market value of all the equity MV_d = total market value of all the debt
That is, the individual costs of equity and debt capital are taken and each is weighted by the proportion of its market value to the company's total market value.

Worked example: Finding the WACC

Thus, given the following data about a company:

$MV_e = £500{,}000 k_e = 0.20$

$MV_d = £500{,}000 k_d = 0.10$

Requirement

What is the WACC?

Solution

Substituting this data into the expression for the WACC:

$$k = \frac{(£500{,}000 \times 0.20) + (£500{,}000 \times 0.10)}{£(500{,}000 + 500{,}000)} = 0.15$$

15% is the discount rate to be used in the company's investment appraisal.

CHAPTER 5

This formula can be extended to incorporate other forms of long-term finance, such as preference shares or bank loans.

Interactive question 11: Calculating WACC

The market value of the debt is £1 million and its cost is 6%. The market value of the equity is £2 million and its cost is 15%.

Requirement

Calculate the WACC.

See **Answer** at the end of this chapter.

Professional skills focus: Assimilating and using information

When considering a WACC calculation, it is important to review and reflect on all of the information available and determine how it fits into the components of the WACC calculation.

3.6 When to use the weighted average cost of capital

The weighted average cost of capital calculated in the above example is based on the firm's current costs of equity and debt. In using it to appraise projects, the following assumptions are implicitly made:

- **The historical proportions of debt and equity are not to be changed**

  The cost of equity and debt based on current market information reflects the firm's current gearing ratio. If the firm substantially changes the long-run proportions in which funds are raised, then the costs of equity and debt are likely to change with a resulting alteration in the weighted average cost of capital. This changing of the company's so-called financial risk (due to changes in financial gearing) is the subject of the next chapter.

- **The systematic business risk of the firm is not to be changed**

  The firm's current costs of equity and debt also reflect the risks in its current area of operations. For example, high-risk electronics companies are likely to have higher costs of funds than, say, low risk food manufacturers. If a food manufacturing company were to diversify into electronics, its cost of capital would change. Current estimates of the cost of capital are therefore only suitable for appraising investments of similar systematic business risk. CAPM could be used to derive the cost of equity where the systematic risk of the project is different from the systematic risk of existing activities.

- **The finance is not project-specific**

  In some circumstances it is unwise to use the average cost of a pool of funds. Suppose a government offered a multinational company an interest-free loan to encourage it to invest in a particular country. In this situation it would be unwise to put the cheap loan into the pool of funds and spread its benefit over all projects, as it is associated with only one specific project. In these circumstances the benefits of the cheap finance would need to be credited to the project.

  Fortunately, this problem is outside the syllabus.

Professional skills focus: Concluding, recommending and communicating

As with any model, it is good practice to clearly state the result at each part of the calculation together with any assumptions you have made, and reservations as to the reliability of the outcome determined. This will provide depth to your conclusion which demonstrates the ability to communicate the overall outcome to key stakeholders.

3.7 Other problems with the weighted average cost of capital

- **Which sources of finance to include**

  The above examples have concentrated on the cost of long-term finance. Firms also raise finance from short-term sources eg, overdrafts, short-term loans, trade credit and so on. It is possible to calculate a cost for short-term finance and it needs to be decided whether it should be included in the calculations.

- **Loans without market values**

  Bank loans do not have market values in the same way as debentures. The most practical approach to calculating a cost of capital for medium-term bank loans is to take the book value of the loans as an approximation to market value, and use the interest rate (adjusted for tax relief) currently payable on the loan (which may be at a variable rate) as its cost.

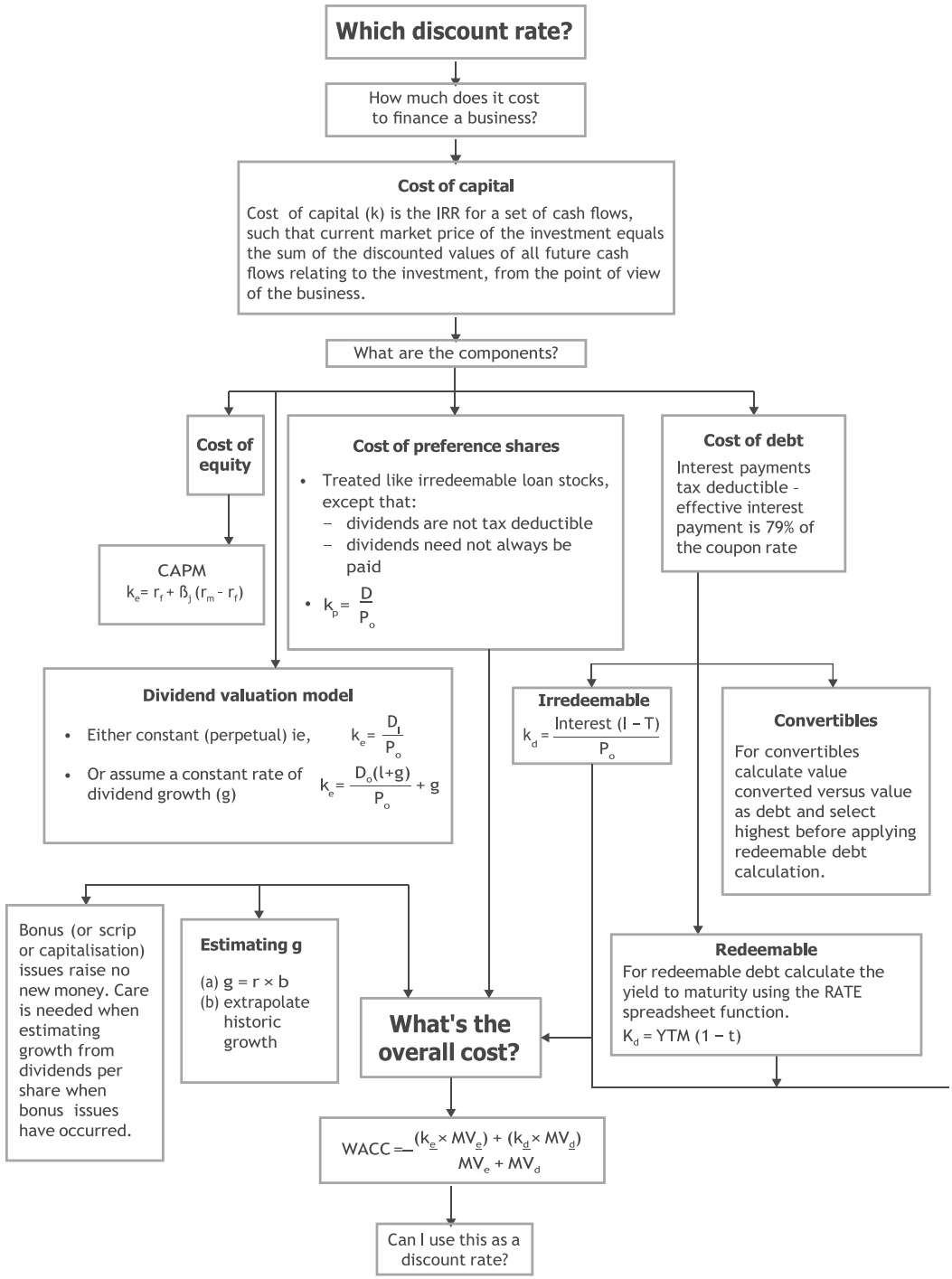
- **Cost of capital for small companies**

  There are important factors relevant to the cost of capital of small companies:

  – If the company is unquoted, obtaining a cost of capital is much more difficult.

  – The lack of liquidity offered by the company's securities, plus the smaller size of the company, tend to make finance more expensive. In addition, there is no share price on which to base an estimate of the cost of equity.

Summary


Which discount rate?
How much does it cost to finance a business?
Cost of capital
Cost of capital (k) is the IRR for a set of cash flows, such that current market price of the investment equals the sum of the discounted values of all future cash flows relating to the investment, from the point of view of the business.
What are the components?
Cost of equity
CAPM
$k_e = r_f + \beta_j (r_m - r_f)$
Cost of preference shares
Treated like irredeemable loan stocks, except that:
– dividends are not tax deductible
– dividends need not always be paid
$k_p = \frac{D}{P_o}$
Cost of debt
Interest payments tax deductible - effective interest payment is 79% of the coupon rate
Dividend valuation model
Either constant (perpetual) ie, $k_e = \frac{D_1}{P_o}$
Or assume a constant rate of dividend growth (g) $k_e = \frac{D_o(1+g)}{P_o} + g$
Irredeemable
$k_d = \frac{\text{Interest } (1 - T)}{P_o}$
Convertibles
For convertibles calculate value converted versus value as debt and select highest before applying redeemable debt calculation.
Bonus (or scrip or capitalisation) issues raise no new money. Care is needed when estimating growth from dividends per share when bonus issues have occurred.
Estimating g
(a) g = r × b
(b) extrapolate historic growth
What's the overall cost?
Redeemable
For redeemable debt calculate the yield to maturity using the RATE spreadsheet function.
K_d = YTM (1 – t)
$WACC = \frac{(k_e \times MV_e) + (k_d \times MV_d)}{MV_e + MV_d}$
Can I use this as a discount rate?

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Can you calculate growth using the Gordon growth model? (Topic 1)
2.	Can you calculate the cost of equity using CAPM and the dividend valuation model? (Topic 1)
3.	Can you calculate the cost of irredeemable and redeemable debt? (Topic 2)
4.	Can you calculate the cost of convertible loan stock? (Topic 2)
5.	Do you understand why we use WACC as the discount rate for investment appraisal? (Topic 3)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
2. Thamos plc	This question focusses on the cost of equity using the dividend valuation model. It is a good question to practice before moving onto the more complex calculation of WACC.
5. Redcoats plc	This question includes a good mix of calculating WACC and discussing the problems encountered when estimating WACC. Students often focus only on the calculations therefore this is a key question to attempt in full.
7. Windmill plc (parts a and b only)	This question tests your understanding of using both the Gordon growth model and CAPM to calculate the cost of equity within the WACC calculation.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the learning in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Technical reference

Gordon, MJ and Eli Shapiro, (1956). "Capital Equipment Analysis: The required rate of profit", Management Science.

Self-test questions

Answer the following questions.

1 Fizzers plc

Fizzers plc is a small listed UK company which makes a range of soft drinks, over 90% of which are sold in the UK market. The company currently has a cash surplus, and the directors are contemplating a major investment in a plant in the Middle East to supply the local market. The Middle East market, important for the company, is currently supplied from the UK.

To assess the economic viability of the investment, the finance department needs a rate at which to discount the projected cash flows from the plant. It has been decided to use the company's weighted average cost of capital (WACC), deducing the cost of equity through the dividend growth model. The company's most recent balance sheet, dated 31 August 20X9, included the following 'capital and reserves' section.

	£'000
Called up share capital (ordinary shares of £0.10 each, fully paid)	5,750
Retained earnings	29,750

The company also had in issue £100 million of 9% loan stock. This is to be redeemed on 1 September 20Y0 at par. Interest is payable (in arrears) on 1 September each year. It has been the company's practice to pay a single dividend each year during September.

Dividends paid per share over recent years have been as follows.

	Pence
20X4	21.25
20X5	22.50
20X6	22.50
20X7	24.50
20X8	25.00

The 20X9 dividend will be 25.50 pence per share. The company's issued and fully paid share capital has not altered since 20X3.

At 31 August 20X9 the shares were quoted at £3.35 per share (cum-div) and the loan stock at

£101.72 (cum-interest) per £100 nominal.

The corporation tax rate is expected to remain at 17% for the foreseeable future.

Requirements

1.1 Determine the company's weighted average cost of capital, explaining your workings and justifying any assumptions which you have made.

(9 marks)

1.2 Explain why the figure which you have determined in 1.1 may not be totally reliable for the purpose for which it has been determined.

(5 marks)

1.3 As an alternative to investing in the Middle Eastern plant the directors are considering a takeover bid for Zoom plc, another UK soft drinks manufacturer. One of the directors, a member of the ICAB, has shares in Zoom plc.

Requirements

Set out the advantages and disadvantages of the following three types of bid.

(1) Cash

(2) Share-for-share exchange

(3) Loan stock for share exchange.

(6 marks)

1.4 What are the ethical issues surrounding the takeover bid?

(3 marks)
Total: 23 marks

2 Thamos plc

Thamos plc is a successful food retailing company. Over the last five years it has increased its share of the UK food retail market by 30%. It makes no use of debt and has financed its operations entirely from retained earnings. Thamos plc has a current price/earnings ratio of 28 compared with the food retailing sector average of 19. Other financial data relating to the company are shown below.

	20X2 p	20X3 p	20X4 p	20X5 p	20X6 p
Earnings per share	16.10	19.30	24.70	30.50	35.80
Net dividend per share	4.86	5.86	7.50	9.00	11.00
Book value of equity per share	103.00	124.00	142.00	165.00	190.00

Requirements

2.1 Estimate the cost of equity capital for Thamos plc using the following.

- Dividend valuation model
- Gordon growth/Earnings retention model

(6 marks)

2.2 Discuss whether the assumptions underlying the models used in part 2.1 are realistic, and explain how the effects of using these assumptions are reflected in the results obtained.

(6 marks)

2.3 Explain why managers need to know the cost of the equity capital of their companies.

(6 marks)
Total: 18 marks

3 Osmin plc

The directors of Osmin plc are considering opening a factory to manufacture a new product. Detailed forecasts of the product's expected cash flows have been made, and it is estimated that an initial capital investment of £2.5 million is required. The company's current (31 December 20X1) authorised share capital consists of 4 million ordinary shares, each with a nominal value of 25p.

During the last five years the number of shares in issue has remained constant at 3 million, and the market price per share at 31 December 20X1 is 135p ex-dividend.

The company pays only one dividend each year (on 31 December) and dividends for the last five years have been as follows.

Year	20W7	20W8	20W9	20X0	20X1
Dividend per share (pence)	10.0	10.8	11.6	13.6	13.6

Osmin plc currently has in issue £800,000 8% (semi-annual coupon payments) debentures redeemable at par on 31 December 20X5. The current market price of these debentures is £82.50 ex-interest. The company also has an outstanding £900,000 bank loan repayable on 31 December 20X9. The rate of interest on this loan is variable, being fixed at 1.5% above the bank's base rate which is currently 15%.

Requirements

3.1 Calculate the weighted average cost of capital (WACC) for Osmin plc as at 31 December 20X1.

(6 marks)

3.2 Explain briefly to the directors of Osmin plc what assumptions they are making if the WACC calculation in 3.1 above is used to discount the expected cash flows of the project.

(6 marks)

3.3 Describe the practical problems that might be encountered when attempting to compute the WACC for a large Bangladeshi listed company.

Note: Ignore taxation.

(8 marks)
Total: 20 marks

4 Crowlands plc

Crowlands plc is a listed manufacturing company financed by a mixture of debt and equity. The company's finance department is about to undertake its annual revision of the weighted average cost of capital (WACC) for use in all of the company's investment appraisals for the forthcoming year. The following information on the company's long-term financing was available as at 31 May 20X1.

	£m
220 million ordinary shares of 25 pence each	55
Share premium	23
Revaluation reserve	26
Retained earnings	33
12% (semi-annual coupon payments) loan stock (20X3)	100

The loan stock interest for the year has just been paid. The loan stock will be redeemed at par in cash. The company has also just paid a dividend on its ordinary shares of 23 pence. This was the total dividend for the year. Dividends have grown by an average annual rate of 5% over recent years, but year-to-year growth has been as high as 10% and as low as 2% during individual years.

The shares are currently quoted at 370 pence each, and the loan stock at £104 (per £100 nominal). The company's corporation tax rate is 17%.

Several of the directors believe that the company is relatively low-geared and there is talk of making a substantial loan stock issue during the forthcoming year.

Requirements

4.1 Determine the company's WACC, ignoring any possibility of a further loan stock issue. All of your workings should be clearly explained and you should justify the weightings used.

(6 marks)

4.2 Explain any reservations you might have about using the figure determined in 4.1 for assessing all potential projects during the forthcoming year, still ignoring any possibility of the loan stock issue.

(6 marks)

4.3 Explain how, with reference to relevant theory and in practice, a possible loan stock issue would affect the validity of the WACC determined in 4.1.

(5 marks)
Total: 17 marks

5 Redcoats plc

Redcoats plc is a holding company owning shares in various subsidiary companies. Its directors are currently considering several projects to increase the range of the business activities undertaken by

Redcoats plc and its subsidiaries. The directors would like to use DCF techniques in their evaluation of these projects but, as yet, no weighted average cost of capital has been calculated.

Redcoats plc has an authorised share capital of 10 million 25p ordinary shares, of which 8 million have been issued. The current ex-dividend market price per ordinary share is £1.10. A dividend of 10p per share has been paid recently. The company's project analyst has calculated that 18% is the most appropriate after-tax cost of equity capital.

Capital structure information for both the group and the holding company are given below.

Redcoats plc

	and subsidiaries	Redcoats plc
	£'000	£'000
Issued share capital	2,000	2,000
Share premium	1,960	1,960
Reserves	3,745	708
Shareholders' funds	7,705	4,668
Non-controlling interests	895	Nil
3% irredeemable debentures	1,400	–
9% redeemable debentures	1,500	1,500
6% loan stock	2,000	2,000
Bank loans	1,540	600

All debt interest is payable annually and all the current year's payments will be made shortly. The current **cum-interest** market prices for £100 nominal value stock are £31.60 and £103.26 for the 3% and 9% debentures respectively. The 9% debentures are redeemable at par in 20 years' time and the 6% loan stock is redeemable at par in 10 years' time. The 6% loan stock is not traded on the open market but the analyst estimates that its actual pre-tax cost is 10% per annum. The bank loans bear interest at 2% above base rate (which is currently 11%) and are repayable in six years. The effective corporation tax rate of Redcoats plc is 17%.

Requirements

5.1 Calculate the effective after-tax weighted average cost of capital as required by the directors.

(8 marks)

5.2 Discuss the problems that are encountered in the estimation of a company's weighted average cost of capital when:

- bank overdrafts; and
- convertible loan stock

are used as sources of long-term finance.

(6 marks)

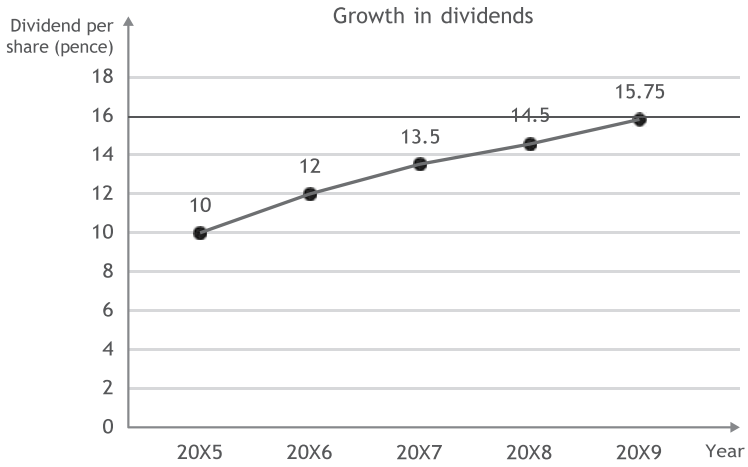
5.3 Outline the fundamental assumptions that are made whenever the weighted average cost of capital of a company is used as the discount rate in net present value calculations.

Note: Ignore personal taxation.

(6 marks)
Total: 20 marks

6 Gale plc

Gale plc (Gale) is an information technology services company listed on the Stock Exchange which is looking to expand its operations into the provision of self-service point-of-sale systems for supermarkets across Europe. The company has grown rapidly in recent years with annual dividends having seen consistent growth as follows:



The company expects dividends to continue to grow for the foreseeable future in line with this recent dividend profile. Extracts from the company's most recent balance sheet at 31 May 20X9 are set out below:

	£'000	£'000
Ordinary £1 shares	14,000	
5.5% £1 irredeemable preference shares	10,000	
Retained earnings	19,400	
Total equity		43,400
7% irredeemable debentures (at nominal value)	50,000	
6% unsecured (semi-annual coupon payments) loan notes (at nominal value)	36,000	
Total non-current liabilities		86,000

The current ex-dividend ordinary share price is £3.50, whilst the current ex-dividend preference share price is £0.77. The irredeemable debentures have a current ex-interest market price of £86.50 per

£100 debenture, whilst the unsecured loan notes have a current ex-interest market price of £84 per

£100 loan note and will be redeemable at par in 20 years' time. The company pays corporation tax at a rate of 17%. The company's current liabilities do not include any overdraft borrowing.

Regarding the company's proposed expansion plans, the chief executive has expressed his preference for any financing requirements to come from increasing debt rather than increasing equity in order to move towards minimising the company's weighted average cost of capital.

Requirements

6.1 From the available information calculate, using market values, the company's weighted average cost of capital.

(10 marks)

6.2 With reference to relevant theories, discuss the preference of the chief executive for any financing to come from increasing debt rather than increasing equity in order to move towards minimising the company's weighted average cost of capital.

(8 marks)
Total: 18 marks

7 Windmill plc

Windmill plc (Windmill) manufactures and fits large scale heating units for factories and warehouses. Key information about the company's equity capital at 28 February 20X9 is shown below:

Issued ordinary shares (£1 nominal value)	55 million
Market value per ordinary share (ex div)	£2.20
Price earnings ratio	8.4
Dividend payout ratio	40%
Profit after tax as % of Capital Employed	10%
Equity beta	1.3
Risk-free rate	7%
Market rate of return	11%

At 28 February 20X9 Windmill also had in issue £10 million 9% convertible loan stock with a market value of £105 (ex interest), which is redeemable at £104 on 28 February 20Y3 or it could be converted to 40 ordinary shares at that date. You should assume that the market value of Windmill's ordinary shares will increase at the same annual growth rate as its ordinary dividends.

The rate of corporation tax is 17% and is payable in the same year as profits are earned.

On 6 March 20X9 Windmill's board met with representatives of Value Shopper plc (Value Shopper), a large, UK based retailer of household goods. Value Shopper wishes to expand its product line via a new range of small domestic heaters and would like Windmill to manufacture and supply them.

Windmill would have to purchase new equipment to manufacture the heaters and this would cost £18 million. Windmill's board is proposing to raise the £18 million via an issue of 10% debentures (redeemable in February 20Y7). Alternatively, it could raise the majority of the £18 million via a 1 for 10 rights issue of ordinary shares at a 15% discount on the current market price per ordinary share. The balance would come from retained earnings. However, Michael Denby, the finance director, and a member of ICAB, is concerned that a rights issue could be unsuccessful and the company could lose money as a result.

In the meeting, the representatives of Value Shopper also offered the directors of Windmill a life time discount of 40% on any Value Shopper purchase.

Requirements

7.1 Calculate Windmill's weighted average cost of capital at 28 February 20X9 using the Gordon growth (or earnings retention) model to calculate the cost of equity.

(13 marks)

7.2 Calculate the cost of equity using the CAPM and explain the reasoning behind the CAPM approach to the cost of equity, comparing the CAPM approach with the earnings retention model used in part 7.1.

(5 marks)

7.3 Identify and explain two alternative models that have been proposed to overcome the weaknesses of the CAPM.

(5 marks)

7.4 Explain the benefits to a company of using convertible loan stock as a means of raising capital.

(3 marks)

7.5 Assuming that the funds are raised by the debenture issue, discuss whether Windmill should use the cost of the newly issued debentures as the hurdle rate when appraising the Value Shopper investment.

(3 marks)

7.6 Calculate the theoretical ex-rights price of Windmill's ordinary shares if it proceeded with the rights issue to raise funds for the Value Shopper investment.

(3 marks)

7.7 Discuss Michael Denby's concerns.

(3 marks)

7.8 Discuss the ethical issues Michael Denby should consider regarding the offer of a discount by Value Shopper.

(3 marks)

Total: 38 marks

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

Answers to Interactive questions

Answer to Interactive question 1

1.1 $K_e = D_0/P_0 = 0.5/2.5 = 0.2$ or 20%

1.2 The answer is as follows:

$$ke = \frac{D0(1+g)}{P0} + g = \frac{0.5 \times 1.1}{} + 0.1 = 0.32 \text{ or } 32\%$$

1.3 The correct answer is:

$P_0 = D_0/k_e = £0.3/0.15 = £2$

1.4 The correct answer is:

2.5

$$P0 = \frac{D0(1+g)}{ke-g} = \frac{£0.3 \times 1.05}{0.15-0.05} = £3.15$$

Answer to Interactive question 2

MV (cum div) = £2.20 MV (ex div) = £2.00

$k_e = D_0/P_0 = 20/200 \times 100\% = 10\%$

Answer to Interactive question 3

The correct answer is as follows.

$$ke = \frac{0.12(1.05)}{1.75} + 0.05 = 12.2\%$$

Answer to Interactive question 4

Data is available for the four years to 20X4, so: $100(1+g)^4 = 145$

$(1+g)^4 = 145/100$

$1 + g = 4\ \frac{145}{100} = 1.097$

Thus compound growth, g = 9.7%

$$\text{The cost of equity is } ke = \frac{D0(1+g)}{P0} + g = \frac{145(1.097)}{1{,}050} + 0.097 = 24.8\%$$

Answer to Interactive question 5

Growth rate: g = r × b where:

(1) b = % profit retained = £25,000/£75,000 = 33%

(2) r = return on investment = Profit after tax/opening net assets

= £75,000/(£1,060,000 – £25,000) × 100%

= 7.2%

(3) g = 0.33 × 0.072 = 0.024 = 2.4%

$$\text{Thus } ke = \frac{D0(1+g)}{P0} + g, \text{ the cost of equity is } \frac{£50{,}000(1.024)}{300{,}000 \times £1.35} + 0.024 = 15.0\%$$

Answer to Interactive question 6

12% preference shares: dividend is 12% × nominal value

$k_p = D_0/P_0 = £12/£115 \times 100\% = 10.4\%$

Answer to Interactive question 7

7.1 Using r = Interest/D = £12/(£92 – £12) × 100% = 15%

Thus return required by debenture holders is 15%.

7.2 The cost to the company is calculated by reference to the ex-interest market price, so:

$$kd = \frac{\text{Interest}(1-T)}{D} = \frac{£12(1-0.17)}{£92-£12} = 12.45\%$$

Answer to Interactive question 8

Using the spreadsheet rate function:

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods	5
2	Pmt = the amount (of interest) paid in any single period	10
3	Pval = the present value of the asset (its market price)	–98
4	Fval = the future value (the amount paid at maturity)	105
5	Gross redemption yield	11.34%
6	Post tax cost of debt 11.34 × (1 – 0.17)	9.41%

Answer to Interactive question 9

Using the spreadsheet rate function:

	=RATE(B1,B2,B3,B4)	
	A	**B**
1	Nper = the number of periods (12 × 2)	24
2	Pmt = the amount (of interest) paid in any single period (5/2)	2.50
3	Pval = the present value of the asset (its market price) (95.5 –2.50)	–93.00
4	Fval = the future value (the amount paid at maturity)	100
5	YTM [1]	0.0291 or 2.91%
6	Annual yield to maturity (2 × 2.91%)	5.82%
7	After tax cost of debt 5.82 × (1 – 0.17)	4.83%

1 (This is the yield expressed in terms of the period assessed, which here is six months)

Answer to Interactive question 10

Firstly, we need to decide whether or not the loan stock will be converted in five years.

To do this we compare the expected value of 40 shares in five years' time with the cash alternative. We assume that the MV of shares will grow at the same rate as the dividends.

MV/share in five years = $2(1.07)^5$ = £2.81 Therefore, MV of 40 shares = £112.40 Cash alternative = £105

Therefore all loan stockholders will choose the share conversion.

To find the cost to the company, use the RATE spreadsheet function.

	=RATE(B1,B2,B3,B4)	
	A	**B**
1	Nper = the number of periods	5
2	Pmt = the amount (of interest) paid in any single period	8
3	Pval = the present value of the asset (its market price)	–85
4	Fval = the future value (the amount paid at maturity)	112.40
5	Gross redemption yield	0.1426

Therefore, the post-tax cost to the company = 14.26 × (1 – 0.17) = 11.84%.

Answer to Interactive question 11

The answer is:

$$\text{WACC} = \frac{\text{£2m} \times 15\%) + (\text{£1m} \times 6\%)}{\text{£2m} + \text{£1m}} = 12\%$$

Answers to Self-test questions

1 Fizzers plc

1.1 Cost of capital calculation

Cost of equity (K_e)

Using the dividend valuation model:

$$ke = \frac{D0\ (1 + g)}{P0} + g$$

Assuming that dividend growth over the last five years is a good indicator of shareholders' expectations regarding the future:

$$g = \left(\frac{25.5}{21.25}\right)^{\frac{1}{5}} - 1 = 3.71\%$$

$$\text{Thus } ke = 25.5\left(\frac{1.037\ 1}{335 - 25.5}\right) + 0.037\ 1 = 12.25\%$$

MV of shares = 57,500 × 3.095 = £177,962,500

Cost of debt (Kd)

The RATE spreadsheet function is used to calculate the pre-tax yield to maturity on a redeemable bond or debenture (ie, the pre-tax cost of redeemable debt).

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods	1
2	Pmt = the amount (of interest) paid in any single period	9
3	Pval = the present value of the asset (its market price)	-92.72
4	Fval = the future value (the amount paid at maturity)	100
5	Yield to maturity	17.56%

Post-tax cost of debt = 17.56 × (1 – 0.17) = 14.57%

The MV of the debt = £100 million × 92.72% = £92,720,000 ex interest

WACC

The WACC normally includes long-term finance only. In the case of Fizzers plc the debt is to be redeemed in one year's time. Thus the debt should only be included in the WACC if it is assumed that more debt will raised in the near future to replace it. (If not, then the WACC is the cost of equity of 12.25%.)

WACC = (12.25 × 177.96 + 14.57 × 92.72)/270.68 = 13.04%

The assumptions made above are justifiable for the following reasons.

- Past dividend growth has been reasonably steady, so it is likely that shareholders will expect similar in the future. It is their expectations that determine the share price. Growth of 2% in 20X8 and 20X9 might be a better estimate for future growth than the five-year average.
- The company's existing gearing ratio (debt:equity) is approximately 1:2, which seems reasonable. Because debt has some advantages eg, low costs of issue, tax relief on interest, no dilution of earnings per share (compared to say a rights issue), some gearing is advised, so it is likely that the directors will seek to raise more debt in the future. Whether they will aim for exactly the same gearing ratio and use debt with the same cost is less certain.

1.2 Suitability

The WACC has been calculated to use as a discount rate for appraising the new overseas venture. To use the existing WACC relies on the following assumptions.

- Gearing is kept constant.
- The project has the same business risk as the company's existing activities.
- The project is small.

The figure calculated is **not** suitable for the following reasons:

- It is implied that the project will be financed out of retained cash reserves. This will not preserve the current gearing of the company.
- The overseas venture involves a different market with different systematic risk to the bulk of existing activities.
- The project is a major undertaking.

1.3 Three types of bid

	Advantages	Disadvantages
Cash	• Fizzers has plenty of cash • There will be no dilution of control in Fizzers • Zoom shareholders receive a certain sum	• Depending on the value of Zoom, more cash may have to be found • Zoom shareholders lose their interest in the business
Shares	• Fizzers' liquidity is preserved. Cash surplus can be used elsewhere • Zoom shareholders keep an interest in the enlarged firm	• Issue costs of new shares • Dilution of control for Fizzers' existing shareholders

	Advantages	Disadvantages
Loan stock	• No dilution of control for Fizzers' shareholders • Fixed income return may appeal to Zoom shareholders	• Obligation to pay interest • Increased gearing for Fizzers

Professional accountants in business must comply with the fundamental principles of the ICAB code of ethics:

- Integrity
- Objectivity
- Professional competence and due care
- Confidentiality
- Professional behaviour

The fact that one of the directors has a financial interest in a company subject to a potential takeover bid poses a self-interest threat to objectivity and confidentiality. This could bias the director into pushing for the takeover decision to serve his own interests over the interests of shareholders.

Possible courses of action include:

- reviewing the level of threat to the fundamental principles by seeking advice from a third party or ICAB; or
- if the level of threat to the fundamental principles is significant, consider selling shares in the company to remain objective.

2 Thamos plc

2.1 Cost of capital calculations

Dividend growth model

$$ke = \frac{D0(1+g)}{P0} + g$$

MV = EPS × PE ratio

= 35.8p × 28

= £10.02 (per share)

$$g = \sqrt[4]{11 \div 4.86} - 1$$

= 22.7%

Or using the POWER function

=POWER(B1/B2,1/B3)

	A	B
1	Most recent dividend	11
2	Oldest dividend	4.86
3	Time period of growth	4
4	POWER function	1.226561
5	Average annual growth	22.7% [1]

1 This is (1.226561 – 1) × 100

$$ke = \frac{11 \times 1.227}{1{,}002} + 0.227$$

= 24%

Gordon growth/Earnings retention model

$$ke = \frac{D0(1 + rb)}{P0} + rb$$

This is similar to the dividend growth model except that, instead of basing the estimate of future dividend growth on an extrapolation of past growth, the formula g = rb is used, where

r = Return on reinvested funds ARR

b = Retention rate = (EPS – Dividend)/EPS

	20X2	20X3	20X4	20X5	20X6
	%	%	%	%	%
ARR	15.6	15.6	17.4	18.5	18.8
Retention rate	70.0	70.0	70.0	70.0	69.0

	20X2	20X3	20X4	20X5	20X6
rb	%	%	%	%	%
	10.9	10.9	12.2	13.0	13.0

Thamos plc has maintained a constant payout ratio over the five-year period. However, its ARR has increased from 15.6% to 18.8%. On the assumption that the most recent results are likely to provide the best basis for a calculation of k_e, a growth estimate of 13% is used in the following calculation.

k_e = (11 × 1.13)/1,002 + 0.13

= 14.2%

2.2 Underlying assumptions and their effects

The calculations in 2.1 produce estimates of the cost of equity of Thamos plc which are markedly different, with a range of 14.2% to 24%. At least part of the difference is attributable to the assumptions underlying the models.

Both the dividend growth model and the earnings retention model are based on the belief that the current market value is the discounted present value of the future dividend stream ie,

$$\mathbf{P0 = \frac{D0(1 + g)}{ke - g}}$$

A strong theoretical case can be made for this model. However, most practising financial managers would believe that other variables, such as the underlying assets and short-run reported profits, have an impact. Neither of these is incorporated in the basic dividend model.

The second assumption common to both the dividend growth model and the earnings retention model is that dividend growth will be constant in perpetuity. This is unrealistic, particularly where companies have achieved high growth rates in the recent past.

Thamos plc has achieved an average compound growth rate of 22.7% over the last four years. Except under conditions of very high inflation it will not be possible to sustain this growth rate.

The earnings retention model is based on the belief that dividend growth is a function of the proportion of earnings ploughed back into the business and the rate of return earned on those reinvested funds. Again, in order to predict future growth, it is assumed that the values of both variables will be constant. As may be seen in 2.1, Thamos has maintained a constant payout ratio, but this has been made possible by an increasing ARR. The ARR cannot increase indefinitely.

Both models depend on a number of assumptions that may not be reasonable. The constant growth formulae are likely to be more reliable in estimating k_e for similar risk companies than they are for individual securities. They are likely to be particularly unreliable for companies with high or unstable historical growth rates.

2.3 Why managers need to know k_e

A primary task of managers is to make decisions between alternatives, and such choices cannot be made without an objective in mind. Most of the conventional theory in financial management is based on the belief that the objective of a company is to maximise shareholder wealth.

Very few chief executives of companies would publicly state that in their decision-making they were exclusively concerned with the maximisation of shareholder wealth, but it does seem reasonable to suggest that all executives are extremely concerned about share prices. If these were allowed to fall too far, the company could lay itself open to a takeover bid.

If managers are keen to increase share prices, they must know what determines them. The price of a share, like everything else, is a function of demand and supply. If managers are to increase the price of their shares, they must stimulate demand. To do this through their investment decisions they must choose opportunities that investors would like the company to take. This should make the company popular: people will buy and the share price will rise.

However, how are managers to find out which ones are the favoured projects? Within a perfect market, the manager can assume that investors are satisfied with their return. If they were not, they would sell the shares, depressing the price and increasing the return until they were satisfied.

The cost of equity is the rate of return that existing and potential investors require in order to persuade them to invest in the shares of the company. If managers accept only those projects which pay a return in excess of that required by investors, they are entitled to assume that they are accepting the projects that investors would like them to accept. This should stimulate demand, resulting in an increase in the share price.

The conclusion is that managers need to know the cost of equity of their companies in order to make investment decisions ie, in order to determine the net present value of prospective projects based on the shareholders' required rate of return.

3 Osmin plc

3.1 Calculation of weighted average cost of capital

Definitions

k = Weighted average cost of capital

k_e = Cost of equity capital

k_d = Cost of debenture capital

k_L = Cost of bank loan

E = Total ex-dividend market value of equity

D = Total ex-interest market value of debt

L = Total value of outstanding bank loan

(1) **Calculation of k_e**

$$ke = \frac{D0(1+g)}{P0} + g$$

MV = EPS × PE ratio

= 35.8p × 28

= £10.02 (per share)

$$g = \sqrt[4]{11 \div 4.86} - 1$$

= 22.7%

Assuming an underlying dividend growth of g per annum, the average growth rate between20W7 and 20X1 is given by

Assuming that shareholders take past dividend growth as a reasonable approximation to future dividend growth, then using the dividend growth model,

$$ke = \frac{D0(1+g)}{P0} + g$$

= ((13.6 × 1.08)/135) + 0.08

= 18.88%

(2) **Calculation of k_d**

k_d is the discount rate which equates the present value of future income (£8 per annum) and redemption (£100) to the current market price (£82.50).

Using the RATE function:

=RATE (B1,B2,B3,B4)

	A	B
1	Nper = the number of periods (4 × 2)	8 1
2	Pmt = the amount (of interest) paid in any single period (8/2)	4 2
3	Pval = the present value of the asset (its market price)	-82.50

	=RATE (B1,B2,B3,B4)	
	A	**B**
4	Fval = the future value (the amount paid at maturity)	100
5	Yield to maturity	6.92% [3]
6	Annual yield to maturity	13.84% [4]

2 This is the number of six-month periods over which payments are made (six months is used as the payments are made every six months).

3 This is the semi-annual coupon, calculated as £8 divided by 2 = £4.

4 This is the yield expressed in terms of the period assessed, which is six months here.

(3) This is the annualised yield to maturity, calculated as 0.0692 multiplied by two (as there are two six-month periods in a year) = 0.1384 or 13.84%.

Calculation of cost of bank loan

(4) The current cost of debt is taken as the best estimate of the future cost of debt ie, 16.5%.

Calculation of weighted average cost of **capital**

$$k = \frac{keE + kdD + kLL}{E + D + L}$$

$$= \frac{(4.05 \times 18.88\%) + (0.66 \times 13.84\%) + (0.9 \times 16.5\%)}{4.05 + 0.66 + 0.9}$$

= 17.9%

3.2 Assumptions underlying the use of k as a discount rate

The weighted average cost of capital (k) should only be used as the target discount rate for appraising investment opportunities whose acceptance will not alter the weighted average cost of capital.

The WACC should not be used to evaluate opportunities which have significantly different risk characteristics from the average risk borne by the company.

It is useful to separate the total risk of the company into business risk and financial risk. The business risk is the risk inherent in the company's operations. The financial risk is a function of a company's gearing. For a project to be evaluated using k, its acceptance must not alter the company's overall business risk or its financial risk. Therefore, it must be of a similar nature to existing projects and it must be financed in such a way that the gearing ratio is unchanged and the financial risk is unaltered.

The situation outlined in the question is such that the project being considered cannot be regarded as marginal. The cost of the project (£2.5 million) is approximately half the existing market value of the company. As k can only be used as a target discount rate if the business risk is the same as that of existing projects, and it is to be financed in the same

way as existing projects, it is unwise to use the existing k to evaluate such a major investment opportunity.

3.3 Practical problems in estimating k for a large Bangladeshi listed company

The problems associated with estimating k can be considered under four headings:

The validity of the model

The estimation of k and, in particular k_e, is based on the assumption that the value of an ordinary share is the discounted present value of the future dividend stream. It is possible that the market is using a different method of valuation, such as one based on an earnings multiple; if this is the case, the validity of the k_e calculation is undermined.

The estimation of the variables in the model

Here again the major problem is in the estimation of k_e. To calculate k_e it is necessary to know or estimate D_0, P_0 and g. Of these only D_0 can be determined with confidence. P_0 is the ex-dividend value of the share but, for the model to give an accurate estimate of k_e, the market value must be in equilibrium. In practice the market value of an ordinary share may fluctuate daily.

Two approaches to estimating g are frequently used, one based on past dividend growth and one using the Gordon growth model. In using past growth rates an average must be calculated, and there is always the danger that the average is misleading. In the question the average dividend growth of Osmin over the past four years has been 8%, although in the most recent year dividends have not grown at all. To what extent is the average growth a meaningful figure? Furthermore, the growth factor in the dividend valuation model is anticipated **future** growth. Past growth rates may not be repeated in the future.

The earnings retention model is based on the belief that future dividend growth depends on the volume of earnings retained in the business and the rate of return earned on reinvested earnings.

The estimate of g is given by:

g = br

Where b = the current retention rate

r = the current return on capital employed

The model will only give a useful approximation to g where the retention rate and the rate of return are stable.

Use of the WACC for investment appraisal

When undertaking investment appraisal using discounted cash flows, it is important to establish an appropriate discount rate. The WACC model is a reasonable approach to determining the appropriate rate. A check on the calculations can be made by comparing the result with the WACC of similar companies, and with the risk-free rate (the return on government stock).

Problems associated with different sources of finance

In part 3.1, a calculation was made of the WACC. Osmin is financed entirely by debt and ordinary share capital, and the procedure for calculating the WACC is straightforward. However, in practice firms may use other sources of finance, which make the computation of WACC more difficult. Specifically:

- A company may have unlisted preference shares, which present problems of estimating their market value.
- The estimation of the true cost of convertible loan stock is notoriously difficult as the calculation requires an assumption about whether or not the option to convert will be exercised.
- Where a company has substantial foreign currency loans, fluctuations in the exchange rate add a new dimension to the estimate of their cost.
- Finance in the form of lease agreements creates further difficulties.

4 Crowlands plc

4.1 Determination of WACC

Cost of equity

Dividend valuation model

$$ke = \frac{D0(1 + g)}{P0} + g$$

$$= \frac{£0.23(1 + 0.05)}{£3.70} + 0.05$$

= 0.115 or 11.5%

	=RATE(B1,B2,B3,B4)	
	A	**B**
1	Nper = the number of periods (2 × 2)	4 [1]
2	Pmt= the amount (of interest) paid in any single period (12/2)	6 [2]
3	Pval= the present value of the asset (its market price)	-104
4	Fval = the future value (the amount paid at maturity).	100
5	Yield to maturity	0.0488 or 4.88% [3]
6	Annual yield to maturity	9.76% [4]

1 This is the number of six-month periods over which payments are made (six months is used as the payments are made every six months).

2 This is the semi-annual coupon, calculated as £12 divided by 2 = £6.

3 This is the yield expressed in terms of the period assessed, which is six months here.

4 This is the annualised yield to maturity, calculated as 0.0488 multiplied by two (as there are two six-month periods in a year) = 0.0976 or 9.76%.

$$\text{WACC} = \frac{(220 \times 3.70 \times 11.5) + (1.40 \times 100 \times 8.1)}{(220 \times 3.70) + (1.04 \times 100)}$$

= 11.43%

The market value weighting was used since, for whatever purpose WACC is needed, it has to be the opportunity cost. This is the value at which the company could raise additional debt or equity and also the price at which debt or equity could be redeemed.

4.2 Reservations about using WACC

Possible problems with using the WACC calculated above as the discount rate for all of the projects assessed by the company in the forthcoming year include the following.

- There is considerable doubt about the future dividend growth rate. The historical rate is not stable, so it is very hazardous to make the assumption that was made.
- A major determinant of the appropriate discount rate for a particular project is the business risk of that project. Since not all projects have the same risk, the discount rate should not be the same.
- Changes in the level of gearing would affect the weightings: taking on positive NPV projects will of itself alter the gearing.
- There could be other sources of funds that have not been considered eg, a bank overdraft.
- The current market values of the shares and the loan stock feature in the calculation, both of the individual costs of capital and of WACC. Any change in market values would probably alter the WACC.
- Changes in the tax rate could occur over the lifetime of the projects.

4.3 The effect of a loan stock issue on WACC

In theory according to Modigliani and Miller (with taxes), the loan stock issue should lower WACC and increase shareholder wealth, because of the value of the additional tax relief.

Financial risk will increase, as the existence of greater commitments will have the effect of making returns to shareholders more variable. Taken to the extreme, the risk of bankruptcy could adversely affect share prices and lower shareholder value, to a greater extent than the tax relief would increase it.

Other practical issues include the following:

- Clientele effect
- Agency issues
- Availability of taxable profits
- Signalling

5 Redcoats plc

5.1 Post-tax weighted average cost of capital

The following calculations are based on the capital structure of the Redcoats group, which is deemed to be more appropriate for determining a discount rate to evaluate the projects available to Redcoats plc and its subsidiaries.

Cost of debt

(1) For irredeemable stock

$$kd = \frac{\text{Interest}(1-T)}{\text{Ex - interest market value}}$$

$$\text{Cost of 3\% irredeemable stock} = \frac{£3.00 \times (1-0.17)}{£(31.60-3.00)}$$

$$\approx 8.71\%$$

(2) For redeemable stock, to calculate k_d it is necessary to use the RATE spreadsheet function with the pre-tax cash flows.

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods	20
2	Pmt = the amount (of interest) paid in any single period	9
3	Pval = the present value of the asset (its market price)	-94.26
4	Fval = the future value (the amount paid at maturity)	100
5	Yield to maturity	9.66%

Post-tax cost of debt = 9.66 × (1 – 0.17) = 8.02%

(3) After-tax cost of bank loan = (11% + 2%) × (1 – 0.17)

= 10.79%

(4) Cost of 6% unquoted stock

The value of the stock is the present value of the pre-tax cash flows discounted at 10%,ie, (£6.00 × 6.145) + (£100 × 0.386) = £75.47

The pre-tax cost is 10%

The post-tax cost is 10 × (1 – 0.17) = 8.3%Cost of equity = 18% (given)

The values of the various sources of finance are as follows.

	£'000	£'000
Equity	8,000 × 1.1	8,800
3% debt	1,400 × 0.286	400
9% debt	1,500 × 0.9426	1,414
6% debt	2,000 × 0.7547	1,509
Bank loan		1,540

$$k = \frac{(0.18 \times 8{,}800) + (0.0871 \times 400) + (0.0802 \times 1{,}414) + (0.083 \times 1{,}509) + (0.1079 \times 1{,}540)}{8{,}800 + 400 + 1{,}414 + 1{,}509 + 1{,}540}$$

= 2,023.7/13,663

= 14.8%

5.2 Problems in estimating k

Where bank overdrafts are used as sources of long-term finance

In practice, many companies use bank overdrafts as a permanent, long-term source of finance. In such circumstances, therefore, it can be entirely justifiable to include bank overdraft financing costs in a WACC calculation.

In order to include such finance in the calculation, however, we need to know two things – the interest rate (though fluctuating, not a problem in the short term – and an average of the fluctuating rate could reasonably be used) and the size of the overdraft (often problematic). We need to know the size of the overdraft for weighting purposes in the WACC calculation, but, by definition, overdrafts fluctuate on a daily basis.

The way forward in such circumstances would be to analyse the actual operation of the overdraft to identify the core permanent element of the fluctuating overdraft – it is this core element that can justifiably be included in any WACC calculation.

Overdraft rates are known and the quoted rate is the 'true' rate. As with other interest payments, overdraft interest is an allowable expense for tax purposes and this must be incorporated in the calculation.

Where convertible loan stocks are used as sources of long-term finance

The formula for determining the cost of a convertible loan stock k_c derives from the basic valuation model for convertibles as follows.

$$Vc = \sum_{t=1}^{n} \frac{Interest(1-T)}{(1+kc)^t} + \frac{MV(or\ RV)}{(1+kc)^n}$$

Where T = Rate of corporation tax n = Years to conversion

MV = Market value of shares at the time of conversion (or redemption value if not converted)
k_c = Cost of convertible stock

$V_{c,}$ = Market value of convertibles

In principle the calculation of k_c is a simple RATE computation. In practice the difficulty is in knowing whether the investor will exercise his conversion right, which will depend upon the market value of the shares at the time of conversion. Therefore, to compute k_c requires a prediction of future share prices.

5.3 Fundamental assumptions underlying the use of k as a discount rate

Where the market value of an ordinary share is the discounted present value of the future dividend stream, acceptance of a project which has a positive NPV when discounted at the WACC will result in the share price increasing by the amount of the NPV. It is this relationship between the NPV and the market value which is the basis of the rationale for using the WACC in conjunction with the NPV rule.

However, the use of the WACC in this way depends upon a number of assumptions.

- The objective of the firm is to maximise the current market value of the ordinary shares. If the firm is pursuing some other objective eg, sales maximisation, some other discount rate may be more appropriate.
- The market is perfect and the share price is the discounted present value of the dividend stream. Market imperfections may undermine this relationship, and cast doubt upon the usefulness of WACC as a discount rate. The market may value shares in some other way (eg, earnings multiplied by a PE ratio).
- The current capital structure will be maintained.
- The project is of the same risk as the existing activities.
- The finance for the project comes from a pool of funds and is not project-specific.

6 Gale plc

6.1 Cost of irredeemable debentures (market value £43.25m):

$K_d = 7 \times (0.83)/86.50 \times 100 = 6.72\%$

Cost of unsecured loan notes (market value £30.24m):

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods (20 × 2)	40
2	Pmt = the amount (of interest) paid in any single period (6/2)	3
3	Pval = the present value of the asset (its market price)	–84
4	Fval = the future value (the amount paid at maturity)	100
5	Yield to maturity	0.0378 or 3.78%
6	Annual yield to maturity	7.56% [1]

1 This is the annualised yield to maturity, calculated as 0.0378 multiplied by two (as there are two six-month periods in a year).

Post-tax K_d = 7.56 × (1 – 0.17) = 6.27%

Cost of irredeemable preference shares (market value £7.7m):

K_p = 5.5/77 × 100 = 7.14%

Cost of equity (market value £49m):

Dividend growth rate = 10.00 × $(1 + g)^4$ = 15.75Therefore, g = 12%

K_e = (15.75 × 1.12)/350 + 0.12 = 17.04%

WACC = (43.25m × 0.0672) + (30.24m × 0.0627) + (7.7m × 0.0714) + (49m × 0.1704)/130.19m

WACC = 13,701,780/130,190,000 × 100 = 10.52%

6.2 The rate of return required on each source of finance depends on its perceived level of risk. Equity is perceived by investors as the most risky source of finance and requires the greatest return, whilst debt is perceived as less risky, requiring a lower rate of return.

In the traditional view of capital structure, shareholders tend to be indifferent to the addition of small amounts of debt finance, and so a company's WACC will fall as debt finance increases.

This line of thinking would appear to endorse the chief executive's views. However, if gearing continues to increase, the cost of equity will increase to include a financial risk premium. At extreme levels of gearing both the cost of equity and the cost of debt will increase, to reflect not only financial risk but also bankruptcy risk.

In contrast to the traditional view, M&M, assuming a perfect capital market (no bankruptcy risk and no taxes), demonstrated that a company's WACC remained constant as a company geared up, with the increase in the cost of equity exactly offsetting any benefits from lower cost debt in the capital structure. WACC is therefore viewed here as being constant at all levels of gearing. This line of thinking appears to contradict the chief executive's views.

However, if the assumptions of a perfect capital market are relaxed, WACC is seen to fall as gearing increases, because of the tax shield on debt. This line of thinking again appears to endorse the chief executive's views.

In the extreme, even the benefits of the tax shield can be more than offset by the effects of increased bankruptcy risk at high levels of gearing. This line of thinking suggests that whilst the chief executive's views carry some weight, they cannot be adopted in the extreme and minimising the company's WACC is, therefore, about identifying the appropriate level of debt in the capital structure from the investor's viewpoint.

7 Windmill plc

7.1 Cost of equity – Gordon growth (earnings retention) model

Current dividend per ordinary share = £2.20/8.4 × 40% = 10.47p

Dividend growth (b × r) = 10% × (1 – 0.4) = 6%

Cost of equity (k_e) = ((10.47 × 1.06)/220) + 6% = 11%

Cost of convertible loan stock (CLS)

Value of shares at conversion (@ 28 February 20Y3) = £2.20 × $(1.06)^4$ = £2.78/share Conversion of £100 of loan stock = 40 shares
Total value of shares (40 × £2.78) = £111.20

Year	Cash Flow	5% factor	PV	10% factor	PV
0	(105.00)	1.000	(105.00)	1.000	(105.00)
1–4	9.0	3.546	31.91	3.170	28.53
4	111.2	0.823	91.52	0.683	75.95

Year

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods	4
2	Pmt = the amount (of interest) paid in any single period	9
3	Pval = the present value of the asset (its market price)	–105
4	Fval = the future value (the amount paid at maturity)	111.2
5	Yield to maturity	0.0985 or 9.85%

Post-tax cost of CLS = 9.85 × (1 – 0.17) = 8.2%

WACC

	Cost	Market value £m	Weighting	Weighted cost
Equity	11.0%	121.0	121.0/131.5	10.12
CLS	8.2%	10.5	10.5/131.5	0.65
		131.5		WACC = 10.77

7.2 ke = 7% + 1.3 (11% – 7%) = 12.2%

The Capital Asset Pricing Model (CAPM) is used in project appraisal and it shows that the discount rate should be related to the project's risk. As risk increases so will the returns required by investors. CAPM distinguishes between specific and systematic risk, and it assumes that investors will have diversified away specific risk. It is therefore based on systematic risk and a project's/share's relationship to the market average (measured by beta).

The earnings retention model is an alternative method of calculating the discount rate and is based on the idea that the current price of a share is the present value of future dividends and capital growth. Dividend growth occurs by retaining and reinvesting profits on which a return is earned.

7.3 Arbitrage pricing theory (APT)

APT assumes that there are several factors that influence the return on a portfolio (or security), whereas the CAPM states that there is just one factor, which is systematic risk.

The French and Fama four-factor model has identified size, value and momentum as additional factors, which can influence returns.

Fundamental beta

Many analysts and business managers have moved to calculating a fundamental beta. This is a beta which is based on basic notion of the risk-return relationship: where a company's cash flows are subject to greater risk, then the required return should be higher.

Greater risk can be caused by the nature of the business operations, the level of operating gearing or the level of financial gearing.

7.4 Convertible loan stock is fixed return securities which can, at the option of the holder, be converted into ordinary shares of the same company. Its benefits are as follows.

- The issuing company can obtain finance at lower rates of interest.
- It encourages investors with the prospect of a future share in profits.
- It introduces an element of gearing, albeit short-term.
- It can avoid the cash flow problems associated with redemption.
- It means that equity can be issued cheaply (via conversion).
- It does not dilute shareholder control initially.

7.5 Windmill's current market value is £131.5 million (see part 7.1) and so the additional £18 million being raised is fairly small in comparison (13.7%). Thus the existing WACC should be used as it is reasonable to assume that the firm's balance of equity and debt will be maintained in the long term.

The operating risk of the Value Shopper proposal is considerable – it is a new product and a new market. Thus the existing WACC may not be relevant and CAPM should be considered as a means of establishing the hurdle rate. The cost of the new debt represents the risk to the lenders and not that of the project.

7.6

	Shares	**Value**	**Total**
Current market capitalisation	55.0m	£ 2.20	£m 121.000
Rights issue	5.5m	1.87	10.285
Total	60.5m		131.285

Theoretical ex-rights price of shares = £131.285m/60.5m = £2.17

7.7 By doing nothing a shareholder would lose money and so must take up the rights or sell his/her rights. So, Windmill's shareholders may react negatively to the rights issue, especially if there have been previous calls for extra capital via this method. As a result, Windmill's share price could decrease.

Many of the issue costs will be fixed and have been estimated at 4% on £2 million raised, so a rights issue is fairly expensive.

Windmill should consider underwriting the rights issue as a means of insurance. Whilst this is an expensive option, it is preferable to Windmill failing to raise sufficient funds.

7.8 As stated above, the operational risk of this project is considerable, and financing this project may be undesirable to shareholders. However, the offer of the discount from Value Shopper appears to be an inducement and could unduly bias the directors into pursuing this project

to serve their own self-interests.

This is a self-interest threat to the fundamental principle of objectivity in the ICAB code of ethics. This states: 'A professional accountant shall comply with the fundamental principle of objectivity. This is to not allow bias, conflict of interest or undue influence of others to override professional or business judgments.'

Possible courses of action by Michael Denby include:

- refusing to accept the inducement from Value Shopper in order to make an objective decision;
- calling the ICAB helpline for advice and clarification on the most appropriate course of action; and
- considering the need to inform the shareholders of the offer.

Chapter 6
Capital structure and assessing financing options

Introduction

Learning outcomes

Students will be able to identify capital requirements of businesses and assess financing options. This will involve being able to:

- explain, in non-technical terms and using appropriate examples, the effect of capital gearing both on investors' perceptions of risk and reward and the weighted average cost of capital;
- calculate and justify an appropriate discount rate for use in an investment appraisal taking account of both the risk of the investment and its financing;
- forecast the capital requirements for a business taking into account current and planned activities and/or assess the suitability of different financing options to meet those requirements, comparing the financing costs and benefits, referring to levels of uncertainty and making reasonable assumptions which are consistent with the situation; and
- construct a straightforward investment and financing plan for a given business scenario.
- organise, structure and assimilate data in appropriate ways, using available statistical tools, data analysis and spreadsheets, to support business decisions.

Syllabus links

The theory behind this chapter is seen elsewhere in this subject, and the practical issues of capital structure are explored again in Advanced Level and the final Case Study.

Examination context

Exam questions on this topic are likely to require an explanation of the underlying theory of capital structure and then a description of any shortcomings of the theories and the practical issues surrounding gearing.

The traditional view is that as an organisation introduces debt into its capital structure, the weighted average cost of capital will fall, because the benefit of cheaper debt finance will outweigh any increases in the cost of equity required to compensate equity holders for the higher financial risk.

However, as gearing becomes a greater proportion of total long-term funds, the cost of debt will start to increase and WACC will rise too, and the value of the company will fall.

The implications of increased debt causing the WACC to rise has implications for how debt-financed investments are evaluated. Adjusted present value (APV) takes account of the present value of the tax shield.

The main sources of long-term funding are new equity (or preference shares) or increased borrowing. There will be implications of any changes in capital structure for the cost of capital. Candidates may be asked to determine whether the finance required should be raised by debt or equity sources, and to discuss the likely reaction of shareholders and the financial markets, as well as give advice on which source of finance should be used.

In the exam, candidates may be asked to draft a straightforward business plan for a given situation, or prepare forecast financial statements from a large amount of information.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**Capital structure** Firms find themselves borrowing for a number of reasons, one of which is to lower the cost of capital. There is a variety of other considerations that influence the capital structure of a business, but whatever the underpinning reasons, the capital structure will always have an impact on achieving the key objectives. Any forecast cash deficit will have to be funded. The main sources of long-term funding are new equity (or preference shares) or increased borrowing. There will be implications of any changes in capital structure for the cost of capital.	**Approach** Chapter 6 builds on the practical sources of finance covered in Chapter 4. Read all the sections carefully to note the arguments surrounding capital structure. **Stop and think** What is the likely impact on the value of a business if it borrows money?	In the exam, you may have to identify and evaluate different financing options and give a recommendation.	
2	**M&M** Several studies have focussed on the link between capital structure and company value. The main studies are associated with M&M. M&M's theories were based on some unrealistic assumptions. It is therefore important to adjust M&M's theories to take account of real-life factors.	**Approach** Make sure you understand the impact on a company's WACC and company value of increasing its gearing under each of the three theories. **Stop and think** What was the conclusion from M&M's with tax theory?	Exam questions in this area are likely to require an explanation of the underlying theory of capital structure and then a description of any shortcomings of the theory and the practical issues surrounding gearing.	**IQ1: Capital structure with effect of taxation** This question considers the most attractive capital structure for a company by considering the total distributions to providers of finance.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
3	**Capital structure and high gearing** The capital structure decision can create financial distress concerns, which will impact upon the work of any accountant, whether working in commerce, industry, audit, etc.	**Approach** Work through each section to understand the real- life problems associated with high gearing. **Stop and think** What types of companies will tend to operate well with high gearing?	In the exam you could be asked to explain, in non-technical terms and using appropriate examples, the effect of capital gearing both on investors' perception of risk and reward and the weighted average cost of capital.	**IQ2: Acceptable debt levels** This question considers the impact of high gearing on various stakeholders.
4	**Adjusted present value** The implications of increased debt causing the WACC to rise has implications for how debt financed investments are evaluated. Adjusted present value (APV) takes account of the present value of the tax shield. APV theory is based on M&M theory with tax, and suffers from the same drawbacks as M&M theory.	Work through the examples in the chapter to make sure you have a structured approach to calculating APV.	Candidates are expected to identify it.	**IQ3: APV** This question will allow you to practice calculating APV by working through a number of logical steps.
5	**Gearing and CAPM** A different approach to allowing for risk and uncertainty in a project is to increase the cost of capital for projects that are riskier.	**Approach** This section builds on the basics of CAPM that were introduced in Chapter 5. Make sure you understand the difference between a company's equity beta and their asset beta. **Stop and think** What happens to the required return of a share if the company takes on more debt?	In the exam you may be asked to calculate and justify an appropriate discount rate for use in an investment appraisal, taking account of both the risk of the investment and its financing.	**IQ4: CAPM** This question looks at calculating a project specific discount rate, reflecting the financial risk of the project.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
6	**Cash forecasts** Issues around cash flow and liquidity will have implications for auditors and management accountants alike.	**Approach** This type of question is time consuming in the exam, so it is important that you practice them. Work carefully through the worked example and interactive question.	In the exam you could be asked to forecast the capital requirements for a business taking into account current and planned activities and/or assess the suitability of different financing options to meet those requirements, comparing the financing costs and benefits, referring to levels of uncertainty and making reasonable assumptions which are consistent with the situation.	**IQ5: Financing gap** This is a detailed question on preparing a set of forecast financial statements. Work carefully through each adjustment.
7	**Financing requirements** Any forecast cash deficit will have to be funded. The main sources of long-term funding are new equity (or preference shares) or increased borrowing. There will be implications of any changes in capital structure for the cost of capital.	**Approach** The detailed worked example shows the impact on a company's financial statements of two financing alternatives. Work through the calculations carefully.	The main sources of long-term funding were covered in Chapter 4. There will be implications of any changes in capital structure for the cost of capital, which was explored in Chapter 5. Exam questions may therefore link the topics in Chapters 4, 5 and 6 together.	**IQ6: Financing decisions** In this question you are asked to write a report evaluating two proposed methods of finance. This is a good question to practice your written skills.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
8	**Writing a business plan** A business plan reflects a company's planning process for a given time horizon. Business plans will include sections on background, history, prospects and a financial assessment.	Ensure you know what issues should be covered in a business plan. Use the summary as a checklist to think through the issues.	In the exam, candidates may be asked to draft a straightforward business plan for a given situation or prepare forecast financial statements from a large amount of information.	

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1 Capital structure

Section overview

- Gearing can be operating gearing or financial gearing.
- Financial risk is the increased risk faced by shareholders as a consequence of higher borrowing by their company.
- Traditional view of financial gearing – there is an optimal capital structure.

1.1 Business and financial risk

Definition

Business risk: The variability in earnings **before** interest and tax associated with the industrial sector in which a firm operates.

It is determined by general business and economic conditions.

Well-diversified shareholders will only be interested in risk that cannot be diversified away ie, the systematic element of business risk (systematic business risk).

Definition

Financial risk: The additional variability in returns as a result of having fixed interest debt in the capital structure. Equity holders take this risk in particular, but debt holders also suffer financial risk at high gearing levels (see later in chapter).

Note: Financial risk is narrowly defined here, for the purpose of this chapter, as the risk relating to financial gearing. A wider definition of financial risk might include liquidity risk, interest rate risk, currency risk etc, (see Chapters 9 and 10).

1.2 Gearing

Operating gearing (or risk) is the extent to which a firm's operating costs are fixed, as opposed to variable. Firms with high operating gearing have high fixed costs (eg, steel plants, oil refineries), have high break-even points and earnings before interest and tax (EBIT). Firms with high operating gearing also have comparatively low variable costs and a high contribution/sales ratio, which makes them very sensitive to changes in sales volumes. Operating gearing is linked to business risk.

Financial gearing is the extent to which debt is used in the capital structure. This can be measured in two ways:

- **Capital** terms (normally by market values*) Debt/equity or debt/(debt + equity)

  *Where no market values are available then book values should be used. For the purpose of this exam the book value of debt is to be taken as its total nominal value. Either of these expressions of financial gearing is acceptable.

- **Income** terms using interest cover EBIT/Interest

Note: For the purposes of this Workbook, preference shares should be treated as debt for gearing calculations.

Worked example: Demonstration of gearing

A company has £40 million of debt on which it pays 5% interest. The company's expected results areas follows:

	£m	£m
Sales		10
Variable costs	2	
Fixed costs	5	
		7
EBIT		3

Requirement

Ignoring tax, show the effect of the fixed costs and the interest cost on the volatility of the earnings, and the interest cover if sales:

(1) decrease by 10%; and

(2) increase by 10%.

Solution

The following shows an abbreviated statement for a financially geared firm before and after a 10% decrease in sales and a 10% increase in sales.

Sales before	£m	Before £m	Decreased Comment	sales After £m	Increased Comment	sales After £m
Sales		10	– 10%	9.0	+ 10%	11.0
Variable costs	2		– 10%		+ 10%	2.2
Fixed costs	5		no change	1.8	no change	5.0
		(7)		5.0 (6.8)		(7.2)
EBIT		3	– $26^2/_3$%	2.2	+ $26^2/_3$%	3.8
Interest (£40m @ 5%)		(2)	no change	(2.0)	no change	(2.0)
Earnings before tax		1	– 80%	0.2	+ 80%	1.8
Interest cover	3 ÷	2 = 1.5	2.2 ÷ 2	= 1.1	3.8 ÷ 2	= 1.9

Conclusion. Returns are enhanced when sales increase but the position is reversed when sales fall. Financial gearing affects the volatility of equity earnings and, therefore, requires a premium to be reflected in the cost of equity.

This can be seen in the $26^2/_3$% change in EBIT and the 80% change in earnings before tax created by only a 10% change in sales.

1.3 What happens if gearing changes?

As a company **gears up** financially two things happen:

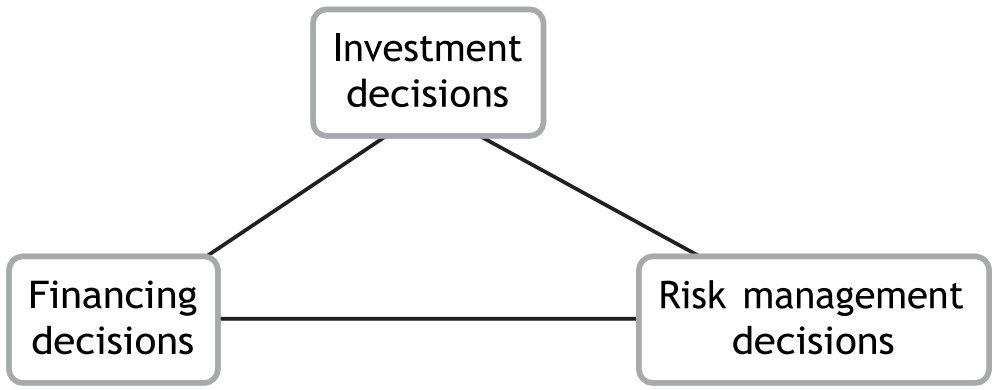


Figure 6.1: Impact on WACC of increasing gearing

The effect of increased gearing on the WACC depends on the relative sizes of these two opposing effects. So how **precisely** does the gearing affect the WACC and, therefore, shareholder wealth?

1.4 Traditional view of gearing

The traditional view is that as an organisation introduces debt into its capital structure, the **weighted average cost of capital will fall**, because initially the benefit of cheap debt finance more than outweighs any increases in the cost of equity required to compensate equity holders for higher financial risk. Initially, at low levels of gearing, there is very little change in the shareholders' required returns.

As gearing increases, the equity holders will ask for progressively higher returns and eventually this increase will start to outweigh the benefit of cheap debt finance, and the **weighted average cost of capital will rise**. At extreme levels of gearing the cost of debt will also start to rise (as debt holders become worried about the security of their loans) and this will also contribute to an increasing weighted average cost of capital.

Conclusions

- There is an optimal level of gearing at which the value of the firm's equity plus debt is maximised. This occurs at the point where the WACC is minimised (this is shown in the diagram in section 2.3 below).
- There is no precise method of calculating k_e or WACC, or indeed the optimal capital structure. The latter needs to be found by trial and error by changing the gearing and seeing how the market responds.
- The above conclusion applies equally to situations either with or without corporation tax.
- If simplifying assumptions are made (ie, that both interest and dividends are constant perpetuities and debt is irredeemable), then

$$MV_E + MV_D = \frac{\text{earnings } (1-T)}{\text{WACC}}$$

Given any set of earnings, if the lowest WACC is maintained, projects will have the highest NPV (at the lowest discount rate) and shareholder wealth is maximised.

2 Modigliani and Miller (M&M) 1958 and 1963

Section overview

- In a no-tax world, there is no optimum gearing level.
- In a taxed world, debt is a tax efficient way to finance a business.

In 1958 and 1963 M&M published papers on capital structure which were at odds with the traditional approach (Pike, Neale & Linsley, 2012).

2.1 M&M 1958: capital structure ignoring the effect of taxation

M&M showed in 1958 that with no corporation tax there is no advantage for firms to issue debt (gearup). (Pike, Neale & Linsley, 2012)

Worked example: Capital structure (ignoring effect of tax)

A company generates EBIT (earnings before interest and tax) of £100 million. It currently has no debt in the capital structure. It is considering the use of debt, and is exploring raising either £800 million or £1,800 million. Interest is payable at 5%.

Requirement

Ignoring taxation and assuming all earnings after interest are paid out as dividends, find out which is the most attractive capital structure.

Solution

The total returns to all investors needs to be calculated.

	No debt	£800m debt	£1,800m debt
	£m	£m	£m
EBIT	100	100	100
Interest (£800m @ 5%)	–	(40)	
Interest (£1,800m @ 5%)			(90)
Dividends	100	60	10
Dividends + Interest	100	100	100

The **total** distributions to providers of finance are the same, no matter what the level of gearing.

Thus these firms should be worth the same in **total**, as they generate the same total distributions for investors with the same business risk.

M&M showed in 1958 that:

$V_g = V_u$

Where V_g = value of debt + value of equity in a geared firm, and V_u = value of equity in an equivalent ungeared firm.

The implication is that the WACC is constant no matter what the gearing level.

This suggests that there is **no** optimal level of gearing. The benefits of cheap debt finance are exactly offset by the increased returns required by shareholders for the extra financial risk – the cost of equity rises in direct proportion to the increased gearing.

In the traditional view it was felt that at lower gearing levels the increase in required return was less than proportional to the increased gearing. The result of this is that under the traditional view the WACC falls at low gearing levels, whereas according to MM it remains constant whatever the level of gearing.

2.2 M&M 1963: capital structure allowing for the effect of taxation

M&M showed in 1963 that, in the presence of corporation tax, it is advantageous for firms to issue debt (gear up). (Pike, Neale & Linsley, 2012)

Interactive question 1: Capital structure with effect of taxation

The same situation as in the Capital structure worked example above, but this time corporation tax is payable at 17%.

	No debt	£800m debt	£1,800m debt
	£m	£m	£m
EBIT	100		
Interest	–	(40)	(90)
	100	60	10

Requirement

Which capital structure is most attractive in terms of total amount paid to investors, taking into account the tax payable?

See **Answer** at the end of this chapter.

Conclusion

The effect of interest being allowable against tax means that geared companies pay less tax. This means geared companies will have more cash to pay out to investors, and therefore are worth more.The optimal capital structure is therefore a geared one.

More formally M&M showed in 1963 that:

$V_g = V_u + DT$

Where V_g = value of debt + value of equity in a geared firm, and V_u = value of equity in an equivalent ungeared firm, T is the corporation tax and D is the market value of the geared firm's debt.

The implication is that the WACC falls as the gearing level rises.

Here the benefits of the tax relief mean that increasing amounts of debt reduce the WACC and this is **less** than offset by the increasing returns required by shareholders which push up the WACC. As a result, the WACC falls as the level of gearing increases.

This suggests that the optimal level of gearing is nearly 100% debt.

The implications of increased debt causing the WACC to rise due to additional gearing has implications for how debt-financed investments are evaluated. This is explored in section 4 on Adjusted Present Value (APV).

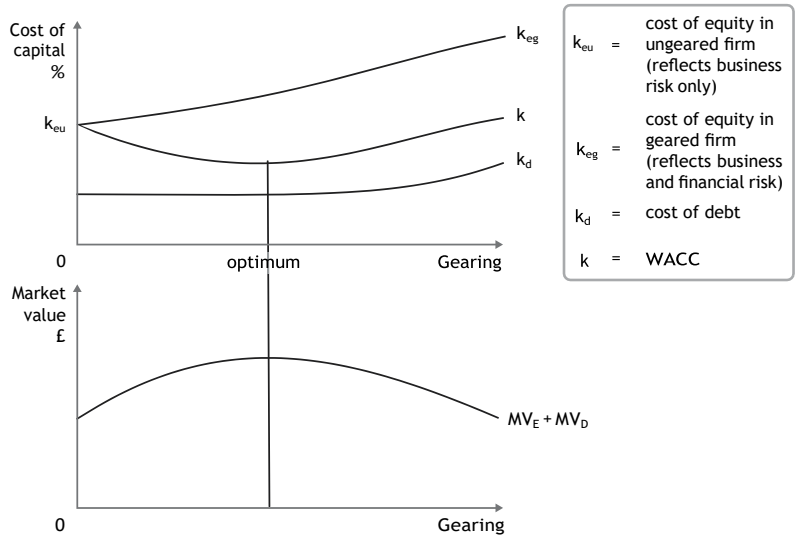


Figure 6.2: The traditional view of gearing

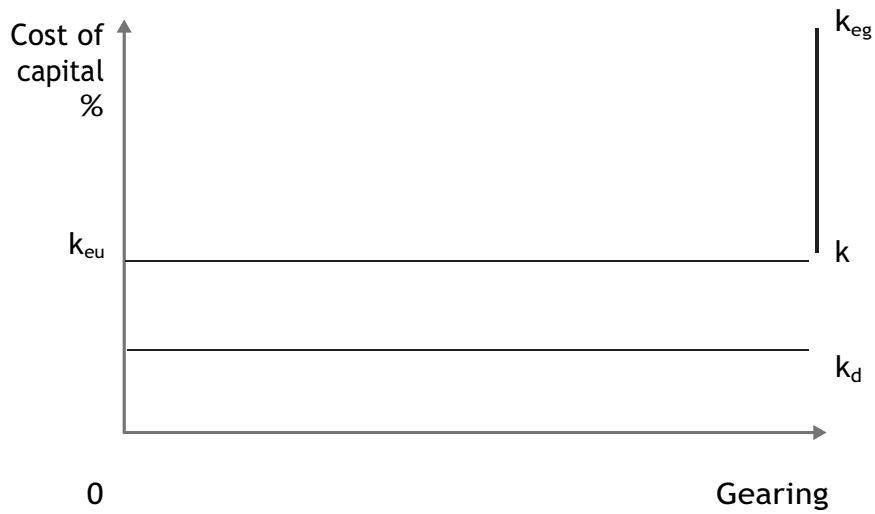


Figure 6.3: M&M 1958 position

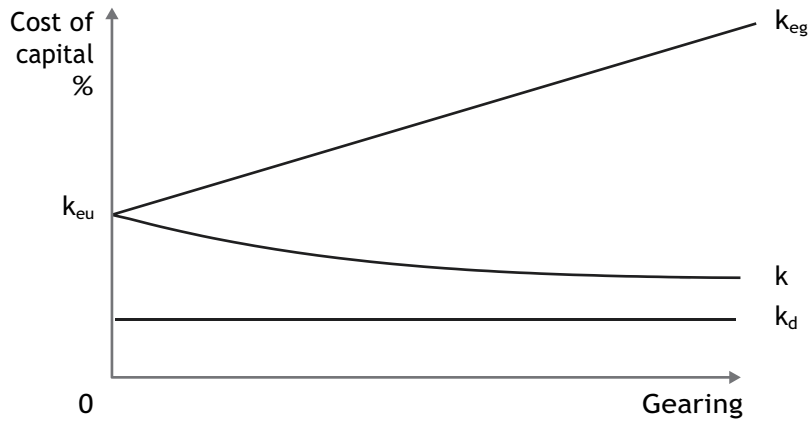


Figure 6.4: M&M 1963 position

3 Capital structure and high gearing

Section overview

- There are some problems with high gearing as advocated by M&M, notably bankruptcy costs, agency costs and tax exhaustion. As a result, the optimum gearing level is below 100% debt finance.
- Managers can act in ways which prefer shareholders to debtholders and so increase bankruptcy costs.
- Lenders use loan covenants to protect their position.

3.1 Problems associated with high levels of gearing

A brief examination of company balance sheets would reveal that in reality companies do not use100% debt gearing levels. The reasons for this are usually categorised as follows:

(a) Bankruptcy costs

(b) Agency costs

(c) Tax exhaustion

3.2 Bankruptcy costs

The basic M&M with-tax equation is $V_g = V_u + DT$

Market value of the firm = Value if all-equity financed + Value of the tax shield

As firms take on higher levels of gearing, the chances of default on debt repayments, and hence the risk of insolvency ('bankruptcy'), increases. Investors will be concerned about this and will sell their holdings, causing a fall in the value of the company's securities, with a corresponding increase in the firm's cost of funds. To optimise capital structure, financial managers must therefore keep gearing below the point where the cost of investor concerns over bankruptcy outweigh the benefits gained from the increased tax shield on debt.

Thus the M&M equation can be written:

Market value of the firm = Value if all-equity financed + Value of the tax shield – Bankruptcy costs

It is not the risk of bankruptcy in itself that is the problem, but the costs that accompany it. These costs may be categorised as follows.

Direct costs of bankruptcy

- If a firm is liquidated, its assets are usually sold at less than their going-concern value. Liquidation costs, redundancy costs and distress prices for assets can all lead to assets realising less than their economic value.
- These costs mean that the company's going concern value will be greater than its winding-up value. This loss in value will often be **borne by the debt holders** in the event of bankruptcy.
- To compensate for this, investors in both debt and equity will ask for higher rates of return from highly-geared companies and thus drive down the prices for their securities.

Indirect costs of bankruptcy

These costs can be suffered by companies that eventually go bankrupt or by those that hover close to bankruptcy for many years. They relate to the problems of operating a company under severe financial distress.

Interactive question 2: Acceptable debt levels

Jethro plc has very high debt levels, well over what is considered normal for this type of company,and has had for a number of years.

Requirement

What are the implications for the following?

- Managers
- Key employees
- Suppliers

- Customers
- Asset replacement
- Ability to enforce contracts

See **Answer** at the end of this chapter.

3.3 Conflicts between shareholders and debt holders

There are ways in which managers (appointed by shareholders) can act in the interests of the shareholders rather than the debt holders and in doing so, contribute to the indirect costs of bankruptcy, for example:

- Paying large cash dividends will realise part of the company's value for the shareholders at the expense of the debt holders.
- Managers may try to hide the extent of a firm's poor financial state by cutting back on research, maintenance, etc, and thus improve the results of 'this year' at the expense of those of 'next year'. This 'playing for time' tactic can worsen a debt holder's position.
- Management may negotiate a loan for a relatively safe investment project offering good security, and therefore carrying only modest interest charges, and then use the funds to finance a far riskier investment.
- Management may arrange further loans which increase the risks of the initial lenders by undercutting their asset backing.

It is probably fair to say that most managers do not actively set out to deceive lenders, as they have little to gain – after all most of them are employees rather than owners and may suffer considerable personal loss if their company goes bankrupt. (It is often not easy for the financial director of a failed firm to find similar employment elsewhere.) In addition, they know that, although these tactics may be to the short-run gain of the equity holders, they cannot expect to win in the long run – a lender may be deceived once but it is doubtful if the deception will work a second time.

Nevertheless, it is because of the risk that managers might act in this way that most loan agreements (see Chapter 4) contain restrictive covenants for protection of the lender. Complying with such covenants places a restriction on the actions of managers and imposes a potential additional cost of borrowing.

These restrictions on the managers or agents are referred to as **agency costs**.

3.4 Loan covenants

Restrictive covenants used by suppliers of debt finance can be divided into four main categories:

- **Restrictions on issuing new debt**

  These usually prevent the issue of new debt with a superior claim on assets unless the existing debt is upgraded to have the same priority, or unless the firm maintains a minimum prescribed asset backing. Restrictions on asset rentals, leasing, and sale and leaseback are also often used.

- **Restrictions on dividends**

  Dividend growth is usually required to be linked to earnings growth. Repurchase of equity shares in share repurchase schemes (effectively a dividend) is also often restricted.

- **Restrictions on merger activity**

  Debt covenants may prohibit mergers unless post-merger asset backing of loans is maintained at a minimum prescribed level.

- **Restrictions on investment policy**

  Covenants employed include restrictions on investments in other companies, restrictions on the disposal of assets, and requirements for the maintenance of assets. This is usually considered to be the most difficult aspect for creditors to monitor.

  Contravention of these agreements will usually result in the loan becoming immediately repayable, thus allowing the debenture holders to restrict the size of any losses. Obviously, no set of covenants can completely protect creditors, and any remaining risks will be covered by the interest rate charged and by securing loans on the assets of the company.

3.5 Tax exhaustion

A further disincentive to high gearing is that the firm must be in a taxpaying position to obtain the tax shield on debt. At a **certain level of gearing** companies may discover that they have no taxable income left against which to offset interest charges. This is particularly likely if they have been investing heavily and are in receipt of large capital allowances. After this point firms will experience all the problems of gearing but none of the advantages.

The effect of the risks and costs of bankruptcy, the agency costs and tax exhaustion is likely to push up both the cost of equity and the cost of debt.

The conclusion is that the WACC is likely to be saucer-shaped and that there is now an optimal level of gearing, but no easy way of determining where it is. In other words, **the traditional view** is likely to be correct.

The next section looks at some of the factors which determine the amount of gearing a firm should have.

3.6 Practical aspects in the capital structure decision

In addition to the above points, the following practical aspects apply equally to the traditional and M&M (1958 and 1963) theories:

- **Business risk**

  Gearing adds financial risk on top of business risk; hence the higher the business risk (including operating risk), the lower the gearing tends to be.

- **Bankruptcy**

  Bankruptcy costs (legal, administrative, accountancy, forced sale of assets at less than market value) have a higher chance of being incurred at higher levels of gearing.

- **Quality of assets**

  Lenders look for security: thus firms with substantial tangible assets (land, buildings, plant and equipment) tend to be able to borrow more.

- **Availability of other sources of finance**

  Small firms may have limited access to external finance and are forced to use equity (eg, retained earnings) rather than borrowings.

- **Cost of raising finance**

  Issue costs are zero for retained earnings, whereas new issues (including rights) are much more expensive. Loan finance is comparatively cheap to raise.

- **Tax rate**

  The higher the tax rate the higher the tax relief on interest, subject to tax exhaustion. The above aspects are depicted in the diagram below.

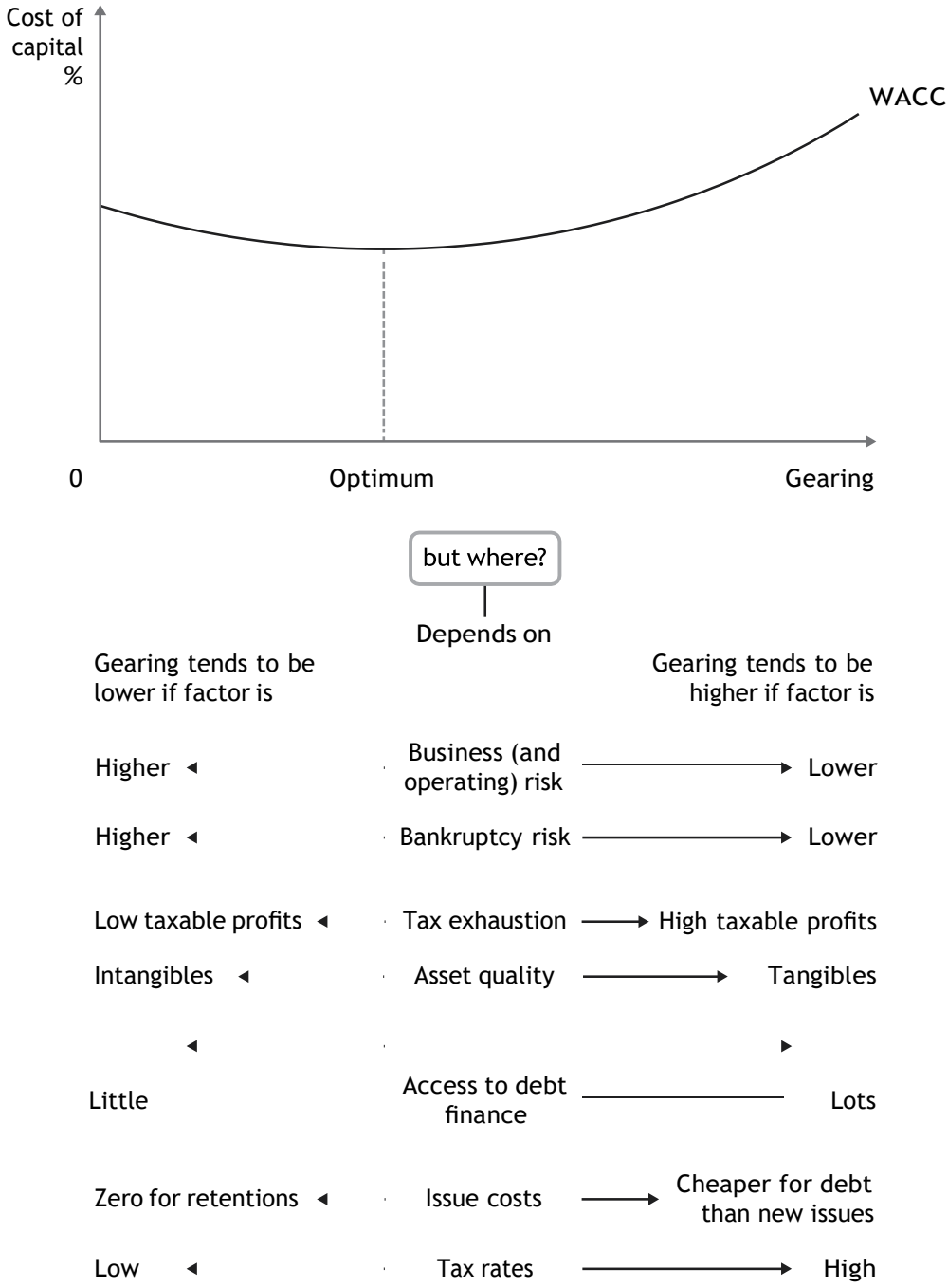


Figure 6.5: Impact of practical aspects in the capital structure decision

In addition, the following should be borne in mind:

- **Signalling**

  Raising debt could be taken as a sign of confidence by investors ie, the directors are sufficiently confident about future prospects that they are willing to expose the business to debt capital and interest payments.

- **Clientele effect**

  Particular shareholders (a 'clientele') may be satisfied with the existing level of gearing of a firm (eg, in the context of their wider portfolios of investments). A change in the level may not suit them and they may sell their shares. Equally the change in gearing may suit new investors who would want to buy the firm's shares if gearing changes. The net effect may be adverse, however, and the wealth of the original shareholders may fall.

Professional skills focus: Applying judgement

The capital structure decision is complex and depends on various factors that are specific to an individual company. When producing recommendations on an optimal capital structure, you are going to need to display sound logic that your actions follow on from the information provided.

4 Adjusted present value

Section overview

- In a with-tax world, M&M (1963) argued that changing the capital structure may cause the cost of capital to alter.
- Projects financed with new debt can be evaluated using the Adjusted Present Value (APV) technique.
- APV
  - Find the base case NPV @ k_{eu}
  - Adjust for the present value of the tax shield @ pre-tax cost of debt

4.1 Changing capital structure

Worked example: Changing gearing

Spears Ltd is currently an all-equity company. It is considering borrowing a significant amount to finance a new project. The new project is similar, in terms of business risk, to the existing projects.

Requirements

1 What will happen to the company's cost of capital?

2 What cost of capital should be used to assess the new project?

- The existing cost of capital?

- The cost of the new debt?
- The new WACC?

Solution

1 The increased level of gearing may cause the overall WACC to fall, due to the tax shield on the debt interest.

2 The company's existing cost of capital (the cost of equity ke) is inappropriate, as the new gearing will have altered it.

The cost of the new debt is not the correct discount rate, because the cost of debt does not reflect the risk that will be borne by the shareholders.

The new WACC is difficult to identify, for the following reason:

$$WACC = \frac{K_e MV_e + K_d MV_d}{MV_e + MV_d}$$

One component of the above is the market value of the shares (MV_e in the above equation) – which reflects the impact of both the new debt **and** the project.

The impact of the new project on the share value is its NPV – the value of the shares should reflect the wealth created by the project.

The NPV requires the new cost of capital (the new WACC) to be known.

Thus there is a problem – to find the new cost of capital requires the new market value of the shares, and this requires the NPV to be known, which in turn requires the new cost of capital.

4.2 Adjusted present value

The Adjusted Present Value (APV) approach can be used to address the above problem in the following way:

(a) Calculate a base case value of a project using k_{eu} (cost of equity for an ungeared company). This gives the value of the project as if it were ungeared.

(b) Establish the present value of the tax shield arising as a result of the debt capacity generated by the project. The appropriate discount rate for the tax shield is the pre-tax cost of debt.

(c) Adjust for the costs of issuing the finance.

Adding these two together gives an Adjusted Present Value (APV) which should be interpreted in the same way as an NPV. For example, a positive value for the APV indicates an increase in shareholder wealth, and so the project should go ahead.

Interactive question 3: APV

Toes Ltd, currently all-equity financed, is considering a project which will involve investing £240 million now and will generate annual post-tax net cash flows of £40 million for each of the next 10 years. The project will use buildings and equipment which, when used as security, will enable Toes Ltd to borrow £187.5 million at a rate of 8%. The costs of issuing the debt are £1 million. The debt will last as long as the project: 10 years.

Corporation tax rate is 17%.

If the project were to be funded entirely by equity, the cost of capital would be 12%.

Requirement

Establish whether Toes should go ahead with the project, by ascertaining the following:

- Project base case?
- Value of tax shield?
  - Interest charge
  - Tax relief per annum
  - Present value at pre-tax cost of debt
- Adjust for the issue costs

See **Answer** at the end of this chapter.

4.3 Problems with the APV approach

The APV technique is based upon the assumptions of M&M with tax. That means that issues such as agency costs and financial distress, which may affect the attractiveness of debt finance, are not reflected in this technique.

5 Gearing and the CAPM

Section overview

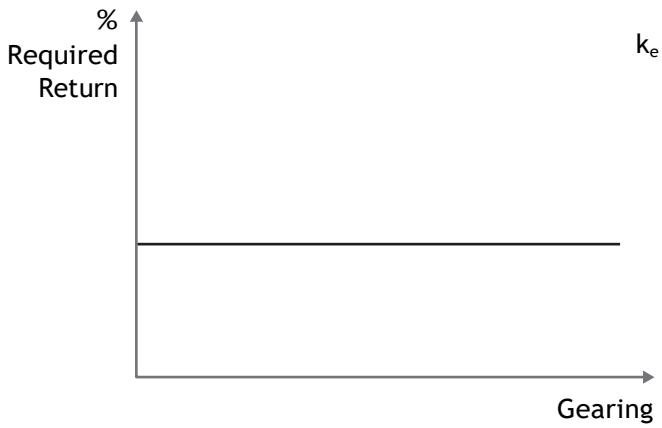
Revisiting CAPM again briefly, the beta of equity is sensitive not only to the amount of systematic risk but also to the amount of financial risk ie, the level of gearing.

Worked example: Gearing betas

What happens to the required return on a share if the company takes on more debt? What are the implications of this for the beta value of equity?

Solution

The relationship between the required return on a share and the level of gearing is as shown in the graph.



Relationship between required return on a share and the level of gearing

The reason the required return goes up is because as a company borrows more, the risk that the shareholders face will increase.

It follows that a geared company's shares will have a higher beta.

This is because financial risk applies systematically and cannot be diversified away.

In the CAPM the beta of equity rises as gearing increases. (Debt can also have a beta such that the required return is greater than the risk-free rate. For simplicity, in the explanation that follows it is assumed that debt is risk-free and its beta is zero.)

The assets of a business contain only systematic business risk which is measured by β_a (asset beta). In an ungeared firm this must be the same as β_e (since there is no financial risk arising from any gearing). But, as gearing increases, the β_e increases, such that $\beta_e > \beta_a$. One way of relating β_e, β_a and the level of gearing (assuming risk-free debt) is:

$$\beta_e = \beta_a\left(1 + \frac{D(1 + T)}{E}\right)$$

where D and E are the market values of debt and equity respectively, and T is the corporation tax rate.

(This formula is given on the formulae sheet in the examination.)

One particular use of this relationship between β_e and β_a is to derive a discount rate for project appraisal which takes account of both the systematic risk of the project and also the financing risk.

While the CAPM is a less-than-perfect theory, it is robust enough to be widely used in the real world and certainly adequate for the examination. Thus, a risk-adjusted discount rate based on the systematic risk of a project can be devised and used to derive the project's NPV, in order to determine whether or not it is acceptable and whether the project should be undertaken.

Interactive question 4: CAPM

Hubba plc, an all-equity financed food manufacturer, is about to embark on a major diversification into the consumer electronics industry. Its current equity beta is 1.15, while the average equity beta of electronics firms is 1.6. Gearing in the electronics industry averages 30% debt, 70% equity by market values. Debt is considered risk-free.

$r_m = 25\%$ $r_f = 10\%$ $T = 17\%$

Estimate a suitable discount rate for the project if it were financed:

Requirements

4.1 entirely by equity;

4.2 by 30% debt, 70% equity (by market values); and

4.3 by 40% debt, 60% equity (by market values).

See **Answer** at the end of this chapter.

Professional skills focus: Assimilating and using information

You are expected to be able to filter information provided to identify critical facts. The information needed to calculate a project specific cost of capital is normally embedded within lots of detail in the question scenario. It is helpful to annotate the scenario on the screen and prepare a separate calculation to show your workings clearly.

6 Cash forecasts

Section overview

- Cash forecasts provide an early warning of liquidity problems.
- A forecast balance sheet helps identify any cash shortfall (or surplus).
- A cash flow forecast can be derived by adjusting the profit figure.

6.1 Introduction to cash forecasts

Definition

Cash budget (or forecast): A detailed budget of estimated cash inflows and outflows incorporating both revenue and capital items.

Cash forecasts (or budgets) provide an early warning of liquidity problems, by estimating:

- how much cash is required;
- when it is required;
- how long it is required for; and
- whether it will be available from anticipated sources.

A company must know **when** it might need to borrow and **for how long**, not just **what amount** of funding could be required. This area was introduced in Management Information, where cash management and working capital were explored.

6.2 Cash forecasts based on the balance sheet

A balance sheet-based forecast is produced for **management accounting purposes** and so is not for external publication or statutory financial reporting. **It is not an estimate of cash inflows and outflows**, but an estimate of the company's balance sheet at a future date which identifies either the **cash surplus** or the **funding shortfall** at that time.

6.3 Estimating a future balance sheet

A balance sheet estimate calls for some prediction of the amount/value of each item in the company's balance sheet, **excluding cash and short-term investments**, as these are what we are trying to predict. A forecast is prepared by taking each item in the balance sheet, and

estimating what its value might be at the future date. The figures on each side of the balance sheet will not be equal, and there will be a balancing figure being the amount of cash in surplus/deficit.

- If there is a surplus of share capital and reserves over net assets (total assets minus total liabilities) the company will be forecasting a **cash surplus**.
- If there is a surplus of net assets over share capital and reserves the company will be forecasting a **funding deficit**.

Worked example: Funding deficit

Alpha has an existing balance sheet and a forecast balance sheet in one year's time before the necessary extra funding is taken into account, as follows.

		Existing	Forecast after one year	Difference
Assets	£'000	£'000	£'000	£'000
Non-current assets		100	180	
Current assets		90	100	
Total assets		190	280	90
Equity and liabilities				
Share capital and reserves £1 ordinary shares	50		50	
Other reserves	20		20	
Accumulated profits	30		50	
		100	120	(20)
Non-current liabilities 5% loan notes	20		20	
Other (tax)	10		10	
		30	30	
Current liabilities		60	90	(30)
Total equity and liabilities		190	240	

Requirement

What is the funding required?

Solution

The company is expecting to increase its total assets in the next year by £90,000 (£280,000 –

£190,000) but expects accumulated profits for the year to be £20,000 (£50,000 – £30,000) and current liabilities to increase by £30,000. There is an excess of net assets over share capital and reserves amounting to £40,000 (£280,000 – £240,000), which is a **funding deficit**. The company must consider ways of obtaining extra cash (eg, by borrowing) to cover the deficit. If it cannot, it will need to keep its assets below the forecast amount, or to have higher short-term payables.

A revised projected balance sheet can then be prepared by introducing these new sources of funds. This should be checked for realism (eg, by **ratio analysis**) to ensure that the

proportion of the balance sheet made up by non-current assets and working capital, etc, is sensible.

6.4 Deriving cash flow from income statement and balance sheet information

It is possible to derive a forecast figure for cash flows using both the **balance sheet** and the **income statement**. The profit from operations is adjusted first of all for items not involving cash, such as depreciation. This is further adjusted for changes in the levels of working capital (eg, receivables and payables) to arrive at operational cash flows.

6.5 Forecast financial statements

Forecast financial **statements** can be constructed from first year data.

Interactive question 5: Financing gap

Mylotic plc produces radio-controlled toys. The most recent balance sheet of the company is set out below.

Balance sheet as at 30 November 20X2

	£m	£m	£m
Non-current assets Freehold buildings at cost		24.4	
Less accumulated depreciation		4.4	20.0
Plant and machinery at cost		37.9	
Less accumulated depreciation		12.9	25.0
			45.0
Current assets			
Inventory	39.0		
Trade receivables	20.0		
Bank	0.5	59.5	
Less payables: amounts falling due within one year			
Trade payables	16.5	16.5	
			43.0
			88.0
Capital and reserves			
Ordinary £1 shares			20.0
Accumulated profits			68.0
			88.0

During the year to 30 November 20X2, the sales revenue for the business was £240 million.

As a result of recent changes in overseas markets, combined with developments in technology, it has been predicted that the market for the company's products will increase significantly in the short- term. The directors of Mylotic are planning to expand the business significantly during the forthcoming year in order to exploit these new market conditions. The following forecasts and assumptions for the forthcoming year have been prepared by the directors:

- Sales for the forthcoming year will be 25% higher than the previous year. Sales are expected to be spread evenly over the year.
- The gross profit margin will be 30% of sales.
- To prepare for the expansion in output, new machinery costing £57 million will be purchased at the beginning of the year and a long-term loan will be taken out immediately to help finance this purchase. At the end of the year, the long-term debt to equity ratio is planned to be 1:3.
- The average receivables collection period will be three times that of previous years and the average payment period for creditors will be one and a half months.
- The value of inventory at the end of the year will be £18 million lower than at the beginning of the year.
- Depreciation charges for freehold buildings and plant and machinery are calculated using the reducing balance method and will be 5% and 20% respectively. Other expenses for the period will be £54.5 million. There will be no prepayments or accruals at the end of the year.
- The dividend pay-out ratio will be 50% which is in line with previous years. The tax rate will be 17% of net profits before taxation. The dividend will be paid during the year to which the profits relate. Tax is paid in the same year that it is charged.

Requirements

1.1 Prepare in as much detail as the information allows:

(a) A forecast income statement for the year ended 30 November 20X3

(b) A forecast balance sheet as at 30 November 20X3

1.2 Comment briefly on the liquidity and position of the business using the financial statements prepared in 5.1 above.

Note: All workings should be in £ millions and should be made to one decimal place. Workings must be clearly shown.

See **Answer** at the end of this chapter.

6.6 Sensitivity analysis and changes in variables

In a well-designed forecast a great number of **'what if'** questions can be asked and answered quickly by carrying out **sensitivity analysis** and changing the relevant variables. In a cash flow forecast model, managers may wish to know the cash flow impact if sales growth per month is nil, ½%, 1%, 1½%, 2½% or minus 1% and so on.

However, businesses will also want to estimate the magnitude of changes in sales (and ultimately profits) if economic or business variables change. This will be more problematic.

6.7 Changes in economic variables

Businesses need to be aware of likely changes in inflation, interest rates and so on. Governments and central banks issue regular updates and forecasts, and the financial press is also helpful as a source of information.

However, businesses will also need to forecast:

- how the **predicted changes** will **affect demand**. The links between variables are complex and may not be easy to forecast. Businesses should consider separately the effect of changes in the rate of price increases or in interest rates etc, on each type of product.
- how the **business** will **respond to changes in variables**. For example, will the business automatically adjust prices upwards by the rate of inflation, or will it try to hold prices? What will its competitors do? If raw material prices increase, will the business try to change suppliers? What effect will this have on payment patterns?

6.8 Changes in business variables

Economic variables will clearly impact upon business variables such as **sales volumes** and **profit margins**. Businesses need to be aware of the other factors, such as changes in the competitive environment, that could affect these variables and how this effect might work. The original forecast should itself have been based on **demand forecasts,** determined by market surveys and statistical models based on past changes in demand. However, if factors such as taste or lifestyle change, businesses need to recognise this might not just require marginal changes in forecasts, but a re- visiting of the base data, since the changes will ultimately render the previous market surveys or models redundant.

Professional skills focus: Structuring problems and solutions

You are expected to be able to identify and apply relevant technical knowledge and skills to analyse a specific problem. Your ability to prepare forecast financial statements will allow you to identify a company's funding requirement and should lead to an analysis of how to address any potential cash deficit problems.

7 Financing requirements

Section overview

- **Cash deficits** will be funded in different ways, depending on whether they are short- or long-term.
- Businesses should have procedures for investing **surpluses** with appropriate levels of risk and return.

7.1 Deficiencies

Any forecast cash **deficiency** will have to be funded. Chapter 4 on sources of finance explored these in detail. The main sources of long-term funding are new equity (or preference shares) or increased borrowing. There will be implications of any changes in capital structure for the cost of capital, which was explored in Chapter 5. Exam questions may therefore link the topics in Chapters 4, 5 and 6 together.

- **Share capital**. The firm may consider raising new equity or preference share capital. The cost of issuing and the time frame required for this, together with the level of investor

confidence in the equity markets, will all need to be factored into the assessment of whether this is suitable.

- **Borrowing**. If borrowing arrangements are not already secured, a source of funds will have to be found. If a company cannot fund its cash deficits it could be wound up.
- The firm can make arrangements to **sell any short-term marketable** financial **investments** to raise cash.
- The firm can delay payments to suppliers, or pull in payments from customers. This is sometimes known as **leading and lagging**.

Because cash forecasts cannot be entirely accurate, companies should have **contingency funding**, available from a surplus cash balance and liquid investments, or from a bank facility.

The approximate size of contingency margin will vary from company to company, according to the cyclical nature of its business and the approach of its cash planners.

Forecasting gives management time to arrange its funding. If planned in advance, instead of a panic measure to avert a cash crisis, a company can more easily choose when to borrow, and may be able to obtain a lower interest rate.

7.2 Cash surpluses

Many cash-generative businesses are less reliant on high-quality cash forecasts. If a **cash surplus** is forecast, having an idea of both its size and how long it will exist could help decide what to do with it. The choice may be between investment (Chapters 2 and 3) and dividend payment (Chapter 7).

In some cases, the amount of **interest** earned from surplus cash could create a significant improvement to the company's earnings. The company may then need a forecast of its interest earnings in order to indicate its prospective **earnings per share** to stock market analysts and institutional investors.

7.3 Analysis

In order to explore whether a potential source of finance is viable or attractive a forecast cash flow, balance sheet or income statement is required.

Worked example: Financing decisions

Max plc is a printing and publishing business. The business has traded very successfully for many years, largely on the basis of a lifestyle magazine which has sold well due to the recent fashion for such publications. The increase in the number of similar offerings from competitors however has resulted in a need to re-invigorate the product range.

A plan to launch new magazine titles by the directors is expected to increase revenue by 10% per annum for the foreseeable future. In order to finance the expansion, the directors are considering either a rights issue or new debt finance.

The overheads of the business should be unaffected by the expansion in sales. Other relevant information is as follows:

- The level of competitive rivalry between the suppliers to this industry is very pronounced, and as a result an increase in direct costs of only 8% per annum is expected.
- The working capital will be controlled in the same fashion as before, with no changes anticipated to the terms of trade. Thus, the amount of credit taken (in proportion to

revenue) and the credit given (in proportion to direct costs) will be unchanged. The increase in the business will require increased inventory of £5 million.

- Depreciation on non-current assets existing at 30 December 20X0 is forecast to be £5.7 million pa and it is forecast that £10 million of new non-current assets will be needed. This, together with the new inventory, will be acquired in the year to 30 December 20X1. Depreciation on these new assets will be 18% on a reducing balance basis starting in the year of purchase.
- The company pays tax at 17% per annum in the year in which the liability arises, and capital allowances are available at the same rate as depreciation.
- Annual dividends are payable the year after the year in which the profits are earned. The company intends to maintain the existing payout ratio.

Summary financial statements		
Income statement year to 30 December 20X0		
		£'000
Revenue		81,000
Direct costs		(45,600)
Depreciation		(5,700)
Indirect costs		(12,000)
Interest payable		(1,500)
Profit before tax		16,200
Tax on profit at 17%		(2,754)
Profit after tax		13,446
Dividends for the year		8,068
Balance sheet at 30 December 20X0		
	£'000	£'000
Non-current assets (NBV)		70,200
Current assets		
Inventory	10,500	
Receivables	14,700	
Cash at bank	3,150	
		28,350
		98,550
Capital and reserves		
Ordinary shares (£1 nominal value)		15,000
Reserves		47,582
		62,582

	£'000	£'000
Non-current liabilities		
10% debentures 20X5		15,000
Current liabilities		
Payables	12,900	
Dividends payable	8,068	
		20,968
		98,550

Note: The balance sheet includes dividends payable as a current liability because dividends for the year have not yet been paid. For the purpose of forecasting, the dividend that will be paid must be included in the forecast and so is included in the balance sheet here for convenience.

The proposed financing methods are:

(1) 1 for 5 rights issue at £5 per share; or

(2) a £15 million term loan at 8% interest.

Requirement

For the two financing alternatives being considered by the directors of Max plc, prepare forecast:

(1) income statements for the year to 30 December 20X1; and

(2) balance sheet at 30 December 20X1.

Note: Ignore transaction costs on the issuing of new capital and returns on surplus cash invested short term.

Solution **Year ended 30 December 20X1Income statement**	**Rights issue**	**Loan**
	£'000	£'000
Revenue 81,000 × 1.1	89,100	
Direct costs	(49,248)	
Depreciation 5,700 + (18% × 10,000)	(7,500)	
Indirect costs	(12,000)	
Operating profit (same for each method)	20,352	20,352
Interest payable (unchanged for rights issue)(1,500 + £15m × 8% for loan)	(1,500)	(2,700)
Profit before tax	18,852	17,652
Tax at 17%	(3,205)	(3,001)
Profit after tax	15,647	14,651
Dividend (60% of profit after tax)	(9,388)	(8,791)
Retained profit	6,259	5,860

Summary balance sheet

	Rights issue £'000	Loan £'000
Non-current assets		
70,200 + 10,000 – 7,500 depreciation	72,700	72,700
Inventory 10,500 + 5,000	15,500	15,500
Receivables 14,700 × 1.1	16,170	16,170
Cash (balancing figure)	17,791	16,795
	122,161	121,165
Capital and reserves		
Share capital 15,000 + 3,000	18,000	15,000
Reserves b/fwd	47,582	47,582
Retained profit	6,259	5,860
Share premium on new issue	12,000	0
Debentures 15,000 + 15,000	15,000	30,000
Payables 12,900 × 1.08	13,932	13,932
Dividend payable	9,388	8,791
	122,161	121,165

Note: The cash position has been identified as the balancing figure above. The cash flow below has been included to illustrate the reconciliation between cash flow and balance sheet.

Cash flows

		Rights issue		Loan
	£'000	£'000	£'000	£'000
Operating profit		20,352		
Add depreciation Increase in:		7,500		
inventory		(5,000)		
receivables		(1,470)		
payables		1,032		
Net cash flow from operations		22,414		22,414
Dividends paid	(8,068)		(8,068)	
Interest paid	(1,500)		(2,700)	
		(9,568)		(10,768)
Tax paid		(3,205)		(3,001)
Acquisition of non-current assets		(10,000)		(10,000)
Net cash outflow before financing		(359)		(1,355)

Share issue/new loan	15,000	15,000
Increase in cash	14,641	13,645

		Rights issue		Loan
	£'000	£'000	£'000	£'000
Opening cash		3,150		3,150
Increase in year		14,641		13,645
Closing cash		17,791		16,795

Interactive question 6: Financing decisions

Write a report to the directors that evaluates the proposed methods of financing for Max plc (worked example above).

See **Answer** at the end of this chapter.

8 Writing a business plan

Section overview

- A business plan reflects a company's planning process for a given time horizon.
- Business plans will include sections on background, history, prospects and a financial assessment.

8.1 Introduction

A written business plan is a result of a process of planning, and sets out:

- the direction of an organisation;
- strategies chosen;
- the background to the decisions made; and
- their practical implications and outcomes.

In a broad sense, planning is the process of deciding in advance what is to be done. When planning takes place in an organisation it involves an explicit evaluation of alternative courses of action and communication of the decision process to others.

An organisation's survival depends on maintenance of an income stream, and ensuring that it has the resources – people, equipment, premises, materials and funds – with which to carry out its activities. Changing business environments mean that planning needs to be a continuing process. A business plan must be updated regularly to maintain its usefulness.

A business plan can be produced for any period or scale of activity. Most large organisations have **long-term plans** of about 10 years as well as **business plans** for three to five years and **operational plans** for the next 12 months.

Small and medium-sized companies may be required to prepare a business plan as part of an application for financing from a bank or venture capitalist.

The document does not need to be over long, but must justify its financial forecasts. This means that sufficient weight must be given to:

- marketing, sales and growth forecasts;
- competitor analysis;
- risk analysis; and
- cost control.

8.2 Format of the business plan

8.2.1 A standard format: layout, supporting documents and appendices

- Front sheet: Title page, foreword or disclaimer
- Contents page
- Executive summary
- History and background
- Mission statement and objectives
- Products and services offered
- Market information
- Resources employed, management and operations
- Financial information in a business plan
- Action plan containing milestones
- Appendices – past accounts, CVs, market research, brochures, technical data etc.

Executive summary	The executive summary is typically a one-page document that allows the reader to grasp the nature and purpose of the business plan quickly and understand the detail by providing a context.
History and background	This section is designed to provide an insight into the business's goals, strengths and weaknesses, provide a context for decisions by describing its origins and trading record and for new ventures, to describe how the business idea developed.
Mission statement and objectives	Mission statement indicates how the business wants to be seen – its long-term goal, whereas objectives, long- and short-term, state what the organisation intends to achieve during the plan period.
Products and services offered	A brief statement of products and services provided and customers, together with any unique selling proposition differentiating the product from competitors, as well as any planned further development of the product or service.

Market information	Distribution and promotion methods, type of buyer, demographic description, location, occupation, quality required, etc, competitor pricing and a comparison of products and services, market characteristics and trends and market research.
Resources employed, management and operations	• Key people and management team – CVs, job descriptions, succession plan, organisation chart • Premises – address, type of tenure, planning permission, size, facilities, costs • Operations – a broad description of how the goods or services are provided
Financial information in a business plan	**A financial summary should highlight:** • Past and present revenue • Profitability • Key aspects of the balance sheet and cash flow • Impact of any identified risks and contingency plans for them • Amount and timing of finance required • The offer to the equity investor, if applicable, including exit route • Anticipated gearing • The purpose of any finance sought **A business plan will typically include the following forecasts:** • Cash flow in monthly intervals for the first year of the plan • Revenue forecast in monthly or longer intervals for the first year • Sales forecasts supporting the income projections • Financial forecasts in quarterly or annual intervals up to five years **It will often be appropriate to include sensitivity analysis and 'what if' analysis:** • Breakeven calculation – especially useful when sales are uncertain • Setting up costs – a separate statement for a new venture or activity • Projected balance sheet if there are significant changes to the capital structure or assets • Payback Period, Net Present Value or Internal Rate of Return if used in decision-making

Action plan containingmile-stones	An **action plan** is a detailed statement of the main actions needed to carry out the strategy, and a summary should be included in the business plan.
Appendices	Some types of detailed information are better included in an appendix – for example: • Technical product information • Specialist market reports • CVs of key people • Organisation chart • Audited accounts for past three years • Names of accountants, solicitors, bankers

Professional skills focus: Concluding, recommending and communicating

When preparing a business plan, you are expected to be able to make evidence-based recommendations which can be justified by reference to supporting data and other information.

9 The examining team's guide to answering financing questions

Section overview

There are a number of key points to consider when answering questions on financing and capital structure.

Use the mnemonic 'FAT PRICE'

When answering questions on financing and capital structure, keep the following points in mind.

F Financial risk

A Analysis and discussion

T Theory

P Practical gearing

R Ratios

I Industry averages

C Conclusion

E Easy marks

(An alternative mnemonic is 'CAFÉ TRIP'.) These points are expanded below.

Financial risk – When considering the implications for a company of choosing between equity and debt as its means of raising finance, remember that changes in gearing will alter the financial risk associated with the company, and the cost of equity, which in turn will influence the WACC.

The traditional view of gearing is that at reduced levels of gearing a company's WACC will decrease – this will cause the value of the company to rise. When gearing is reduced, this improves the stability of equity earnings, reducing shareholders' financial risk and lowering the return that they demand.

However, as gearing becomes a greater proportion of total long-term funds, the cost of debt will start to increase and WACC will rise too, and the value of the company will fall. There is therefore an optimal level of gearing, at which WACC is lowest (see 'Practical gearing' below).

The view of Modigliani and Miller (1963) is that a company's WACC and therefore value is not affected by the level of gearing, other than through the effects of tax relief, which leads to a fall in WACC and a corresponding increase in the value of the company. However, at very high levels of gearing then bankruptcy costs, tax exhaustion and agency costs can all cause the cost of debt to increase and, as with the traditional theory, the WACC will start to rise and the value of the company fall.

Analysis and discussion – When you are giving advice on whether to raise finance by debt or equity, it is essential that you incorporate numerical information in your discussion and analysis as far as the data provided allows. For example, you could be asked to comment on the implications of a change in capital structure for a company's financial health. Your discussion could include a consideration of interest cover and gearing levels, and whether they are reasonable (both in comparison to current levels and against the industry average). An increase in gearing and interest payments will cause shareholders' returns to drop if profits are not as expected, increasing financial risk and the cost of equity capital. A share issue will often cause a fall in EPS, especially in the early years of a new investment.

Theory – When answering any question stop and think whether references to theory are required. Does the question explicitly ask for such a discussion? For example:

Discuss, **with reference to relevant theories**, whether the change in Puerto's capital structure following the restructuring on 1 December 20X3 will bring about a permanent change in its weighted average cost of capital.

If a question is worded like this, then you should refer to M&M 1958, M&M 1963, and modern and traditional theories about capital structure. If it does not, you will gain no marks by including it.

Practical gearing – Traditional and modern theories suggest that there is an optimal capital structure. Changing the gearing may move away from it or towards it. If a company is currently at or above its optimal gearing level, then if gearing were to increase, the WACC would increase. However, if not yet at optimal gearing level and the increase in the debt/equity ratio moves it towards that, then the WACC will fall because of tax relief on debt interest.

There is no precise method of identifying the optimal level of gearing. It needs to be found by trial and error, taking account of current debt levels and the levels in the industry as a whole, and seeing how the market responds.

Ratios – The key ratios to cover when looking at financial indicators in the context of a financing question are interest cover, EPS, and gearing. Make sure that you know how to calculate these. When calculating gearing, if no market values are available then book values

should be used. The book value of debt is its total nominal value. Either 'debt/equity' or 'debt/debt + equity' is acceptable as an expression of gearing, but if a definition of gearing is given in the question, then use that.

Industry averages – Use these for comparison if they are given in the question, and note their absence if they are not. For example:

Outline the advantages and disadvantages of the two alternative sources for raising the £200 million and, using the industry average interest cover and gearing information, advise Wiggins' board on which source should be used.

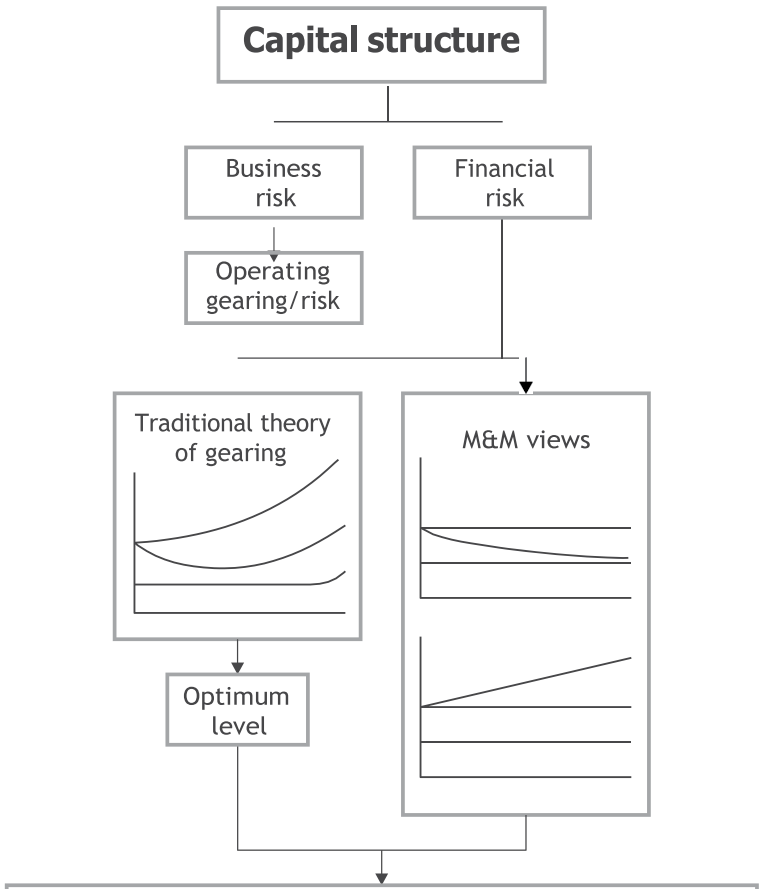
If gearing is well below the average for the industry, and interest cover is well above the industry average, such safe margins would indicate that a company has spare debt capacity. If new debt is issued, the resultant gearing ratio and interest cover will be closer to industry averages, and this may be welcomed by the markets. Loan finance may be the preferred option in such circumstances, since it is quicker to arrange and less costly than a share issue.

Conclusion – When giving advice on whether to raise finance by debt or equity it is essential that you give a supported conclusion on which to use. If a new project has uncertain profits, equity finance may be preferred because the financial risk represented by increased interest payments for the existing shareholders may be too high. Debt finance may be preferred for projects with more stable profiles, because of its cheaper direct cost. Your advice might even be to raise finance by a combination of the two.

Easy marks – Remember to refer to factors such as:

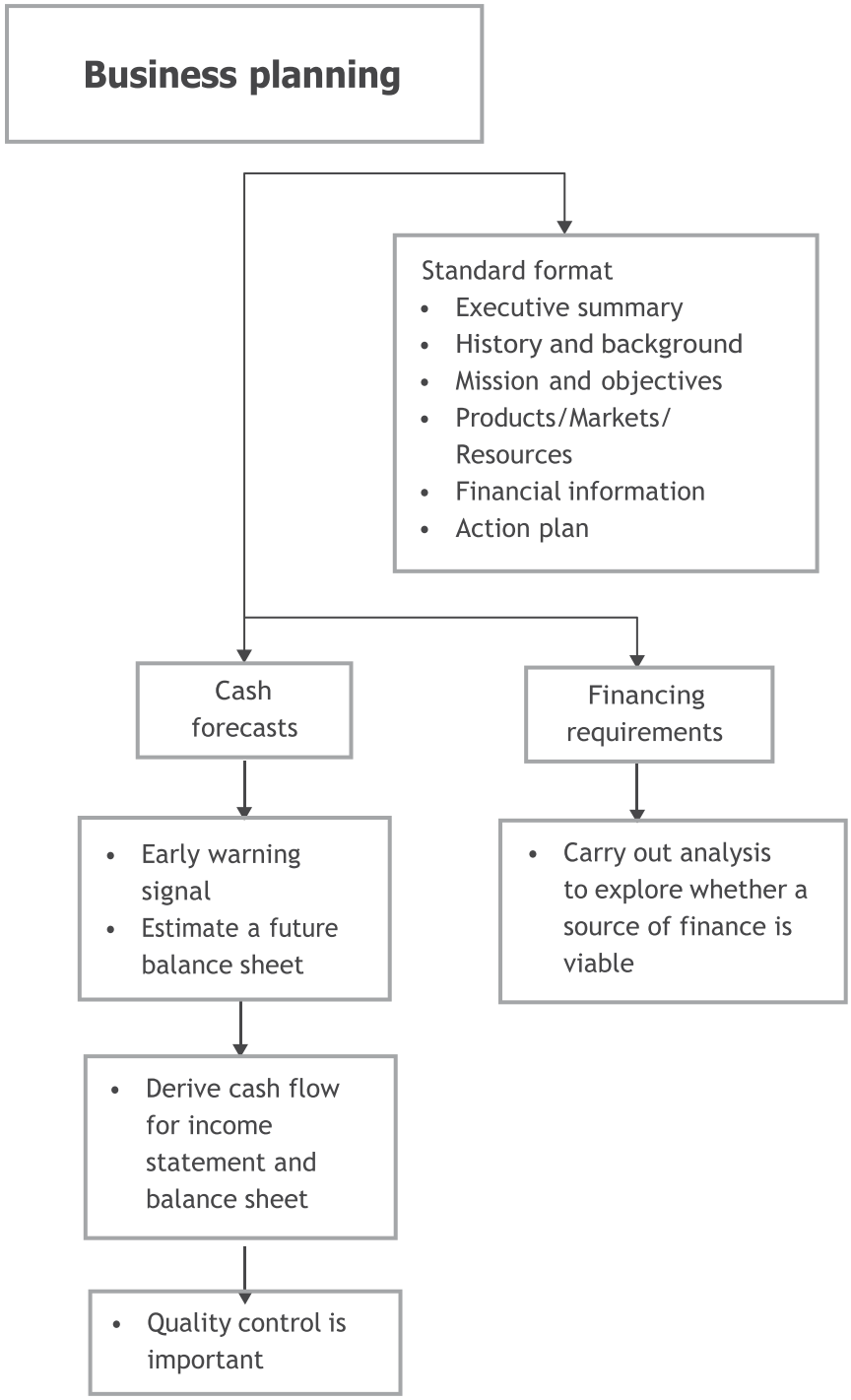
- There are issue costs associated with equity financing, along with other obligations.
- Share issues are generally reserved for large expansions or acquisitions.
- New share issues have implications for control, diluting the holdings of original shareholders.
- The size of any share issue or new debt should be compared with the current levels of financing.
- Interest has a tax shield, although this may be overstated when interest rates are low.
- Loan financing imposes a fixed obligation both for interest payments and its redemption, so its holders normally require a lower return.
- Floating rate debt could contain the risk of future interest rate rises.
- Borrowing is quicker to arrange than share issues.
- Financial managers will usually look to retained earnings first as a source of capital ('pecking order theory').
- There may be other sources of finance available (hire purchase, leasing etc).

Summary



Practical aspects

- Most businesses seem to use gearing, but not to very high levels.
- Business with high operating gearing may be unsuitable for high financial gearing.
- Lenders may use covenants to protect their position.
- Businesses may attract shareholders because of their gearing level.
- High tax rates will encourage high gearing.
- Tax capacity may well affect gearing levels.
- The relative costs of raising funds:
  - Equity from retained earnings - virtually nothing
  - Equity from rights or public issues - very expensive
  - Debt finance - relatively cheap
- Issuing debt could be taken as a sign of confidence by investors.


Business planning
Standard format
Executive summary
History and background
Mission and objectives
Products/Markets/ Resources
Financial information
Action plan
Cash forecasts
Financing requirements
Early warning signal
Estimate a future balance sheet
Carry out analysis to explore whether a source of finance is viable
Derive cash flow for income statement and balance sheet
Quality control is important

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Can you distinguish between business risk and financial risk? (Topic 1)
2.	Can you explain the impact on WACC using the traditional theory of gearing and both of M&M's theories? (Topic 2)
3.	Can you explain the three main problems associated with high gearing? (Topic 3)
4.	Can you calculate the APV of a project? (Topic 4)
5.	Can you adjust a beta for differences in gearing? (Topic 5)
6.	Can you prepare a set of forecast financial statements? (Topic 6)
7.	Can you advise on managing cash surpluses **and** deficits? (Topic 7)
8.	Can you identify the contents of a business plan? (Topic 8)
9.	Can you use the mnemonic FAT PRICE? (Topic 9)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
1 Jug plc	This is a good introductory question to allow you to practice calculating an equity beta after a change in capital structure. This is a popular area in the exam and is often examined as part of a much larger NPV question.
2 New project	This is a good preparation question to test your understanding of APV before moving onto past exam questions in the question bank.
6 Quigley Industries plc	This is a very good written answer question covering the different theories on capital structure. It is important that you practise written questions and don't just focus on the calculations so don't overlook this question.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the learning in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Technical reference

Pike, R, Neale B and Linsley P, (2012). Corporate finance and investment 7th edition. London, Pearson Education Limited.

Self-test questions

Answer the following questions.

1 Jug plc

An extract from the balance sheet of Jug plc is as follows.

	£
Ordinary shares of £1 each	3,000,000
Reserves	11,000,000
Total equity	14,000,000

The current market value of the shares is £8.

The company also has in issue £16 million of debt, which you can assume to be risk-free, which is currently valued at par.

The equity beta of Jug is 1.20.

The company proposes to issue new shares to raise £4 million in order to pay off some of its debt. The tax rate is 17%.

Requirement

Assuming there are no transaction costs with issuing the new shares or redeeming £4 million of debt,what should the equity beta of the company be after the capital restructuring?

Total: 5 marks

2 New project

A company is considering a new project that would earn cash profits before tax of £5,000,000 per annum for three years. Tax is at the rate of 17% of cash profits. The cost of the project would be

£7,500,000 and the finance would be obtained by obtaining a three-year loan at 10% interest, for which annual repayments would be as follows:

End of year	Capital repayment	Interest payment	Total
	£'000	£'000	£'000
1	2,500	750	3,250
2	2,500	500	3,000
3	2,500	250	2,750

Loan issue costs would be £100,000. The loan would significantly alter the company's gearing. Its current weighted average cost is 12%, but if the company were all equity financed, its cost of capital would be 13%.

Requirement

What is the adjusted present value of the project, to the nearest £100,000?

Total: 6 marks

3 Sorina plc

Sorina plc has always been an all equity financed company with a cost of capital of 15%. The finance director, Mr Brush, has read an article extolling the benefits of raising debt finance and has asked you to provide him with advice as to how Sorina plc should finance itself for the future. He is also interested in what discount rate he should be using for project appraisal. In order to assist you Mr Brush has helpfully collected data on four companies which is summarised below.

Company	Debt: Equity ratio	Ex-div share price	Dividend per share
P	0	£1.00	12p
Q	1:1	£2.00	36p
R	0	£1.50	24p
S	1:3	£3.00	58p

For each of these companies the dividends have been constant at the above levels for many years. Companies P and Q operate in the same industrial sector, while companies R and S both operate in a different industrial sector which is perceived as riskier than that of P and Q.

All four companies and Sorina plc itself operate in Widbergia, a country that is at present a tax-free society.

You also ascertain that debt, which may be assumed to be risk-free, is currently yielding 6% per annum to investors.

Requirements

3.1 With reference to relevant theories, comment on the data supplied by Mr Brush in relation to the optimal capital structure of Sorina plc and advise on an appropriate discount rate for project appraisal.

(8 marks)

3.2 With reference to relevant theories, indicate how your advice might change if corporate taxes were introduced into Widbergia.

Note: Your answers should address **both** theories of gearing.

(5 marks)
Total: 13 marks

4 Bayton plc

Bayton plc (Bayton) is a listed automotive engineering company and is currently planning to increase its production capacity through a significant investment in a new factory. Bayton's finance director is proposing to finance the project with long-term funding in the form of a mix of new equity and new 5% irredeemable debentures.

The finance director is currently considering the issue of the cost of capital for this particular investment project as he considers the company's existing weighted average cost of capital (WACC) to be the appropriate discount rate to use in appraising the proposed investment.

He has obtained the following up to date information:

- The company has 130 million £1 ordinary shares in issue, which are currently trading at 250p per share.
- An annual dividend of 13.6p per share has just been paid which compares with an annual dividend of 10.0p per share paid four years ago.
- The company has £125 million of 4% redeemable debentures in issue, which are currently trading at £98 per £100 of debentures and are redeemable at par in 20 years' time.

The finance director wishes to assume that the corporation tax rate will be 17% for the foreseeable future.

Bayton's managing director has, however, expressed some concerns regarding the proposed financing of the new factory. The managing director feels that the company should use only debt to finance its future projects in order to maximise the wealth of shareholders. He feels that the finance for this latest project should be raised solely through a new issue of 5% irredeemable debentures and that the debenture interest rate of 5% should, therefore, be the appropriate discount rate to use in appraising the new investment.

The production director, on the other hand, cannot understand why the company should be concerned about the cost of capital when it has access to retained profits, as they have no cost.

Requirements

4.1 Calculate Bayton's existing WACC on the basis of the information provided.

(6 marks)

4.2 Describe the difficulties that Bayton might encounter when attempting to calculate its WACC.

(7 marks)

4.3 Critically evaluate the suggestions of the finance director, the managing director and the production director, in respect of both the method of financing and the cost of capital.

(11 marks)
Total: 24 marks

5 Adams, Parlour & Vieira

Adams, Parlour & Vieira plc is a leading hotel group interested in expanding its activities. It is planning a new flagship hotel which will require an additional capital injection.

The potential cash inflows from this investment would be £5 million indefinitely from an initial investment of £50 million, £25 million of which would come from new debt finance – the balance from internal funds.

The company wishes to use the adjusted present value technique to determine the financial viability of the above.

Relevant information

- The company's existing WACC is 10.5%.
- The ungeared cost of capital for this sector is 11.06%.
- Taxation is currently at the rate of 17%.
- The loan to fund the investment will attract an interest rate of 10%.

Requirements

5.1 Calculate the Base Case NPV, the present value of the tax shield and therefore the adjusted present value of the proposed investment.

(4 marks)

5.2 What is the true WACC for the above project?

With reference to relevant theories, explain why the company's existing WACC is not the appropriate discount rate.

(4 marks)

5.3 What are the shortcomings of the APV approach?

(4 marks)
Total: 12 marks

6 Quigley Industries plc

Quigley Industries plc is a listed manufacturer whose principal product is 'Qboard'. Qboard is widely used in the building trade, particularly in residential properties. The company has several manufacturing plants in the UK. Qboard manufacture is a highly capital-intensive activity. The company's other products, which account for only a small part of revenue are also supplied to the building trade.

Recently demand for Qboard has been very buoyant and the directors have decided to open a new manufacturing plant in Staffordshire to supply the local market and save on transport costs. A net present value assessment of the projected plant shows a substantial positive outcome. The cost of establishing this plant will be significant for the company, representing about 15% of its current stock market value.

The company is financed by a combination of equity and loan stock. Since the company's funds are all tied up in operations, establishing the new plant will require that the company raises additional finance. The directors generally have open minds on the source or sources of finance.

You are the company's finance director and have had some conversations with your colleagues, when the following points were made.

Director A

"This is not a good time to be issuing equity. I have a small share portfolio of my own and I plot the monthly prices of each share on graphs. I have done this for some years now and I can tell you that the patterns clearly show that we are heading for a major downturn in share prices. If we went for equity finance, by the time that we could get it organised the bear market would be with us and we would need to issue a large number of shares to raise the necessary cash."

Director B

"We must pay attention to financial gearing. If we get that wrong, the stock market will probably savage our share price. By the way, are we going to make the financing decision without outside advice and are we going to handle the practicalities? If not, who is going to do it for us?"

Director C

"People only seem interested in equities these days; the evidence all shows that average returns are higher than you get from lending. We'll struggle to raise loan finance."

Director D

"Everyone seems to be talking about external finance, but I'm not so sure that it's necessary. We make good profits and have done for some time; can't we use some of the retained earnings for this?"

Requirement

Draft notes for the directors, with reference to relevant theories, addressing the whole question of the financing decision, as well as picking up the points raised by the directors. The notes should use language that you expect the directors to understand and should explain any technical terms.

Total: 18 marks

7 Webcroft plc

Webcroft plc is a listed company that has a number of subsidiaries operating in the civil engineering sector. The company is currently financed by a mix of debt and equity and the company's current debt/equity ratio is expected to remain constant for the foreseeable future.

The finance director of Webcroft plc has been approached by the company accountant at one of its larger subsidiaries, Webplant Ltd, in connection with a potential investment of £15 million in a new cement pumping machine that would be rented out to construction companies.

The finance director has started work on a discounted cash flow analysis of this potential investment and is currently considering the rate at which to discount the estimated after-tax cash flows of the investment. The company accountant has suggested using the cost of the group's debt finance, as it has already been agreed with the parent company that if this investment were to proceed, it would be financed wholly by debt. However, the finance director is conscious that the company's normal policy is to use the weighted average cost of capital (WACC) as the discount factor in such calculations.

At the present time, the capital structure of the company comprises:

	£m
180m £0.50 ordinary shares	90
6.2% redeemable (semi-annual coupon payments) debenture stock	60
Revaluation reserve	36
Retained earnings	39

The company's ordinary shares are currently quoted at a price of 250p per share and the debenture stock has a market value of £98 per £100 nominal value. The prevailing corporation tax rate is 17% per annum and this rate is expected to be stable for the foreseeable future. The company recently paid a dividend of 20p per ordinary share. This compares with a dividend of 18.69p per share paid in the previous year and 17.47p per share paid the year before that. Interest on the redeemable

debenture stock has also recently been paid. The debenture stock will be redeemed in cash at a 5% premium at the end of 20 years.

Requirements

7.1 Calculate the company's WACC, detailing all your workings together with any assumptions you have made in your calculation.

(6 marks)

7.2 Explain to the company accountant any reservations the finance director might have with using:

(a) the cost of debt finance as a discount factor for this investment;

(b) the weighted average cost of capital calculated in 7.1 as a discount factor for this investment.

(6 marks)

7.3 Describe the potential practical problems that might be encountered by a listed company such as Webcroft plc when calculating its weighted average cost of capital.

(4 marks)

7.4 With reference to relevant theories, advise the finance director of the potential consequences, both in theory and practice, for the company's WACC if this new investment was financed in such a way as to increase the company's long-term debt/equity ratio above the industry average.

(4 marks)
Total: 20 marks

8 Bill Jackson Haulage Ltd

Bill Jackson Haulage Ltd is a family-owned, unlisted company specialising in transporting bulk materials and waste, particularly for the local building trade, using its own fleet of lorries.

The company leases a site on which are located the company's lorry maintenance facility, a small office building and parking space for the lorries. The lease is shortly due to expire, and the land owner wishes to sell the site rather than renew the lease. A figure of about £500,000 has been mentioned as a possible price for the freehold. This represents about 20% of the value of the company's total assets less current liabilities.

You are the partner in a local firm of chartered accountants responsible for the company's audit. You have been speaking to Paul Jackson, the company's chief executive, about the possible purchase of the site. During the conversation he said:

"We are very keen to buy this site. Land prices seem to rise pretty reliably round here, so there's not much chance of it turning out to be a bad move commercially. If we don't buy it, we don't know who will. It could be people who want to use it themselves, and then we would have to find a new site. If we buy it, a lot of uncertainty would be taken away.

The problem is where would the cash come from? We haven't got any. We recently expanded our fleet of lorries and that took up all our spare funds and we had to borrow a bit from the bank as well.

We could obviously borrow more – if we can find a lender, but we are not keen to overstretch ourselves. As I understand it, some borrowing is usually regarded as a good thing, though I'm not clear why. There must be a limit on the amount of borrowing that is wise. What is the maximum figure for a company like ours?

Could you do us a short report on where we might get the cash, plus any related financial issues that you feel we ought to think about? I'd be grateful if you would keep it simple, so that we can understand it and discuss it among ourselves."

Requirements

8.1 Prepare the report requested by Paul Jackson.

(16 marks)

8.2 Critically comment on each of the following statements that have appeared in the press, explaining the reasons for your comments and clearly defining all technical terms used.

(a) 'A spin-off is a corporate restructuring device, where a company sells off a set of assets which constitute a definable part of its business to another business. The selling company's objective is usually to raise finance either for investment in its core activity or to stave off a financial crisis.'

(4 marks)

(b) 'Where there is 'hard' capital rationing, the business should seek to take on projects with the highest net present value.'

(4 marks)
Total: 24 marks

9 Zimba plc

Zimba plc is a listed, all-equity financed company which makes parts for digital cameras. It is a relatively small operator in a rapidly changing market with high fixed costs. The company pays out all available profits as dividends.

Zimba plc has a share capital of 150 million £1 ordinary shares. On 30 September 20X0 it expects to pay an annual dividend of 20p per share. In the absence of any further investment the company expects the next three annual dividend payments also to be 20p, but thereafter a 2% per annum growth rate is expected in perpetuity. The company's cost of equity is currently 15% per annum.

The Marketing Director is proposing a new investment in plant and equipment to manufacture equipment for digital televisions. This would require an initial outlay of £50 million on 30 September 20X0. If this investment were financed by a 1 for 3 rights issue it would enable the annual dividend per share to be increased to 21p on 30 September 20X1 and all further dividends would be increased by 4% per annum. The new investment is, however, more risky than the average of existing investments, as a result of which the company's overall cost of equity would increase to 16% per annum were the company to remain all-equity financed.

The Finance Director argues, however, to the contrary. "It is nonsense to continue to be all-equity financed. I believe that we could finance the new investment by an issue on 30 September 20X0 of 8% irredeemable debentures. Debt would be far cheaper than equity and the interest is available for tax relief."

The Company Accountant has reservations. "New debt finance would add financial risk on top of the existing high operating risk, which is a particular concern due to the uncertainty of future sales. I believe that we should continue to use equity finance, particularly with the additional risk of this new investment; a rights issue is the best way of doing this."

The Managing Director was unsure. "I seem to recall that it should not really matter whether we use debt or equity finance. Moreover, most of our shares are owned by large, well-diversified investors and they do not view risk from the perspective of an individual company, as we do. I am sure that this must have implications for the way in which we assess this investment and decide on its financing."

Assume a corporation tax rate of 17%.

Requirements

9.1 Assuming that Zimba plc remains all-equity financed, and using the dividend valuation model, calculate the expected ex-dividend price per share at 30 September 20X0 on

each of the following bases:

(1) The new investment does not take place

(2) The new investment takes place

Based on the above computations, determine whether the new investment should be undertaken.

(8 marks)

9.2 As an external consultant to the company, and with reference to relevant theories, write a report to the directors which, so far as the information permits, advises them on the implications of the new investment and the most appropriate method of financing.

Your report should include an analysis of the concerns expressed by the directors and the company accountant.

(12 marks)
Total: 20 marks

10 Greenfings Ltd

Greenfings Ltd (Greenfings) is a private company that owns and operates a small chain of garden centres in the Lincoln area. The company has expanded rapidly over recent years, opening new sites frequently, mainly using retained earnings to finance them. The directors have found there are significant economies of scale in operating garden centres and they are keen to expand more rapidly by extending their geographical horizons.

The directors have reason to believe that Adams Ltd (Adams) might be for sale. Adams operates 10 garden centres in Nottinghamshire. The freeholds of six of these sites are owned by Adams, the other four being leased under arrangements that expire in three years' time. Adams is owned by two brothers and their families. The brothers are in their sixties and the directors of Greenfings believe that a reasonable offer would persuade the directors of Adams to sell the company.

You are the senior on the Greenfings audit and the directors have asked you, as the only person whom they know and trust and with any knowledge of the subject, to meet them to provide some idea of the issues involved with a possible deal.

During the telephone conversation, when the meeting was requested, one of the Greenfings directors said: "We are asking for this meeting because we haven't any experience of anything like this. Should we be considering this deal in the first place? Assuming that we decide to go ahead, can we get someone to help us with it? How much should we offer to Adams? How should we pay? If we have to pay in cash, how could we raise it? Is it best to buy the assets from Adams or buy all of the shares in Adams? Should we go straight to the Adams directors or get someone to act for us? Are there any other issues that you feel that we should consider?"

In preparation for the meeting you intend to make notes of the points you will raise with the directors. You are aware that the directors are people who have skills in horticulture and retailing, but not in more general business issues, particularly not in finance.

Requirements

10.1 Draft a brief set of notes of the points that you intend to raise with the directors at the meeting. Each of these points should be developed and explained clearly in a way that the directors will be able to understand. The notes should cover all of the issues raised by the director on the telephone, particularly possible sources of cash, plus any others that you feel to be relevant.

The notes need not consider factors relating in detail to the effects of financial gearing.

(15 marks)

10.2 What ethical issues should you consider in relation to the corporate finance advice provided to Greenfings?

(3 marks)
Total: 18 marks

11 Myloson plc

A summary of the financial statements for the year to 31 December 20X2 is set out below:

Summarised income statement for the year to 31 December 20X2

	£'000
Revenue	3,744
Cost of sales	2,280
Gross profit	1,464
Operating expenses	780
Interest	72
Tax liability	200
Net profit	412

	£'000
Dividends declared	163

Summarised balance sheet at 31 December 20X2

	£'000
Non-current assets (net book value)	1,800
Current assets	
Inventory	782
Receivables	460
Cash and bank	164
	3,206
Current liabilities	
Trade payables	324
Other payables (including dividends)	163
Financing	
Ordinary share capital (ordinary shares of £1)	1,200
Retained profits to 31 December 20X1	550
Retentions for the year to 31 December 20X2	249
10% loan repayable 20Y8	720
	3,206

You have identified the following information:

- **Expansion plans**

  The company plans to spend £1.2 million on new modern production equipment. This will allow current capacity to be increased and there will be a consequent increase in the number of customers serviced.

  The business is therefore expected to grow at 20% for each of the next three years. This applies to revenue and cost of sales. Costs will be tightly controlled in this period and will only rise at 10% pa.

- **Working capital control**

  The company prides itself on maintaining its control over its sales and purchase ledger. Consequently, even though there is a high growth anticipated, the company does not expect the average credit period given or taken to alter ie, sales to receivables ratio and payables to cost of sales ratio will be maintained.

  The inventory levels are not anticipated to change, as a result of the modern production techniques that will be employed.

- **Depreciation**

  The new capital expenditure will be depreciated on a straight-line basis over 10 years.

- **Taxation**

  The company pays tax at 17%. Capital allowances on the new equipment are available at 18% pa on a reducing balance basis. All of the existing capital has been written down to zero for tax purposes.

  Tax is paid in the same year in which it is charged.

- **Returns to investors**

  Dividends will grow each year in line with revenue ie, 20% pa.

Requirements

11.1 Using the information in the scenario:

Notes

1 You should ignore interest or returns on surplus funds invested during the three-year period of review.

2 This is not an investment appraisal exercise; you may ignore the timing of cash flows within each year and you should not discount the cash flows.

3 Ignore inflation.

(a) prepare forecast income statements for the years 20X3, 20X4 and 20X5; and

(7 marks)

(b) prepare cash flow forecasts for the years 20X3, 20X4 and 20X5, and estimate the amount of funds which will need to be raised by the company to finance its expansion.

11.2 Plan a report to the directors of Myloson plc which:

(9 marks)

(1) discusses the key aspects and implications of the financial information you have obtained in your answer to part 11.1 of the question; and

(2) recommends additional methods of financial forecasting which could be used with advantage by the company's management. You should assume that the only forecasts prepared by the company at present are similar to those you have prepared for your answer to part 11.1 of this question.

(5 marks)
Total: 21 marks

12 Newton Pearce plc

Newton Pearce plc (NP) is a well-established retailer of gymnasium equipment. The company's key market is in southern and central England. Extracts from the company's most recently published annual report (as at 31 December 20X6) are shown below:

	£'000
Non-current assets	3,518
Current assets	
Inventories	3,780
Trade receivables	3,668
Ordinary shares (50p)	980
Retained earnings	1,954
Current liabilities	
Trade payables	2,870
Other payables	372
Short-term borrowings	2,240

NP's finance director has calculated that the company needs to raise £1,827,777 of additional long-term funds to provide finance for the following three matters.

- Over the past three years, NP's annual revenue has changed very little and so its senior management is now considering extending operations into northern England and Scotland. This would necessitate expenditure of £950,000 on new buildings and vehicles at the company's existing distribution centre.
- NP's short-term borrowings comprise only a bank overdraft and the company is under pressure from its bank to reduce that overdraft (which has stayed close to its current level for the past 18 months) to £2 million.
- Its trade suppliers are unhappy that they have to wait, on average, 45 days to receive payment and would like this figure reduced by 10 days.

You are a member of NP's finance team and have been asked to prepare workings that would aid management in their decision. Other information relevant to the situation is:

NP's total revenue (20X6)	£28.5m
NP's net margin (20X6) – before interest costs	3%
Bank overdraft interest rate (fixed)	17.5%
Dividends per share (20X6)	5p

Earnings per share (20X6)	9.25p
Gearing using book values: debt / (debt + equity) (20X6)	46.5%
Existing 8% debentures (redeemable in 20Y1)	£2.55m

NP's marketing director believes that the expansion into northern England and Scotland will generate additional revenue of £6 million in 20X7 and, because of the impact of fixed costs, it is estimated that the net margin on these extra sales (before interest costs) would be 5%. NP's management estimates that the 20X6 dividend per share will be maintained in 20X7.

You have been advised that, for the additional long-term funds, senior management wishes to use either:

- a rights issue, with the new shares priced at about 20% below the current market value of £1.55 per share; or
- an issue of irredeemable debentures with a coupon rate of 10%. Currently investors expect a 12% return on similar debentures in the market.

The corporation tax rate is 17%. NP's management has assumed that there will be no additional working capital requirements associated with the additional revenue.

Requirements

12.1 Demonstrate how NP's finance director calculated the long-term funding requirement of £1,827,777.

12.2 Assuming that NP needs to raise £1,827,777, calculate:

(1 mark)

(a) its projected earnings per share figure for 20X7 if it raises those funds by:

- a rights issue; or
- a debenture issue.

(7 marks)

(b) NP's projected gearing figure at the end of 20X7 if it raises those funds by:

- a rights issue; or
- a debenture issue.

(5 marks)

12.3 Based on your workings in 12.2 above, recommend, with reasons, which, if either, method of long-term funding NP's senior management should choose.

(5 marks)

12.4 Comment on the assumption made by NP's management that there would be no additional working capital requirements associated with the additional revenue.

(4 marks)

Total: 22 marks

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

Answers to Interactive questions

Answer to Interactive question 1

	No debt	£800m debt	£1,800m debt
	£m	£m	£m
Profit before tax	100	60	10
Tax @ 17%	(17)	(10.2)	(1.7)
Dividends	83	49.8	8.3
Dividends + Interest to providers of finance	83	89.8	98.3
Cost to company			
Dividends	83	49.8	8.3
Interest × (1 – 0.17)	0	33.2	74.7
	83	83.0	83.0

The extra distributions arise because of the corporation tax savings on debt interest. For example, paying £40 million interest saves £40m × 17% = £6.8 million tax (which is the difference between the tax bills of £17 million and £10.2 million in the first and second columns). This gives rise to the extra

£6.8 million distributed (£89.8m – £83m).

The more highly geared a firm, the greater should be its total distributions. Therefore, the firm should become more valuable as gearing increases.

Answer to Interactive question 2

In highly-geared firms **managers** may find that the bulk of their time and attention is spent on keeping lenders happy. For example, it may make good financial sense to dispose of a **surplus asset** and use the funds to finance a profitable area of operations. However, if this means a loss of collateral for the lenders, time may be wasted in persuading them to allow the asset to be sold. These operating problems will reduce the future cash flows of the business.

Additionally, the firm may find that **key employees** leave. **Suppliers** may refuse to deliver trading inventory, and **customers** may refuse to buy if they have doubts about the firm's ability to deliver. It may be necessary to liquidate non-current assets in order to finance working capital, leading to a reduction in the scale of operations. Parties with which the firm is contracted may renege on **contracts** if they know that the firm is not in a position to bring legal action.

Answer to Interactive question 3

Base case NPV

Time	£m	**DF@12%**	**PV** £m
0	(240)	1.00	(240)
1–10	40	5.65	226
			(14)

PV of tax shield
Interest pa = £187.5m × 0.08 = £15m

Time	Tax shield: £m	DF @ 8%	PV £m
1–10	15 × 0.17 = 2.55	6.710	17.11

Adjust for issue costs of £1m.

APV = £(14)m + £17.11m + £(1m) = £2.11m

∴ Project is worthwhile overall. (In fact, the project itself would not be acceptable if financed by equity, but the benefit of financing the project with debt creates a positive NPV.)

Answer to Interactive question 4

4.1 Find the systematic risk of the electronics industry – measured by β_a.

$$1.6 = \beta_a\left(1 + \frac{30(1 - 0.17)}{70}\right)$$

$\beta_a = 1.18$

(The electronics industry is riskier than existing activities in food manufacturing where β_a = 1.15, which is the same as β_e as there is no debt.)

Next, calculate the ungeared cost of equity in the electronics industry.

$k_e = 10\% + 1.18\,(25\% - 10\%)$

$= \underline{27.7\%}$

(= WACC as no debt)

So, if the project were financed entirely by equity, the cost of capital should be 27.7%.

4.2 If the project is financed by 30% debt and 70% equity, project gearing is the same as the industry gearing. So use the industry equity beta $\beta_e = 1.6$ to get k_e.

$k_e = 10\% + 1.6\,(25\% - 10\%)$

$= 34\%$

$k_d = 10\%(1 - 0.17)$

$= 8.3\%$

$WACC = (34\% \times 0.7) + (8.3\% \times 0.3)$

$= \underline{26.3\%}$

4.3 If the project is financed by 40% debt and 60% equity, we need to adjust the asset beta for the electronics industry ($\beta_a = 1.18$) to an equity beta that reflects the new gearing.

$$\beta_e = 1.18\left(1 + \frac{40(1 - 0.17)}{60}\right)$$

$\beta_e = 1.833$

Now use this equity beta to obtain a cost of equity for the project and then calculate a discount rate for the project based on a weighted cost of capital.

$k_e = 10\% + 1.833\,(25\% - 10\%)$

$= 37.5\%$

$k_d = 8.3\%$

$WACC = (37.5\% \times 0.6) + (8.3\% \times 0.4)$

$= 25.82\%$

Answer to Interactive question 5

5.1

(a) There is no information about the cost of loan interest, and it is assumed that this cost is included within other expenses.

Mylotic plc

Forecast statement of profit or loss for the year to 30 November 20X3	£m	£m
Revenue (£240m × 1.25)		300.0
Cost of sales (70%)		210.0
Gross profit (30%)	54.5	90.0
Expenses		
Depreciation of buildings (5% of £20m)	1.0	
Depreciation of plant and machinery (20% of £(25m + 57m))	16.4	
		71.9
Profit before taxation		18.1
Taxation (17%)		3.1
Profit after taxation		15.0
Dividend (50%)		7.5
Retained profit		7.5

Mylotic plc

(b) **Mylotic plc**

Forecast balance sheet as at 30 November 20X3

	£m	**£m**	**£m**
Non-current assets			
Freehold buildings at cost		24.4	
Less accumulated depreciation		5.4	
			19.0
Plant and machinery at cost		94.9	
Less accumulated depreciation (12.9 + 16.4)		29.3	
			65.6
			84.6
Current assets			
Inventory (39 - 18)		21.0	
Trade receivables (W1)		75.0	
		96.0	
Payables: amounts falling due within one year			
Bank overdraft (W4)	29.3		
Trade payables (W2)	24.0		
		53.3	
			42.7
			127.3

Payables: amounts falling due after more than one year

	£m	£m	£m
Loan (W3)			31.8
			95.5
Share capital and reserves Ordinary shares of £1			20.0
Accumulated profits (68 + 7.5)			75.5
			95.5

WORKINGS

(1) Trade receivables

Average debt collection period in year to 30.11.20X2 = (20/240) × 12 months = 1month.

Average debt collection period in year to 30.11.20X3 = 3 times one month = 3months.

Trade receivables as at 30 November 20X3 = (3/12) × £300 million = £75 million.

(2) **Trade payables**

Purchases in the year = closing inventory + cost of sales – opening inventory.Purchases are therefore (given an £18 million reduction in inventory levels) 21m + 210m – 39m = £192 million.

Trade payables at 30.11.20X3 = (1.5/12) × £192 million = £24 million.

(3) **Loan**

	£m
Share capital	20.0
Reserves as at 30 November 20X2	68.0
Retained profit, 20X3	7.5
Share capital and reserves at 30.11.20X3	95.5
Loan at 30.11.20X3 (one-third of £95.5m)	31.8
Original loan	57.0
Loan repaid in the year	25.2

(4) **Cash**

Note: The cash balance in the balance sheet can be calculated as the 'missing figure' to make the balance sheet net assets equal the share capital and reserves. A proof of the cash position, however, is shown here.

Operating profit	£m	£m
		18.1
Add back depreciation (1.0 + 16.4)		17.4
		35.5
Reduction in inventory	18.0	
Increase in receivables (75 – 20)	(55.0)	
	£m	£m
Increase in trade payables (24 – 16.5)	7.5	
		(29.5)
Cash flow from operations		6.0
Tax paid		(3.1)
Dividends paid		(7.5)
Machinery purchase		(57.0)
Loan raised		57.0
Loan repaid		(25.2)
Cash flow in the year		(29.8)
Cash at start of year		0.5
Cash at end of year		(29.3)

5.2 Liquidity is expected to deteriorate. The company is forecasting a bank overdraft of £29.3 million at the end of November 20X3, compared to a positive cash balance the previous year. The company will have to ensure that bank overdraft facilities are available if it goes ahead with its plan to increase sales.

The company will also have some long-term debt capital, having been ungeared in the year to 30 November 20X2.

On the basis of the forecasts, it is questionable whether there is any financial benefit to be obtained from expanding sales, and the company management should review its plans urgently, before implementing them.

Answer to Interactive question 6

To: The directors of Max plc

From: Consultants

This report outlines the advantages and disadvantages of the two financing methods and gives a consideration of alternative methods.

These figures illustrate some of the following characteristics of equity and debt financing.

Dilution of share ownership

A share issue may reduce the influence of the original shareholders. Because it is risk-bearing capital, and dividends are not tax deductible, equity finance is expensive compared with the direct cost of debt. It also has very high issue costs because of the legal requirements that must be observed. A share issue will often cause a fall in EPS, especially in the early years of a new investment. However, the advantage is that gearing is reduced, which improves the stability of equity earnings, reducing shareholders' financial risk and lowering the return that they demand from their investment.

Debt finance

Debt finance will not cause any dilution of shareholding and, because interest payments are more predictable than dividends and are an allowable expense for tax purposes, debt has a cheaper direct cost than equity finance. The additional profit generated from the investment will therefore enhance expected EPS. However, the increase in gearing and interest payments will cause shareholders' returns to drop markedly if profits do not materialise, increasing their financial risk and causing an increased cost of equity capital. Floating rate debt brings the added problem of possible significant increases in future interest rates, referred to as interest rate risk.

Profit uncertainty

In general, if the new project has highly uncertain or volatile predicted profits, **equity** finance **may be preferred** because financial risk for existing shareholders may become too high if debt finance **is used**. Gearing that is too high may also increase bankruptcy risk, with its attendant costs. Debt finance may be preferred for projects with more stable profit and cash flow profiles, because of its cheap direct cost.

Tax shield

However, financial **theory** shows that the combined effects of the advantages and disadvantages listed above create very little difference between the **effect of equity and debt finance** on company value. If anything, debt has an advantage if the company is not highly geared and can take advantage of interest payments as a tax allowable expense, but it has been argued that this **'tax shield'** effect of debt is overstated, and this will certainly be the case when interest rates are low.

Retained earnings

As a purely practical method of financing projects, **'pecking order theory'** shows that financial managers will normally look to **retained equity earnings** as a first source of capital for expansion. This implies that companies wishing to expand will normally have low dividends. The advantage of using retained earnings is that there are **no issue costs**, and **no prospectus** or **other requirements** for reporting to investors. Only when retained earnings have been fully utilised will companies look to the **next source of** finance, which is normally **borrowing**, because of the speed at which it can be arranged compared with share issues, its relatively low issue costs and the many different forms it can take. Share issues are reserved for **very large expansions or acquisitions**.

Because of their high issue costs and the onerous legal requirements, they cannot be carried out too often.

Variations on borrowing

Convertible debt gives the holder an option to convert from debt to the company's shares, and **warrants** (options to buy the company's shares at a fixed price) can be **linked to debt** issues. Both of these methods succeed in **reducing the interest cost of debt** to the company but may become more expensive in the long run if the options are exercised, resulting in the effective issue of cheap shares. Types of debt instrument have grown greatly in number in the last few decades.

Swaps enable fixed rate debt to be converted to floating rate or vice versa. Futures and forward debt contracts can be arranged and, as in our case, options can be purchased to provide caps (maximum interest rates) or collars (maximum and minimum interest rates).

Other sources of finance

We might also consider **acquisition of the new assets by hire purchase or lease** finance, sale and leaseback of existing property, or raising finance from our working capital, for example by factoring our debts or invoice discounting, or by negotiating purchase finance for inventory.

Answers to Self-test questions

1 Jug plc

The equity beta will be 1.04.

The market value of the company's equity is £24 million.

Step 1 is to convert the current equity beta (β_g) into a beta for an identical all equity-company (β_a).

$\beta_a = \beta_g \times E/(E + D(1 - t))$

$\beta_a = 1.2 \times 24/(24 + 16\ (1 - 0.17)) = 0.77$

By raising £4 million in equity to pay off debt, it has to be assumed that the company's equity shares will be worth £28 million and the debt capital £12 million.

At this new gearing level, the equity beta (β_g) will be:

$\beta_g = \beta_a\ /[E/(E + D\ (1 - t))]$

$\beta_g = 0.77/[28/(28 + 12\ (1 - 0.17))] = 1.04$

2 New project

Step 1 Calculate NPV as if the company were all-equity financed. Here the cost of capital will be 13%. Loan issue costs will be considered later.

Year		Cash flow	Discount factor at 13%	PV
		£'000		£'000
0		(7,500)	1.000	(7,500)
1-3	Post tax (5,000 × 0.83) =	4,150	2.361	9,798.2
				2,298.2

Step 2 Calculate the PV of the tax shield provided by the loan interest, discounting the tax reliefs at the pre-tax cost of interest. (Assumption: tax shields are just as risky as the interest payments that generate them.)

Year		Cash flow	Discount factor at 13%	PV
0		£'000	1.000	£'000
		(7,500)		(7,500)
1–3	Post tax (5,000 × 0.83) =	4,150	2.361	9,798.2
				2,298.2

Calculate the PV of the tax shield provided by the loan interest, discounting the tax reliefs at the pre-tax cost of interest. (Assumption: tax shields are just as risky as the interest payments that generate them.)

=NPV(0.1,C2:C4)

	A	B	C
1	Year	Interest £'000	Tax shield £'000
2	1	750	128
3	2	500	85
4	3	250	43
5	PV @10%		218.9

	£'000
NPV of project if all equity financed	2,298.2
PV of tax shield due to loan interest	218.9
Loan issue costs	(100.0)

	£'000
APV	2,417.1

3 Sorina plc

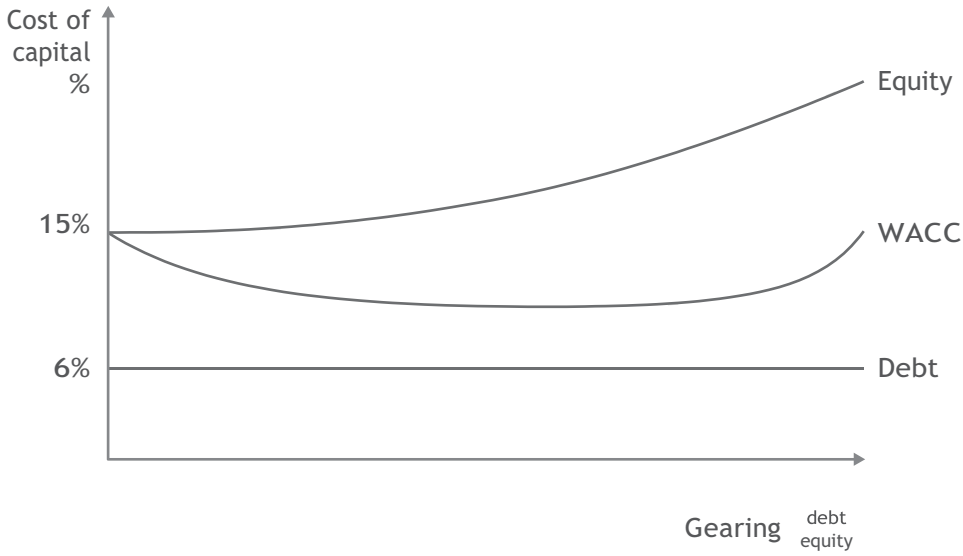
3.1 Mr Brush

The data collected by Mr Brush supports Modigliani and Miller's (M&M) theory of gearing (see below). This states that, in the absence of taxation, a company's weighted average cost of capital (WACC) depends only on the risk of that company's earnings (ie, the level of business or earnings risk). In particular the WACC of a company in these circumstances is independent of its capital structure.

If one accepts these results, then Sorina plc would always be faced with a WACC equal to its present WACC of 15%. The downward effect of issuing cheaper debt finance (at 6%) on the WACC will always, as predicted by M&M, be counteracted by an equal and opposite rise in the cost of equity. This can be illustrated as follows for Sorina plc.

Consequently, the discount rate that should be used for project appraisal is the WACC of 15%. This assumes that the projects to be appraised will carry the same business risk as that from the existing operations of Sorina plc.

As an alternative to the above analysis, it is also necessary to consider briefly the implications of the traditional theory of gearing. This is best illustrated in its results by the following diagram.



Under the traditional theory of gearing, the initial rise in the cost of equity as gearing increases is initially outweighed in the WACC calculation by the introduction of cheaper debt finance.

Eventually this effect is reversed and, with the influence of bankruptcy risk (see below), even the cost of debt rises at high levels of gearing. The overall effect is to produce a WACC that, for some optimal level of gearing, is a minimum.

If the data collected by Mr Brush is consistent with M&M purely by chance (ie, the traditional theory is that which actually describes the relationship between WACC and gearing), then Sorina plc should issue sufficient debt to attain its optimal gearing level (ie, lowest WACC). At optimal gearing the associated minimum WACC will be an appropriate discount rate for investment appraisal.

WORKING

WACC

Company P = Cost of equity = 12/100 = 0.12, or 12%

Company Q = Cost of equity = 36/200 = 0.18, or 18%

Cost of debt = 6% (= return to debt holders)

$$\text{WACC} = \frac{1 \times 18\% + 1 \times 6\%}{2} = 12\%$$

Company R = Cost of equity = 24/150 = 0.16, or 16%

Company S = Cost of equity = 58/300 = 0.1933, or 19 1/3%

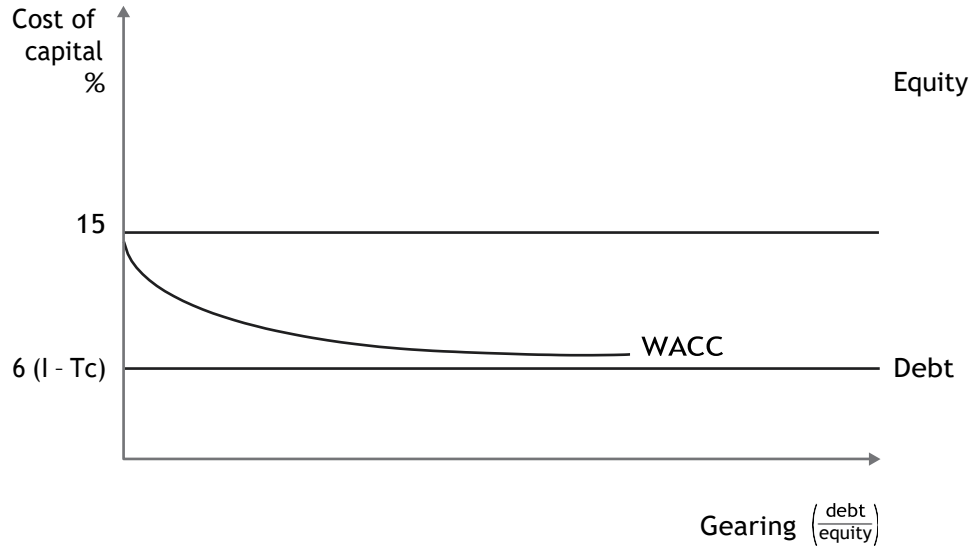
Cost of debt = 6%

$$\text{WACC} = \frac{3 \times 19\frac{1}{3} + 1 \times 6}{4} = 16\%$$

If corporate taxes are introduced, the effect is to produce a cost of debt that is lower than the 6% return required by the providers of debt finance. This is on the assumption that companies in Widbergia can obtain tax relief on interest payments.

M&M predict that the effect on WACC will be as indicated below.

Cost of capital



It can be seen that any increase in gearing will produce a lower WACC. Thus, if one accepts M&M's hypothesis with corporation tax, Sorina plc would seek to gear as highly as possible (in practice investors will set an upper limit on borrowing). An appropriate discount rate for project appraisal would be the WACC at the highest gearing level.

Considering the traditional theory of gearing with corporation tax, the effect of tax on the cost of debt is as described above. However, this will not change the basic result of the traditional theory (ie, that there exists an optimal level of gearing) and again the minimum WACC will be used as a discount rate.

4 Bayton plc

4.1 **Assuming an underlying dividend growth rate of g per annum, the average growth rate in the last four years is given by:**

$(1 + g)^4 = 13.6/10(1 + g) = 1.0799$

$g = 8\%$

Cost of equity

$k_e = D_o(1+g)/P_o + g$

$= (13.6 \times 1.08)/250 + 0.08$

$= 13.88\%$

Pre-tax cost of debt (assuming the debentures are 'ex int')

=RATE(B1,B2,B3,B4)		
	A	**B**
1	Nper = the number of periods	20
2	Pmt = the amount (of interest) paid in any single period	4
3	Pval = the present value of the asset (its market price)	–98
4	Fval = the future value (the amount paid at maturity)	100
5	Yield to maturity	0.0415

Post-tax cost of debt = (1 - 0.17) × 4.15% = 3.44%

Therefore, the WACC is given by:

$$\frac{(MV_e \times k_e) + (MV_d \times k_d)}{MV_e + MV_d} = \frac{(325.0 \times 0.1388) + (122.5 \times 0.0344)}{325.0 + 122.5} = 11.02\%$$

4.2 The calculation of both the WACC and the k_e is based on the assumption that the value of an ordinary share is the discounted present value of the future dividend stream, but the market may be using a different method of valuation such as an earnings multiple, which may undermine the validity of the calculations.

In order to estimate k_e, it is necessary to know or estimate d_o, P_o and g. Of these, only d_o can be determined with confidence.

For the model to give an accurate estimate of k_e, the ex-dividend market value of the share must be in equilibrium, but in practice market values fluctuate daily.

Estimating g is difficult and can be based on either past dividend growth or the Gordon growth model. Simply using an average of past dividend growth might produce a figure that is somewhat misleading. In addition, extrapolating future growth rates based on past growth rates assumes that past growth rates will be sustained into the future.

Use of the Gordon growth model to estimate g will only give a useful approximation where the company's retention rate and rate of return are stable.

In practice, companies use sources of finance other than debt and equity, which makes the computation of WACC more complicated. Unlisted preferences shares, overdrafts or convertible loan stock, for example, can pose problems in terms of establishing a market value, whilst leases or loans denominated in foreign currencies can provide additional challenges.

4.3 The comments of the finance director:

The cost of capital should reflect future costs of finance, because in decision making the concern is only with the future. Here the future financing mix is not known precisely.

We do not, therefore, know whether the gearing ratio will remain the same or not.

Cost should be derived from the future financing mix and cost, rather than using a cost derived from the current financing situation.

In addition, there is an assumption that the systematic business risk of the company will not be changed by making this latest investment, which is described as 'significant'. However, if there is a consequent change in business risk, then this will also affect the cost of the constituents of the 'WACC calculation'.

The comments of the managing director:

'The cost of an individual' source of finance should not be associated with an individual project

– the cost of the overall pool of funds should be considered.

The comments of the production director:

It is inaccurate to assert that retained profits are a costless source of finance. There may be no issue costs, but shareholders will still expect a return on the funds re-invested in the business – they will expect the funds to be invested in projects that increase their wealth.

5 Ada ms, Parlour & Vieira

5.1 k_{eu} = 11.06% Base case NPV = –£50m + £5m × 1/0.1106 = –£4.79m

The present value of the tax shield

Interest paid per annum = £25m × 10% = £2.5m

Tax relief per annum = £2.5m × 17% = £0.425m

Present value of the tax relief (discounted @ pre-tax cost of debt) = £0.425m × 1/0.10 = £4.25m

APV = –£4.79m + £4.25m = £0.54m

5.2 The company's existing WACC is not appropriate because it reflects the existing capital structure of the company. An increase in gearing will cause it to change. Modigliani and Miller (M & M) argued that in a taxed world, the cost of capital would fall down to the tax shield on debt interest. There is a limit to how far this effect will be observed, however. The traditional view is that very high increases in gearing will cause the WACC to rise.

5.3 The APV approach is based on the assumptions underpinning M&M's view on capital structure. These do not necessarily fully reflect the practical aspects of raising capital such as:

- agency costs;
- financial distress costs.

6 Quigley Industries plc

Financing and other issues relating to a major investment

- **Gearing**

  Quigley Industries plc (QI) is operating in a classic cyclical industry, with high capital intensity and, almost certainly, high operating gearing. Operating profits are susceptible

to great fluctuations in the face of fluctuations in revenue.

Financial gearing must therefore be approached with caution. Identifying the optimal level of gearing can only be a matter of judgement, but forming that judgement must take account of QI's current level of gearing and of levels of gearing in the industry.

In theory (using Modigliani and Miller) gearing makes no difference to the wealth of the shareholders: cheap loan finance has a positive effect that is precisely cancelled out by the higher returns required by shareholders in the face of higher risk. If we take account of the tax deductibility of loan interest, gearing in theory favours shareholders since, in effect, there is a transfer of wealth from the tax authorities to shareholders.

At higher levels of gearing the risk of the company being unable to meet its debt commitments of interest and capital repayment, particularly during a period of low revenue/operating profitability,

could force the company to liquidate (Director B's comment). Gearing policy tends to be seen as balancing the benefits of tax relief and the potential costs of bankruptcy.

Other factors that could come into play

- **Agency**

  Directors may be unwilling to gear the company up to a level optimum to the shareholders. This is because gearing imposes a set of disciplines on the directors ie, of having to meet interest payments and arranging continuing finance when the loan is due for redemption.

- **Signalling**

  It is believed by some that a company making a loan issue implies confidence in the future, and this could have a favourable effect on the share price.

- **Clientele effect**

  It is believed that particular shareholders are attracted to the shares of a particular company, because of the level of gearing. Altering the level of gearing could lower the share price as investors move away from the company. Uncertainty about the company's intentions could also have a negative effect.

  A large positive NPV project, such as the new plant, will affect gearing, since it will add value to the equity of the company.

Equity

This is an obvious source of finance, subject to the gearing level. The most obvious source of equity is a rights issue to existing shareholders. This has the advantage of being relatively cheap to issue and the issue price can be more easily determined. There is normally a right that existing shareholders are offered new shares before a public issue can be made.

A public issue is much more expensive than a rights issue because of the procedures that are required. Public issues tend to be more likely to fail, and setting prices for public issues tends to be difficult to judge.

Equity is rather more expensive to QI than loan finance: investors expect higher returns than they do for loans, but their returns are distinctly more risky (Director C's comment).

Loan finance

Whether a loan stock issue to the public, or a term loan from a financial institution, loan finance is relatively cheap to raise. Lenders typically expect good security, and freehold land

tends to offer the best security. So the ability of QI is likely to be linked to the extent that it has unused 'debt capacity' in its assets.

Lenders typically expect lower returns than equity holders, but they have contractual rights to interest and redemption payments on the due dates.

Provided that the company has sufficient taxable profits, loan interest is tax deductible and this makes it even cheaper for the company.

Retained earnings

This is an important source of new finance to UK companies. It would not be suitable in this case, since all of the company's available funds are already committed. There is the option of waiting, perhaps a few years, until retained earnings build up before making the investment, but commercially this may not be a real option.

The revenue reserves are not cash, but part of the owners' claim. Therefore, they are not available as investment funds (Director D's comment).

Retaining profit has implications for dividend policy and, possibly, for shareholder wealth.

Market efficiency

It is illogical to feel that a time of low share prices is a bad time to issue new shares. Market efficiency theory (and evidence) suggests that whatever the share price is at any point represents the best unbiased estimate of its worth based on available evidence (Director A's comment).

Other sources

- Leasing the plant
- Sale and leaseback
- Working capital efficiencies
- Possibility of grants from public funds

Advice

It is possible that QI has sufficient 'in-house' expertise to enable it to avoid the need for professional advice, but the level of finance being considered here means that it is probably better to seek advice from experts.

Merchant banks are able to offer advice and may be able to put the company in touch with potential investors, assuming that the rights-issue route is not taken.

Larger firms of chartered accountants, including QI's auditors, also have links to corporate finance advisors.

The advice will not typically be cheap (Director B's comment).

7 Webcroft plc

7.1

$$1 + g = 20/17.47 = 1.07$$

$g = 7\%$

$k_e = D_1/P + g = 20(1.07)/250 + 0.07 = 0.1556 = 15.56\%$

k_d = the spreadsheet RATE function, as follows:

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods (2 × 20)	40
2	Pmt = the amount (of interest) paid in any single period (6.20/2)	3.10
3	Pval = the present value of the asset (its market price)	–98
4	Fval = the future value (the amount paid at maturity)	105
5	Yield to maturity	0.0325 or 3.25% [1]
6	Annual yield to maturity	6.5% [2]

1 This is the yield expressed in terms of the period assessed, which here is six months.

2 This is the annualised yield to maturity, calculated as 0.0325 multiplied by 2 (as there are two six-month periods in a year).

Pre-tax k_d = 6.5%

Post-tax k_d = 6.5% × (1 – 0.17) = 5.4%WACC

((180m × 2.50 × 15.56%) + (60m × 98% × 5.4%))/((180m × 2.50) + (60m × 98%)) = 14.39%

The assumptions made in undertaking this calculation are as follows:

- The validity of the dividend valuation model is assumed.
- The current share price is correct (the result of an efficient market) and is not being distorted by short-term factors.
- The tax rate will prove stable at 17% per annum.
- Interest on the debenture stock remains tax deductible.
- The past growth rate in dividends will be continued in future.
- The future growth rate in dividends will be constant.

7.2

(a) Firms should not usually discount investment returns at the cost of debt simply because it is being financed mainly with debt. In the long run, the firm would undoubtedly need to raise additional equity in order to balance the debt finance raised for this particular investment, given that the stated intention is to leave the current debt/equity ratio intact, and the cost of the overall funds should, therefore, be considered. Only when a particular source of finance is project specific should the accountant's recommendation be considered valid.

(b) The reservations that might attach to using the WACC calculated in 7.1 as a discount factor are because WACC is only suitable if:

- the investment being considered maintains the company's historical proportions of debt and equity by market value;
- the investment maintains the company's overall business and financial risk; and
- new debt can be issued at the same cost as the existing redeemable debenture stock.

These conditions can be relaxed if the proposed investment is considered small or marginal.

1.3 The potential problems that might be encountered by a company such as Webcroft plc when calculating its WACC are as follows.

- The validity of the model may be called into question. The estimated cost of equity is based on the assumption that the value of an ordinary share is the discounted present value of the future dividend stream, but if the market is using a different valuation method model eg, CAPM, the calculation would be undermined.
- There are numerous practical problems in estimating the various variables in the model – is the average dividend growth rate meaningful given that it is a past figure? The share price is subject to daily fluctuations.
- A firm of this size may well have other sources of finance which can pose problems for an accurate WACC calculation – for example, unlisted preference shares, convertible loan stock, loans denominated in foreign currency, off-balance sheet financing items and short- term debt such as overdrafts, which although classified as short-term may well constitute a long-term source of finance.

7.4 The traditional theory of gearing would suggest that if the company is currently at or above its optimal gearing level, then if gearing were to increase, the WACC would increase. However, if the company is not yet at its optimal gearing level and the increase in the debt/equity ratio moves it towards that, then the WACC would fall because of tax relief on debt interest.

Modigliani & Miller, however, theorised that in the presence of corporation tax, firms should gear up as much as possible as the tax shield means that the WACC will fall as gearing rises.

The precise impact on the company's WACC will depend on market reaction. An increase in gearing need not necessarily be viewed as negative by the market, but an increase in gearing to a level in excess of the industry average is likely to increase the perceived risk of the company and will increase the WACC by increasing both the cost of debt and the cost of equity.

8 Bill Jackson Haulage Ltd

8.1 See the following report.

To: Paul Jackson, Chief Executive of Bill Jackson Haulage Ltd (BJH)
From: J Gray, Black, White and Gray, Chartered Accountants
Date: 13 June 20X2
Subject: Financing the purchase of the company's site

Terms of reference

To advise on possible sources of finance for the purchase of the freehold of the company's site.

General points

Before proceeding with plans to purchase the site, the directors must be confident that purchasing the current site represents the best option. Moving to an alternative site, whether leased or bought, may be preferable. If such a site exists, a net present value assessment should be made.

Irrespective of other sites, the directors must be confident that purchase of the site at the price expected is economically viable. Can BJH afford this site, given the use to which it will be put?

Financing

General points

Broadly, financing sources fall into two categories; equity and debt. A question arises about the extent to which debt should be used. For most businesses, debt is relatively cheap because interest payments attract tax relief. It also seems cheaper because interest rates tend to be lower than the level of returns expected by shareholders. This is because lenders' returns are less risky than those of shareholders.

Ignoring tax for a moment, as soon as a business starts to borrow the returns of shareholders become more risky, because they have the additional burden of interest payments. They expect higher returns because of this additional risk.

Tax is the only reason that debt is cheaper. From this it might appear that businesses should raise all or almost all of their finance from borrowing. This is not practical, because there is the danger that the business would not be able to meet its interest or loan redemption obligations, leading to the loan creditors forcing it into liquidation (bankruptcy). This can be very costly to the shareholders because it leads to assets being sold off less than their worth to the shareholders on a 'going concern' basis.

A balance needs to be struck between taking advantage of tax relief, and avoiding the costs of bankruptcy. Where this balance lies is a matter for managerial judgement.

Factors that tend to be involved include the following:

- Whether the business has sufficient profits to take advantage of tax relief on interest payments – not a problem with BJH.
- Whether the business can provide security, normally in the form of suitable assets – probably not a problem for BJH with the lorries and the land itself.
- The type of assets that the business owns – if they tend to have relatively high realisable values, bankruptcy cost would be less.
- The extent to which revenues fluctuate – high gearing is not compatible with fluctuating profits; much of your business comes from the building trade, which tends to have peaks and troughs of demand.
- The level of operating gearing (fixed costs to total costs) – high operating gearing leads to profit fluctuations which capital gearing would add to; a business like BJH tends to have relatively high fixed costs.

- The level of operating gearing (fixed costs to total costs) – high operating gearing leads to profit fluctuations which capital gearing would add to; a business like BJH tends to have relatively high fixed costs.
- The attitude of the shareholders – if they are prepared to take more risk for higher rewards, higher capital gearing may be appropriate. For your size of business £500,000 is a large loan. On the other hand, you are presently paying rent which I presume is commensurate with the prospective interest payments, with broadly the same implications ie, failure to pay implies eviction from the site. Borrowing to buy the site would lower your operating gearing, but increase your capital gearing.

Sources of equity finance

New issue

The most obvious source of equity is a rights issue to existing shareholders. This has the advantage of being cheaper than a public share issue, and there is less uncertainty over the issue price. A key issue here is the extent to which the shareholders have the funds necessary to take up new shares. They may also be unwilling to make further investment in the company. On the other hand, they will see the company's problem and may be prepared to help if they can.

Normally, equity is rather more expensive to the company than debt; investors expect higher returns, but their returns are distinctly more risky. This tends to be less of an issue with a private company.

It is possible that the directors would consider taking the company public. There are companies like this listed on the Alternative Investment Market (AIM), but for this size of company the fixed costs of an AIM listing are very high. Moreover, the potential loss of control, together with the exposure to public scrutiny, would probably not be welcome.

A more fruitful area for an equity issue might be a business angel or a venture capitalist. Such investors tend to seek high returns and an exit route for their investment. This means that such investors are interested only in expanding companies that are likely to be taken over, or to go public within a reasonable time.

Retained earnings

This is an important source of new finance to UK companies, but it is slow. It would not be suitable in this case, since all of the company's available funds are already committed. There is the option of waiting until retained earnings build up before making the investment, but this may not be realistic.

Retaining profit normally has implications for dividend policy and, possibly, for shareholder wealth, but this too may not be a big issue for this company.

Sources of debt finance

Term loan from a bank or similar institution

Your bank may be prepared to lend you the money, or to put you in touch with another lender. My firm has corporate finance contacts, which will be able to advise, if necessary.

A term loan tends to be tailored to the needs of the borrower. It may involve partial repayment of the principal (the amount borrowed) with interest payments over the period of the loan (like a repayment mortgage), or interest only payments until the loan is due to be repaid. Term loans tend to be very cheap to negotiate.

Interest rates tend to be low where there is good security, such as the site value. Lenders would tend to want a margin of safety, so it may be that other assets could also be pledged as security, or that other sources (see below) could reduce the amount required.

It is not unusual for lenders to impose covenants or restrictions on the borrower, such as insisting that it maintains a particular current assets/current liabilities ratio.

This type of finance looks as if it may be the most appropriate for BJH and should be seriously considered.

Loan stocks

In theory this is a possibility but, for a small family company, it is probably not very practical. One of the main benefits of loan stocks is their transferability, but without a listing this is probably not an issue.

Other sources Working capital

It may be worth assessing whether there is any scope for generating some cash from the company's working capital. For example, might it be possible for you to reduce trade receivables and/or increase trade payables? There is little scope with inventory, since you hold very little. Anything that you can obtain from working capital, provided that you are prudent, would have little or no cost.

Unused non-current assets

Are there any assets that you do not use, or which are not used profitably? If there are, and they could be sold, cash could be generated.

8.2

(a) Critical comments on the spin-off statement

The statement is comprehensively wrong. A spin-off occurs where a company takes a definable part of its activities and places it in another, subsidiary company. It then hands out the shares in the new subsidiary to members of the original company, in proportion to their shareholding. Usually a stock exchange listing is obtained for the new, spun-off company.

There are usually two reasons for doing this:

(1) A desire to give the spun-off company its own identity, which might enhance overall shareholder value

(2) To avoid a takeover attempt for the whole company, by making the spun-off element more expensive

Thus no new finance is raised, and there is no change in ownership of any of the assets of the original company.

What is described in the quote is a 'sell-off'.

(b) Critical comments on the capital rationing statement

Capital rationing is a situation where a company does not have sufficient funds to make all of the available investments that have a positive NPV, when discounted at the investors' opportunity cost of capital.

The capital restriction may arise from the company's inability to raise funds in the market,so-called 'hard' capital rationing. (A company-imposed restriction on the amount of investment finance available to managers is known as 'soft' capital rationing.)

In principle, selecting investments on the basis of the highest NPV per £ of investment finance (not necessarily the highest NPV projects) will lead to the maximum generation of shareholder wealth.

9 Zimba plc

9.1 Determination of whether an investment should be undertaken The new investment does not take place

=NPV(0.15,B3:B5)

	A	B	C
1	**Year**	**Dividend**	**PV**
2		£m	£m
3	1	30	
4	2	30	
5	3	30	68.50
6	4 onwards:		
7	Year 3 value = £30m(1.02)/(0.15 – 0.02) = £235.385m × 0.6575		154.765
8	Total PV		223.265

Value of equity excluding project = £223,265,000
The new investment takes place

Year	**Dividend**	**Discount factor at 16%**	**PV**
	£m		£m
1	42	1/1.16	36.207
2 onwards:			
Year 1 value = £42m(1.04)/(0.16 – 0.04) = £364m		1/1.16	313.793
Total PV = Total equity value			350.000
			£m
Difference in values (350.00 – 223.265)			126.735
Initial outlay			(50.000)
Value generated by investment			76.735

Thus the new investment appears to be viable.

9.2

To: The Directors, Zimba plc
From: A Jones, External Consultant
Date: Today
Subject: Financing of digital television investment

Introduction

The new investment is significant in relation to the existing size of the company and is a departure into a related, but new, market. The implications for returns, risk, liquidity and chosen form of finance thus need to be carefully considered.

The new investment Returns

The calculations provided in Appendix 1 (part (a)) show that, using the dividend model, there is an increase in the share price, and hence the project appears to be worthwhile. One minor concern is that, in effect, profits net of taxes are distributed and thus the increase in annual dividend is an increase in profit rather than cash flows. The information relating to cash flows of the project has not been provided. Nevertheless, in the longer-term profits are equivalent to cash and the dividend stream is maintained in perpetuity. Therefore the two can, in this instance, be seen as more or less equivalent.

Additionally, there appears to be a significant increase in the value of the company, so there is considerable margin for error.

Risk (company accountant and managing director)

The existing business relating to digital cameras appears to be risky in terms of both sales volatility and cost structure (operating gearing). Nevertheless, the question of introducing financial gearing should not be ruled out entirely on risk grounds without considering other issues. The problem of gearing is examined below.

Debt financing (finance director)

The introduction of debt to finance the project will create a benefit in terms of the tax shield on the interest payments.

The finance director is not, however, correct in stating that debt finance at 8% is necessarily cheaper than equity at 15%. The risk of the project is greater than the average of existing projects, but if the project were debt financed there would also be financial risk exposure for shareholders. In a perfect world the cost of equity would rise sufficiently to maintain the weighted average cost of capital at 15%, but with the tax advantage of debt it would be a little lower than this.

This point underlines the irrelevance of gearing in a perfect world (containing no tax, equal borrowing and lending rates, risk averse investors, costless transactions, zero bankruptcy costs). The tax shield generates an advantage to gearing, but ultimately bankruptcy costs will create additional cost as debt approaches high levels. Moreover, gearing will increase both company specific and systematic risk and, in the latter case, will demand a price in the market.

A further cost of debt may be the existence of restrictive covenants, which may prevent the company from taking certain actions, such as the issuing of further debt ranking above this issue. The importance of financial flexibility would thus need to be considered.

A final point relates to the form of debt. The finance director argues for a publicly-issued debenture, but consideration should also be given to privately-issued debt eg, from a bank. This type of debt tends to have lower interest rates and issue costs than debentures, but more covenants and other forms of control.

Rights issue (company accountant)

Where a company faces high operating and business risk it may be prudent to limit financial gearing. The question of the optimal level of gearing is a question of balancing costs and benefits, and even where other types of risk are high this does not exclude the possibility of further debt. While the debt financing of this new investment would not give a high gearing level, there would still need to be a detailed examination of the operating and business risk.

Regarding the rights issue, its main function is to implement pre-emption rights in respect of existing shareholders, such that they capture the value of the new project and have the opportunity to maintain their share of equity and control in the company.

The issue costs, while smaller than a public issue of shares, and possibly debentures, are likely to be greater with a rights issue than with privately-issued debt.

Conclusion

The project looks to be viable with a considerable margin of safety, not with standing the fact that it is likely to result in an increased risk. The optimal form of financing is, however, far from clear: it should be the subject of further analysis and negotiation with the potential finance providers.

10 Greenfings Ltd

10.1 Financing and other issues relating to a takeover by one small company of another.

Lifecycle phase

At this stage in the lifecycle of the business, takeover may well be a sensible way to grow. It may, however, represent too large a jump in the scale of operations, and the company's directors should carefully consider whether organic growth might be more appropriate.

Advice

Most companies, particularly smaller entities, need advice in this area. Takeovers are likely to be once-in-a-lifetime events, and it is unlikely that there will be in-house expertise.

Merchant banks are an obvious source of experience and expertise. They may also have access to clients who could help with the financing. Most of the larger firms of chartered accountants have corporate finance departments that can offer advice.

Valuation

This is a difficult area. As with any other asset, a whole business should have a value based on the projected cash flows from it, discounted at a suitable rate. Estimating the cash flows will be difficult, though if Adams is keen to do a deal, help may come from its directors. Deriving a suitable discount rate will also be tricky. Looking at a listed company, whose cost of capital is more easy to estimate, might be helpful as a basis for comparison using CAPM. The value of Adams to Greenfings is the value of the combined operation, taking account of synergistic benefits, less the value of Greenfings without Adams.

On a practical note, Adams' shareholders would be unlikely to accept less than the breakup value of their company. Greenfings would be unwilling to pay more than the cost of setting up a similar operation from scratch, bearing in mind that this would leave Adams as a competitor.

This is an area where the advisers may be able to help. Negotiations between the two sets of directors are likely to be involved before a price will be agreed.

Payment

Typically, takeovers are achieved by shares, loan stocks or cash, or some combination of these. The payment method used must be acceptable to Adams' shareholders.

Issuing shares or loan stocks will have some financial gearing implications for Greenfings.

Shares have the advantage to the shareholders of Adams that they continue to hold an equity interest. On the other hand, they may prefer to have cash if the objective is retirement.

Moreover, Adams' shareholders may not be happy to have shares in an unlisted company as they could be difficult to sell. Returns could be high, but they will be risky.

Having 'outsider' shareholders may not appeal to Greenfings' shareholders. On the other hand, they may see Adams' shareholders as having some useful expertise.

To Greenfings, shares represent a relatively expensive form of financing, but it is low risk as there is no obligation to pay a dividend. A share issue to the shareholders of Adams would have a very low issue cost.

A loan stock issue to Adams' shareholders might be acceptable to them, but they have been equity holders and may prefer an equity investment. On the other hand, they may be pleased to have a 'guaranteed' annual return with good security. As with shares, however, disposal of loan stock could be a problem. A loan stock with a contractual redemption date might be a possibility.

From Greenfings' point of view some capital gearing might be welcome. The company seems to be lowly geared at present.

A cash payment to the directors of Adams would be likely to incur capital gains tax, as it would represent a disposal and could crystallise a liability.

Were cash to be the consideration – and this looks to be the most likely to be acceptable to Adams' shareholders – this would have to be found. The quote in the question implies that Greenfings does not have the necessary amount of cash immediately available.

Cash

The most obvious source of cash would be a rights issue to existing Greenfings' shareholders. It would keep control within the existing shareholders, and not increase the financial risk.

However, it might be difficult to achieve. The shareholders may not be willing to inject more of their personal funds, or they may not have the funds available.

Venture capital may be a possibility. Venture capitalists are generally seen as providers of funds to fast organic growth companies that will obtain some public market listing in the near future. Greenfings may not fit that description. Exit routes will be a major factor for any external provider of equity.

A loan stock issue or a bank loan would be possibilities, depending on the sort of security on offer and Greenfings' existing level of financial gearing. Given that Adams owns the freeholds on most of its sites, the value of these is likely to be a relatively high proportion of the agreed value of the business.

From Greenfings' point of view, loan financing tends to be cheap, partly because of tax relief on interest payments, but it imposes a fixed cash flow obligation both for the interest and redemption.

Issue costs for a rights issue or a loan would be relatively low.

The adviser would probably be able to help with raising the necessary cash.

Takeover?

There is not too much difference to Greenfings whether it buys all of the Adams' shares (a takeover) or buys all of the assets from Adams. It may wish to use the 'Adams' name. It may wish to keep the Adams' part of the business with separate limited liability. In either of these cases, buying the shares may be better. One advantage of acquiring the assets is that Greenfings would be in no danger of acquiring unexpected liabilities.

To the shareholders of Adams, there might be a preference for a takeover. This relieves them of the task of liquidating the company. On the other hand, they may wish to retain the company shell for some other venture.

Intermediary

It might be helpful to have someone act as a go-between to supervise the negotiations. This is a role that the adviser might perform.

Other issues

- Other questions are as follows:
- Has Greenfings sufficient management expertise to manage the larger enterprise?
- Will the economics of scale extend to the larger enterprise?
- Is it a good idea for an unlisted company to expand without diversifying?

10.2 Ethical issues

(1) Professional accountants in public practice need to comply with the fundamental principles of the ICAB code of ethics:

(2) Integrity

(3) Objectivity

(4) Professional competence and due care

(5) Confidentiality

Professional behaviour

There is no restriction on an accountant in public practice providing general corporate finance advice to an audit client. However, the nature of corporate finance activities is wide-ranging, and so the threats to a professional accountant's objectivity, integrity and independence will depend on the nature of the corporate finance activities being provided and the particular circumstances and relationships involved.

In this scenario, the advice given to Greenfings is general corporate finance advice and does not pose a threat to the fundamental principles. However, if the directors of Greenfings asked you or your firm to assist them in implementing the advice, or act as adviser or sponsor in a takeover bid, the threat of non-compliance with objectivity is increased.

To safeguard this threat, you should consider putting a disclaimer in writing that the advice is general guidance and does not constitute any specific

recommendations. If the directors request further involvement from you in relation to a takeover, you should consult with the audit partner at your firm and the ICAB helpline to assess the level of threats to the fundamental principles.

11 Myloson plc

11.1

(a) **Myloson plc income statements**

	Actual		Forecast	
	20X2	**20X3**	**20X4**	**20X5**
	£'000	£'000	£'000	£'000
Revenue (increase 20% pa)	3,744	4,493	5,391	6,470
Cost of sales (increase 20% pa)	(2,280)	(2,736)	(3,283)	(3,940)
Gross profit	1,464	1,757	2,108	2,530
	Actual		**Forecast**	
	20X2	**20X3**	**20X4**	**20X5**
	£'000	£'000	£'000	£'000
Operating expenses (increase 10%pa)	(780)	(858)	(944)	(1,038)
Depreciation (over 10 years)		(120)	(120)	(120)
Profit from operations	684	779	1,044	1,372
Interest (assumed constant)	(72)	(72)	(72)	(72)
Profit before tax	612	707	972	1,300
Taxation (see Working 1)	(200)	(104)	(156)	(217)
Net profit	412	603	816	1,083
Dividend (20% growth pa)	(163)	(196)	(235)	(282)
Retained profit	249	407	581	801
Reserves b/f	550	799	1,206	1,787
Reserves c/f	799	1,206	1,787	2,588
Share capital	1,200	1,200	1,200	1,200
Year end reserves	799	1,206	1,787	2,588
Year end shareholders' funds	1,999	2,406	2,987	3,788
Pre-tax return on shareholders'funds	31%	29%	33%	34%

(1) WORKINGS

Tax payable

	Actual		Forecast	
	20X2	**20X3**	**20X4**	**20X5**
	£'000	£'000	£'000	£'000
Profit before tax	612	707	972	1,300
Add back depreciation	0	120	120	120
Less capital allowance (18%red./bal)	(0)	(216)	(177)	(145)
Taxable profit	612	611	915	1,275
Tax at 17% (actual for 20X2)	200	104	156	217

(2) **Changes in net current assets**

	Actual		Forecast	
	20X2	20X3	20X4	20X5
Receivables *	460	552	662	795

Receivables/Sales 12.3%

Actual Forecast

	20X2	**20X3**	**20X4**	**20X5**
Trade Payables * *	324	389	467	560

Trade Payables/Cost of sales 14.2%

* Receivables can be computed as a 20% increase each year or as 12.3% of sales.

* * Trade payables can be computed as a 20% increase each year or as 14.2% of cost of sales.

(3) **Changes in net current assets**

	20X2 £'000	**Actual**		**Forecast**	
		20X3	**20X4**	**20X5**	
		£'000	£'000	£'000	
Inventory (unchanged)		782	782	782	782
Receivables (12.3% of sales)		460	552	662	795
Trade payables (14.2% of cost of sales)		(324)	(389)	(467)	(560)
Dividends payable		(163)	(196)	(235)	(282)
Net current assets		755	749	742	735

Increase/(decrease) in net current assets	(6)	(7)	(7)

(b) **Cash** flow **forecasts**

	20X3	**20X4**	**20X5**
	£'000	£'000	£'000
Retained profit for the year	407	581	801
Add back depreciation	120	120	120
(Investment in working capital) / release of working capital (see Working 3 above)	6	7	7
Expenditure on non-current assets	(1,200)		
Surplus/(deficit) for the year	(667)	708	928
Cash/(deficit) b/f	164	(503)	205
Cash/(deficit) c/f	(503)	205	1,133

Reconciliation

Cash receipts and payments

Receipts

Cash from sales (sales + opening receivables –closing receivables)

Cash receipts and payments

	20X3	**20X4**	**20X5**
	£'000	£'000	£'000
Payments			
For purchases (cost of sales + opening payables – closing payables)	(2,671)	(3,205)	(3,847)
Operating expenses	(858)	(944)	(1,038)
Machinery	(1,200)		
Interest	(72)	(72)	(72)
Tax	(104)	(156)	(217)
Dividends (previous year)	(163)	(196)	(235)
	(5,068)	(4,573)	(5,409)
Net cash flow	(667)	708	928
Cash/(deficit) b/f	164	(503)	205
Cash/(deficit) c/f	(503)	205	1,133

The company has a predicted shortfall at the end of 20X3 of £503,000.

11.2

To: The directors of Myloson plc

From: RT Consultants

Date: 2 May 20X3

Subject: Report on the financial forecasts of Myloson plc

As requested by the terms of reference, I have prepared forecast income statements and cash flow forecasts for the years 20X3 to 20X5.

Key aspects of the financial information and the likelihood of achieving the objectives

While the company is making good profits, the calculations show that the return on shareholders' funds will be maintained at over 30%.

The effect of the additional borrowing in 20X3 will be to increase **gearing**. An analysis of the impact of using debt finance has not been carried out here. However, it is possible to say that although interest cover (operating profit/interest) is safe in 20X2 at 10.5 times (684/72), this figure will fall with borrowing the capital required.

In summary, the projections show that the company is profitable, with a good growth rate predicted, but a financial strategy needs to be developed.

Additional methods of financial forecasting

The forecasts prepared for this report are prepared on the basis of rather simplified assumptions. For example, the relationships between sales, costs, receivables and payables remain the same over the period. No additional inventory holdings have been budgeted for, and interest on additional borrowings has been omitted.

A more detailed set of forecasts needs to be prepared, on a month-by-month basis, within the context of the company's strategic plans. Input to the forecasts will include:

- marketing, production and purchasing plans; estimates from line managers of sales, costs and inventory;
- statistical analysis of the relationship between the variables in the model and a cross-check against the managers' detailed estimates;
- estimates of general economic factors and their likely effect on the company and the industry as a whole; estimates of any likely changes in the behaviour and attitudes of competitors, customers and suppliers; and
- the results of capital investment appraisal and other decisions.
- There are many ways of handling **risk** and **uncertainty** in the estimates. Suitable techniques include:
- the preparation of best- and worst-case estimates;
- use of data tables to show ranges of possible results;
- sensitivity analysis and the identification of 'key' variables;
- assignment of probabilities to estimates;
- use of simulations for complex and repetitive uncertain events;
- scenario planning and the development of contingency plans.

12 Newton Pearce plc

12.1

Finance to be raised	£
New assets	950,000
Reduction in overdraft (2,240 – 2,000)	240,000
Reduction in payables (2,870,000 × 10/45)	637,777
	1,827,777

12.2

(a)

	Rights issue	Debenture issue
Earnings per share	£0.145	£0.162
	(£498,830/3,434,014)	(£316,784/1,960,000)

	£	£
Sales	34,500,000	34,500,000
Net margin (£28.5m × 3%)	855,000	855,000
(£6m × 5%)	300,000	300,000
	1,155,000	1,155,000

Interest Current debentures (8%× £2,550)	204,000	204,000
New debentures (12%× £1,827,777)	0	219,333
Bank overdraft		

		£		£
(£2m × 17.5%)	350,000		350,000	
		(554,000)		(733,333)
Profit before taxation		601,000		381,667
Taxation (17%)		(102,170)		(64,883)
Profit after tax/Earnings		498,830		316,784

WORKING

Number of shares

Rights issue (£1,827,777/[£1.55 – 20%])	1,474,014 shares
Plus existing shares (£980,000/£0.50)	1,960,000 shares
Total	3,434,014 shares

(b)

		Rights issue	Debenture issue
Gearing % (see Working below)	(£2,550,000/£7,638,907)	33.4%	58.1% (£4,377,777/£7,530,561)

WORKING

Retained profit

	£	£
Profit after tax/earnings (part (1))	498,830	316,784
Dividends Existing shares (5p × (980/£0.50))	(98,000)	(98,000)
New shares (5p × 1,474,014)	(73,700)	0
Retained profit	327,130	218,784

	Rights issue	Debenture issue
Total long-term funds at 31/12/X6	£5,484,000	£5,484,000
Plus: New long-term funds raised 20X7	1,827,777	1,827,777
Plus: Retained profit 20X7	327,130	218,784
Total long-term funds at 31/12/X7	£7,638,907	£7,530,561
Total geared funds at 31/12/X7	£2,550,000	£4,377,777 (£2,550,000 + £1,827,777)

WORKING **Retained profit**		
	£	£
Profit after tax/earnings (part (1))	498,830	316,784
Dividends Existing shares (5p × (980/£0.50))	(98,000)	(98,000)
New shares (5p × 1,474,014)	(73,700)	0
Retained profit	327,130	218,784

	Rights issue	Debenture issue
Total long-term funds at 31/12/X6	£5,484,000	£5,484,000
Plus: New long-term funds raised 20X7	1,827,777	1,827,777
Plus: Retained profit 20X7	327,130	218,784
Total long-term funds at 31/12/X7	£7,638,907	£7,530,561
Total geared funds at 31/12/X7	£2,550,000	£4,377,777
		(£2,550,000 +
		£1,827,777)

Note: An alternative calculation in this gearing calculation ie, using the nominal value of the new debentures issued would not have been penalised: 10% Debenture issue (£1,827,777 × 12%/10%) = £2,193,332 nominal value.

12.3 NP's current earnings per share figure is 9.25 pence. This is significantly lower than both of the forecast earnings per share figures for the forthcoming year.

The debentures issue will lead to a higher earnings per share figure than the rights issue.

Debenture issue: The risks associated with this issue are greater than those associated with the rights issue. The level of gearing might be considered too high in relation to the expected returns. The interest cover ratio under this option of 1.49 (£1,155,000/773,333) is also low. The level of interest payments will prove a burden unless profits can be maintained at a high level.

Do the existing debenture holders have any collateral? Will the new debenture holders expect something similar? Is there potential conflict here? Is there sufficient security for these borrowings – the current book value of the assets is only £3,518,000 (plus new assets of £950,000). What is the market value of the non-current assets?

Rights issue: Although the EPS is less than for the debenture issue, it will be higher than in 20X6. The level of gearing is much lower than under the debenture issue option. Also, it gives a lower level of gearing than the current one. The interest cover ratio of 2.08 is higher than that for the debenture issue. Shareholders may find it difficult to raise the required finance to subscribe, because the rights issue equates to 75% (1,474,014/1,960,000) of the existing shares in issue. This may limit its success.

12.4 Working capital typically comprises inventories, trade receivables, bank/cash and trade payables.

Contrary to management's view, NP's expansion into northern England and Scotland is likely to affect its level of working capital.

It would be prudent to carry sufficient additional inventory to avoid a 'stock out' (which could cause a loss of customers). With inventory, NP must strike a balance between the costs of 'stock outs', ordering costs and holding costs.

To encourage potential new customers, NP would be wise to offer credit terms on its new sales

– thus the level of trade receivables will increase.

NP should continue with its policy of purchasing goods on credit and, once the 10-day adjustment has been made to the creditors' payment period, the expansion of trade means that the level of trade payables will increase, which will reduce NP's working capital investment.

Chapter 7
Equity sources and dividend policy

Introduction

Learning outcomes

Students will be able to identify capital requirements of businesses and assess financing options. This will involve being able to:

- compare the features of different means of making returns to lenders and owners (including dividend policy), explain their effects on the business and its stakeholders, and recommend appropriate options in a given scenario.

Syllabus links

This subject follows on from the chapters on sources of finance and gearing.

Examination context

You may be expected to explore the implications of raising equity finance from a variety of sources. The most important sources are retained earnings, rights issues and new issues of shares.

There are a number of practical issues that need to be considered when paying out dividends. You may be asked to evaluate the implications of different dividend policies in the exam. Answers **are expected to refer to Modigliani and Miller's theory** that the amount of dividends paid will not affect shareholder wealth, providing that retained earnings are invested in profitable investment opportunities. Any loss in dividend income will be offset by gains in the share price. According to **traditional theory**, shareholders would prefer dividends today rather than dividends or capital gains in future. Cash now is more certain than in the future.

Supplementing these main theories is the impact of 'signalling' and the 'clientele effect'. A change in dividend policy may send a negative signal to the market, and have a negative impact on the share price. Investors will seek a company with a particular dividend policy that suits them. It is important that if dividends are cut, shareholders are given clear reasons for it.

As an alternative to dividend payments, a company may use the cash to repurchase issued shares Candidates may be asked to explain how a share buy-back works, its implications for individual shareholders, and to discuss how the share buy-back would affect the company's gearing and WACC. Note this practically share buy back option is absent in Bangladesh as of now; however, candidates are expcted to learn the global context.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**The classic view of the irrelevance of the sources of equity finance** Making use of equity finance, particularly retained profits, is important for most businesses. Retained profits are the main source of finance for most companies, and it is important to understand the issues surrounding their use.	**Approach** Chapter 7 has a large worked example. Ensure you are happy with the points coming out of it. The differences between theory and practice are important to reconcile. **Stop and think** Does it make any difference if we retain profits or pay a dividend?	You may be expected to explore the implications of raising equity finance from a variety of sources.	**IQ1: Pricing of new issues** It is important that you complete the worked example before attempting this question.
2	**M&M and dividend policy** There are a number of practical issues that need to be considered when paying out dividends. M&M proposed that in theory the pattern of dividends over time is irrelevant in determining shareholder wealth. They are not saying dividends themselves are irrelevant, but they argued that the pattern of payments (ie, the dividend policy) is irrelevant.	**Approach** Make sure you understand M&M's theory of dividend irrelevancy but also the arguments for the relevance of dividend policy. **Stop and think** What are the practical issues that need to be considered when paying out dividends?	You may be asked to evaluate the implications of different dividend policies in the exam.	**IQ2: Dividend policy** This very simple question illustrates the concept of dividend irrelevancy.
3	**Share buy backs and scrip dividends** As an alternative to dividend payments, a company may use the cash to repurchase issued shares (reducing equity and increasing gearing).	**Approach** The worked example on scrip dividends is important, work through this carefully. **Stop and think** Do you know why a company would opt for a scrip dividend?	You may be asked to evaluate the implications of different dividend policies in the exam.	

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1 The classic view of the irrelevance of the source of equity finance

Section overview

The cost of the equity finance is the same, irrespective of whether the equity is new shares, a rights issue or retained profits.

- Pricing new issues – too high and it may not succeed: too low and it will cause too much dilution.

1.1 The M&M view

The cost of equity finance represents the returns required on equity funds invested. If this level of return is not obtained, share prices will fall until the implied return on equity equals the shareholders' required rate of return. This argument applies to all sources of equity.

For example; $k_e = D_0/P_0$

This view was developed by Modigliani and Miller (1961), and is regarded as the classic position. Their argument is that all sources of equity finance have the same cost, and therefore the particular source of equity finance is irrelevant, irrespective of whether it is new shares, a rights issue or retained profits.

If returns to investors (ie, dividends) fall, then the value of the share price will fall. This results in the required rate of returns (k_e) being maintained at the required level.

1.2 The irrelevance argument demonstrated

If both new equity and retained earnings have the same cost, then it should be irrelevant, in terms of shareholder wealth, where equity funds are found. This is demonstrated in the following example.

Worked example: Irrelevance argument

Zeus plc is an equity-financed company. It has 5,000,000 shares in issue. These are currently quoted at £5.50 each cum div. The dividend proposed for the current year is 50p per share. No increase in this dividend is anticipated unless new projects are accepted. There is no long-term debt.

The company's cost of equity (k_e) is 10%.

A project is currently under consideration that would involve investing £500,000 immediately. It would generate a cash surplus of £100,000 in one year's time and annually thereafter in perpetuity. The project cash flows are known to the market, and do not alter the company's risk. All of the project cash flows would be paid as dividends.

The NPV of the project is (£500,000) + £100,000/0.10 = £500,000

Requirements

You are asked to evaluate three alternative sources of finance from the point of view of the existing shareholders:

1 A reduction in the current year's dividend to 40p per share, so as to release £500,000 of internally-generated funds.

2 A rights issue on a one-for-ten basis at £1 per share.

3 A new issue of shares. These would be identical to existing ordinary shares and would first rank for dividend in one year's time.

Note: Ignore taxation and issue costs.

Solution

1 Impact of the new project and related finance.

	£m
Current ex div value of shares = 5 million × £5.00	25.0

	£m
NPV of the project	0.5
Increase in equity capital	0.5
Ex div value of shares afterwards	26.0

Alternative working:

Existing dividend = £0.5 × 5m = £2.5m

Increased dividend = £0.1m

$P = D_1/k_e = (£2.5m + £0.1m)/0.1 = £26m$

This will be the ex div value of the equity irrespective of how the money is raised. The cum dividend value will obviously be affected if some of the dividend is retained, but the wealth of the shareholders will not be.

Retained earnings

(£m)		**Ex dividend value**	**+ Dividend =**	**Cum div value**
Before:		25.0	2.5	27.5
Capital: using dividend Project outlay:	(0.5)	0.5	(0.5)	
PV (inflow)	1.0			
NPV of project		0.5		
		26.0 +	2.0 =	28.0

Increase in shareholder wealth is £0.5m (£28m – £27.5m), being the NPV of the project.

2 Rights issue

	Ex-div value	+ Dividend =	Cum-div value
Before:	25.0	2.5	27.5
Capital:	0.5		

Project outlay	(0.5)		
PV (inflow)	1.0		
NPV Project	0.5		
	26.0	2.5	28.5

Increase in shareholder wealth is:

Increase in value of equity £1.0m

Less: cost of new shares £(0.5m)

£0.5m

In conclusion, the change in shareholders' wealth is the same, irrespective of how the new capitalis injected.

3 New share issue

While the wealth of the shareholders in total is unaffected by the source of the new equity, the way that wealth is divided between the shareholders is influenced by the price chosen for the new issue. The company therefore needs to consider carefully the asking price per share.

If the new shareholders are allowed to enter the company too cheaply, the increased number of shares will detract from the wealth of existing shareholders; if priced too highly they will refuse to subscribe.

If all of the gain is to go to the existing shareholders, the ex-div value of their 5 million shares must be £25.5 million after accepting the project ie, their share price should be £5.10 each. If the company wants to set a price of £5.10, they will need to issue £500,000 ÷ £5.10 = 98,039 new shares.

Taking into account the NPV of the subsequent project, the value of the shares would change as follows.

Issuing new shares at a price of £5.10

	Shares	**Price**	**Value of shares**
		£	£
Amount issued	98,039	5.10	500,000
Currently in existence	5,000,000	5.00	25,000,000
			25,500,000
NPV of project			500,000
	5,098,039	5.10	26,000,000

The combined value of the shares would be £26 million (as illustrated above). This would be shared over the 5,098,039 shares to give a share price of £5.10.

				Gain
Amount issued	98,039	5.10	£500,000	nil
Currently in existence	5,000,000	5.10	£25,500,000	£500,000
				£500,000

Once all shares have moved to the equilibrium price of £5.10, it can be seen that all of the gain has in fact gone to the existing shareholders.

Suppose instead that the company sets an issue price of only £5. The number of shares issued would need to be 100,000 (= £500,000/£5 per share). Taking into account the NPV, the total value of the shares is again £26 million, but this time with a share price of £5.098 (£26 million/5.1 million shares).

Issuing new shares at a price of £5.00

	Shares Price		Value of shares
		£	£
Amount issued	100,000	5	500,000
Currently in existence	5,000,000	5	25,000,000
			25,500,000
NPV of project			500,000
	5,100,000	5.098	26,000,000

Once all of the shares have moved to an equilibrium price of £5.098, the gain of £500,000 due to the NPV is shared between existing and new shareholders.

				Gain
Amount issued	100,000	5.098	£509,804	£9,804
Currently in existence	5,000,000	5.098	£25,490,196	
			£490,196	

Gain

£500,000

In conclusion, the share price set for a new issue determines **how the wealth is shared**, but notthe **total amount of the wealth**, which is unaffected.

Summary of overall position

	New share issue (assuming a price of £5.10)					
					Original value of equity	
Description	Retained earning		Rights issue			
	£m	£m	£m	£m	£m	£m
Cum div 5m × £5.50		27.5		27.5		27.5
Ex div value of original equity with scheme and project	26.0		26.0		25.5	
Proposed dividend	2.0		2.5		2.5	
Cum div value	28.0		28.5		28.0	

Less investment tobuy rights	–	(0.5)	–
	28.0	28.0	28.0
Net gain to existing shareholders	0.5	0.5	0.5

Conclusion

Strict application of the dividend valuation approach indicates that the source of equity finance is irrelevant. This is because whichever way the equity finance is provided, shareholders require a return of 10% per annum.

Note that in all cases the increase in total shareholder wealth equals the NPV of the project.

1.3 Pricing of new issues

One of the most difficult problems in making a new issue of shares to the public is setting the price correctly. If it is too high, the issue will not be fully taken up and will be left with the underwriters. This will reflect badly on the company and on the issuing house.

The solution may be to under-price the new issue. However, this works to the detriment of the existing shareholders.

Interactive question 1: Pricing of new issues

1.1 Using the data in the worked example, calculate the following:

The gain to the existing shareholders if the new shares are issued at £4 each

Method

- To find the gain, use the following approach:
- Find the number of shares
- Find the value per share afterwards

1.2 Compare to the value before (or cost of shares for new shareholders)

The issue price at which the existing shareholders neither gain nor lose

Method

For the existing shareholders to make no gain, the share price afterwards must remain at £5.

See **Answer** at the end of this chapter.

- Comments on the Interactive **question**
- The total gain remains constant at £500,000. The change is the sharing of that gain between new and old shareholders.
- What you should have demonstrated is that if new shares are issued at a very low price, then more of the gain of £500,000 accrues to the new shareholders.

- If the price is set high, then more of the gain goes to the existing shareholders. This presumes however that the new shares will be sold at a high price – which may not occur.

Almost inevitably, the price would have to be below the existing market price for the issue to be subscribed.

A rights issue completely by-passes the price problem. Since the shares are offered to existing shareholders, it does not matter if the price is well below the traded price. Indeed, it would be normal for this to be so. Although there would be a gain on the new shares, by the nature of a rights issue this would go to the existing shareholders.

Professional skills focus: Assimilating and using information

One of the professional skills assessed in the CA exams considers your ability to demonstrate an understanding of the business context. This skill is important when suggesting an appropriate issue price for issuing new equity.

1.4 Practicalities of raising equity finance

The above analysis and conclusions must be considered in the light of the practicalities of raising equity. As discussed in Chapter 4 on the sources of finance, new equity issues, including rights issues, are expensive and time-consuming – a very important practical point that results in retained profits being a much more frequent source of equity finance.

1.5 Pecking order

It has been suggested that because of issue costs firms try to access equity finance in a particular sequence ie, they follow a 'pecking order'. Note that the first worked example in this chapter, Irrelevance argument, assumes that issuing shares is costless. The order in which equity funds are supposedly used is as follows:

- **Retained earnings** are usually the cheapest source of finance as they involve no issue costs. However, if they are used too extensively the result can be a substantial cut in dividends, which will upset shareholders, depress the share price and drive up the cost of equity.
- **Rights issues** are the next cheapest form of equity finance due to the relatively low issue costs.
- **New issues** to the public tend to be the most expensive source of equity finance.

2 M&M and dividend policy

Section overview

In theory, dividend policy is irrelevant in determining shareholder wealth.

- There are a number of practical issues that need to be considered when paying out dividends.
- Shares can be given in lieu of dividends.

2.1 The theory of the irrelevancy of dividend policy

Modigliani and Miller (M&M 1961) proposed that in theory the **pattern of dividends** (**the dividend policy**) over time is irrelevant in determining shareholder wealth.

If the source of new equity finance is irrelevant (retentions or new issues) then dividend policy must also be irrelevant. This means that paying or not paying a dividend does not matter, provided a firm takes on all available positive NPV projects such that shareholders' wealth is maximised.

M&M are **not** saying dividends themselves are irrelevant (after all the value of a share is the present value of the dividend stream) but they are saying that the **pattern** of payments (ie, the dividend policy) is irrelevant.

Interactive question 2: Dividend policy

Consider a firm paying a 10p dividend each year with a cost of equity of 10%.

Requirement

If the firm could invest in a project which meant cancelling the 10p dividend in one year and investing it for one year at the cost of equity, what would happen to shareholder wealth?

See **Answer** at the end of this chapter.

While the dividends themselves are important, the **pattern** of payment is not. Obviously, shareholders would prefer positive NPV investments.

M&M went on to argue that only after a firm has invested in all positive NPV projects should a dividend be paid, if there are funds remaining for distribution. In other words, retained profits should be used for project finance and dividends should be the residual amount after all the worthwhile investments have been made. Given their assumptions, M&M are correct. It is a matter of whether these assumptions hold in the real world.

2.2 Arguments for the relevance of dividend policy

Traditional theory/resolution of uncertainty

In the example in section 1 above, the use of retained earnings involves sacrificing current income (dividends) in order to increase wealth through a higher share value ie, a capital gain. Traditionalists would argue that £1 of dividend income received now is more certain than £1 of capital gain (the socalled **'bird in the hand'** approach). Greater value would be put on a firm paying a dividend (and issuing shares to finance new investments) than one using retentions (ie, cutting dividends).

Essentially this implies that cost of equity increases with time ie, later cash flows should be discounted at a higher rate than earlier cash flows. In fact, rather than being related to time, risk is related to the nature of the project which produces the cash flows. So, as long as an appropriate risk-adjusted rate is used, there is no need to value earlier cash flows more highly than later cash flows**.**

The 'resolution of uncertainty' argument is, therefore, fallacious.

2.3 Dividend signalling

In reality investors do not have perfect information concerning the future prospects of the company. Many authorities claim, therefore, that the pattern of dividend payments is a key consideration for investors when estimating future performance. For example, an increase in dividends would signal greater confidence in the future by managers and would lead investors to increase their estimate of future earnings, causing a rise in share prices. A sudden dividend cut on the other hand would usually have a serious effect on equity value, as estimates of future dividend flows are also cut.

This argument implies that **dividend policy is relevant**. Firms should attempt to adopt a stable (and rising) dividend pay-out to maintain investors' confidence.

Note that if dividends do convey information, this is evidence **against strong form market efficiency** because it implies that information exists which is not already incorporated into the share price.

2.4 Clientele

Investors may be attracted to firms by their dividend policies. This might be because high pay-outs attract those who prefer current income, or low payments attract those with high marginal income tax rates. Low pay-outs may also attract those seeking capital gains, such as pension funds which must meet long-term pension commitments as well as short-term pension payment obligations.

Major changes in dividend policy should be avoided if possible as these might upset a particular clientele of shareholders, who sell their shares, pushing down the share price. While a new clientele may find the new policy attractive and buy shares, the overall climate of uncertainty as to what is the long-term dividend policy could have a depressing effect on the share price.

2.4.1 Preference for current income

Many investors require cash dividends to finance current consumption. This applies not only to individual investors needing cash to live on, but also to institutional investors, such as pension funds and insurance companies, which require regular cash inflows from **some** of their share investments to meet day-to-day outgoings, such as pension payments and insurance claims. This implies that many shareholders will prefer companies which pay regular cash dividends and will therefore value their shares more highly.

Modigliani and Miller challenged this argument and claimed that investors requiring cash can generate 'home-made dividends' by selling shares. This argument has some attractions, but it ignores transaction costs of selling shares. The sale of shares involves brokerage costs and can therefore be unattractive to many investors. Also some investors, such as trusts, are not allowed to spend out of capital; only income may be used for consumption.

2.4.2 Taxation

Income and capital gains are taxed differently in Bangladesh (eg, gains are taxed at a flat rate subject to an annual exemption). It is not the place of this workbook to examine tax in depth. Suffice it to say that there may be a preference for income or capital gains depending on the investor's tax position.

2.5 Cash

If cash is unavailable to pay a dividend (perhaps because by investing in projects with positive NPVs there is no cash available for dividends), either the planned investments should be cut back or money should be borrowed to finance some of the investments, if it is felt that payment of a dividend is necessary to avoid adverse signalling effects.

2.6 Agency theory

As has been seen in earlier chapters, managers/directors do not necessarily act in the best interests of shareholders. Shareholders can keep some control over their money by insisting on high pay-out ratios. If managers/directors want new funds for investment, they are then forced to issue shares (by rights issue or to the public) and **justify** why the investment is sound. Obviously, managers/directors would prefer to use retentions in this instance. The agency cost is represented by the cost of the new share issue.

Even if managers are allowed to use retentions for investment (with correspondingly lower dividend pay-outs), there may still be an agency cost for shareholders in that managers may invest in 'empire building' projects, rather than in those which increase shareholder wealth.

Professional skills focus: Applying judgement

You are expected to be able to identify assumptions or faults in arguments. It is therefore important that you can explain the assumptions underlying M&M's dividend irrelevancy policy.

3 Share buy-backs and scrip dividends

Section overview

Companies repurchase shares if they want to return large amounts of capital to shareholders.

- Companies may offer shares in lieu of dividends.

3.1 Share repurchases

As an alternative to dividend payments a company may consider using the cash to repurchase issued shares (reducing equity and increasing gearing).

Share buy-backs also enable a company to use surplus cash without disturbing the normal dividend policy. If surplus cash were used to increase the dividend this might be treated over-favourably by the market, expecting higher dividends/growth in future which is not sustainable. An alternative to buying back shares would be to pay a 'special dividend' making it clear that it was a one-off above normal sustainable levels, thus sending the right signal to shareholders.

The repurchase of shares may be achieved by buying shares in the stock market, or inviting shareholders to tender their shares, or by arrangement with particular shareholders. Repurchases are subject to the Companies Act and the rules of the Stock Exchange.

3.2 Scrip dividends (stock dividends)

Companies may offer scrip dividends (ie, shares) in lieu of cash dividends.

Worked example: Scrip dividends

Jack plc has 100,000 shares issued valued at £1.10 cum div per share. The market expects Jack plc to pay a dividend of 10p per share in the near future.

Jack plc is considering the following options:

(1) Pay the dividend of 10p per share

(2) Cancel the cash dividend and substitute a 1-for-10 scrip dividend

(3) Offer a choice of cash (10p) or scrip (1-for-10)

(4) Offer a choice of cash (10p) or enhanced scrip (1-for-8)

Requirement

Calculate the effect on wealth of each of the above options on a shareholder with 1,000 shares. For (3) and (4), assume 90% of shareholders take the scrip dividend alternative.

Solution

(1)

£

Wealth before = 1,000 × £1.10	1,100*
New share price = £1.00 ex div	
∴ MV shares = 1,000 × £1.00	1,000
Cash received = 1,000 × £0.10	100
Wealth afterwards =	1,100*

*MM: dividend policy irrelevance(2)

Number of shares issued = 10,000

Total value of shares = £110,000 as no cash paid out

∴ New share price = £110,000/110,000

= £1.00 ex div

Shareholder now has 1,100 shares therefore the shareholder's wealth is:1,100 × £1.00 = £1,100

∴ No difference from conventional dividend (ie, dividend policy irrelevance).

(3)

10% of shareholders take cash:

Cash paid = 10,000 × 10p

= £1,000

∴ New MV of shares = £(110,000 – 1,000)

= £109,000

90% of shareholders take scrip, therefore number of shares issued = 90,000 × (1/10)

= 9,000

New share price = £109,000/109,000

= £1.00 ex div

Therefore

	£
Wealth of shareholder who took cash 1,000 shares @ £1.00	1,000
Cash	100
	1,100
Wealth of shareholder who took scrip dividend 1,100 shares @ £1	1,100

Thus, ignoring tax effects etc, shareholders should be indifferent between no dividend, a cash dividend and a scrip dividend. This illustrates the argument for dividend policy irrelevance.

Note: With Option (3) the choice only works because the terms of the dividend and scrip were such that, in isolation, they resulted in the same share price.

(4)

New MV = £109,000 (as in (3))

New number of shares = $100,000 + 90,000 \times \frac{1}{8}$

= 111,250

∴ Price = £109,000/111,250

= £0.97978

Therefore

	£
Wealth of shareholder who takes cash 1,000 × £0.97978	979.78
Dividend	100.00
	1,079.78
Wealth of shareholder who takes scrip 1,125 × £0.97978	1,102.00

In this situation a shareholder taking the enhanced scrip is better off (ignoring tax).

Advantages of scrip dividends

With normal scrip dividend ((2) and (3) above)	With enhanced scrip dividend ((4) above)
• Company avoids liquidity problems	• Company avoids liquidity problems
• Shareholders swap income for capital gain and may be better off (depends on their income and capital gains tax position)	• Shareholders swap income for larger capital gain (if less than 100% of them take the enhanced scrip dividend) and may be better off (depends on their tax position)

Professional skills focus: Structuring problems and solutions

You are expected to be able to identify and anticipate problems that may result from a decision. You may therefore need to highlight the impact on various stakeholders if a company decides to change its dividend policy.

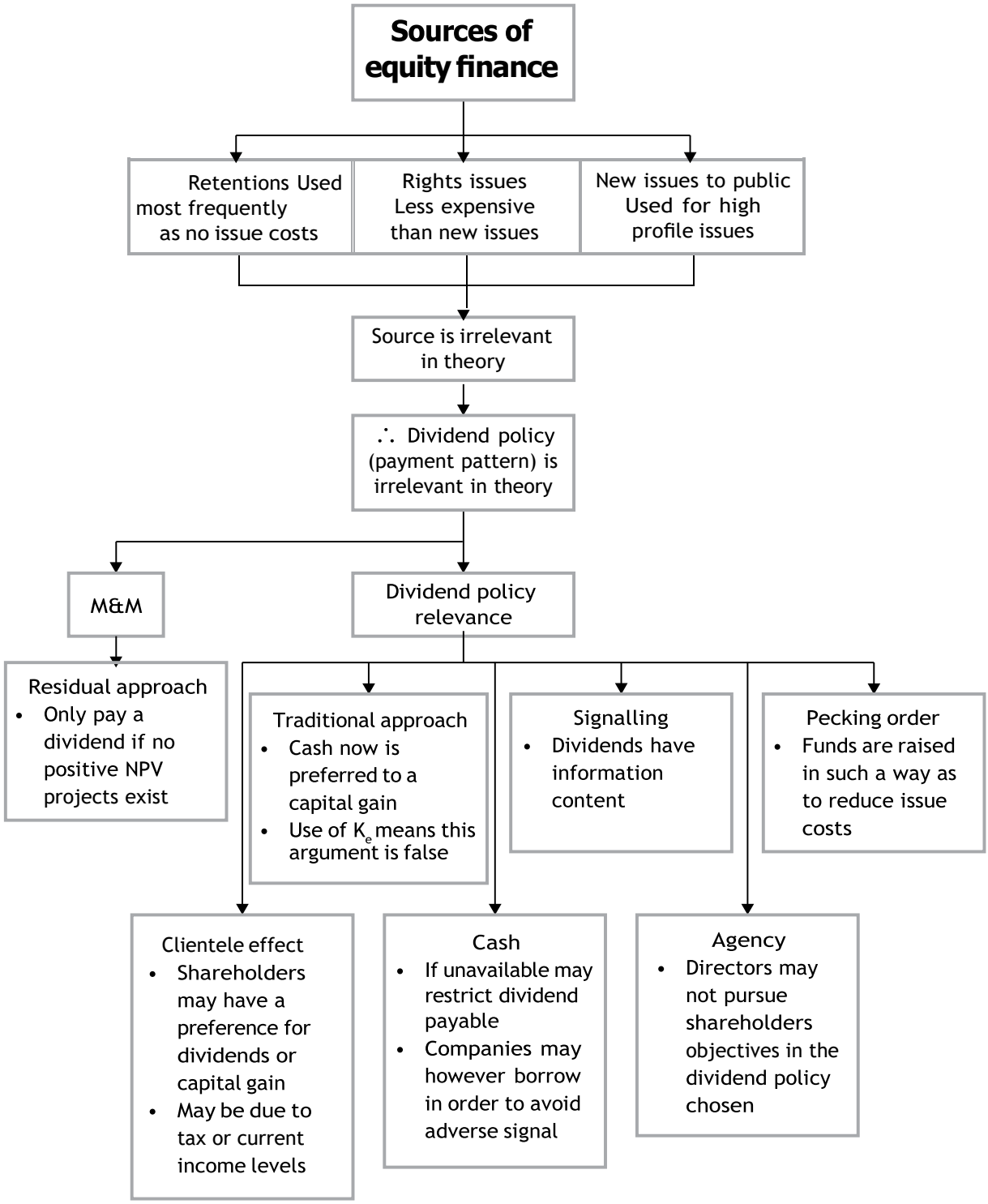
3.3 Conclusions on dividend policy

M&M are probably right, despite their assumptions. Evidence suggests that share value and dividend policy are not closely related. But evidence also points to a clientele effect. Perhaps the best a firm can do is establish a dividend policy and stick with it. Many listed firms opt for a stable, rising annual dividend per share. Dividends are set at a level below anticipated earnings to provide for new investment (thus avoiding the need for too many expensive share issues) and to allow the dividend to be maintained if there is a temporary fall in earnings. Any earnings in excess of normal dividend requirements and beyond those required for investment could be returned to shareholders via one- off special dividend payments or could be used to repurchase some of the firm's shares.

Professional skills focus: Concluding, recommending and communicating

You are expected to be able to make evidence-based recommendations which can be justified by reference to supporting data and other information. A recommended dividend policy must therefore be based on the information provided in the question.

Summary


Sources of equity finance
Retentions Used most frequently as no issue costs
Rights issues Less expensive than new issues
New issues to public Used for high profile issues
Source is irrelevant in theory
∴ Dividend policy (payment pattern) is irrelevant in theory
M&M
Dividend policy relevance
Residual approach
• Only pay a dividend if no positive NPV projects exist
Traditional approach
• Cash now is preferred to a capital gain
• Use of K_e means this argument is false
Signalling
• Dividends have information content
Pecking order
• Funds are raised in such a way as to reduce issue costs
Clientele effect
• Shareholders may have a preference for dividends or capital gain
• May be due to tax or current income levels
Cash
• If unavailable may restrict dividend payable
• Companies may however borrow in order to avoid adverse signal
Agency
• Directors may not pursue shareholders objectives in the dividend policy chosen

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Do you know the pecking order for accessing equity finance? (Topic 1)
2.	Can you explain M&M's dividend irrelevancy theory? (Topic 2)
3.	Can you explain what is meant by dividend signalling? (Topic 2)
4.	Can you calculate the impact on shareholder wealth of offering a scrip dividend? (Topic 3)
5.	Do you know why companies would choose to offer a scrip dividend to shareholders? (Topic 3)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
3 Southern Industrial Services plc	This is a good question focussing on M&M's dividend irrelevancy theory. This topic is unlikely to feature as a full question in the real exam, it is more likely to be included as a part of a question.
4 Miller Sharp plc	This question requires a written answer. Students often overlook written questions in preference of calculations. Think about planning your answer first before writing up the answer in full.
6 Biojack plc	This question includes a good mix of calculation and written answers. It looks at the impact of dividend policy on share price.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the learning in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Self-test questions

Answer the following questions.

1 Jethro plc

Jethro plc has an issued share capital of 5 million ordinary shares, on which it has paid annual dividends of 80p per share for several years. The company has no plans for expansion, and the stock market generally expects dividends to continue at that level. The market price per share is £5.80 cum-dividend. The company has no fixed interest capital.

The directors are considering the acceptance of a new capital project which would require an immediate outlay of £700,000. If the project were accepted, it is estimated that it would generate net cash receipts of £140,000 per annum indefinitely (starting in one year's time). Those additional receipts would be used to increase dividends.

The directors are considering two possible ways of using shareholders' funds in order to finance the new project:

(1) A rights issue of 1 new share for every 25 shares held at present at a price of £3.50 per share. The new shares would rank for dividend one year after issue.

(2) An issue of shares to the general public. The new shares would rank for dividend one year after issue.

Assume that, if the project were accepted, the firm's expectations of future results would be discovered and believed by the stock market, and that the market would perceive the risk of the firm to be unaltered.

Requirements

1.1 Estimate the ex-dividend price per share if the project is financed by the rights issue, and calculate the gain made by shareholders.

1.2 Estimate the gains made by present shareholders and new shareholders if the new shares in option (2) are issued at £4.00 each.

1.3 Calculate the price at which the new shares should be issued under option (2) if the total benefit of the project is to go to existing shareholders.

1.4 Discuss the practical differences between retained earnings, rights issues and new issues to the public as sources of equity finance.

Note: Ignore taxation and issue costs for parts 1.1 to 1.3, but not 1.4.

Total: 15 marks

2 Strontium plc

Strontium plc has an issued share capital of 1 million ordinary shares of £1 each and no fixed interest securities. It has just paid a dividend of 60p per share. Dividends have recently been increasing at the rate of 5% per annum, and shareholders generally believe that this rate of dividend growth will continue indefinitely. The market price is £6.30 per share.

The company is now considering an investment proposal which would require an initial outlay of

£600,000 and would generate net cash receipts for the following three years of £300,000, £500,000 and £300,000 respectively. These additional receipts will be used to increase dividends.

The cash for the initial outlay will be raised by means of a rights issue with issue costs of £20,000. Assume that if the project were accepted the firm's expectations of future results would be discovered and believed by the stock market.

Requirements

2.1 Estimate the market capitalisation of Strontium's ordinary shares once the rights issue has been made and the project has been accepted.

(4 marks)

2.2 Calculate the gain made by the shareholders in total as a result of accepting the project.

(3 marks)

2.3 Calculate the net present value of the project after subtracting issue costs.

2.4 The rights issue in the above example will take one of the following forms:

(3 marks)

(1) A 1 for 10 issue at £6.20

(2) A 1 for 5 issue at £3.10

In each case calculate the gain made by the holder of 100 shares who takes up his rights. Assume issue costs are the same under both options.

2.5 Answer the following.

(5 marks)
(4 marks)

(a) If the rights issue were 1 for 5 at £3.10, at what price should a shareholder who does not wish to take up the offer hope to sell his rights, if he is still to make his full share of the gain on the project?

(b) Calculate the gain made by the holder of 100 shares who sells his rights at this price.

2.6 What is the minimum price at which the shareholder should sell his rights if he is not to make a loss?

(3 marks)
Total: 22 marks

3 Southern Industrial Services plc

Southern Industrial Services plc is an all equity financed, Stock Exchange listed company. Over recent years the company's management has adopted a fairly cautious and conservative policy of not seeking expansion, but has been content to earn a steady level of profits, most of which have been distributed as dividends.

Recently there have been some personnel changes at board level with the result that the company has more actively been seeking new investment opportunities. In the financial year which has just ended the company reported profits of £5 million, a similar figure to that of recent years.

It has been estimated that the company's cost of equity is 15% per annum.

Four investment projects have been identified, all of which could commence immediately. The estimated cash flows and timings of these projects are as follows.

Project		A	B	C	D
		£m	£m	£m	£m
Year	0	(2.00)	(2.00)	(3.00)	(1.00)
	1	0.75	0.65	0.80	0.50
	2	0.75	0.65	0.80	0.50
	3	0.75	0.65	0.80	0.50
	4		0.65	0.80	
	5		0.65	0.80	

Each of these projects is in the same risk class as the company's existing projects.

Requirements

You have been asked by the board to give your advice on dividend policy at next week's board meeting.

1.1 Calculate how much Southern Industrial Services plc should pay to shareholders as a dividend in respect of the company's financial year which has just ended, assuming that Modigliani and Miller were correct in their original 1961 proposition on dividend policy.

You should ignore taxation in this calculation.

(5 marks)

1.2 With reference to relevant theories, prepare notes on which you will base your contribution tothe board meeting. These should include a brief explanation of the Modigliani and Miller proposition on dividend policy and reasons why the company's board may decide not to pay the level of dividend which you indicated in 3.1. You should bear in mind the fact that most members of the board have little or no accounting or financial knowledge. Your comments must relate to the particular circumstances of Southern Industrial Services plc.

Note: Ignore inflation. Work to the nearest £1,000.

(8 marks)
Total: 13 marks

4 Miller Sharp plc

Miller Sharp plc is a Stock Exchange listed company which had operated in two main areas of business – the manufacture of agricultural supplies and the manufacture of furniture, both for the UK market. Recently, however, it sold its furniture-making activity for a cash amount equal to about 30% of Miller Sharp's market capitalisation. This was done in order to concentrate on what the directors see as the company's core activity in agricultural supplies. Since the directors can see no investment opportunities, a decision has been made to use the cash to restructure the company's finances. Three possibilities have been proposed:

- Purchase and cancel some of the company's loan stock
- Purchase and cancel some of the ordinary shares

- Pay a 'special' dividend

Some combination of two or all of these possibilities might be acceptable to the directors.

When the directors met to discuss the use of the cash in one or more of the ways mentioned above, the following comments were made:

The Finance Director: "We've always been modest dividend payers in the past, so our shareholders would probably welcome a large dividend."

The Production Director: "This is a good opportunity to get rid of some of the loan stock burden and push up our share price."

The Marketing Director: "I feel that it would be better to hold on to the cash; redeeming capital in this way will make us look weak and adversely affect the share price. Instead of redeeming some of the shares, why don't we make a bonus issue and so give the shareholders a share of the reserves in that way."

The directors are to meet next week to make a final decision on precisely how the cash is to be used. The chief executive has consulted you on the matter.

Requirement

With reference to relevant theories, make notes for the chief executive in advance of next week's meeting on what you consider to be the arguments for and against each of the options or any combination of options.

Total: 16 marks

5 TRB

You have been asked for advice by a relative who has raised a number of points, based on articles he has read recently in his newspaper. Here is a summary of his points:

Firstly, I read a piece about a marketing agency, Tollard, Royle, Berwick plc (TRB), which has been going through a bad patch and had been in negotiations with its long term creditors to restructure its debts. Accordingly, it had agreed to sell off parts of the business and issue some more ordinary shares. However, it has just lost a key customer to a competitor. This hasn't had much of an effect on its equity value as TRB is generally well regarded in its industry and has high quality staff and clients. However, its key lenders have taken fright and have sold their TRB debentures via an intermediary to Mayo Allen plc (Mayo) a multinational agency, dominant in TRB's market. Mayo is now in a position to take control of TRB, even though it owns no ordinary shares in the company. How can this be? I've always thought that the ordinary shareholders were the key players.

Secondly, there has been a lot of coverage in the financial press recently about shareholders' concerns over the levels of dividends being paid by their companies. I thought I'd read somewhere (or perhaps you told me a while back) that the dividend payments are irrelevant. What's the situation here?

Requirement

With reference to relevant theories, prepare answers to your relative's questions.

Total: 10 marks

6 Biojack plc

Biojack plc is an all-equity financed listed company that has experienced no profit or dividend growth over recent years. The market expects that the 13p per share dividend, which the company has paid for many years, will continue into the future.

The company manufactures casual outdoor clothing made from natural fibres. The directors have identified an opportunity to make an investment in plant to manufacture warm clothing for outdoor workers. The directors are unwilling to issue additional shares or to borrow, so the only way that the new investment could be undertaken would be by failing to pay the 13p per share dividend expected shortly and that of the following year. Dividends are expected to be resumed in two years' time and then to remain at a constant, higher figure.

The company's current cost of equity is 11% pa but the increased risk associated with the new venture means that this will increase to 14% should the new investment be made. The market does not know of the possible investment and so the current share price does not reflect it.

Requirements

1.1 Calculate the amount of the dividend to be paid in two years' time that should, in theory, maintain the share price at its present level, were the company to announce its intention to go ahead with the new investment.

(5 marks)

1.2 With reference to relevant theories, identify and discuss any factors that could mean that an announcement of forecast resumed dividends, of the amount calculated in 6.1, may not be sufficient to maintain the current share price.

(9 marks)

Total: 14 marks

7 Castle's Cash and Carry plc

You should assume that the current date is 31 August 20X2.

Castle's Cash and Carry plc (CCC) is a food wholesaler operating in a very competitive market. It has a financial year end of 31 August. Extracts from its financial statements for the year to 31 August 20X2 are shown below:

CCC Income statement for the year to 31 August 20X2

	£
Sales	137,500,000
Variable costs	(89,375,000)
Fixed costs	(25,725,000)
Profit before interest and tax	22,400,000
Interest	(1,500,000)
Profit before tax	20,900,000
Tax at 17%	(3,553,000)

Profit after tax	£ 17,347,000
Dividends	(5,400,000)
Retained profit	11,947,000
CCC Balance sheet at 31 August 20X2	
	£
Non-current assets	41,500,000
Working capital	10,100,000
	51,600,000
7.5% debentures (redeemable 20X5)	(20,000,000)
	31,600,000
Ordinary share capital (50p par)	18,000,000
Profit and loss account	13,600,000
	31,600,000

The current market price of one ordinary CCC share is £3.34.

(1) An increasing proportion of CCC's sales are via the internet. As a result, CCC plans to raise and spend £15 million on new technology to support this development. Its board is considering two alternative ways of raising the £15 million:

(2) A rights issue at £2.50 per share; or the issue of new 8% debentures at par (redeemable 20Y0).

The CCC board estimates that this investment will lead to an 8% increase in annual sales in the year ended 31 August 20X3, but that it will cause annual fixed costs to rise by £2 million. However, the board plans that the ordinary dividend per share will remain unchanged.

The directors estimate that the company's current P/E ratio will be maintained if the rights issue is made, but will fall by 15% if an issue of debentures is made.

Some members of the board are concerned that CCC's shareholders will react negatively to the scheme because of the dividend policy planned for next year and the impact on gearing levels that an issue of new debentures will have.

The directors wish to assume that the corporation tax rate will be 17% pa for the foreseeable future.

Requirements

7.1 For each of the two alternative financing schemes under consideration by CCC, prepare a projected Income Statement for the year ending 31 August 20X3.

(7 marks)

7.2 For each of the two alternative financing schemes under consideration by CCC, estimate the following:

(a) Earnings per share for the year ending 31 August 20X3

(b) Dividend payout ratio for the year ending 31 August 20X3

(c) Gearing ratio at 31 August 20X3 (based on book values)

(5 marks)

7.3 Taking into account your calculations in parts 7.1 and 7.2 above, assess each of the financing schemes under consideration from the viewpoint of CCC's shareholders. You should, where relevant, make reference to relevant theories regarding the impact on share price of capital structure and dividend policy.

(13 marks)
Total: 25 marks

8 Styx plc

Styx plc is an all equity financed company. It has in issue 7,500,000 shares. These are currently quoted at £4.40 each cum-div. The dividend proposed for the current year is 40p per share. No increase in this dividend is anticipated unless new projects are accepted.

One such project is currently under consideration. This project would involve investing £750,000 immediately. It would generate a cash surplus of £125,000 in one year's time and annually thereafter in perpetuity. The project cash flows are known to the market, and do not alter the company's risk. All of the project cash flows would be paid as dividends.

The company's cost of equity (ke) is 10%.

(3) The NPV of the project is (£750,000) + £125,000/0.1 = £500,000 Three alternative sources of finance are being considered:

(4) a reduction in the current year's dividend to 30p per share, so as to release £750,000 of internally-generated funds.

(5) a rights issue on a 1-for-10 basis at £1 per share.

a new issue of shares. These would be identical to existing ordinary shares and would first rank for dividend in one year's time.

Requirement

Demonstrate that the increase in the existing shareholders' wealth under the first two financing alternatives is the same and discuss the impact on shareholder wealth of the third financing alternative (with calculations to support your discussion as appropriate).

Note: Ignore taxation and issue costs.

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

Answers to Interactive questions

Answer to Interactive question 1

1.1 Number of new shares issued = £500,000/£4 = 125,000

Once trading begins the total value of all shares ex div will be as follows:

= Total dividends/k_e = £(2.5m + 100,000)/0.1 = £26m

Ex div price per share = £26m/5.125m = £5.0732

	£'000
Gain made by existing shareholders	
5m × £0.0732 (£5.0732 less current £5 ex div)	366
Gain made by new shareholders	
125,000 × £1.0732 (£5.0732 less £4 cost)	134
Total gain	500

Thus, the total gain remains the same (ie, the NPV of the project) but the new shareholders receive, in effect, a windfall gain by investing in the new company.

1.2 For the **existing** shareholders to make no gain, the ex div price must remain at £5. Total shares in issue = £26m/£5 = 5.2m

Number of new shares issued = (5.2 – 5)m = 0.2m Issue price = £500,000/200,000 = £2.50

Gain to new shareholders = 200,000 × £(5 – 2.5)

= £500,000

Answer to Interactive question 2

The original ex-div value is:

$$\frac{10p}{1.1} + \frac{10p}{1.1^2} + \frac{10p}{1.1^3} +$$

… etc

or more simply (as it is a perpetuity):

10p/0.1 = £1

Paying an extra 11p of dividend one year later (nothing else changed), the present value would be:

$$\frac{0p}{1.1} + \frac{10p}{1.1^2} + \frac{11p}{1.1^3} +$$

… etc

As the 10p dividend in one year has been reinvested at the shareholders' required rate of return(10%) to earn 10p × 1.1 = 11p one year later, there is no increase in wealth ie, zero NPV and the present value of this new stream must still be £1.

Answers to Self-test questions

1 Jethro plc

INITIAL WORKINGS

WORKINGS

(1) Market price ex-dividend

	£
Present market value per share cum-dividend	5.80
Less current dividend	(0.80)
Market price ex-dividend	5.00

(2) Shareholders' required rate of return

£0.80/£5.00 = 0.16 or 16%

(3) Revised annual dividend estimate from t1 onwards

	£
Existing annual dividends (80p × 5,000,000)	4,000,000
Add: net cash receipts from project	140,000
Revised annual dividend estimate from t_1 onwards	4,140,000

(4) Revised market capitalisation of company, ex-dividend, after accepting project

£4,140,000/0.16 = £25,875,000

This figure is the same regardless of the method of equity finance used.

Note: The shareholders' required rate of return has remained at 16% because the risk of the firmis perceived to be unaltered.

1.1 Rights issue and shareholder gains

Number of shares issued = (1/25) × 5,000,000 = 200,000

New market price ex-dividend = £25,875,000/5,200,000 = £4.976

	£'000
New ex-div market capitalisation 5,200,000 × £4.976 (subject to rounding)	25,875
Original ex-dividend market capitalisation 5,000,000 × £5.00	(25,000)
Increase	875
Less: cash subscribed on issue 200,000 × £3.50	(700)
Net gain made	175
The gain made equals the NPV of the project at 16% ie,	175,000

1.2 Public issue at £4.00

Number of shares issued = £700,000 ÷ £4 = 175,000

Total shares after issue = 5,175,000

Ex-dividend market value of company = £25,875,000

Market value per share after issue ex-dividend = £25,875,000/5,175,000 = £5

The present shareholders make no gain or loss. Their shares were originally quoted at £5 ex-dividend and remain at that figure after the issue.

The new shareholders make a gain of £1 per share, a total gain of:175,000 × £1 = £175,000

1.3 New issue price

There are various ways of solving this part of the question.

If the new shareholders are to make no gain, their share value will settle at the price of

£700,000.

	£
Value of whole company ex-dividend	25,875,000
Less value of new shares	(700,000)
New value of original shares	25,175,000

There are 5,000,000 original shares. Therefore, new value per share is:

£25,175,000/5,000,000 = £5.035

New shares should be issued at £5.035.They will then show no gain.

Gain made by existing shareholders = £0.035 × 5,000,000

= £175,000 = NPV of project

1.4 Practical differences between the three sources of finance

Various transactions costs are involved with the options. The retention of earnings is costless, because it takes up no management time or effort, whereas the issue of shares can cost a significant amount, particularly when issued to the general public. This would make retentions preferable.

A further transaction cost is that of the shareholder selling shares. If he requires cash now, he may prefer a dividend to a capital gain, since to realise the latter he will have to sell shares which will involve brokerage fees.

Taxation is different depending on whether the company finances itself by retained earnings, or pays full dividends and raises money by a share issue.

From the individual's point of view, dividends are subject to income tax which may be at a higher rate than the basic rate.

Capital gains are likely to be taxed at a flat rate subject to the annual exemption, but payment can be deferred until the sale of the equity.

Imperfect information available to investors will have an important effect. With an issue of shares to the public, it would not usually be possible to sell shares at their theoretical maximum price, since investors may not feel confident that the firm will earn the predicted returns. This could work in the opposite way, if investors overestimate the value of the company.

Imperfect information also has an impact on retentions. In theory this should not affect a firm's value, but the dividend is frequently taken as a signal of how the firm is expected to perform. Thus, a drop in dividend could well depress share prices below their 'true value'.

In general, these 'imperfections' stack up in favour of financing by retained earnings. This is borne out by the real world in which over 95% of investment using equity shareholders' funds is financed by retained earnings.

2 Strontium plc

2.1 Market capitalisation

Cost of equity shares = ((0.60 × 1.05)/6.30) + 0.05

= 0.15 or 15%

	£'000
PV of future dividends without the project (ie, MV)	6,300
Add: PV of extra cash receipts used to increase dividends	
Year 1 £300,000 × 0.870	261
Year 2 £500,000 × 0.756	378
Year 3 £300,000 × 0.658	197
PV of dividends with project accepted	7,136

Thus the market capitalisation of the company rises to £7,136,000.

2.2 Shareholders' gain

	£'000
Market capitalisation with project	7,136
Market capitalisation without project	(6,300)
	836
Less cash subscribed for rights issue	(620)
Gains made by shareholders	216

2.3 Net present value of project

=NPV(0.15,B3:B5)+B2

	A	B	C
1	Time	Cashflow	
2	0	(620)	
3	1	300	
4	2	500	
5	3	300	216

(Gains made by shareholders = NPV of project)

2.4 Shareholder's gain, taking up rights

(1) Value of company after project accepted = £7,136,000 Number of shares in issue = 1.1 million

Price per share after rights issue = £7,136,000/1.1m

= £6.4873

Effect on holder of 100 shares

	£
Value of shareholding after issue 110 × £6.4873	713.60
Value of shareholding before issue 100 × £6.30	(630.00)
	£
Increase in shareholding value 83.60	
Cash subscribed for issue 10 × £6.20	(62.00)
Gain made	21.60

(2) Value of company after project accepted = £7,136,000Number of shares in issue = 1.2 million

Price per share after rights issue= £5.9467

Effect on holder of 100 shares

	£
Value of shareholding after issue 120 × £5.9467	713.60
Value of shareholding before issue 100 × £6.30	(630.00)83.60
Cash subscribed 20 × £3.10	(62.00)
Gain made	21.60

2.5

(a) The shareholder should hope to sell his rights for the difference between the rights price and the share's final value ie,

£(5.9467 – 3.10) = £2.8467

(b) Effect on holder of 100 shares

	£
Value of shareholding after issue 100 × £5.9467	594.67
Value of shareholding before issue 100 × £6.30	(630.00)
Decrease in value of shareholding	(35.33)
Cash from sale of rights 20 × £2.8467	56.93
Net gain	21.60

2.6 Minimum price of rights

If the shareholder is not to make a loss, he must recover £35.33 from the sale of the rights.The rights should therefore be sold for £35.33/20 each ie, £1.7665 each.

3 Southern Industrial Services plc

3.1 Net present value of projects

A = – 2m + (0.75m × 2.283) = –£0.288mB = – 2m + (0.65m × 3.352) = £0.179mC = – 3m + (0.8m × 3.352) = –£0.318m D = – 1m + (0.5m × 2.283) = £0.142m

As there is sufficient capital to undertake all positive NPV projects, the company should investin B and D and use £3 million.

The dividend under the Modigliani and Miller policy is the residue ie, £5m – £3m = £2m. It could also be argued that under M&M's assumptions any dividend would do, as shortfalls of cash could be replaced by new equity issues.

3.2 Notes for board meeting

- **Modigliani and Miller proposition**

M&M suggested that, in a perfect capital market, the dividend valuation model would give the **share** price exactly. If the share price was the present value of future dividends, the actual pattern of those dividends did not matter as long as the present value of these remained unchanged. For example, shareholders would be indifferent in valuing a share between a constant stream of dividends and a large lump sum dividend paid at some point in the future.

M&M concluded that the only way to enhance the share price was to invest in positive NPV projects, as these would result in a higher present value of dividends, reflecting the beneficial project cash flows.

The current dividend should be whatever was not needed for investing in positive NPV projects (residual dividend policy).

M&M suggested that any shareholders who require income, and who are unhappy with the level of dividend paid, can sell some of their shares. These shares will have increased in value as a result of the company accepting positive NPV projects.

This is in effect the manufacture of 'home-made' dividends.

No loss of wealth would result as in a perfect market there are no transactions costs.

- **Reasons the company may not pay a £2 million dividend**
  - Imperfections in the capital market

    The above analysis assumes a perfect capital market. The major imperfections that may cause Southern Industrial Services plc to reconsider its dividend are discussed below.

  - Information content of dividends

    In a perfect market, investors know everything about a company and its intentions, including that a dividend is reduced in order to fund attractive projects.

    In reality, information is restricted and investors may not be aware of the reasons.

    The dividend itself is taken as an important indicator of company health, and cutting the dividend may convince investors of problems in the company.

    If enough shareholders decide to sell their holding, the share price will drop.

  - Tax preferences of shareholders

    A perfect capital market assumes indifference between income in the form of dividends, and capital gains made as the share price rises.

    In reality, however, the different tax positions of investors will mean that some prefer dividend income, while some prefer an increase in share prices.

  - Transaction costs

    The buying and selling of shares is not costless in the real world.

    Therefore, the 'manufacture' of home-made dividends would cause a loss in the wealth of shareholders, leading to a preference for payouts (dividends) rather than retentions.

  - Clientele theory

    It follows that Southern Industrial Services plc should discover whether its shareholders prefer dividends or capital gains.

    However, as the company has been following a policy of paying out most of its profits as dividends, it is likely to have attracted those investors (or the clientele) who prefer this policy.

    A change to one of retaining profits in order to give a capital gain may be unpopular with these current investors, prompting a wide trading of the shares as they are replaced by investors who prefer a policy of retention.

  - Preference for cash now

    Some investors will prefer to take the dividend now, rather than rely on an increase in future years.

    In a perfect market this will be fully reflected in the discount rate (cost of equity) used and so be compensated in the share price; in real life this may not be so.

  - Other sources of finance

    While there are arguments for continuing to pay out nearly all the profits as dividend, viable projects need funding, and using retained earnings is far cheaper than any other source of equity finance. It is likely that the company will want to

retain some of the £5 million profit for projects and for unexpected needs.

However, the company currently has no debt, and finance could be raised with a reasonably cheap redeemable or irredeemable debenture.

- Project estimates

  The calculation of the dividend depended upon the net present value of the projects, which in turn depended upon estimates of the cash flows and the company's cost of capital.

  Reassessment of any of these estimates may lead to a different dividend, and the company may want to undertake some sensitivity analysis on these net present values.

- Future fund raising

  If the firm is about to embark upon a major expansion programme, it is likely to need external equity in the near future.

  It could therefore be unwise to cut dividends too sharply, as this could undermine shareholder confidence and make later issues of new equity difficult.

4 Miller Sharp plc

Notes for chief executive on proposed uses of funds received

In advance of next week's meeting I have set out the arguments for and against the three proposed uses of the funds received from the sale of our furniture production division. I have also set out the arguments for and against the specific suggestions of the board of directors.

Preliminary observations

The sale of our furniture production division has narrowed our area of operations, and we have lost the benefits of diversification. Miller Sharp's earnings are subject to greater specific risk than was previously the case, and its earnings are likely to be more volatile.

As a manufacturing concern Miller Sharp has significant tangible assets and fixed costs. This indicates high operating gearing and relatively volatile returns.

WACC and shareholder wealth

If the cost of capital behaves as traditional theory proposes, and Miller Sharp has moved beyond its optimal capital structure, redemption of debt finance may lead to a reduction in the cost of capital.

This, in turn, could lead to an increase in shareholder wealth.

If Miller Sharp is currently at or below its optimal capital structure, then redemption of debt finance may lead to an increase in the cost of capital, leading to a fall in shareholder wealth.

Modigliani and Miller have shown that (assuming perfect capital markets) the cost of capital will rise if the gearing ratio is reduced.

In addition, shareholder wealth will fall by the present value of the tax savings lost.

Repurchase of shares and payment of a special dividend, leading to increased gearing, will have the opposite effects to those described above for redeeming debt.

Finance risk and bankruptcy

The repurchase of loan stock will lead to a reduction in financial gearing. This will reduce the financial risk experienced by Miller Sharp, making bankruptcy and its associated costs less likely.

Repurchase of shares and payment of a special dividend will reduce the relative value of equity from its current level and hence increase relative financial gearing. This will increase the finance risk experienced by Miller Sharp and hence the risk of bankruptcy (and associated costs).

Cost of equity

With a reduction in financial gearing through repurchase of loan stock, the volatility and the risk of dividends has reduced, because the company will not be committed to fixed interest payments. This should lead to a reduction in the required return, and the cost of equity capital.

The reverse is true with repurchase of shares or payment of a special dividend.

Tax

Whilst interest on debt is tax deductible, this benefit is only experienced if Miller Sharp is in a tax- paying position. The reduction in debt finance makes tax exhaustion less likely.

The redemption of debt is unlikely to lead to significant tax payments for the debt holders, and so is relatively efficient from the personal tax perspective.

By increasing relative gearing through repurchase of shares or paying a special dividend, rather than using cash to generate earnings, the company has increased the risk of tax exhaustion.

The repurchase of shares is treated as a distribution for tax purposes (to the extent that the sum paid for the shares exceeds the nominal value). An element of the proceeds is hence subject to income tax.

Since dividends are assumed to be received net of lower rate tax, many shareholders will prefer to realise what is currently share value as a dividend. This is because a capital gain will be received without any associated tax credit.

Market perceptions

The production director has suggested that Miller Sharp's share price would rise in response to a reduction in debt finance. This may be true if the markets perceive Miller Sharp to be excessively geared, and share prices reflect the cost of financial distress.

It is probable that the markets would receive the news unfavourably. Issuing debt is seen as a sign of confidence regarding future earnings capacity and favourable investment opportunities. An early redemption of debt could be seen as an indication of reducing future earnings or a lack of feasible investment opportunities.

The sum employed to repurchase shares would be significant. Demand for shares would be likely to increase the share price and hence shareholder wealth. This may, however, be temporary.

The marketing director has suggested that the repurchase of shares would be taken as a sign of weakness by the markets. This may well be the case if investors perceive the company to lack viable investment opportunities. A downward pressure on the share price is likely to result.

Assets

The company has significant tangible assets which can be used as security for cheap debt finance. To redeem debt would fail to utilise the assets fully.

The repurchase of shares and payment of dividend would not affect the level of debt finance and the company would continue to employ its assets efficiently as security for cheap debt.

Control

The repurchase of shares can be used to buy out dissenting minorities or manipulate control of the company.

The proportion of shares to be repurchased is significant, and Miller Sharp could come under the control of a small group of shareholders. This may significantly limit the board's freedom.

The payment of the dividend would not disturb the effective control of shareholders. This may be favourably received by some investors.

Repurchase of debt – other

Since future interest commitments are lower, dividends and earnings per share would be expected to increase above previous levels. This should exercise a positive influence upon the share price.

The loan stock contracts would need to be examined to ensure penalties for redemption are not too severe. Should the proposed mechanism be repurchase from the market, brokers' fees would need to be accounted for.

Payment of dividend – other

Dividends often give signals to the market. Such a dividend may be perceived as a signal of extreme confidence in future earnings and dividends, and hence exert a positive influence on the market share price.

Shareholders may prefer to get a return on their shares now (in the form of a special dividend) than have an uncertain capital gain in the future. It should be noted that the gain can, however, be made certain by shareholders selling shares at the current market value.

Assuming perfect capital markets, Modigliani and Miller have shown that in order to maintain shareholder wealth a company should immediately distribute any surplus funds it cannot usefully invest.

Since no favourable investment opportunities exist for Miller Sharp, shareholder wealth is best maintained by an immediate distribution. (It should be noted that in theory shareholder wealth is also maintained by repurchasing shares.)

As compared with other alternatives, the payment of a dividend would not involve transaction costs (brokers' fees, etc). Shareholder wealth is therefore not depleted.

Miller Sharp has always paid a modest dividend according to the finance director. Investors may well have been attracted to Miller Sharp precisely because of this policy.

Should Miller Sharp suddenly pay an enormous dividend, shareholders will become concerned that its dividend policy does not suit their needs. The consequent sale of shares would lead to a depression in the share price.

The payment of such a large dividend would almost certainly indicate to the market that

Miller Sharplacks favourable investment opportunities. The market may then revise its expectation of future returns and the share price may fall.

Bonus issue

(1) **Arguments in support of proposal**

By retaining the cash, the company will ensure it preserves liquidity.

A bonus issue will increase the number of shares in issue without in any way altering shareholder wealth or the market value of the company.

The drop in share value renders the shares more marketable as the unit cost per share becomes smaller.

(2) Arguments against proposal

Earnings per share and net assets per share would fall. A drop in these indicators may be interpreted as unfavourable.

Unless Miller Sharp can reinvest the cash proceeds profitably, simply holding on to the cash will result in a reduction of shareholder wealth. The more Miller Sharp delays in distributing the surplus cash, the less is its effective value to the shareholders.

A bonus issue does not address the question of dealing with the cash.

Combinations

The arguments for and against using each option individually have already been discussed. There may, however, be particular benefits to combining some of the options available.

(1) Combining repurchase of shares and debt

If Miller Sharp has a known optimal gearing level, combinations of share and debt repurchase could be used to achieve this optimum.

This would lead to the lowest possible cost of capital for Miller Sharp and probably result in a gain in shareholder wealth.

By repurchasing smaller volumes of both debt and equity, Miller Sharp may not have to pay as large a premium over equilibrium value as if it attempts to repurchase a very high volume of either debt or equity (as effective demand is lower).

(2) Combination of share repurchase and other option

By exercising only a partial repurchase of shares, Miller Sharp would be better able to manipulate control of the company. Miller Sharp could simply buy out any dissenting minority willing to sell their shares on favourable terms.

5 TRB

(1) It is likely that TRB had problems in servicing its borrowings, and its long-term creditors would also have been concerned. Thus, they were keen to get as much of their money back as possible.The debentures were sold on and the long-term creditors were, presumably, satisfied with the negotiated price. However, the new debenture holder (Mayo) does have considerable power and if a company, such as TRB, is in 'financial distress' then Mayo can take control of its assets and TRB as a whole. As the debt market becomes more liquid and companies such as Mayo take advantage of such situations

(buying the debt of distressed companies) what happened to TRB will happen more frequently.

(2) Traditional school of thought Shareholders would prefer dividends today rather than dividends or capital gains in the future. Cash now is more certain than in future.

Future payments would be discounted at a higher rate to take account of uncertainty.

If current dividends are reduced so that investment can occur, then the market value will fall as the discount rate increases. However, does risk increase over time?

Residual theory of dividends

Company should reinvest earnings rather than pay a dividend, as long as the rate of return achieved is higher than that of other investment opportunities which have similar levels of risk. Otherwise, pay a dividend.

This can cause erratic dividend payments which may not meet the cash demands of shareholders. Erratic dividends may give a bad market signal, with sharp fluctuations in dividends leading to sharp fluctuations in the share price.

Modigliani and Miller

MM contend that share value is not determined by dividend policy, but by future earnings and the level of risk. They argue that the amount of dividends paid will not affect shareholder wealth, providing the retained earnings are invested in profitable investment opportunities.

Any loss in dividend income will be offset by gains in the share price.

Shareholders can create home-made dividends and do not have to rely on the company's dividend policy. If cash is needed, they can sell some shares instead.

Other issues

Dividends **signal** that management is confident of the future. Note also the 'clientele effect' which suggests that investors have a **preferred habitat**, seeking a company with a particular dividend policy that suits them. If shares are unpopular because of an inconsistent policy, then the share price will suffer.

6 Biojack plc

6.1 Estimation of the new dividend

Current share price cum div = (0.13/0.11) + £0.13 = £1.31

If the share price is to remain at £1.31, the new dividend (d) from year 2 onwards in perpetuity is given by:

£1.31 = (d/0.14) × (1/1.14)

d = 1.31 × 1.14 × 0.14 = £0.2091, say 21 pence

6.2 Discussion of the practical effects on the share price

The analysis in 6.1 assumes that the assertions of Modigliani and Miller (M&M) hold true. M&M argued that share valuation is entirely dependent on the amount, timing and perceived riskiness of future dividends. Changing the pattern of dividends, as in the Biojack plc case, will not affect shareholders' wealth. M&M made the following assumptions in reaching this conclusion:

- Frictionless capital markets
- Efficient capital markets
- Companies can issue shares without cost or restriction

- No taxes on income or capital gains for companies or individuals

  This could be a situation where shareholders might choose to create 'home-made' dividends to ease possible cash flow problems.

  The issues likely to cause the new share price not to equal £1.31 include the following:

- Informational content of dividends. It is believed that the failure to pay a dividend could cause shareholders' perceptions of the future to alter.
- Clientele effect. This company is planning to change its pattern of dividends. This may not appeal to existing investors, who may react by selling their shares. The lack of appeal may stem from the shareholders' tax position or from their need for cash. Efficient market evidence suggests that the market will correctly value the new situation, but there will be losses of value as a result of the change in ownership of some of the shares.

  The change in the risk profile of the company's returns could also cause a clientele effect.
- Lack of belief that there will be a constant level of dividend in the future (in real life, such constancy would be unusual).

7 Castle's Cash and Carry plc

7.1

Projected Income Statements for the year to 31 August 20X3	**Rights issue**	**Debenture issue**
	£m	£m
Sales (137.5 × 1.08)	148.500	148.500
Variable costs (89.375 × 1.08)	(96.525)	(96.525)
Fixed costs (25.725 + 2)	(27.725)	(27.725)
Profit before interest	24.250	24.250
Interest	(1.500)	(2.700)
Profit before tax	22.750	21.550
Tax at 17%	(3.868)	(3.664)
Profit after tax	18.882	17.886
Dividends	(6.300)	(5.400)
Retained profit	12.582	12.486

7.2 (a)

		Rights	Debenture
Earnings/share	Current EPS = £17.347m/36m = £0.482		
	£18.882m/42m	£0.45	
	£17.886m/36m		£0.497

(b)

		Rights	Debenture
Dividend payout ratio	Current (£5.400/£17.347) = 31.1%		
	£6.300/£18.882	33.4%	
	£5.400/£17.886		30.2%

(c)

		Rights	Debenture
Gearing ratio	Current gearing = £20.0/(£31.6 + £20.0) = 38.8%		
	New gearing = £20.0/(£51.6 + £12.582 + 15.0)	25.3%	
	New gearing = (£20.0 + £15.0)/(£51.6 + £12.486 + £15.0)		44.3%

7.3

	Rights issue	Debenture issue
EPS (20X2 = 48.2)	Decrease	Increase
Dividend payout ratio	Increase	Decrease
Gearing	Decrease	Increase

CCC's gearing with the rights issue seems reasonable at 25.3%, but with the issue of extra debt it is close to 50% (ie, 44.3%), which may be considered high.

CCC's shareholders will see that, despite the extra income generated from the new technology, with the rights issue the extra shares have diluted the EPS figure and they may react negatively. However, there is an increase in EPS with the issue of debt.

The changes to the dividend payout ratio are not significant, however, and may not have much of an impact.

		Rights	Debenture
Market price per share	Current EPS £0.482		
	Current MV/share = £3.34		
	Current P/E = 334/48.2 = 6.9		
	MV = 6.9 × £0.45 =	£3.11	
	MV = (6.9 × 85%) × £0.497 =		£2.91

Thus, CCC's share price would fall in both cases, but this is based only on the directors' P/E estimates.

Capital structure

Traditional theory – As gearing climbs, because of the introduction of comparatively cheap debt, CCC's WACC figure will fall and its market value will rise. This will continue until the optimal level of gearing is achieved, but beyond that as gearing increases equity holders will demand a higher yield and the WACC will increase.

M&M theory – The level of gearing is irrelevant, other than for the impact of the tax shield. So geared companies will have a higher value than ungeared companies, but at higher levels of gearing the market value of the company will fall as the benefits of tax relief are balanced by costs of bankruptcy and interest rate increases – here WACC will be at a minimum, and value of the business at a maximum.

Dividend policy

Traditional theory – Shareholders would prefer dividends today rather than dividends or capital gains in future. Cash now is more certain than in future.

M&M theory – Share value is determined by future earnings and the level of risk. The amount of dividends paid will not affect shareholder wealth, providing the retained earnings are invested in profitable investment opportunities. Any loss in dividend income will be offset by gains in share price.

Clientele effect seems to operate – whereby dividends do not affect the value of shares, provided that shareholders know the dividend policy. CCC should establish a consistent policy, because a lack of consistency could mean that CCC shareholders sell their shares and the share price would fall.

8 Styx plc

Impact of the new project and related finance on the value of the business

Impact of the new project and related finance **on the value of the business.**	£m
Current ex-div value of shares = 7.5m × £4.00	30.0
NPV of the project	0.50
Increase in equity capital	0.75
Ex-div value of shares afterwards	31.25

Alternative working

Existing dividend = £0.4 × 7.5m = £3.0m Increase in dividend = £0.125m (annual income)
(£3.0m + £0.125m)/0.1 = £31.25m

This will be the ex-div value of the equity, irrespective of how the money is raised. The cum-div value will be affected if some of the dividend is retained, but the wealth of the shareholders will not be.

Financed by retained earnings (ie, by reducing the dividend about to be paid)

		Ex div value + Dividend		= Cum-div value
Before:		30.0	3.00	33.0
Capital: using dividend NPV of project	0.75 0.50*		(0.75)	
		31.25	2.25	33.5

*This is the project outlay of 0.75 plus the PV of the inflow 1.25. Increase in shareholder wealth is £0.5m, being NPV of project. **Financed by rights issue**

		Ex div value	+ Dividend	= Cum-div value
Before:		30.0	3.00	33.0
Capital: using dividend NPV of project	0.75 0.50*			
		31.25	3.0	34.25

*This is the project outlay of 0.75 plus the PV of the inflow 1.25.

Increase in shareholder wealth is £0.5m: increase in value of equity of £1.25m (34.24 – 33) less new funds injected of £0.75m.

In conclusion, the change in shareholders' wealth is the same, irrespective of how the new capital is injected.

New share issue

While the wealth of the shareholders in total is unaffected by the source of the new equity, the way that wealth is divided between the shareholders is influenced by the price chosen. The company therefore needs to consider carefully the asking price per share.

If these new shareholders are allowed to enter the company too cheaply, the increased number of shares will detract from the wealth of existing shareholders; if priced too highly they will refuse to subscribe.

If all of the gain is to go to the existing shareholders, the ex-div value of their 7.5 million shares must be £30.5 million after accepting the project ie, (£30.5m/7.5m) = £4.07 each. If the company wants to set a price of £4.07, they will need to issue £750,000 ÷ £4.07 = 184,275 new shares, but the issue is unlikely to be successful as the price is above the current ex-div value of the shares.

Chapter 8

Business valuation

Introduction

Learning outcomes

Students will be able to apply investment appraisal techniques and calculate the value of shares and businesses.

This will involve being able to:

- outline the investment decision making process and explain how investment decisions are linked to shareholder value; and
- describe options for reconstruction eg, merger, takeover, spin-off, purchase of own shares and calculate the value of minority interest shareholdings in traditional and new technology businesses using income- and asset-based approaches.
- organise, structure and assimilate data in appropriate ways, using available statistical tools, data analysis and spreadsheets, to support business decisions.

Syllabus links

The focus on high level decision-making such as corporate restructuring, business valuation and the analysis needed to support both will be taken further in the Case Study.

Examination context

Business valuation is an important part of the **Financial Management** syllabus and a popular theme in examination questions. You can expect to be asked to carry out a valuation of a business using different methods, perhaps for the purpose of a stock exchange listing. Shareholder value analysis (SVA) is also a fruitful source of questions. As a typical example, candidates may be asked to prepare a report for the board, advising it of a range of suitable prices for acquisition targets using asset, dividend and earnings-based valuations. The report needs to include workings, supported by a clear commentary as to the strengths and weaknesses of each of the valuation methods used.

A question on valuations might be combined with related topics, including methods of payment and issues around divestment decisions. Candidates may also be asked to summarise the advantages and disadvantages of valuation methods used, explain the difference between an offer for sale and an offer for subscription, outline the advantages and disadvantages of underwriting a share issue and explain two methods by which a company could divest itself of one of its divisions.

Management buy-outs (MBOs) may be examined too. Topics covered included an outline of the sources and forms of finance that an MBO team is likely to need, possible exit routes for financiers that contribute to the funding of the MBO and likely contents of an MBO team's business plan.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**Organic growth versus acquisition** As companies pursue their objective of	**Approach** Business valuation is an important part of the syllabus and	In the exam, you may be required to carry out a valuation of a business using	
	maximising shareholders' wealth they must take decisions that allow expansion, either organically or by acquisition. There are a variety of mechanisms that deliver this expansion and businesses at key points in their lifecycle will need to determine which mechanisms to use.	a popular theme in examination questions, so make sure you are aware of, and can apply, the different methods of business valuation. **Stop and think** What valuation techniques do businesses employ to assess their choices for growth and expansion?	different methods, perhaps for the purpose of stock exchange listing. This will involve being able to outline the investment decision making process and explain how investment decisions are linked to shareholder value.	
2	**Asset-based valuations** An asset-based valuation is most useful when a company is being broken up, rather than purchased as a going concern. Since the method does not incorporate the valuation of intangible assets, it usually gives a low valuation figure, which helps the parties to set a minimum price in a takeover situation. Digital assets are now extremely valuable to a business and are not taken into account in traditional asset valuation methods.	**Approach** There is a choice of asset valuation bases, make sure you work through each of them in this section of the chapter. **Stop and think** What are the three different asset-based valuations that can be used?	You may be asked to value a business using the asset-based valuation method.	

Topic	Practical significance	Study approach	Exam approach	Interactive questions
3	**Income-based valuations** Income-based approaches can provide more meaningful business valuations than asset- based valuations, especially for companies such as service businesses that have few tangible assets.	**Approach** This is a very detailed section of the chapter so make sure you work through each of the income-based valuation methods carefully and attempt all the interactive questions. The worked example on SVA is important. **Stop and think** Do you know how to calculate the value of equity using the SVA method?	Income-based valuation methods are popular in the exam, you could be asked to apply any of the income-based valuation methods covered in this section.	**IQ4: Maximum price** This is a good question to practice as it uses the P/E method of valuation to recommend a maximum price for acquisition. **IQ5: EV/EBITDA valuation** This is a good question to attempt as it allows you to practice calculating the enterprise value of an entity.
4	**Valuation of technology companies** The valuation of start- ups and technology companies presents a number of challenges for the traditional methods of valuation.	**Approach** The specific valuation of digital assets is outside the scope of the Financial Management syllabus, but you should be aware that digital assets can be extremely valuable to a business.	In the exam you could be asked to discuss some of the difficulties associated with valuing digital assets and technology companies.	
5	**Methods of payment** The method of payment will have an impact on how attractive the bid is.	**Approach** Work through the table comparing the different forms of offer that can be made. It is important to consider each method of payment from both the buyer and seller's perspective. **Stop and think** What are the advantages of a cash bid to both the seller and the purchaser?	A question on valuations might be combined with related topics, including methods of payment and issues around divestment decisions.	

Topic	Practical significance	Study approach	Exam approach	Interactive questions
6	**Reasons for divestment** Divestment is the opposite of investment. It is the process of selling part of the business in order to maximise shareholder wealth.	**Approach** Work through this section carefully ensuring that you can clearly explain some of the main reasons why a business would choose to divest a subsidiary.	In the exam you may be asked to explain the benefits of divestment.	
7	**Management buy-outs (MBOs)** In an MBO, the purchaser of the business is not another company, but the existing management team. The management team provide some of the capital for the buyout, but the majority is provided by other financiers such as venture capitalists and financial institutions.	**Approach** There are some new terms introduced in this section. Work through the section carefully making sure you fully understand them. **Stop and think** What are the various ways a MBO can be financed?	Management buy-outs (MBOs) are often examined. Topics covered included an outline of the sources and forms of finance that an MBO team is likely to need, possible exit routes for financiers that contribute to the funding of the MBO and likely contents of an MBO team's business plan.	**IQ8: MBO** This is a good question to practice as it considers the objectives of different parties involved in an MBO.
8	**Other arrangements** This section covers some of the other restructuring arrangements available to companies such as a spin off, share repurchase, liquidation and outsourcing.	**Approach** Work through each section making sure that you understand the differences between each form of restructuring. **Stop and think** What are the advantages of outsourcing?	In the exam you may be asked to describe options for reconstruction, eg, merger, takeover, spin-off, purchase of own shares.	

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1 Organic growth versus acquisition

Section overview

- Organic growth achieves expansion of the business at a measured pace and cost.
- Acquisition increases the speed of business development but creates a number of issues.

1.1 Introduction

- Almost all firms seek to grow 'organically' at some stage, by starting up new businesses from a zero base and by developing existing businesses, possibly using retained earnings as the source of finance.
- Mergers and buying parts of other businesses can, however, be a faster approach to growth. These can also be useful approaches to diversifying as a means of avoiding business decline as products go past the maturity phase of their life cycle.
- Sell-offs, including management buy-outs and buy-ins, can be ways for a business to dispose of areas that it does not want to retain. It may not want to retain them because it sees them as going into decline, or because they are 'non-core' or a poor fit with the rest of the business, or as a means to raise cash to pursue other more profitable activities.
- A value may need to be put on a business for a variety of purposes, including:
  - establishing merger/takeover terms;
  - being able to make share purchase/sale decisions;
  - valuing companies listing on the stock exchange;
  - valuing shares sold in a private company;
  - satisfying tax requirements (for example, inheritance tax);
  - providing information for divorce settlements; and
  - valuing subsidiaries for disposals, MBOs, etc.

1.2 Organic growth

This involves the retention of profits and/or the raising of new finance (equity and/or debt) to fund internally-generated projects, such as new product and/or market development.

Advantages

The advantages of organic growth over growth by acquisition are that:

- the costs are spread over time (although organic growth **may** involve higher costs than acquiring other companies); and
- the rate of change within the firm is likely to be slower with organic growth, therefore avoiding the disruption and behavioural and cultural problems that can be associated with an acquisition.

Disadvantages

However, compared with acquisition the disadvantages of organic growth are that:

- it may be more risky than acquiring an established business, for example the risk of failure in an unknown market may be high;
- the process may be too slow, so that the firm fails to exploit the business opportunities available; and
- there may be barriers to entry into new markets.

1.3 Acquisition

1.3.1 Why businesses combine

With an acquisition the **bidder** company acquires the **target** company either in its entirety or by buying sufficient shares in the target to exercise control.

The acquisition may take the form of a takeover or merger. For legal and accounting purposes the difference can be important, but this is not part of the Financial Management syllabus. In the real world the terms are used interchangeably to cover anything which results in the combination of two (or more) businesses.

Some of the reasons why businesses combine are as follows:

• Synergy

Described as the 2 + 2 = 5 effect, this is where a firm looks for combined results that reflect a better rate of return than would be achieved by the same resources used independently as separate operations. The combined performance is greater than the sum of the parts.

Synergistic savings may arise in a number of different aspects of a company's value chain:

- Administration savings
- Economies of scale
- Use of common investment in marketing, new technologies, research and development
- Leaner management structures
- Access to under-utilised assets
    - Synergy is not automatic, and it must be pursued actively by management after the takeover has occurred. Management may consider:
    - sharing activities, for example two subsidiaries sharing the same distribution system;
    - transferring skills, for example a subsidiary good at marketing could transfer its skills to other subsidiaries; or
    - restructuring, for example nursing a 'sick' business back to health and then selling it off to make a short-term gain.
- Synergy can be particularly difficult to achieve if the two businesses are very different: exactly where could costs be saved or expertise transferred?

- **Risk reduction**

  For well-diversified shareholders already owning shares in both businesses, then putting them together does not reduce systematic risk: so for a shareholder in the two companies 2 + 2 = 4. However, cheaper borrowing may be possible because the combination of the firms may result in more stable cash flows, reducing the risk of bankruptcy and reducing the risk to lenders. WACC would also be reduced.

- **Reduced competition**

  Merging with or acquiring another firm reduces or eliminates competition in a market.

- **Vertical integration**

  Acquiring a key supplier of materials or a key customer may safeguard the position of a business. The key question is whether shareholder wealth increases.

Definition

Acquisition: A bidder company acquires a target company either in its entirety or by buying sufficient shares to exercise control.

1.3.2 Who wins and loses?

So who gains and who loses from a takeover?

- **Victim**

  Shareholders in the acquired company are often the only consistent winners, because they usually receive a high price for their shares

- **Bidding company shareholders often lose out, for example because:**
  - the price paid for the acquisition is too much (bid premiums);
  - the takeover costs too much (bid fees); or
  - synergy is insufficient to offset these costs.

- A takeover is often in the interests of the managers in the acquiring company, not their shareholders, and so there may be a conflict of interests (as we saw in Chapter 1 in the context of objectives).

2 Asset-based valuations

Section overview

The net assets valuation method can be used to determine a lower limit for the value of a company. By itself, it is unlikely to produce a realistic valuation

- The value of a share under this method = **net tangible assets**/the **number of shares**
- There is a choice of asset valuation bases

2.1 Net assets approach

Using this method of valuation, the value of a share in a particular class is equal to the **net tangible assets**, divided by the **number of shares**. **Intangible assets** (including goodwill) should be **excluded**,unless they have a market value (for example patents and copyrights, which could be sold).

Worked example: Net assets method of share valuation

The summary balance sheet of Cactus is as follows:

Non-current assets

	£	£	£
Non-current assets			
Land and buildings		160,000	
Plant and machinery		80,000	
Motor vehicles		20,000	
			260,000
Goodwill			20,000
Current assets			
Inventory		80,000	
Receivables		60,000	
Short-term investments		15,000	
Cash		5,000	
		160,000	
Current liabilities			
Payables	80,000		
Taxation	20,000		
		(100,000)	
			60,000
			340,000
12% bonds			(70,000)
Total net assets			270,000
Ordinary shares of £1		80,000	

	£	£	£
Reserves		140,000	
			220,000
4.9% preference shares of £1			50,000
Total equity and reserves			270,000

	£	£
Total value of assets less current liabilities	340,000	
Less intangible asset (goodwill)	(20,000)	
		320,000
Less preference shares	50,000	
bonds	70,000	
		120,000
Net asset value of equity		200,000
Number of ordinary shares		80,000
Value per share		£2.50

Requirement

What is the value of an ordinary share using the net assets basis of valuation?

Solution

If the figures given for asset values are not questioned, the valuation would be as follows:

	£	£
Total value of assets less current liabilities	340,000	
Less intangible asset (goodwill)	(20,000)	
		320,000
Less preference shares	50,000	
bonds	70,000	
		120,000
Net asset value of equity		200,000
Number of ordinary shares		80,000
Value per share		£2.50

2.2 Choice of asset valuation bases

(a) Historical cost (book value)

- Balance sheet value of equity
- Meaningless because historical cost ≠ market value

(b) Net realisable value

- NRV of assets less liabilities
- Minimum acceptable value to owners determined to sell
- Problems:

- Estimating NRV of assets (NRV of specialised assets may only be determinable by actual sale)
- Redundancy costs, liquidator's costs, tax
- Ignores goodwill
- Particularly useful for controlling interests

(c) Replacement cost

- Cost of setting up business from scratch
- Maximum price for buyer
- Problems:

- Estimating replacement costs
- Ignores goodwill, or if not, goodwill would be difficult to value
- Particularly useful for controlling interests

2.3 Factors to consider for asset valuation

- Assets are more certain than income. Income is generated only if its assets are well managed, which is by no means certain.
- Useful method of valuation for asset strippers (acquirers whose intention is to sell off the business assets after a successful takeover).
- Service businesses often have very few tangible assets, so asset valuation methods would place very little value on the business. Most value in a successful service industry often resides in its goodwill.

2.4 Digital assets

A digital asset is content that is stored electronically and provides value to the company. Types of digital assets include photos, audio-visual media, spreadsheets, word documents, websites, and Big Data, eg, information on customer behaviour. The latter is crucial since the ability to gauge customer needs and satisfaction through analytics results in the power to give customers what they want.

Some digital assets can directly create valuable income streams for a company, for example digital subscriptions to a newspaper's website content.

The valuation of digital assets becomes a particular issue when valuing technology companies but in any business model, data can be a valuable asset.

Valuing digital assets is difficult since value is only generated if the assets are well managed.

The specific valuation of digital assets is outside the scope of the Financial Management syllabus, but you should be aware that digital assets can be extremely valuable to a business and are not taken into account in the traditional asset valuation method.

3 Income-based valuations

Section overview

Income-based approaches can provide more meaningful business valuations than asset-based valuations, especially for companies such as service businesses that have few tangible assets.

- Income-based methods require forecasting of expected future income, which is subject to uncertainty
- Income-based valuation methods include:
  - PV of future cash flows
  - P/E valuation
  - EV/EBITDA
  - Dividend valuation
  - Shareholder value analysis (SVA)
- The maximum price to pay = market value (MV) of combined business – MV of bidder before bid is made.

3.1 Introduction

A number of income-based valuation approaches are discussed below.

3.2 Present value of future cash flows

3.2.1 Method

With this method of valuation, the value of a business is derived by calculating a present value of the future expected cash flows from the business.

This approach is theoretically sound, as the value of any asset (or business) is the present value of the cash flows that it generates.

An acquisition would satisfy the objective of maximising shareholder wealth if:

- the present value of the incremental cash flows discounted at a rate appropriate to their risk exceeds the acquisition cost; and/or
- the risk associated with the bidder's cash flows is reduced such that a lower discount rate is appropriate, increasing the present value of the bidder's cash flows.

The maximum price a bidder should pay for a target business is:

Market value of combined businesses less market value of bidder before bid is made.

Anything more than this decreases the wealth of the bidder's shareholders.

Interactive question 1: Acquisition

A plc generates constant annual cash flows of £15 million. The appropriate discount rate for these flows is 20% pa. It plans to make a bid for the entire share capital of B plc. If B plc were acquired the combined businesses would generate constant annual cash flows of £20 million and the appropriate discount rate would be 16% pa.

Requirement

What is the maximum price A plc should pay for all of B plc's shares?

See **Answer** at the end of this chapter.

Part of this maximum price arises because there is risk reduction ie, within the £20 million annual cash flows A plc's flows are now being discounted at 16% rather than 20%, so risk reduction has taken place.

It is not unusual for the maximum price to be higher than the current market value of the target. Reasons include the following:

- **Synergy**. In Interactive question 1 an extra £20m – £15m = £5m of flows is discounted. Some of this may result directly from B's activities and some may be as a result of synergy (see above).
- **Risk profile**. The overall risk of the combined businesses may be less than the risk of B alone.

Interactive question 2: Maximum price

Arrow plc is considering purchasing the entire share capital of Target plc.

Arrow operates on a five-year planning horizon and believes that Target will be able to generate operating cash flows (after deducting funds for necessary reinvestment) of £1 million per annum before interest payments.

The following information is also relevant but has not been included in the above estimates:

(1) Target's head office premises can be disposed of and its staff can be relocated in Arrow's head office. This will have no effect on the operating cash flows of either business but will generate an immediate net revenue of £2 million.

(2) Synergistic benefits of £200,000 per annum should be generated by the acquisition.

(3) Target has loan stock with a current market value of £1.5 million in issue. It has no other debt.

(4) Arrow estimates that in five years' time it could, if necessary, dispose of Target for an amount equal to five times its annual cash flow.

Arrow believes that a WACC of 20% per annum reflects the risk of the cash flows associated with the acquisition.

Requirement

Calculate the maximum price to be paid for Target plc. Ignore taxation.

See **Answer** at the end of this chapter.

3.2.2 Problems

There are several problems with this valuation method.

- Estimating future cash flows (particularly synergy) may be difficult.
- Estimating the discount rate (to allow for the risk).

Professional skills focus: Applying judgement

Time horizon of future cash flows – should estimates of cash flows in perpetuity be discounted, or should a time horizon be imposed for the purpose of the valuation?

Business valuations are not an exact science. You will therefore need to apply judgement when

concluding on an appropriate value to use when acquiring a company, and to be able to highlight any limitations with the techniques that you have used.

3.3 P/E ratio multiple

3.3.1 Method

Definition

Price-Earnings (P/E) ratio: The share price divided by the earnings per share for a company.

The P/E ratio multiple method of equity valuation is to multiply expected annual earnings by an appropriate P/E ratio multiple. The value of a company can be found as:

Value = P/E × Earnings

The value is based on the purchase of a number of years' earnings.

- The shares of quoted companies have a P/E ratio, which is the ratio of their current share price to the most recent annual earnings. For quoted companies, this method of valuation is appropriate only if there are reasons to alter the annual earnings (from historical to expected future annual earnings) or to adjust the P/E ratio.
- The value of the equity in a private company could be estimated by using the P/E ratio of a comparable quoted company as a benchmark. As a general rule, an unquoted company will be valued on a lower P/E multiple than a similar quoted company.

The P/E ratios of quoted companies can be difficult to interpret.

Broadly speaking, if a company has a great deal of potential to generate growth, its share price will reflect this and will be high: investors look to future returns and will value the share on the basis of expected future growth. If the high share price is then divided by the company's historical earnings, which will be low relative to expected future earnings, the P/E ratio will be high.

There can be other reasons for P/E ratios being high or low. For example, if a company is considered very high risk, this can be factored into the price giving a low P/E ratio.

A large, stable, mature business with excellent cash flow generation but very limited growth potential eg, a utility company, may also have a low P/E ratio.

Nevertheless, a generalisation is that a high P/E ratio indicates a high degree of investor confidence in the future prospects of the company.

Similarly, a low P/E ratio implies the opposite.

Interactive question 3: P/E valuation

You are given the following information regarding Accrington Ltd, an unquoted company.

(1) Issued ordinary share capital is 400,000 shares.

(2) The P/E ratio applicable to a similar type of business (suitable for an unquoted company) is 12.5.

(3) Extract from Income Statement for the year ended 31 July 20X4

	£	£
Profit before taxation		260,000
Less corporation Tax		72,800)

	£	£
Profit after taxation		187,200
Less preference dividend	20,000	
ordinary dividend	36,000	
		(56,000)
Retained profits for year		131,200

Requirement

Value 200,000 shares in Accrington Ltd on a P/E basis.

See **Answer** at the end of this chapter.

Interactive question 4: Maximum price

Price plc wishes to acquire the entire share capital of Maine plc. Details of current earnings and P/E ratios are as follows:

	Earnings	**P/E**
	£m	
Price plc	50	20
Maine plc	20	15

It is believed that as a result of synergies the combined earnings would be £75 million and the market would apply a P/E of 18 to the combination.

Requirements

1.1 What is the maximum amount Price plc should pay for Maine plc?

1.2 What price are Maine plc's shareholders likely to accept?

See **Answer** at the end of this chapter.

3.3.2 Problems

- Estimating maintainable future earnings (particularly when some synergy is expected and the circumstances of the company being valued are volatile). For example, if earnings have been erratic over the last few years, how can a reliable estimate be made for future annual earnings?
- Accounting policies can be used to manipulate earnings figures.
- Selecting a suitable P/E ratio to value unquoted companies is a matter of judgement. The approach is to:
  - find a similar quoted company (same industry, size, gearing, risk, etc); but
  - watch for distorted P/Es (as above).

  Adjustments for non-marketability of unquoted shares are often made (totally arbitrarily). In other words, the value is reduced to take into account how difficult it can be to sell unquoted shares.

  Typically, 1/3 to 1/2 is deducted from the initial P/E multiple to account for non-marketability. For example, if a similar quoted company is valued on a P/E multiple of 12, the equity of an unquoted company may be valued on a multiple of 6–8 times expected future annual earnings.

3.4 Enterprise value/EBITDA multiple method

3.4.1 Method

Definition

Enterprise value (EV): A measure of a company's total value, often used as an alternative to market capitalisation. It is the price you would pay for the entire business based on the current market price of the company's shares and net debt.

EV represents the total value of a business or enterprise to all providers of capital, including equity investors, preference share investors, debt investors and minority interests. It can be calculated by adding the company's market capitalisation and the market value of its gross borrowings, and deducting any cash balances.

EV = Market Capitalisation of equity + Preference shares + Debt + Minority interest – Cash and cash equivalents

Definition

Enterprise value/EBITDA multiple: The enterprise value of the company divided by earnings before interest, tax, depreciation and amortisation. It is a widely used valuation multiple.

EV/EBITDA is often used in conjunction with, or as an alternative to, the P/E ratio to determine the fair market value of a company.

The formula for calculating the multiple is:

Enterprise Value Multiple = Enterprise Value/EBITDA

The benefit of EBITDA multiples is that they strip out depreciation and amortisation, which may vary substantially between companies. EBITDA therefore provides a better basis for comparison.

One very important point to note about multiples is the connection between the numerator and denominator. Since enterprise value (EV) equals equity value plus net debt, EV multiples are calculated using denominators that are relevant for both equity and debt holders (that is, before the inclusion of interest expense and preference dividends). An advantage of this is that the multiple can be used to directly compare companies with different levels of debt.

Interactive question 5: EV/EBITDA valuation

The following financial information is available for Arlo Ltd:

	20X7	20X8
	Historic	Forecast
	£m	£m
Revenue	39.6	42.1
Operating profit	8.7	9.2
Depreciation	0.5	0.6
Amortisation	0.3	0.3
Net asset value	24.4	
Book value of debentures – currently trading at £80	16.25	

The closest comparable company to Arlo Ltd has been identified as its competitor Alfie plc, for which you have been able to ascertain the following financial data.

	20X7	20X8
	Historic	Forecast
	£m	£m
Revenue	57.7	61.9
Operating profit	10.0	12.6
Depreciation	2.2	2.2
Amortisation	–	–
Net asset value	48.1	
Book value of debentures – currently trading at £125	20.0	

Requirement

Today's share price for Alfie plc is 175p. Alfie has 27,300,000 shares in issue.

Use the information to derive an equity value for Arlo Ltd, based on an EBITDA multiple. See **Answer** at the end of this chapter.

An enterprise value multiple indicates how long it would take for an acquisition to earn enough to pay off its cost. For example, an EV/EBITDA multiple of six indicates that the acquirer will pay six times the acquisition target's EBITDA. Offering an EV/EBITDA multiple that is substantially higher than that paid for a comparable acquisition is an indication that the acquirer is paying too much.

Often, an industry average EV/EBITDA multiple is calculated on a sample of listed companies to use as a benchmark.

Higher quality businesses deserve higher valuation multiples, but finding a company on either a high or low multiple relative to its sector does not necessarily indicate whether or not the company is a good buy.

An expensive company may be on a high multiple due to expectations of growth arising from its strategies in the market. A cheap company may be on a low multiple because it has no distinguishing characteristics. Thinking however that a company is 'cheaper' because it trades at an EV/EBITDA multiple of four times, compared to its peers that trade at six times EV/EBITDA can be misleading. It may be that the stock market has failed to value the company correctly. The multiple can change with various factors: capital intensity, the nature of the business, competitive position of the firm, and the sustainability of cash flows.

Interactive question 6: EV/EBITDA comparison

Pomegranate plc and Magnolia plc are furniture retailers. The following information is available:

Pomegranate plc

	20X7	20X8 forecast
	£m	£m
Revenue	26.30	26.2
Operating profit	1.55	1.5
Depreciation	0.50	0.5
Amortisation	0.30	0.3
Book value of debt – currently trading at £80	6.25	
Share price	£1.25	
Shares in issue	6,500,000	

Market share	20X7	20X8 forecast
	£m	£m
	2%	2%

The CEO of Pomegranate has recently re-signed.

Magnolia plc

	20X7	20X8 forecast
	£m	£m
Revenue	57.0	75.0
Operating profit	6.0	7.5
Depreciation	2.5	2.0
Amortisation	1.0	1.0
Book value of debt – currently trading at £125	16.0	
Share price	£2.95	
Shares in issue	27,500,000	
Market share	8%	11%

Requirement

The average EBITDA multiple for the home furnishings sector is 9. Using the available information,calculate the EBITDA multiple for each company, and comment briefly on the results.

See Answer at the end of this chapter.

3.4.2 Advantages and disadvantages of using the EV/EBITDA multiple

Advantages

- It is unaffected by the capital structure of a company.
- It takes net debt into account.
- Ignoring capital expenditure and tax enables comparison of companies which have different levels of cap ex and tax planning.
- Ignoring depreciation and amortisation enables more direct comparison between companies which might have different policies.

It is relevant – EBITDA multiples focus on the key statistics that are in common use by investors.

Disadvantages

- It is simplistic – a lot of information from many value drivers is distilled into a single number.
- Ignoring capex and tax could be a disadvantage in some circumstances – management can for example potentially add value through skilled tax management.
- It is static – the multiple reflects a point in time which ignores the evolution of the business. The multiple is only meaningful if the profit figure used is representative of the future.

It can be difficult to compare – there are many reasons why multiples may differ between companies.

3.5 Dividend valuation method

Definition

Dividend valuation model: Model that determines a share valuation based upon expected future dividends, discounted at the investors required rate of return.

3.5.1 Method

A dividend valuation method is useful for the valuation of non-controlling interests (a small number of shares) in a company.

As we have seen, a future dividend stream can be valued using the following formula:

$$\text{Value} = \frac{d0(1+g)}{(ke-g)}$$

Where d_0 is the dividend at time 0

g is the expected annual growth rate in future dividends k_e is the cost of equity

Interactive question 7: Dividend valuation

Claygrow Ltd is a company which manufactures flower pots. The following data are available:
Current dividend: 25p per share

Required return on equities in this risk class: 20%

Requirement

Value one share in Claygrow Ltd under the following circumstances:

- No expected growth in dividends
- Constant dividend growth of 5% per annum
- Constant dividends for five years and then growth of 5% per annum to perpetuity
- Constant dividends for five years and then sale of the share for £2.00

See **Answer** at the end of this chapter.

3.5.2 Dividend yield valuation method

The dividend yield valuation method measures the income earned per share. The formula for calculating the dividend yield is:

Dividend yield = Dividend per share/Market price of the share

Note that the dividend per share is the most recent annual dividend.

In the UK the dividend valuation method represents a net yield, since investors cannot reclaim the tax paid by the company before the dividend was paid.

3.5.3 Problems

- Estimating future dividends and the rate of dividend growth.
- Estimating k_e (risk).
- Adjustments for non-marketability. The model is often used for valuing shares in non-quoted companies and then an arbitrary downwards adjustment made to reflect the lack of marketability (as with the P/E ratio approach).
- It is not very useful for valuing controlling interests.
- The dividend yield valuation model ignores growth because it is based on the most recent dividend only.

Professional skills focus: Structuring problems and solutions

You are expected to be able to structure information from various sources into suitable formats for analysis. Questions on business valuations often ask you to apply up to five different valuation methods. You will therefore need to apply a wide range of valuation techniques in a logical and time-efficient manner, stating any assumptions that you make.

3.6 Shareholder value analysis

3.6.1 Method

The seven key factors which drive shareholder value were covered in Chapter 2. A company valuation can be obtained through forecasting future free cash flows using these value drivers:

- Sales growth
- Operating profit margin
- Tax rate
- Investment in non-current assets
- Investment in working capital
- Cost of capital
- Life of cash flows

There are two relevant periods to consider.

First, a period where the company enjoys a competitive advantage over its competitors, during which value is being created at a fast rate. This could be a period of up to ten years in some cases.

Second, there will be a period after the competitive advantage period, when the annual growth in free cash flows end or reduces to a much lower rate. In this second period the cash flows are determined or valued by one of the following methods:

- Cash flow in perpetuity with no growth
- Cash flow in perpetuity with growth
- Given as a lump sum, through using a P/E ratio at the end of the competitive advantage period

Once these future free cash flows have been estimated, they should be discounted at the current WACC to obtain a present value. Any short-term investments that are held by the company should be added to this present value.

The free cash flows show the cash available to the providers of both debt and equity, so the market value of debt should be deducted from the total present value to get the value of equity.

Worked example: SVA method

Mark plc expects to have a competitive advantage over its competitors for the next three years. It has the following estimates for its value drivers for this period and beyond.

			Competitive advantage period	
Year	**1**	**2**	**3**	**Beyond 4+**
Sales growth %	7	4	2	0
Operating profit margin %	10	12	12	12
Tax rate %	17	17	17	17
Incremental non-current asset investment (as a % of sales increase)	5	3	2	0
Incremental working capital investment (as	2	2	2	0

Competitive advantage period

Year	**1**	**2**	**3**	**Beyond 4+**

a % of sales increase)

Other information is as follows:

- Current year sales are £380 million.
- The current WACC is 10%.
- Depreciation for the current year will be £7 million, increasing by £0.5 million each year in the competitive advantage period.
- Replacement non-current asset expenditure is assumed to be equal to depreciation.
- Short-term investments are held with a value of £2.5 million.
- Debt held by Mark plc has a nominal value of £120 million and has a market value of £95 per £100.

Requirement

Calculate the value of equity using the SVA method.

Solution

The information above can be used step by step to calculate the free cash flows.

=NPV(0.10,B13:D13)

	A	B	C	D	E
1		**Competitive advantage period**			
2	**Year**	**1**	**2**	**3**	**Beyond 4+**
3		£m	£m	£m	£m
4	Sales (W)	406.6	422.9	431.3	431.3
5					
6	Operating profit	40.7	50.7	51.8	51.8
7	Tax	(6.9)	(8.6)	(8.8)	(8.8)
8	Depreciation	7.0	7.5	8.0	8.0
9	Operating cash flow	40.8	49.6	51.0	51.0
10	Replacement non-current asset expenditure	(7.0)	(7.5)	(8.0)	(8.0)
11	Incremental non-current asset expenditure (W)	(1.3)	(0.5)	(0.2)	0.0
12	Incremental working capital investment	(0.5)	(0.3)	(0.2)	0.0
	(W)				
13	Free cash flow	32.0	41.3	42.6	43.0
14	PV of cash flows years 1–3 using NPV function @10%	95.23			
15	Present value beyond year 4	322.9 [1]			

[1] The calculation in cell B15 is 43.0 × 0.751 × 1/0.1 = 322.93

Total present value = £418.16m (95.23 + 322.93) Value of short-term investments = £2.5m

Market-value of debt = 120m × 95/100 = £11

Value of equity = £418.16m + £2.5m – £114m = £306.66m

WORKING

SVA

Year	0	1	2	3	4+
	£m	£m	£m	£m	£m
Sales (increasing at given rates)	380.0	406.6	422.9	431.3	431.3
Sales increase		26.6	16.3	8.4	0
Incremental non-current asset expenditure		1.3	0.5	0.2	0
Incremental working capital investment		0.5	0.3	0.2	0

Professional skills focus: Assimilating and using information

A question on business valuations will present you with a lot of information in the scenario. When applying the different methods of valuations, it is important that you select the correct information from the scenario that is relevant to the valuation technique that has been requested.

3.6.2 Problems

There are some problems with the SVA method of valuation.

- The constant percentage assumptions used in the valuation may be unrealistic. In the example above, constant percentage assumptions are used for sales growth, operating profit margin, tax rate, and incremental investments in non-current assets and working capital. Any of these may be unrealistic.
- The input data may not be easily available from current information systems, particularly to outsiders. It may not be easy to test whether the assumptions on which the forecasts are based are realistic.
- It may be difficult to establish the length of the competitive advantage period. This may have a substantial effect on the valuation.
- Other models have been suggested with different value drivers.
- For many valuations, a large proportion of the value is made up of the terminal value (ie, PV of future cash flows after the competitive advantage period) which is at best an unreliable estimate.

3.7 Other factors in valuation

3.7.1 Quoted companies

- Existing market value (that is, stock market share price) is normally a minimum valuation. (Why would a shareholder accept less than the current market value?)
- A premium to the current market price will be necessary to obtain control or a large interest in the company's equity.

3.7.2 Income valuations

- Surplus assets. The estimated NRV of surplus assets (ie, those not generating income) should be added to the income value to determine overall value.
- Trade and non-trade investments. Trade investments are held long term and dividends from these should be included in earnings to obtain an income-based valuation. Non-trade investments are those held short-term. Dividends from these should be excluded from earnings to calculate an income valuation and the market value of these investments added on at the end to obtain a total equity valuation.
- Freehold properties. The view commonly taken is that a company with the freehold interest in its premises has made an investment. Ownership of the freehold is not necessary to carry on the business, since rented premises could be used instead. Thus in valuing the company it is common to charge a market rent in calculating earnings for the purpose of the income-based valuation and then to add the value of the freehold at the end to obtain a total valuation.
- Directors' remuneration. Frequently the level of remuneration paid to directors in private companies is based on tax rather than commercial considerations. Earnings should reflect a fair commercial reward for their services for the purposes of valuation. The amount of the directors' remuneration may therefore be adjusted in deriving a suitable figure for annual earnings.
- Preference shares and debentures. Earnings before charging interest and preference dividends can be capitalised at the WACC to find the value of all the capital. Total capital value less the market value of all the preference shares and debt (or redemption value if no market value exists) is deducted from the total company value to obtain a valuation for the equity.

3.7.3 General

There are other issues that may affect a decision about a takeover and business valuation:

- Human resources. Will key employees leave after acquisition thus reducing the value of the business?
- Service contracts. Do key staff have service contracts with long notice periods? Do unwanted staff have service contracts with long notice periods and high pay-off clauses for early termination?
- Restrictive covenants. Do the debt agreements of the target company contain clauses for immediate repayment of the debt in the event of a takeover?
- The existence of rival bidders for the target company will tend to push up the price.

4 Valuation of technology companies

Section overview

The valuation of start-ups and technology companies presents a number of challenges for the methods that we have considered so far due to their unique characteristics.

- No track record of profit (often loss making)
- Unpredictable market acceptance of products
- Unknown competition
- Inexperienced management
- Difficulties in valuing digital assets and associated income streams

Valuing start-up and technology companies is complicated by periodic swings in stock market sentiment (herd behaviour) that may result in over-valuation of these companies. Chapter 4 discussed behavioural finance where research has shown that investors attach too low a probability to likely outcomes and too high a probability to unlikely outcomes. This can help to explain stock market bubbles such as the 'dotcom' bubble as investors overestimated the potential of the internet start-ups and their ability to dominate their market segments.

For example, during the period 1998-2000 huge amounts of money were invested in internet related companies even though most of them did not have financially sound business models. For example, Pets.com was listed in February 2000 and was valued at $11 per share, but its business model wasn't suitable. The company lost about $147 million in the first nine months of 2000 and went into liquidation in November 2000. The bubble eventually burst in early 2000 after many companies failed to get off the ground, let alone generate a profit.

In more recent times the valuation of tech companies specialising in areas such as artificial intelligence, social media and data analytics has also been criticised as being too optimistic partly due to investors desperately looking for growth opportunities in an era of low interest rates. For example, Uber was listed in 2019 at a valuation of $82 billion before it announced a $1-billion loss in the following month. In early 2020 its market capitalisation had fallen dramatically to $52 billion.

4.1 Valuation methods

Given the lack of profitability, swings in stock market sentiment and the difficulties in forecasting growth prospects, valuation of start-ups and tech companies is difficult, however there are a number of possible approaches.

Valuation method	Description
Asset	The asset method is not easy to apply because the value of capital in terms of tangible assets may not be high. Most of the investment of a technology company is in people, digital assets, marketing and/or intellectual rights that are not capitalised as assets. Value could be assessed by estimating how much it would cost for an investor to create the assets of the company from scratch; this could also consider the cost of R&D spending, patent protection etc. However, such approaches would not capture the value resulting from the potential future growth, which is likely to represent the main part of a company's value.
Earnings	The fact that there may be no earnings in the early years discredits this method. It will also be difficult to find the P/E ratio of a comparable quoted company with similar risk profile to use when valuing a start-up or unquoted tech company.
Dividend	A start-up or technology company is unlikely to pay a dividend as it will be retaining cash flow to fund future growth therefore this method will not be appropriate.
Market multiples	It is possible to use ratios based on acquisitions of similar companies (in terms of their growth potential and stage of development) to create a valuation. However, similar acquisitions may be difficult to identify, which may make this approach difficult to apply and it may be distorted by stock market sentiment as discussed earlier. For example, the ratio of amount paid compared to sales in recent acquisitions could be used. If a start-up or technology company has reached the stage when it is making positive earnings before interest tax depreciation and amortisation (EBITDA) then Price to EBITDA ratio for recent
DCF	Despite the problems with estimating future cash flows, the DCF approach is likely to be the most valid approach. Revenue growth prospects and margins could be estimated by comparing to more mature businesses in different countries or companies that have a similar business model (eg, a similar business to business internet service provider, or a similar internet retailer). Different scenarios can be created and analysed using probabilities, although clearly these will be subjective. Cash flows should be discounted at a risk-adjusted cost of capital. acquisitions can help to place a value on a start-up.

5 Methods of payment

Section overview

The method of payment will have an impact on how attractive the bid is.

Several forms of offer can be made:

		Buyer	Seller
Cash	For:	• More attractive to seller	• Certain amount received
	Against:	• Liquidity issues	• Possible immediate tax issues
Share-for- share exchange	For:	• Preserves liquidity • Sellers can undertake not to sell the shares for a period to ensure their continued cooperation with the buyer	• No immediate tax issues
	Against:	• Increased dilution	• Uncertain value received • Dealing costs to sell shares
Loan stock-for-share exchange	For:	• Avoid dilution	• More assured return than on shares
	Against:	• Gearing problems	• May prefer equity

In practice a combination of methods may be used eg, the main form of the bid may be the share- for-share exchange but with a cash element to act as a 'sweetener' from the point of view of shareholders in the target company.

Professional skills focus: Concluding, recommending and communicating

You are expected to be able to make evidence-based recommendations which can be justified by reference to supporting data and other information. A recommended bid value and method of payment (if relevant) must therefore be based on the information provided in the question.

6 Reasons for divestment

Section overview

Investments typically have a strategic rationale.

For every buyer there must be a seller and therefore divestment is as common as investment. A number of reasons can be put forward for divestment of a subsidiary:

- **Lack of fit** within the existing group of companies – Often a subsidiary that is unprofitable or incompatible with other operations is sold to allow the firm to concentrate on activities in which it is more successful.
- The subsidiary is **too small** and does not warrant the management time devoted to it.
- A belief that the individual parts of the business can be worth more than the whole when shares are selling at less than their potential value – the so-called **conglomerate discount**. This is sometimes expressed as 5 – 1 = 5! This does not necessarily involve immediate divestment but can lead to part of a business being transferred to a new company which is still owned by the existing shareholders (known as a demerger or a spin-off – see below).
- It is **trading poorly**, but selling the subsidiary as a going concern may be a cheaper alternative than putting it into liquidation, particularly when redundancy and winding-up costs are considered.
- The parent company may need to improve its liquidity position, particularly when a good offer is received for a subsidiary.
- Highly acquisitive organisations view companies as **portfolios of assets** and dispose of companies as risk and returns change – they frequently acquire them with a view to retaining some aspects of the business and selling the remainder to recoup much of their initial investment.

The following sections consider briefly how divestment may be achieved.

7 Management buy-outs (MBOs)

Section overview

- Management buy-out (MBO) – various parties act to achieve their own agendas.
- The management team buying the company will usually need financial support.

The part of the business being sold (eg, a subsidiary) is bought by **existing** management from the company. The management team buying the company are unlikely to have all the money needed for the purchase, and will therefore usually need financial support from a provider of venture capital and in the form of bank loans.

7.1 Parties to an MBO

The various parties for an MBO and their involvement are typically (but not always) as shown below.

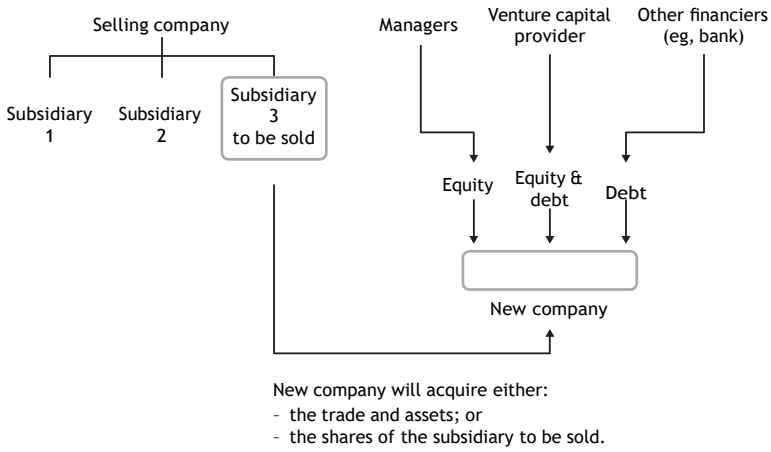


Figure 8.1: Parties to an MBO

7.2 Private equity funding of an MBO

Private equity is another source of capital for companies looking to fund expansion, product development, or restructuring. Private equity firms raise funds to invest from sources such as pension funds, state-owned investment funds, banks, insurance companies and high net worth individuals and manage the funds to yield favourable returns for their clients. The investment horizon is typically between three and five years.

When funding an MBO, the private equity provider subscribes for ordinary shares in the new company and will require the management team to do the same, so that they have an incentive to make the business succeed by improving performance and strategic direction. On smaller buy-outs, management may have a large role in determining which private equity provider will fund the buy- out. On the larger buy-outs, it tends to be the seller who chooses the private equity provider.

A private equity provider will typically look to realise any capital gain within three to five years from the date of the investment. The usual exit strategy for an investor is either:

- listing on a recognised stock exchange;
- sale to a trade purchaser; or
- a secondary buy-out (SBO).

An SBO occurs when a company currently owned by private equity is acquired by another private equity provider. SBOs have become increasingly popular as an exit strategy in recent years.

7.3 Financing the MBO with debt capital

It is not uncommon for the various parties to want an exit route at some point in the future, by selling the business or possibly by floating the firm on the Stock Exchange. The exit route will enable outstanding bank loans to be paid off, and provides investors with a means of cashing in the investment for a profit.

The initial finance for an MBO can cause problems, because of the large amounts of debt capital that may be needed in a financing package. If the MBO is not successful, and operating profits are lower than expected, the company may be unable to pay the interest on its debt, and so would face the risk of insolvency.

The two following common types of debt are typically (but not exclusively) used in large MBOs.

(a) **Junk bonds** – these are high risk because they rank behind other forms of debt in terms of claims on assets. This results in a high cost of capital for this type of debt.

(b) **Mezzanine debt** – similar to junk bonds but the coupon rate is reduced by allowing the possibility of equity participation, either through an option to convert the debt to shares or by attaching warrants to the loan stock.

(c) When junk bonds or mezzanine debt are used to finance an MBO (instead of or in addition to bank loans) the new company issues the debt and uses the money to acquire the purchased business.

7.4 Management buy-ins (MBIs)

Essentially the same as an MBO but the business is bought by an **external group of managers** who have not previously been connected with running the business. Often used when the shareholders in a family owned business need an exit route from the business.

Occasionally, an external buyer (such as a private equity firm) may purchase a business using a large amount of debt. Buyouts that are mainly financed by debt may be called leveraged buyouts (LBOs).

7.5 Sell-offs

The sale, normally for cash, of part of the operations of a business to another established business. Only the assets may be sold, the seller using the cash to settle any remaining debts.

Interactive question 8: MBO

Can plc is divesting one of its subsidiaries and the managers of the subsidiary have offered an attractive price of £20 million subject to confirming a finance package with a venture capital provider (VC) and a bank.

The finance package is as follows:

	£m
Equity from managers	2
Equity from VC	1
Mezzanine finance from VC	7
Senior debt from bank	10
	20

Requirement

What are the objectives facing the various parties (sellers, managers, venture capitalists and the bank), and how might they manage their specific risk?

See **Answer** at the end of this chapter.

8 Other arrangements

Section overview

- Other restructuring arrangements include:
  - Spin off or demerger
  - Share repurchase
  - Liquidation
  - Outsourcing

8.1 Spin-off or demerger

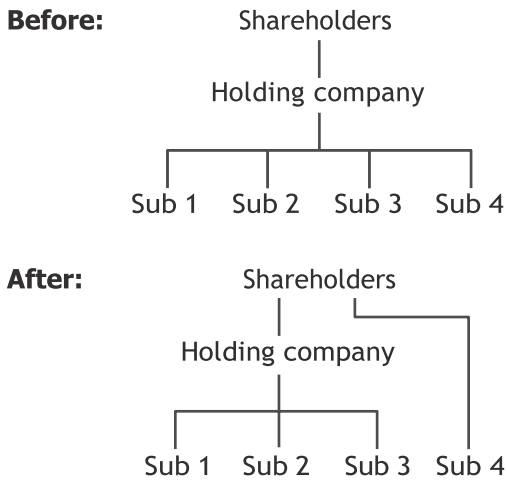


Figure 8.2: Group structure

The shareholders are given shares in the new entity pro rata to their shareholding in the original parent.

- No change in ownership occurs ie, the shareholders now have shares in two separate businesses.
- The spin-off gives separate corporate identities. Shareholders can choose whether they wish to realise their investment in one or other of the two businesses, or remain shareholders in both.
- A spin-off may avoid the problem of conglomerate discount discussed above, where the value of the businesses in a conglomerate group are worth less than the total of the businesses if they were separate and independent companies.
- It may be used as a device to avoid the takeover of the **whole** business by separating a particularly attractive part in a spin-off.

Definition

Demerger: Divestment accomplished through the separation of a division or subsidiary from its parent to create a new entity by issuing shares; these shares are distributed to current shareholders in proportion to their current holdings.

8.2 Repurchase of own shares

Reasons for repurchase include the following:

- **Enhancement of share price** – There may be an increase in the price of the shares remaining because the supply is reduced and because earnings per share may be enhanced where cash used for the repurchase was not previously earning an adequate return.
- **Escape route** – It provides a mechanism for shareholders in unquoted companies to sell their shares.
- **Gearing** – If gearing is less than some target level because of over-retention of profits, a buy-back can be used to reduce equity and to increase gearing.

8.3 Liquidation (or winding-up)

The ultimate corporate restructuring device is to liquidate the business. This results in the passing of the assets, net of liabilities, to the shareholders in proportion to their individual shareholdings.

Usually the assets are first converted into cash, but assets other than cash can be distributed to shareholders. Windings-up are typically initiated:

- either by the shareholders, because the purpose for which the business was founded has, by intention or otherwise, come to an end; or
- by the creditors, because their interest and/or redemption payments are overdue.

8.4 Outsourcing

Though not strictly a corporate restructuring device, outsourcing can often have a similar effect. Outsourcing is acquiring goods and services needed by the business from another business, rather than from within (ie, making the goods or performing the services with its own staff). All businesses outsource to some extent and it is not a new phenomenon.

A fairly recent development, however, is the extent of outsourcing. The logic of extending outsourcing to a larger range of supplies and services is to enable the business to concentrate on what it sees as its core activities, while buying in specialist goods and services from experts.

Thus a motor car manufacturing business might not employ staff to operate its personnel function, but instead outsource it to a specialist human resources business. This might be because the managers see car manufacturing as their specialist skills area, so they leave providing the personnel function to others who specialise in that area.

Other examples of outsourced functions are IT systems, payroll, accounting, catering, motor fleet management and property maintenance.

Advantages of outsourcing include access to **specialist skills** at a lower cost to the business than would be incurred by having specialist staff on its own payroll. Another advantage is that the business can use its **investment capital** for its core activities.

Disadvantages include the potential **loss of control** present in any sub-contracting arrangement.

As with all corporate decision-making, outsourcing should be undertaken to the extent that it has the effect of enhancing the wealth of shareholders.

9. International Valuation Standards (IVS)

ICAB students are expected to know that International Valuation Standards (IVS) are applicable for valuation assignments as it is adopted by Bangladesh Bank, the Bangladesh Securities and Exchange Commission (BSEC) and the Financial Reporting Council (FRC).

9.1 About IVS

IVS are developed with the aim of serving as a professional benchmark for valuers around the world with the "objective to increase the confidence and trust of users of valuation services by establishing transparent and consistent valuation practices".

IVS consist of mandatory requirements that must be followed in order to state that a valuation was performed in compliance with IVS. IVS are focused on the whole valuation engagement (i.e. process), not just the valuation report.

IVS are principles-based multi-disciplinary standards; hence, they include requirements for multiple asset classes - tangible assets (such as plant & equipment and real property interests), business valuation, intangible assets and financial instruments. IVS requirements apply to external as well as internal valuation engagements.

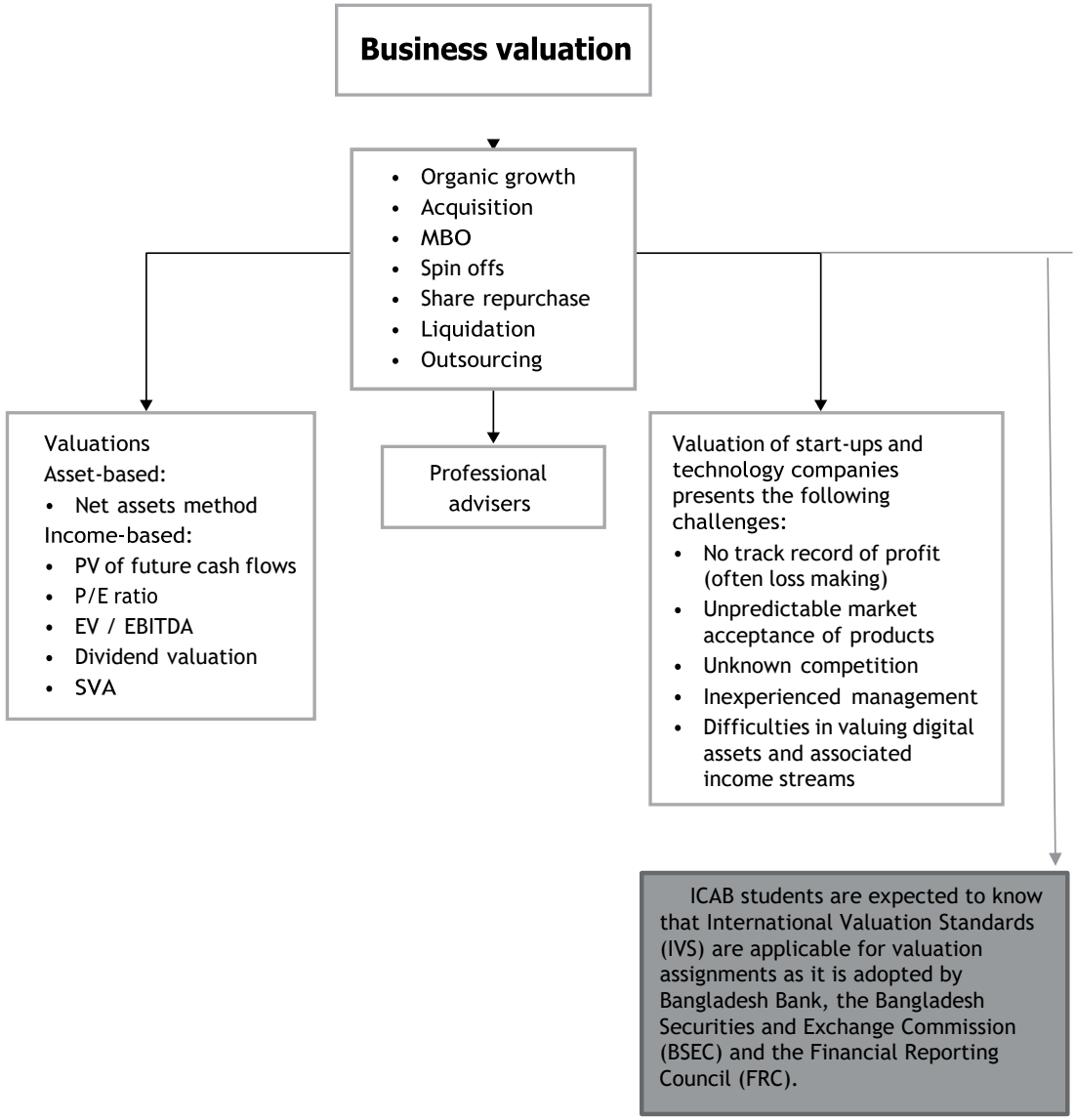
9.2 Structure of IVS

This version of International Valuation Standards is published on 31 July 2021, with an effective date of 31 January 2022. The IVSC permits early adoption from the date of publication. References hereafter to IVS will be to the IVS 2021 publication. IVS include a glossary, framework and five general standards that apply to all valuation assignments, as well as eight asset standards that include requirements related to specific types of assets.

General Standards	Assets Standards
· **IVS 101** – Scope of Work · **IVS 102** – Investigations and Compliance · **IVS 103** – Reporting · **IVS 104** – Bases of Value ·**IVS 105** – Valuation Approaches and Method	· **IVS 200** – Businesses and Business Interests · **IVS 210** – Intangible Assets · **IVS 220** – Non-Financial Liabilities · **IVS 230** – Inventory · **IVS 300** – Plant & Equipment · **IVS 400** – Real Property Interests · **IVS 410** – Development Property · **IVS 500** – Financial Instruments

A summary guidance on IVS is part of Strategic Business Management & Leadership module at Advanced Level.

Summary


Business valuation
Organic growth
Acquisition
MBO
Spin offs
Share repurchase
Liquidation
Outsourcing
Valuations
Asset-based:
Net assets method
Income-based:
PV of future cash flows
P/E ratio
EV / EBITDA
Dividend valuation
SVA
Professional advisers
Valuation of start-ups and technology companies presents the following challenges:
No track record of profit (often loss making)
Unpredictable market acceptance of products
Unknown competition
Inexperienced management
Difficulties in valuing digital assets and associated income streams
ICAB students are expected to know that International Valuation Standards (IVS) are applicable for valuation assignments as it is adopted by Bangladesh Bank, the Bangladesh Securities and Exchange Commission (BSEC) and the Financial Reporting Council (FRC).

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Do you know the advantages of organic growth over growth by acquisition? (Topic 1)
2.	Can you value a business using the net assets approach? (Topic 2)
3.	Can you calculate the enterprise value of an entity? (Topic 3)
4.	Do you know the different methods of payment that can be used for an acquisition? (Topic 4)
5.	Can you explain the problems in applying traditional valuation methods to technology companies? (Topic 5)
6.	Do you understand the motives for divestment? (Topic 6)
7.	Do you understand the difference between an MBO and an MBI? (Topic 7)
8.	Do you know what a spin off is? (Topic 8)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
2 Zappa Ltd	This question requires a written answer covering MBOs and other divestment strategies. Students often overlook written question in preference of calculations. Think about planning your answer first before writing up the answer in full.
4 Lafayette Ltd	This question covers four of the valuation methods mentioned in the chapter and is therefore a good one to practice.
6 Highgate plc	This is a good question to practice calculating the value of an entity using the SVA approach. Refer back to the worked example on SVA in the chapter if you need to. Having a good layout for your calculations will help you tackle this question.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the learning in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Self-test questions

Answer the following questions.

1 Rhythm Ltd

You have recently started a job as Finance Manager for Rhythm Ltd, a record company. Rhythm are interested in the acquisition of an online streaming company, Blues Ltd.

1.1 You have been asked by the Managing Director of Rhythm to provide advice to the board of directors in relation to the acquisition. You are hesitant as you do not have sufficient knowledge in this area, but are keen to impress the Managing Director, so you accept the assignment.

Requirement

What are the ethical issues you should consider?

(5 marks)

1.2 A significant proportion of Blues Ltd's value is included in the value of its digital assets.

Requirement

Explain what a digital asset is and highlight some of the difficulties Rhythm Ltd will face when valuing a technology company such as Blues Ltd.

(5 marks)

Total: 10 marks

2 Zappa Ltd

You have been approached for financial advice by the management of a client, Zappa Ltd, a manufacturing company. Zappa was established in 1957 and formed the platform for growth.

The following information relates to the proposed financing scheme for a management buy-out of Zappa.

	%	£'000
Share capital held by Management	40	100
Institutions	60	150
		250
10% redeemable cumulative preference shares		
(redeemable in ten years' time and all sold to institutions)		1,200
		1,450

Clearing bank	
Loans	700
Overdraft facilities (currently 12% per annum)	700
	2,850

Loans are repayable over the next five years in equal annual instalments. They are secured on various specific assets, including properties. Interest is 12% per annum.

Zappa is at present part of a much larger organisation, which considers this segment to be no longer compatible with its main line of business. This is despite the fact that Zappa has been experiencing growth in revenue in excess of 10% per annum.

The assets to be acquired have a book value of £2,250,000, but the agreed price was £2,500,000.

Requirements

2.1

What is the difference between the following:

(4 marks)

(a) A management 'buy-in' and a management 'buy-out'?

(b A 'sell-off' and a 'spin-off'?

2.2

Outline briefly the major advantages and disadvantages of a management buy-out.

(4 marks)

2.3 Write a report to the buy-out team of Zappa Ltd appraising the financing scheme. Your report should include its cash flow implications.

(9 m arks)

2.4 What problems are likely to be encountered in assembling a financing package in a management buy-out of a service company, as opposed to a manufacturing company?

(3 marks)

Total: 20 marks

3 Bigun plc

The acquisition committee of Bigun plc is considering making takeover bids for two competitors, Klein plc, a listed company, and PTT Ltd.

Summarised financial data is given below for the three companies.

Balance sheets as at 31 March 20X2

	Bigun	£m	Klein	£m	PTT	£m
Non-current assets Current assets Add payables: amounts payable	43[1]	50	6.7	8.6	9.5	6.4
within 1 year	27	16	3.0	3.7	3.9	5.6
Less payables: amounts payable after 1 year		19[3]		6.0[4]		5.5[5]
		47		6.3		6.5
Ordinary share capital (50p shares)		17		5.0[2]		2.8[2]
Retained profit		30		1.3		3.7
		47		6.3		6.5

Notes

1 Of which £5 million cash

2 £1 ordinary shares

3 8% debentures 20Y5 – 20Y8 currently trading at £80

4 11% debentures 20X2 – 20X4 currently trading at £110

5 7-year 10% bank loan

	Bigun	Klein	PTT
Average sales growth 20W8 – 20X2	8%	10%	8%
Average growth in profit after tax and interest on medium and long-term debt 20W8 – 20X2	6%	10.5%	9.5%
Average payout ratio 20W8 – 20X2	60%	40%	75%
P/E ratio at 31 March 20X2	18.4	18.6	N/a
Estimated required return on equity	9.5%	12%	13%
Depreciation charge	£2m	£0.5m	£0.2m
Profit before tax and interest on medium and long- term debt for year ended 31 March 20X2	£10m	£1.5m	£1.4m

The corporation tax rate is 17%.

3.1 Requirements

Prepare a report advising the main board of Bigun on the possible cost of acquiring each of the companies using a P/E method, a dividend method and an asset method to calculate an equity value for each of the companies.

3.2 **(15 marks)**

Use EV/EBITDA multiples to calculate an estimated equity value for PTT and comment upon your results.

3.3 **(5 marks)**

Discuss alternative terms that might be offered to the shareholders of Klein and PTT, and the implications of these terms for the shareholders of Bigun.

(10 **marks)**

Total: 30 **marks**

4 Lafayette Ltd

The directors of Lafayette Ltd, a medium-sized private company, have been approached by a large public company which is interested in purchasing their business. The directors of Lafayette Ltd have indicated that they would like to receive cash for their shares, and this is acceptable to the prospective purchaser. They have been asked by the public company to state the price at which they would be willing to sell. You have been asked to advise Lafayette Ltd.

Extracts from the last set of published financial statements for Lafayette Ltd for 20X2 are given below:

Income **statement**

	£
Profit before interest and tax	5,337,349
Interest	1,000,000
	4,337,349
Taxation (17%)	737,349
Profits after tax	3,600,000
Dividends paid – preference	200,000
ordinary	1,000,000
Profits retained	2,400,000

Balance sheet as at 31 December **20X2**

Non-current **assets**

	£'000	**£'000**

Goodwill	5,000
Freehold property	10,000

	£'000		£'000
Plant and equipment	20,000		
Investments	5,000		
Current assets			40,000
Inventory	3,000		
Receivables	6,000		
Cash	1,000		
Less Payables: amounts due within 1 year			10,000
Payables	6,000		
Less Payables: amounts due after 1 year			6,000
Loan stock			10,000
			34,000
Ordinary share capital (£1 par)	20,000		
5% preference shares	4,000		
Retained earnings	10,000		
			34,000

For the year ending 31 December 20X0, the profits before interest and tax were £10 million and in the year ending 31 December 20X1 they were £8 million. The depreciation charge in 20X2 was£750,000. The owners of the preference shares have found a financial institution who will buy at a price of £0.40 per preference share. They are willing to sell at this price.

- You are asked to take the following factors into account in calculating a value per share:
- The prospective purchaser has agreed to purchase the debentures at a price of £75 per £100 stock.
- It has been ascertained that the current rental value of the freehold property is £1.5 million per annum, and that this could be sold to a financial institution on the basis of offering an 8% return to the freeholder.
- The investments owned by Lafayette have a current market value of £7.5 million.

There is an amount of £1 million shown in the 20X2 receivables figure which is now thought to be irrecoverable.

Two companies in the same business as Lafayette Ltd are quoted on the stock market. However, both are slightly bigger in size than Lafayette. The most recent financial data relating to the companies is given below:

Net

	Par value per share	Market price	P/E ratio	EV/EBITDA	dividend per share	Times covered	Yield %
X	£1.00	£3.50	11.3	7	£0.12	2.6	4.9
Y	£0.50	£1.25	8.2	8	£0.04	3.8	4.1

Requirements

4.1 The directors of Lafayette Ltd are naturally interested in obtaining the highest price possible for their shares. You are asked to determine the highest possible asking price for the shares that can be justified on the basis of the available information and comment on the alternative prices you have arrived at, based on the following valuation methods:

(a) The net asset value

(b) The price/earnings ratio

(c) The dividend yield EV/EBITDA multiple

(20 marks)

4.2 Advise the directors on the lowest price at which they should be willing to sell.

(5 marks)

4.3 Discuss the major factors that have contributed to the popularity of management buyouts and explain why lenders often permit high gearing ratios in MBO companies.

(10 marks)

Total: 35 marks

5 Jodocus plc

Jodocus plc is contemplating the purchase of 100% of the equity of Victim Ltd, a private company. Two alternatives are being reviewed:

(1) The purchase of shares of Victim Ltd at £5.30 cash per share; or

(2) the issue of new shares in Jodocus plc in exchange for the shares of Victim Ltd in the ratio of 3 Jodocus shares for 10 Victim shares.

Both Jodocus plc and Victim Ltd are currently financed entirely by equity. Jodocus currently has one million shares in issue with a market value of £20 each. Victim has 1 million shares in issue. If Victim is acquired by Jodocus, it is believed that increased efficiency in operations will result, and that the stream of net pre-tax cash flows from operations will be £1,800,000 per annum in perpetuity.

Corporation tax at the rate of 17% is payable in the year of occurrence. At the end of each year Victim Ltd will pay out its cash surplus after paying the corporation tax to Jodocus as a dividend. The appropriate discount rate for the cash flows generated by both Jodocus and Victim is 20%. You should assume that all cash flows occur at the end of the year in which they arise.

Requirements

5.1 Compute the increase in wealth that will accrue to the existing shareholders of Jodocus under each of the two acquisition schemes

(8 marks)

5.2 Outline the practical problems that you would expect to encounter in applying valuation models to a private company.

(5 marks)

Total: 13 marks

6 Highgate plc

Highgate plc is an online retailer. The company expects to have a competitive advantage over its competitors for a period of four years.

6.1 The following forecasts relating to the value drivers for this competitive advantage period have been created.

Year	**1**	**2**	**3**	**4**
Sales growth %	10	8	5	3
Operating profit margin (post depreciation) %	10	12	12	12
Incremental non-current asset investment (as a % of sales increase)	6	4	2	2

Year	**1**	**2**	**3**	**4**
Incremental working capital investment (as a % of sales increase)	4	3	2	2

The following information is also relevant:

- Current sales for the year are £550 million, and current post-tax profits are £10 million.
- Tax on profits is expected to be paid at a rate of 17% for the foreseeable future.
- Shareholders require a return of 8% per annum.
- Non-current assets will also be sold during the first year and receipts are estimated to be
- £12 million.
- The present value at the end of year four of the free cash flows for the period following the competitive advantage period can be estimated by applying a multiple of 13 to the year four cash flow.
- No short-term investments are held.
- Debt with a market value of £225 million is held by Highgate plc. A covenant attached to this debt prevents the payment of a dividend until the debt is repaid (which is in six years' time).
- Highgate plc has 50 million £1 shares in issue.

  Highgate intends to operate a residual dividend policy when it becomes possible to pay a dividend.

Requirement

Calculate the value of a Highgate plc share using the SVA approach.

(10 marks)

6.2 Highgate's competitive advantage is mainly due to its transactional artificial intelligence. The algorithms embedded in its customer online ordering system enable it to predict what customers are likely to buy based on their past online buying behaviours. This has enabled Highgate to grow at a much higher rate than its competitors.

Requirement

Discuss the challenges of adapting traditional valuation models to value internet-based companies such as Highgate.

(5 marks)

Total: 15 marks

7 Megagreat plc

Megagreat plc has recently announced a takeover bid for Angelic plc. The offer is that for every four Angelic plc ordinary shares the owner would receive three ordinary shares in Megagreat plc plus £6 in cash. Both companies are listed.

According to published estimates, if Angelic plc were to remain independent the company would pay its next dividend in one year's time at 37p per share. Subsequently dividends are expected to grow by an average 5% pa. Angelic plc has an equity cost of capital of 12% pa.

Estimates for Megagreat plc, assuming that the takeover goes ahead, suggest that a dividend of 43p per share will be paid in one year's time and the same amount in two years' time. In three years' time the dividend paid will be 7% higher than the 43p to be paid next year and the year after. This rate of growth is expected to continue indefinitely. The expanded Megagreat plc is expected to have a cost of equity of 11% pa.

Requirements

7.1 Show calculations that indicate whether, on the basis of the published estimates, Angelic plc shareholders would be advised to accept the offer from Megagreat plc.

(6 marks)

7.2 Discuss reasons why any particular shareholder might look beyond the result of the calculations in 7.1 when deciding whether to accept the offer.

(4 marks)

7.3 Suggest the possible effect on Angelic plc's ordinary share price of the announcement of the bid, stating and explaining any assumptions made in reaching your conclusion.

(4 marks)

7.4 Suggest and explain any other strategies that Megagreat plc could use to achieve growth, apart from taking over other businesses.

(3 marks)

Total: 17 marks

8 Pinky and Perky

Pinky plc and Perky plc operate in the same field, manufacturing children's clothes and toys although Perky plc also has interests in sportswear and equipment. Pinky plc is planning to take over Perky plc and the shareholders of Perky plc do not regard it as a hostile bid.

The following information is available about the two companies:

	Pinky plc	Perky plc
Current earnings	£650,000	£240,000
Number of shares	5,000,000	1,500,000
Percentage earnings retained	20%	80%
Return on new investment	15%	15%
Return required by ordinary shareholders	21%	24%

Dividends have just been paid and the retained earnings have already been reinvested in new projects. Pinky plc plans to adopt a policy of retaining 35% of earnings after the takeover and expects to achieve a 17% return on new investment.

Savings due to economies of scale are expected to be in the region of £85,000 per annum.

Required return to ordinary shareholders will fall to 20% due to portfolio effects. Neither company is quoted.

Requirements

8.1 Calculate the existing share values of Pinky plc and Perky plc.

(4 marks)

8.2 Find the value of 8.2 Pinky plc after the takeover.

(6 marks)

8.3 Advise Pinky plc on the maximum amount it should pay for Perky plc.

(3 marks)

8.4 What reasons might a company have for buying another company?

(7 marks)

Note: Ignore taxation.

Total: 20 marks

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

Answers to Interactive questions

Answer to Interactive question 1

		£m
Value of A and B combined	£20m/0.16	125
Value of A on its own	£15m/0.20	(75)
Maximum price for B's shares		50

Answer to Interactive question 2

=NPV(0.2,C7:G7)+B7

	A	B	C	D	E	F	G
1	**Year**	**0**	**1**	**2**	**3**	**4**	**5**
2		£m	£m	£m	£m	£m	£m
3	Operating cash flow		1.000	1.000	1.000	1.000	1.000
4	Sale of head office	2.000					
5	Synergistic benefits		0.200	0.200	0.200	0.200	0.200
6	Disposal						5.000
7	Net cash flow	2.000	1.200	1.200	1.200	1.200	6.200
8							
9	PV using spreadsheet NPV function	7.60					

The formula used in cell B9 to calculate the PV of the cash flows is =NPV(0.2,C7:G7)+B7.

	£m
Total present value	7.60
Less value of loan stock	(1.500)
Maximum value of Target shares	6.10

Notes

1 The estimated disposal value of Target is included to compensate for Arrow's short planning horizon. It is assumed that the estimated disposal value is an approximation of the present value of cash flows from year 6 onwards.

2 The present value of the cash inflows is £7.60 million. This is generated by a company funded by equity and debt. Therefore, the market value of loan stock has to be deducted from the total value of the business to arrive at an equity value.

Answer to Interactive question 3

Valuation of 200,000 shares = 200,000 × P/E ratio × EPS

= 200,000 × 12.5 × ((£187,200 – 20,000)/400,000)

= £1,045,000

This amount would then, typically, be reduced by 1/2 to 1/3 to reflect the difficulty in selling the shares in an unquoted company, so a valuation may be in the region £522,500 to about £697,000.

Answer to Interactive question 4

4.1

			£m
Combined value	= £75m × 18	=	1,350
Price plc on its own	= £50m × 20	=	(1,000)
Maximum amount			350

4.2

			£m
Current value of Maine plc	= £20m × 15	=	300

The increase in wealth arising from the takeover is £50 million. This is likely to be the minimum price. Any purchase price between £300 million and £350 million splits the additional £50 million between both sets of shareholders. The maximum amount that should be paid for Maine's equity is £350 million: at a higher price, shareholders in Price will suffer loss of wealth as a result of the takeover.

Answer to Interactive question 5

Stage One – Calculate EBITDA multiple for Alfie plc

Equity value = £1.75 × 27.3m = £47.8m

Enterprise value (EV) = £47.8m + £25.0m = £72.8m

	20X7	20X8
EBITDA multiples	72.8/(10 + 2.2) = 6.0×	72.8/(12.6 + 2.2) = 4.9×

Stage Two – Apply multiple to value Arlo Ltd

Valuation based on:

	20X7	20X8
EBITDA	6.0 × £9.5m = £57.0m	4.9 × £10.1m = £49.5m

Suggested range for EV of Arlo: £49.5m–£57m

From this, the market value of Arlo's debt (£13 million) will need to be deducted to obtain an equity valuation, giving a range between £36.5 million and £44 million.

These figures are before any discount that might be made for the non-marketability of Arlo's shares. If we were to apply say a 25% discount, this would give a range of values between £27.38 million and

£33 million.

Answer to Interactive question 6

Pomegranate plc		
EV =	**20X7**	**20X8**
Market capitalisation	£8.125m	£8.125m
plus net debt =	£13.125m	£13.125m
EBITDA =	**20X7** 2.35	**20X8** 2.3
EV/EBITDA =	5.6	5.7
Magnolia plc		
EV =	**20X7**	**20X8**
Market capitalisation	£81.125m	£81.125m
plus net debt =	£101.125m	£101.125m
EBITDA =	9.5	10.5
EV/EBITDA =	10.6	9.6

Pomegranate plc is trading on a lower EBITDA multiple than the sector average (5.6 – 5.7 compared to an average of 9), reflecting its forecast lack of growth, low market share and the fact that there appear to be problems with senior management.

Magnolia plc is trading slightly above the sector average. It has forecast strong growth in revenues, and a larger market share. In a company where shares are trading at a higher multiple, earnings (and thus cash flow) are expected to grow at a higher rate than comparable companies with lower multiples. Other market factors might also be at work, such as the market assigning a premium to Magnolia because of, for example, a strong management team.

Answer to Interactive question 7

• Constant dividend

P_0 = £0.25/0.2 = £1.25

• Constant growth in dividend

P_0 = (£0.25 × 1.05)/(0.2 – 0.05) = £1.75

Present value of five years' dividend of £0.25 pa = £0.25 × 2.991 = £0.748

Plus

Present value of growing dividend from Year 6 onwards

$$\frac{£0.25 \times 1.05}{(0.2-0.05)} \times \frac{1}{1.2^5} =$$

£0.703

£1.451

Present value of five years' dividend of £0.25 pa = £0.25 × 2.991

Present value of £2.00 in five years' time =

£0.748

$£2.00 \times 1/(1.2^5)$

£0.804

£1.552

Answer to Interactive question 8

Seller:	They will want to ensure that the amount offered from the managers is backed up by a reliable financial package. Work by financial advisers and lawyers will help to ensure that the finance is in place. There may be other, lower bids where finance is more easily available, particularly if the bidder is a large organisation with liquid assets.
Managers:	The attractions of an MBO are: • independence; • financial reward; and • motivation. The risks however are: • lack of support from within the business and also from suppliers and customers; • lack of skills within the business if key employees leave; and • financial risk. If business profits fall, it might be impossible to service the debt.
VC:	The objective will be to make a very high financial return. This is typically achieved by selling the business within three to five years. The VC will cannot be certain that the value of their shares will be as high as they want. This downside risk is typically managed by: • having board representation; • investing a mixture of debt and equity; and • including convertible terms in the debt, so that debt converts into a higher equity share in the event that the company on subsequent sale is worth less than originally expected.
Bank:	The bank will manage its risk by investing in senior debt, which ranks higher than other debt in terms of interest, security and repayment. The bank might also want personal guarantees from the buyout team.

Answers to Self-test questions

1 Rhythm Ltd

1.1 Since you do not have sufficient expertise to advise the board on the acquisition, this is a threat to compliance with the fundamental principle of professional competence and due care in the ICAB code of ethics. The Code requires a professional accountant 'to maintain professional knowledge and skill at the level required to ensure that a client or employer receives competent professional services'.

An acquisition would be a big undertaking for Rhythm, and therefore warrants proper advice which you are currently not in a position to provide. If you proceeded with the assignment, this would be misleading to your employer.

You should consider the following courses of action:

- Tell the managing director that you do not have sufficient expertise in this area and the board should consider someone else who has.
- Ask for training in this area to then be in a position to advise the board.
- Offer to lead on the assignment but procure professional advice from other staff/ consultants with expertise in this area.

1.2 A digital asset is content that is stored electronically and provides value to the company. Types of digital assets include photos, audio-visual media, spreadsheets, word documents, websites, and Big Data, eg, information on customer behaviour. For Blues Ltd, its online streaming platform would be classified as a digital asset.

The valuation of digital assets becomes a particular issue when valuing technology companies since value is only generated if the assets are well managed. When valuing Blues Ltd, the directors of Rhythm Ltd will need to consider the operational efficiency of the online streaming platform.

The valuation of technology companies presents a number of challenges for the directors of Rhythm due to their unique characteristics. They often have no track record of profit and are managed by inexperienced management teams. The valuation is further complicated by periodic swings in stock market sentiment (herd behaviour) that may result in over-valuation of these companies.

2 Zappa Ltd

2.1

(a) In a buy-in, the managers who are doing the buying are not existing managers in the firm.

In a buy-out the managers work for the firm, usually in that part which is the subject of the sale.

(b) A sell-off involves selling part of a firm's business, perhaps to another firm, perhaps to the managers.

A spin-off involves dividing the operations of the existing firm into two (or, possibly, more) parts by creating a new firm (or firms) to take responsibility for the spun-off part.

Shareholders are given shares in this new firm (or firms) in proportion to their original

shareholding. Thus the shareholders own the same assets, but through two (or more) separate shareholdings.

1.2 Advantages and disadvantages of a management buy-out

Advantages	Disadvantages
Managers know and understand the business	Heavy debt burden and complicated financing packages due to the managers' inability to raise all the cash themselves
Managers are committed to its success	Loss of head office support and services

2.3**To:** Buy-out team of Zappa Ltd

From: An analyst

Date: Today

Subject: MBO financing scheme

Overview

The financing scheme involves the purchase of assets with a net book value of £2,250,000 for an agreed price of £2,500,000. The finance raised will provide funds of £2,850,000, made up as follows:

£'000

Ordinary shares	250
Preference shares	1,200
Loan	700
Overdraft	700
	2,850

Of the funds raised, only £350,000 will be available to the business after the purchase price has been paid. This will be in the form of unused overdraft facilities.

Gearing

As is common to MBOs the gearing level will be very high: (1,200 + 700 + 700)/250 = 1,040%

There is only £250,000 of equity compared with £2,600,000 of debt finance (including the preference shares and all of the overdraft). The gearing level will mean that the returns to equity will be risky, but the buy-out team owns 40% of a £2.5 million company for an investment of only £100,000. The rewards are potentially very high. Careful monitoring of cash flow will be vital.

One consequence of this level of gearing is that it will be difficult to raise any additional finance. There are unlikely to be any assets that are not secured, and the level of interest and loan repayments would probably prohibit further borrowing.

Cash commitments

The following is a summary of the annual cash commitments from the financing structure:

- Loan repayments

Annual repayments of capital and interest on the £700,000 loan will have to be made. The annual amount will be: £700,000/3.605* = £194,000

*The annuity factor for five years at 12%.

- **Redeemable cumulative preference shares**

The preference shares will require an average of £120,000 to be paid every year. There is a little flexibility, in that if the dividend cannot be met it can be postponed (but not avoided).

The redeemable preference shares will have to be repaid after ten years. This can be provided for over the ten years, or an alternative source of finance found to replace the funds. Assuming that they are to be provided for according to the terms of the financing package, this will require a further cash outflow of up to £120,000 per annum, depending upon the rate of interest on the sinking fund.

- **Overdraft**

The element of the overdraft used to finance the purchase price is effectively a source of long-term finance. The rate of interest is currently 12%; £350,000 drawn down will cost £42,000 per annum.

In total there will be a commitment to pay approximately £476,000 per annum. This will be the first priority of the new company. The management team will need to generate sufficient funds from the only available source – operations – in order to meet this commitment.

Other cash commitments

Apart from the need to generate cash to satisfy the elements of the financing package, the company will also need to generate funds to invest in working capital and non-current assets as required. At the moment these capital needs are unknown. In the context of 10% annual growth in revenue, however, they might exceed the unused element of the overdraft facility.

Institutional involvement

With 60% of the ordinary shares of the company, the financial institutions hold the controlling stake. They also hold all of the preference shares. They will be able to determine many aspects of the company's management, including the appointment of directors.

Institutional board representation is also probable.

The institutions are likely to have two overriding objectives:

(1) The security of loan and interest repayments

Any breach of the loan arrangements might trigger the appointment of administrators or receivers, and the investment of the institutions would almost certainly be lost.

(2) Realising their equity investments

The institutional investors will probably expect to realise their investment in a relatively short time frame. This is commonly set between five and seven years, and management need to make plans for an exit route, probably by planning a flotation at that time.

Profit growth

Apart from the need to generate cash as noted above, the company must also generate steady profit growth. The institutional investors will require a history of profit growth in order to dispose of their stake successfully.

Conclusion

The financing scheme will place a heavy cash burden on the company, particularly in the early years. The involvement of the institutions will perhaps prove unwelcome, but the MBO would be impossible without it.

1.4 Financing packages for service company MBOs

There are three main problems particular to arranging a finance package for a service company:

(1) The lack of tangible assets

Because MBOs normally have to be highly geared, there is a need to provide security for the loans. Service companies commonly have a very low level of tangible assets. It will therefore be difficult to attract debt finance. Mezzanine finance may be helpful.

(2) 'People' businesses

The success of service companies depends on their staff. Institutions tend to view such success with suspicion because people can resign. Unless the people in question are tied into the company by, for example, insisting on their investing in equity, there is little guarantee that they will stay with the company. Service contracts may be required.

(3) Working capital

The nature of most service companies is that they have unusually high working capital needs. The main expense for a service company is staff costs, who need to be paid

regularly. In addition, the supplies of service companies often involve a long period of work before customers can be billed. Consequently, a finance package will have to provide for the working capital: working capital finance is particularly risky because it is difficult to secure and may be difficult to raise.

3 Bigun plc

3.1 Report

To: The Directors, Bigun plc
From: Anna Liszt
Date: Today
Subject: Cost of possible acquisitions by Bigun plc

Terms of reference

The following report estimates the values of Klein plc and PTT Ltd.

Summary

The following table gives estimates of the possible equity values of the two companies.

Valuation basis	Klein plc	PTT Ltd
P/E ratio	£12.95m	£13.13m
Dividend valuation	£20.55m	£16.55m
Net asset value	£6.3m	£6.5m

Because these valuations are based on estimates, they must be seen as guides only and should be interpreted with reference to the assumptions lying behind their calculation. Details of the calculations are given in the appendix.

Klein plc

The P/E ratio approach for Klein plc is the best estimate of market value available because it is based on actual earnings and the observed P/E ratio. It will give actual market value at 31 March 20X2. Note, however, that the situation of Klein might have changed significantly since that date. The dividend valuation approach gives a higher valuation for Klein, but the assumption that investors expect past growth to continue into the future is questionable. It is not clear from the information supplied how the required return on equity was estimated, and this too will affect the valuation.

The asset valuation is of little worth, being based on historical book values with no indication being given of current values, goodwill, etc.

PTT Ltd

PTT is not a quoted company and therefore any estimate of its value will be somewhat subjective.

The dividend valuation is £16.55 million, but caution must be exercised due to the difficulty in estimating growth and the estimate of the required return on equity.

The P/E ratio approach needs caution, as the multiple of Klein plc (a quoted company) has been used. It is usually considered that non-quoted firms should have much lower P/E ratios, and a reduction of up to 50% on this valuation is possible.

For similar reasons as those given for Klein plc, the asset value of PTT Ltd is of limited use.

Conclusions

All of the above figures should be seen as educated guesses. The final price paid will depend on how much each party wishes to sell and how badly Bigun plc wishes to buy. The estimates of £12.95 million and £16.55 million for Klein and PTT respectively are probably the best guide but premiums of up to 25% on current market price are not uncommon, rising to 50% plus if the bid is contested.

Appendix

Klein plc

(1) **P/E ratio approach**

EPS × P/E ratio = Market value per share

$$\text{Current EPS} = \frac{(£1.5\text{m} - (£6\text{m} \times 11\%)) \times 0.83}{5\text{m shares}} = £0.13944$$

P/E ratio (given) = 18.6

Market price per share on historic EPS = £0.13944 × 18.6 = £2.59

Total value of Klein equity = £2.59 × 5m shares = £12.95m

(2) **Dividend valuation**

D0 = EPS × proportion paid out as dividend

= £0.13944 × 40%

+ £0.0558

$$P0 = \frac{D0(1 + g)}{}$$

$$\frac{}{ke-g}$$

= (0.0558 × 1.105)/(0.12 – 0.105)

= £4.11 per share

Therefore, total value = £4.11 × 5m

= £20.55m

PTT

(3) **Dividend valuation**

$$D0 = \frac{(£1.4m-(£5.5m \times 10\%)) \times 0.83 \times 0.75}{2.8m \text{ shares}}$$

= £0.189 per share

$$P0 = \frac{D0(1+g)}{ke-g}$$

= (0.189 × 1.095)/(0.13 – 0.095)

= £5.91 per share

Total value of PTT = £5.91 × 2.8m = £16.55m

(4) **P/E valuation – using P/E ratio for Klein plc**

$$EPS = £0.252 \text{ (that is } D0 \times \frac{1}{0.75} = 0.189 \times \frac{1}{0.75} = 0.252)$$

£0.252 × 18.6 = £4.69 per share

Total equity value of PTT Ltd = £4.69 × 2.8m

3.2 Use of EV/EBITDA to value PTT

We could use the EV/EBITDA multiple of Klein and/or Bigun to estimate an equity value for PTT, as the companies are in the same industry sector. Using the share price for Klein of £2.59 from the workings in Appendix (1) above we can estimate the value as follows:

EV =	**Klein**
Market capitalisation	£12.95m
+ market value of debentures = £6.6m	£19.55m
EBITDA of Klein = £1.5m + £0.5m =	2.0m
EV/EBITDA =	9.775
EV of PTT	£15.64m

with EBITDA of (£1.4m + £0.2m) = £1.6m

To find the EV/EBITDA multiple of Bigun, we first need to calculate its current share price:

Bigun

Calculation of share price:

Earnings per share = ((£10m – (£19m × 8%)) × 0.83)/34m shares

=	0.207
EPS × P/E ratio=	0.207 × 18.4
=	£3.81
Market capitalisation	£129.54m
Plus market value of net debt (£15.2m – £5m)	£139.74m
EBITDA of Bigun (£10m + £2m)	£12.00m
EV/EBITDA =	11.65
EV of PTT with EBITDA of £1.6m	£18.64m

From these EV figures, the market value of PTT's debt (£5.5 million) will need to be deducted to obtain an equity valuation, giving a range between £10.14 million and £13.14 million.

These figures are before any discount that might be made for the non-marketability of PTT's shares. If we were to apply say a 25% discount, this would give a range of values between £7.61 million and £9.86 million.

It should also be noted that care needs to be taken when using the EBITDA multiple of either Klein or Bigun when valuing PTT. These companies may be trading on higher or lower multiples than the average for the sector due to various market factors (growth expectations, management strength, forecast cashflows etc).

3.3 Terms to be offered by Bigun plc

The terms that may be offered partly depend upon the sum of money involved. Let us assume that both companies are bid for at a total cost of:

- £12.95 million for Klein (P/E method); plus
- £12.41 million for PTT (dividend valuation of £16.55 million, adjusted by 25% for non- marketability – this is also in line with the valuation suggested by the EV/EBITDA multiple); plus
- A 25% premium for Klein, say £3 million.

Making £28 million in total.

The following terms could be used.

A cash offer

This has the advantage that all parties are assured of the sum received. However, it could mean that the shareholders in the victim companies will have to pay capital gains tax almost immediately. Further, Bigun plc only has £5 million of cash, and borrowing or an equity issue would be required to raise the remainder.

A loan for share exchange

Bigun plc could offer to exchange loan stock in return for the shares of the victim companies. This would give the victim shareholders a fairly safe income stream and not expose them to immediate capital gains tax. It would, however, prevent them from participating in future profit growth and this might not be popular.

From the viewpoint of Bigun plc it would cause a significant increase in gearing which might be of concern to existing investors.

A share-for-share exchange

Bigun plc could offer to exchange new shares for the existing shares in Klein and PTT. At a current market price of £3.81 (EPS 20.70p ´ P/E ratio 18.4) and a bid of £28 million, this would require the issue of approximately 7.349 million shares.

The current equity earnings of Klein and PTT is as follows:

(PBIT – Interest on payables more than one year) × (1 – tax rate)

= [1.5m + 1.4m – (6.0 × 11%) – (5.5 × 10%)] × 0.83

= (2.9m – 1.21m) × 0.83

= £1,402,700

The current EPS of Bigun plc is 20.70p, whereas the incremental EPS on the new shares is: Currency equity earnings of Klein and PTT/7.349m shares

= £1,402,700/7,349,000

= 19.1p

This would result in a reduction in EPS (and possibly market value) of Bigun shares.

Overall each of the various packages presents problems. Bigun shareholders might not be happy with a cash offer because of liquidity problems, whereas the use of loan stock could drive gearing to an unacceptable level. An equity issue could result in a reduction in EPS, though much would depend upon the combined earnings of the three companies. A compromise solution often adopted would be to use a mixture of the above packages, for example a cash and equity offer.

4 Lafayette Ltd

4.1 Comment

There is clearly a big difference between the value per share arrived at on an asset basis and one based on earnings. The highest price is £2.14 but the purchaser may not be willing to accept this. It is based on the market value of the freehold property which presumably is needed by Lafayette in order to continue in business. It also includes a valuation for goodwill, an intangible asset. If the goodwill valuation is excluded, which might well be justified as the profits from Lafayette are falling and the property is kept at its balance sheet value, the asset basis shows the following valuation.

£'000

Property	10,000
Plant	20,000
Investments	7,500
Current assets	9,000
	46,500
Debentures, payables, preference shareholders, as before	17,500
	29,000

This is £1.45 per share, which is close to the price arrived at by the P/E ratio method and the price based upon an EV/EBITDA multiple. A price of £1.50 or £1.60 would appear to be a reasonable price, but in the negotiations Lafayette should start by asking for a higher figure, nearer to the £2 per share based on asset values under one set of assumptions, namely

break-up value (see below).

(a) Asset basis

Revalued assets:

	£'000	£'000
Goodwill	5,000	
Property (1.5m/0.08)	18,750	
Plant	20,000	
Investments	7,500	
Receivables	5,000	
Inventories	3,000	
Cash	1,000	
Less:		
Debenture payment	7,500	
Payables	6,000	
Assets of preference shareholders	4,000	
		60,250
		(17,500)
		42,750
Number of equity shares		20m
Price per share (£42.75m/20m)		2.14

(b) P/E ratio

Earnings per share (20X2)
= Earnings after tax and pref divs/Number of shares
= £3.4m/20m
= £0.17
Higher of the P/E ratios = 11.3
Note that the higher value of the two is used here, given the requirement that the directors are interested in the highest price possible.

	£
Suggested price = £0.17 × 11.3 =	1.92
Less reduction for non-marketability (25% say)	(0.48)
	1.44

Dividend yield

(Dividend 20X2 ÷ Number of shares) = (£1m ÷ 20m) = £0.05 Higher of the dividend yields = 4.9

(Again the higher value is used, with the directors interested in the highest price possible.)

	£
Suggested price = £0.05 ÷ 0.049	1.02
Less reduction for non-marketability (25%, say)	(0.26)
	0.76

(d) **EV/EBITDA**

Using the higher EV/EBITDA multiple of 8:

EBITDA of Lafayette = £5,337,349 + £750,000 = £6,087,349

£6,087,349 × 8 = EV of £48,698,792

Less market value of net debt (£7.5m + £4m – £1m) = £38,198,792

Price per share = £38,198,792/20m shares = £1.91

Less reduction for marketability (25%, say) = £1.43

4.2 Lowest price at which the directors should sell

The earnings-based figures calculated in 4.1 above are calculated using market ratios from similar quoted companies, adjusted to reflect the non-marketability of Lafayette shares. The earnings figures used are the 20X2 figures. However, a potential purchaser will be interested in future maintainable earnings and the experience of the last three years suggests these may continue to fall. Any earnings-based share price is therefore likely to be lower than those calculated above.

In view of the low earnings-based valuations and the higher asset-based valuation, the directors of Lafayette would be advised to consider the break-up value of the business as the lowest possible price. As the directors wish to receive cash for their shares – that is, realise their investment – it may be better to sell off the assets rather than sell the business as a going concern.

Further work is required to ascertain the net break-up value of the business after disposal costs and taxation (for example, what is the disposal value of the plant and machinery?) but this figure should be regarded as the 'worst case scenario' for the directors and, therefore, the lowest figure they should be prepared to accept.

4.3 For several decades leading up to the early 1980s there was rapid growth in the size of many companies. The perceived benefits of economies of scale and servicing an expanding global market fuelled this growth.

However, the recession of the 1980s and the rapid change of consumer preferences led to a need for firms that serviced 'niche' markets. These firms were able to change quickly with consumer desires. Consumers often sought high quality and innovation rather than high volume. This cultural change from large to small enterprises servicing specialised rather than general markets has probably been the major factor in the growth of management buyouts.

Other contributing factors to this increase can be considered from the viewpoint of the company that is selling and the management team that is buying.

Vendors

If the company to be sold is part of a group, the following benefits can arise:

- Divestment of an area of business that is peripheral to its main business or no longer fits its overall corporate objectives
- Cash flow benefits from the disposal – for reinvestment in other, more suitable, areas or to reduce overall corporate borrowing

If the company to be sold is privately owned:

- Realising capital locked up in the business either on retirement, death or lack of successors
- The disposal to a trusted team who will maintain the firm with the same identity and should minimise any redundancies that result from the sale

In general terms the sale to a known team should minimise any risk of disruption to client relationships and confidential information.

Lastly the vendors may have no choice but to sell to the managers if no other purchaser is available.

Management team

Reasons for planning a buyout may include the following:

- A wish to share more directly in the success of the business
- Freedom from constraints on decision-making and strategic planning
- As an alternative to expected redundancy
- Opportunity to continue to use skills in a changing business environment
- The apparent success of other buyouts leading to flotation on the AIM

The most recent cases of management buyouts are predominantly divestments by a parent company of areas of business that no longer suit the overall corporate strategy.

Reasons for lenders allowing high gearing ratios

Any lender is concerned with risk and return. In a buyout situation, high debt to equity ratios of 5 to 1 are not uncommon. In many buyouts, the confidence of the financiers in the ability of the management team has been a major factor in determining the high levels of gearing that are commonly seen.

The degree of gearing will be limited by the company's forecast ability to pay capital and interest on loans. Some security for these loans will also be sought, both on the assets of the business and with personal guarantees from the buy-out team. It is not unusual for financiers to seek the assignment of life assurance policies. The security may be enhanced by taking an equity stake in the business, and exercising some direct management control.

The major concerns for the providers of finance can be summarised as follows:

- What is the nature and condition of the company's assets?
- What is the expected cash flow and profitability?
- Will the high gearing be reduced within a reasonable amount of time (three to five years)?
- Are there any taxation benefits accruing from underutilisation of debt capacity?

5 Jodocus plc

5.1 Increase in existing shareholders' wealth

Value of extra earnings = PV of earnings post-tax at discount rate appropriate to business risk Extra value to Jodocus

= (£1.8m × 0.83)/0.2

= £7.47m

(1) Purchase of Victim's shares

New market price per share = (£20m + £7.47m – £5.3m)/1m

= £22.17

Increase in wealth for Jodocus shareholders = £2.17 per share

(2) Share exchange

New market price per share = (£20m + £7.47m)/(1m + 0.3m)

= £21.13

Increase in wealth for Jodocus shareholders = £1.13 per share

5.2 Practical problems of valuation models and private companies

The valuation model used to value a private company will depend on whether a minority holding or majority holding is to be valued. A minority shareholding may be valued by using a dividend growth model where the market value of equity is assumed to be

$$P0 = \frac{d0(1+g)}{(ke-g)}$$

A simpler approach using conventional views of dividend yield might be appropriate. The practical problem arises in attempting to estimate g and k_e. The anticipated annual future growth rate may be estimated by past growth or using the earnings retention model.

A company's cost of equity may be estimated using a quoted company with the same capital structure in the same business risk class. However, in practice some adjustment should be made for the increased risk in investing in a private company as it will tend to be smaller and less diversified. The same problems arise in the necessary adjustment to the dividend yield of a quoted company.

In valuing a majority holding, a number of different models reflecting control of dividend policy and/or assets can be used, including basing the value of a company's equity on the present value of the future earnings stream. Problems arise in estimating growth in earnings and estimating a discount rate to reflect the risk of those earnings.

A similar quoted company's current earnings yield or price earnings ratio may be applied to the company's current earnings. However again an adjustment should be made to reflect the lower marketability of the shares. An acquiring company will also need to consider any synergistic benefits that may arise.

Problems arise in using asset-based value. Balance sheet values are based on historical costs and are unlikely to be useful. Service companies have relatively small investments in tangible assets, and it would be inappropriate to apply an asset-based value as this does not reflect any goodwill. The net realisable value could be used for a company as a guide to a minimum price, particularly if the company were in financial difficulty and unable to continue in its own right.

Inevitably a range of different models will give different valuations, and it is always a process of negotiation between the minimum the target will accept and the maximum the acquirer will pay. Part of that process of negotiation will involve determining the purchase consideration.

For instance, in a takeover where the consideration may be mainly for cash or loan stock, the target company's shareholders will have no control of the business. However, in a merger, both companies' shareholders will continue to be involved in the company's operations and may place a different value on their holdings.

6 Highgate plc

6.1

=NPV(0.08,B9:E9)

	A	B	C	D	E	F
1	**Year**	**1**	**2**	**3**	**4**	**5+**
2		£m	£m	£m	£m	£m
3	Sales (W)	605.0	653.4	686.1	706.7	
4	Operating profit	60.5	78.4	82.3	84.8	

	A	B	C	D	E	F
5	Tax	(10.3)	(13.3)	(14.0)	(14.4)	
6	Operating cash flow	50.2	65.1	68.3	70.4	
7	Incr. non-current asset expense (W)	8.7	(1.9)	(0.7)	(0.4)	
8	Incr. working capital investment (W)	(2.2)	(1.5)	(0.7)	(0.4)	
9	Free cash flow	56.7	61.7	66.9	69.6	904.8
10	NPV function for Years 1–4 @8%	209.66				
11	PV of year 5 + (904.8 × 0.735)					665.0

Total present value = £874.7m (209.66 + 665) Value of equity = £874.7m – £225m = £649.7mValue per share = £649.7m/50m = £12.99WORKING

SVA

Year	**0**	**1**	**2**	**3**	**4**
Sales (increasing at given rates)	£m 550.0	£m 605.0	£m 653.4	£m 686.1	£m 706.7
Sales increase		55.0	48.4	32.7	20.6
Incr. non-current asset expense		3.3	1.9	0.7	0.4
Non-current asset sale in year 1		(12.0)			
Total		(8.7)	1.9	0.7	0.4
Incr. working capital investment		2.2	1.5	0.7	0.4

6.2

Valuation method	Application to technology company like Highgate
Asset	The asset method is not easy to apply because the value of capital in terms of tangible assets for an online retailer may not be high. Most of the investment is likely to be in people, digital assets, marketing and/or intellectual rights that are not capitalised as assets. Value could be assessed by estimating how much it would cost for an investor to create the assets of the company from scratch. However, such approaches would not capture the value resulting from the potential future growth, which is likely to represent the main part Highgate's value.

Earnings	Highgate's sales and profits are predicted to grow at a substantial rate. The use of current year earnings of £10 million to value the company will therefore not be appropriate. It will also be difficult to find a company with similar risk profile to Highgate, however the PE ratio of a company like Amazon could be used to attach an approximate value.
Dividend	Highgate cannot currently pay dividends and intends to operate a residual dividend policy in future. Dividends are therefore not payable for the next six years and will be difficult to forecast thereafter especially if Highgate is able to continue to grow at a substantial rate in which case it will retain cash flow to fund its future growth. This method is therefore not appropriate.
DCF	Despite the problems with estimating future cash flows, the DCF approach is likely to be the most valid approach for Highgate. Revenue growth prospects and margins could be estimated through the use of predictive analytics or by comparing companies that have a similar business model (eg, Amazon). Different scenarios can be created and analysed using techniques such as simulation. Cash flows should be discounted at a risk-adjusted cost of capital.

7 Megagreat plc

7.1 Evaluation of a takeover offer

Value of an Angelic plc (A plc) share (P0) $= D1/(ke-g)$

$= 0.37/(0.12-0.05)$

$= £5.29$

Value of a Megagreat plc (M plc) share $= \frac{0.43}{1.11} + \frac{0.43}{1.11^2} + \left(\frac{0.43(1.07)}{0.11-0.07}\right)\frac{1}{1.11^2}$

$= £10.07$

The holder of one A plc share will receive $\frac{£6 + (3 \times £10.07)}{4} = £9.05$

Therefore, accept the bid.

7.2 Discussion of the limitations of the calculations in 7.1 as the basis of a decision

Possible reasons include the following:

- Lack of confidence in the estimates on which the calculations are based.
- Unwillingness on the part of A plc shareholders to hold M plc shares – dividend policy, level of capital gearing etc, and the cost of share dealing charges when selling M plc shares.
- A plc shareholders may not be happy with the different risk profile of M plc.

- The cash payment may not be appealing to A plc shareholders because of potential capital gains tax.

7.3 Suggestions on how a target company's share price would tend to move when a takeover offer is announced

If the market were to accept the estimates, believing that the bid would be successful and disregarding the factors in 7.2, A plc's share price would tend immediately to move to £9.05.

If the market were to believe that M plc would have to increase its bid, the price would tend to rise to more than £9.05.

If the market were to believe that the bid would be unsuccessful, the A plc share price would tend to remain at its present level.

Changes in market perceptions during the bid period may cause the share price to move.

7.4 Suggestions for strategies for growth without making takeovers

Alternatively, growth could be achieved organically by undertaking internally-generated projects, perhaps using retained earnings.

Another growth strategy might be to 'buy-in' parts of other businesses without going for a full takeover. Buy-ins tend to involve only assets, whereas takeovers involve the whole of the business.

8 Pinky and Perky

8.1 Existing share price of Pinky plc

$g = r \times br = 15\%$

$b = 20\%$

$g = 0.15 \times 0.2 = 0.03$

Ex-dividend market value = Next year's dividend/(k_e – g)

= (650,000 × 0.8 × 1.03)/(0.21 – 0.03)

= £2,975,556

= 59.5p per share

Existing share price of Perky plc

$g = r \times b$

$= 0.15 \times 0.8$

$= 0.12$

Ex-dividend market value = Next year's dividend/(k_e – g)

= (24,000 × 0.2 × 1.12)/(0.24 – 0.12)

= £448,000

= 29.9p per share

8.2 Value of Pinky plc after the takeover

Care must be taken in calculating next year's dividend and the subsequent growth rate. Next year's earnings are already determined, because both companies have already reinvested their retained earnings at the current rate of return. In addition, they will get cost savings of £85,000.

The dividend actually paid out at the end of next year will be determined by the new 35% retention, and the future growth rate will take into account the increased return on new investment.

Growth rate for combined firm, g = 0.17 × 0.35

= 0.06

New cost of equity = 20%

Next year's earnings = 650,000 × 1.03 + 240,000 × 1.12 + 85,000

= £1,023,300

Next year's dividend = £1,023,300 × 0.65

= £665,145

Market value = 665,145 / (0.2 – 0.06)

= £4,751,036

8.3 Maximum Pinky plc should pay for Perky plc

Combined value = £4,751,036

Present value of Pinky plc= £2,975,556Increase in value = £1,775,480

8.4 Reasons for one company to buy another

- Buying another company can be a way of investing in a set of projects which are already up and running, allowing instant access to the new market.
- Economies of scale can occur if the companies are in the same field, such as in reduced advertising and marketing, reduced sales teams, combined R&D, etc. They can also occur even if businesses are completely different, with combining administrative functions such as the accounts department, human resources, and the use of buildings and other fixed assets.
- To buy out a competitor and thus increase market share, while possibly being in a position to increase prices.
- A cash-rich company might buy a business (often small owner-managed) which has good ideas for products/projects but lacks the resources to develop them.
- To buy in expertise and goodwill.
- To increase geographical coverage. It is often cheaper and more efficient to buy a company in the area into which you want to expand rather than set up for yourself.
- Acquisition of assets (especially intangibles which are difficult to generate).
- Diversification
- Tax reasons
- To acquire new technology
- A larger company has increased borrowing powers.

Chapter 9
Managing financial risk: interest rate and other risks

Introduction

Learning outcomes

Students will be able to identify the main price and overseas trading risks facing a business and the principal methods of managing those risks.

This will involve being able to:

- identify and describe the key price risks facing a business in a given scenario;
- explain how financial instruments (eg, derivatives, hedging instruments) can be used to manage price risks and describe the characteristics of those instruments;
- discuss different methods of managing interest rate risk appropriate to a given situation, perform calculations to determine the cost of hedging that risk and select the most suitable method of hedging; and
- discuss different methods of managing share price risk, perform calculations to determine the cost of hedging that risk and select the most suitable method of hedging.

Syllabus links

This topic complements the foreign exchange hedging in the next chapter. These hedging techniques will be further developed and applied at Advanced Level.

Examination context

Some of the risks facing a business derive from the possibility of future price changes, such as changes to exchange rates, interest rates and commodity prices. Interest rate movements create risks for companies with interest-paying liabilities or interest-earning assets. Hedges available include forward rate agreements (FRAs), futures, options and swaps.
Traded interest rate options, and their advantages and disadvantages, may be examined.
Other techniques for hedging interest rates are regularly examined.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**Introduction to derivatives** As derivatives markets become better developed, more and more businesses are using them to manage their risks (ie, hedging). Some of these techniques are now available in the retail market, for example, capped mortgages.	**Approach** Chapter 9 covers a fairly technical topic. Ensure you work through the examples thoroughly to understand how the hedges work. This topic complements the foreign exchange hedging in the next chapter. Use the self-test and interactive questions to practise the techniques.	In the exam you are likely to be asked to explain how derivatives provide a hedge against risks. This will involve being able to explain how financial instruments (eg, derivatives, hedging instruments) can be used to manage price risks and describe the characteristics of those instruments. You may have to illustrate the use of these instruments with (non-complex) calculations.	
2	**Forwards and futures** As the use of complex financial derivatives becomes more widespread, it is increasingly likely that an accountant – viewed as a financial expert and/or financial adviser in the public eye – should be aware of their main characteristics. In order to report on hedging techniques or to comment on how they are reported in financial statements, it is important to have an understanding of how hedging transactions work. To introduce the area of hedging risk, this section considers a simple instrument known as a forward contract and then moves on to consider derivatives – starting with futures contracts.	**Approach** Make sure you understand how a forward contract and a future work. Go through the detailed worked examples on commodity forwards and futures carefully as this will help you to understand them in more detail. **Stop and think** What are the main differences between a forward contract and a future?	A basic understanding of commodity hedging will help you to apply the concepts to other forms of hedging covered in later sections. The section on index futures is more important and is frequently examined.	

Topic	Practical significance	Study approach	Exam approach	Interactive questions
3	**Options** This section introduces the basics of an option contract by considering share options. An option gives its holder the right, but not the obligation, to buy or sell an item on or before a future date, at a fixed price.	**Approach** There is lots of new terminology in this section that your will use when applying both interest rate and currency hedging. Take your time working through each area making sure that you fully understand each of the new terms introduced. **Stop and think** Do you know the difference between a put option and a call option?	In the exam you could be asked to explain or apply different methods of managing risk. The terminology introduced here will be very important as part of this.	**IQ1: Impact of a put option** This question looks at quantifying the impact of purchasing on a put option on a share. It is a good introduction to show how option contracts work.
4	**Interest rate risk** Interest rate movements create risks for companies with interest-paying liabilities or interest-earning assets. Hedges available include forward rate agreements (FRAs), futures, options and swaps. FRAs are introduced in this section.	**Approach** FRAs are an important hedging strategy. Work carefully through section 4.5 and 4.6, paying particular attention to the worked example. **Stop and think** Do you know how to interpret the term '3-9' FRA?	In the exam you could be asked to explain different methods of managing interest rate risk appropriate to a given situation and perform non-complex calculations to determine the cost of hedging that risk.	

Topic	Practical significance	Study approach	Exam approach	Interactive questions
5	**Interest rate futures** Interest rate futures are similar in effect to FRAs, except that the terms, amounts and periods are **standardised**. Interest rate futures contracts are traded on a futures exchange.	**Approach** Work carefully though the worked examples as the knowledge gained here will help you with currency futures in the next chapter. **Stop and think** If you commit to **sell** an interest rate future will that commitment mean that you pay or receive interest?	Interest rate futures are popular in the exam. Make sure you can explain how they work and illustrate how they work with non-complex calculations.	**IQ3: Interest rate hedge using futures** This is a good question to practice using the standard steps for tackling a question on interest rate futures.
6	**Interest rate options** Interest rate options allow an organisation to limit its exposure to adverse interest rate movements, while allowing it to take advantage of favourable interest rate movements.	**Approach** The worked example on interest rate options is important. Work carefully through each of the steps. **Stop and think** What are the five points you should note when setting up an option (ie, Step 1)?	Interest rate options are popular in the exam. Make sure you can explain how they work and illustrate how they work with non- complex calculations.	
7	**Interest rate swaps** Interest rate swaps can be used to hedge an exposure to changes in interest rates over a long period of time. They can also be used to change the nature of borrowing from fixed to floating and vice versa.	**Approach** It is important that you understand how swaps work. This is explained in section 7.2.2. Work carefully through each of the worked examples before tackling the interactive questions. **Stop and think** What are the risks associated with swaps?	In the exam you could be asked to demonstrate how an interest rate swap is implemented and calculate the net cost of entering into an interest rate swap.	**IQ6: Practice creating a swap** This question allows you to practice creating a swap that will benefit both parties.

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1 Introduction to derivatives

Section overview

- A derivative is a financial instrument whose value derives from an underlying financial item, for example an option on a share.
- A futures contract is a standardised exchange-traded contract to buy or sell a specific amount of a notional underlying financial item on a certain date.
- Futures fix a price for buying or selling whereas options provide a maximum or a minimum price.
- Futures and options can be used for hedging or for speculation.

1.1 Exploring risk

Risk and the impact it has on investment appraisal was explored in Chapter 3. In this chapter and the next we explore what can be done about protecting investors.

Where does it come from?	The risk facing any business comes from a variety of factors, such as customer demand, rivals' actions, the economic environment, social and demographic conditions, technological change, cost structures etc. Many of these strategic risks are explored in more depth in **Business Strategy & Technology.** Some of the risks facing a business derive from the possibility of future price changes, such as changes interest rates, exchange rates and commodity prices. This chapter and the one that follows considers these financial risks and how they can be managed.
Impact on investors	Many of the above influences will cause profits to alter, and therefore share prices to change, resulting in risks ultimately being borne by investors.

The purpose of hedging is to remove or reduce price risk. A range of hedging devices exists to address risks – this chapter will explore price risks associated with shares, commodities and interest rates.

The next chapter looks at currency risk.

Definition

Derivative: A financial derivative is a financial instrument whose value is derived from the value and characteristics of an underlying financial item. Option contracts, futures and swaps are types of derivative.

2 Forwards and futures

Section overview

Forward contracts allow a price to be set in advance.

- Futures can also be used as a hedge, to provide a fixed price.
- Futures are available on commodities, shares, currencies and interest rates.
- Futures are standardised exchange-traded contracts.

To help introduce the area of hedging risk, and before we move on to derivatives themselves, consider a simple instrument known as a forward contract.

2.1 Forwards

Definition

Forward contract: A binding agreement to buy or sell an item for settlement at a future date, at a price agreed today.

Forward contracts allow businesses to set the price of an item well in advance, although usually not more than several months ahead. They are particularly suitable in commodity markets such as gold, oil and agriculture where prices can be highly volatile and in currency markets (discussed in the next chapter).

Context example: Commodity forward contract

A manufacturer of chocolate needs to purchase a quantity of cocoa beans for future production in three months' time and wants to fix a price for them now.

The manufacturer can achieve this by agreeing with a producer of cocoa beans to purchase a specified quantity for delivery at a specific date in the future at a price agreed now.

In January, when the price of a consignment of cocoa beans is £1,000, the chocolate manufacturer agrees a price with the supplier of £1,100 for delivery at the end of March.

The price for both parties is now set – and thus whilst the market price in March may be higher or lower than the agreed price of £1,100, the benefit for both parties is that they have certainty, and so are better able to plan and budget effectively.

Commodity forward contracts are tailor-made between two parties: the terms of a contract are agreed between the two parties, which means that forwards are non-standard. Each contract is different as to amount, settlement date and so on. They are 'over-the-counter' contracts and are not dealt on any exchange.

As a contract, they are binding on both parties. Whilst this is useful as a means of giving each party what they want (certainty about price), they are difficult for one party to cancel because agreement is needed from the counterparty. This is one of the reasons why a futures contract may be preferred to a forward contract – see section 2.2 below. Nevertheless, forward markets for some commodities flourish, and the forward market in foreign exchange is also extremely large. This is explored in Chapter 10.

2.2 Futures

Futures contracts are similar to forward contracts and can be used to fix a price for buying or selling an item at a future date. However, there are some significant differences between futures and forwards.

Definition

Future: A future is a **standardised contract** to **buy** or **sell** a **specific amount** of a commodity, currency or financial instrument at an **agreed price** on a **stipulated future date**.

Futures are bought and sold on specialist futures exchanges. Each futures exchange trades different types of futures contract. The standard specification for each contract and the stipulated settlement date for a contract are determined by the exchange.

Features of futures contracts

When two parties agree to buy/sell a quantity of a futures contract, they both open a position in the futures.

A futures contract fixes the price for buying and selling. The price is agreed between buyer and seller. Prices at which contracts are made will vary up or down over time, up to the settlement date for the contract.

- If someone buys futures (not having traded in the futures contract before), they open a long position in futures contract.
- Someone can sell futures contracts without previously having bought any of them. The seller opens a short position.
- For every futures contract, the number of futures in long positions is always equal to the number of futures in short positions.

  Each futures contract has a final settlement date. Typically, contracts are traded for settlement dates in March, June, September and December. Anyone with an open position (long or short) at the settlement date must buy or sell the underlying item at the agreed contract price.

  However, anyone can close their futures position at any time before settlement date for the contract.
- For example, the holder of a long position in 200 June short-term interest rate futures can close this position by selling 200 June futures at any time before settlement date in June. On closing the position, there is a gain or loss, equal to the difference between the original purchase price for the contracts and the selling price obtained for selling the futures.
- Similarly, the holder of a short position in 100 September bond futures can close this position by buying 100 September futures at any time before settlement date in September. On closing the position, there is a gain or loss, equal to the difference between the original selling price for the contracts and the price obtained for buying the futures to close the position.

In practice, most positions in futures are closed before the settlement date for the contract.

The futures exchange guarantees performance of all futures contracts and so protects everyone with a short or long futures position against default by the counterparty. (It

does this by taking deposits ('margin') from everyone holding a position in futures, and by becoming the legal counterparty to every futures contract. However, the mechanics of margin are not relevant to the examination.)

Context example: Commodity futures

1 January

(a) On 1 January the market price (the spot price) of cocoa beans is £1,000 per tonne in the cocoa market.

(b) You know that you will want to buy a consignment of cocoa beans on 31 March, but you are concerned about what the price will be in three months' time. You decide to hedge your exposure to the price risk in the commodity futures market.

(c) You buy separately on a futures market a number of three-month cocoa futures contracts at

£1,100 that expire on 31 March. The contracts are standardised, so you buy as many standard contracts that you need to make up the total consignment of cocoa that you will want to buy. Through your intermediary on the futures exchange, you are able to buy the futures contracts at a price of £1,100. This means you are committing to buying a consignment of cocoa beans, not at today's spot price, but at the futures price of £1,100 per tonne, which represents what the futures market thinks the spot price will be on 31 March.

31 March

(a) You buy the consignment of cocoa beans on 31 March from the cocoa market. At this date the spot price is £1,200 per tonne, so you buy the cocoa beans at £1,200.

(b) The futures contract in cocoa beans is not settled by the physical exchange of cocoa for cash. Instead, it is settled for cash difference: this is the difference between the original price for buying the futures in January and the closing settlement price on the futures exchange at the end of March.

(c) The closing settlement price on the futures exchange will be the spot market price at that date,

£1,200. So you will sell your futures contracts for £1,200, having bought them for £1,100. You will make a gain of £100 per tonne.

(d) The gain on the futures position of £100 per tonne can be set against the spot purchase you made in the cocoa market.

Net cost = £1,200 – £100 = £1,100

This means that the effective net price that you have paid for the cocoa is the £1,100 price that you contracted in January, when you opened your futures position.

A summary of the transactions is as follows:

Prices on the cocoa market		Prices on the futures market	
1 January: prevailing price (the spot price)	£1,000	Price for buying cocoa for March delivery	£1,100
31 March: prevailing price (the spot price)	£1,200	Price for selling cocoa for March delivery	£1,200
Increase in cost of cocoa in cocoa market	£200	Gain from trading futures contracts	£100

As noted above, the increase in the cost of cocoa has been hedged by the trading carried out on the futures market. These are two separate markets – the cocoa market is involved with buying and selling physical consignments of cocoa. The futures market is not: with futures you are trading in the price of the item, **not the item itself.** Notice that on the futures market no physical delivery has taken place. Rather, the opening contract to buy in March has been cancelled by an opposing contract to sell in March.

- The net effect of these is:
- Buy the cocoa in the cocoa market for £1,200
- Take the gain on the futures market £100

Overall cost of the cocoa £1,100

In this example, you wanted to buy the cocoa at exactly the same date that the futures contract reached its settlement date. If instead you had wanted to buy the cocoa at the end of February, not the end of March, you would have opened a position by purchasing cocoa futures on 1 January at

£1,100 and you would have closed your position by selling the same number of March futures contracts at the end of February. Your gain or loss on futures trading would be the difference between the original buying price (£1,100 per tonne) and whatever price you are able to sell the futures for at the end of February.

2.3 The development of futures contracts

- **Futures** are derivatives which have their origins in the markets for commodities such as wheat, coffee, sugar, meat, oil, base metals and precious metals.
- The prices of all of these commodities fluctuate **seasonally** and are also subject to large changes because of unpredictable events such as storms, drought, wars and political unrest.

To avoid the uncertainty arising from large swings in prices, buyers and sellers of these commodities would **agree quantities** and **prices in advance** ie, a forward contract. This encourages investment in production and benefits buyers and sellers alike by enabling them to plan in advance.

Originally the buyer and seller would agree a **forward** price for settlement by **actual** delivery of an agreed amount of the commodity on an agreed date. As a protection against defaulting on the deal, both parties would put down a deposit.

However, the commodity futures markets developed rapidly when the contracts were **standardised** in terms of **delivery date** and **quantity** (and quality, in the case of commodity futures). This enabled the futures contracts to be traded purely on the basis of price, like shares on a stock exchange and this separates the futures market from the physical commodity market.

The London International Financial Futures and Options Exchange (LIFFE) was set up in 1982, and in 2002 became part of Euronext to form Euronext.Liffe. This in turn was acquired by the New York Stock Exchange in 2007 to form the NYSE Euronext group, and LIFFE is now referred to as NYSE Liffe. The largest group of futures exchanges in the world is owned and operated by CME Group Inc (Chicago Mercantile Exchange).

Traditionally, derivatives have been used to hedge market price risk. For example, currencies, interest rates, commodity, and share prices all change. Those changes can be hedged against by using the various hedges outlined above.

2.4 Index futures

Index futures are futures contracts on a portfolio of shares represented by a stock market index.

These can be used to protect investors against future falls in the value of a portfolio of shares. They can be of real importance to organisations with significant investments, such as pension funds.

There are futures on the FTSE100 share index. The **transaction costs** of investing in these futures are much less than the costs of actually selling and buying the underlying shares. Buying or selling futures is an alternative to adjusting a share portfolio, which may not be appealing because of the time and cost involved.

Each FTSE100 index futures **contract** is for a notional value of the futures price multiplied by £10. Thus, if the FTSE index futures price stands at 6,700, the notional value of a contract is £67,000.

Index futures can be useful to an investor in a number of ways, either for **speculative purposes** or as a

'hedge' against risk of adverse movements in stock market prices generally.

Index futures are used by speculators because it is possible to take a very large position in share prices for a relatively small cost. With futures, there is a deposit to pay ('margin') for having an open or closed position, but the cost is much less than buying the underlying shares themselves. The speculator hopes to make a big profit from a favourable movement in the stock market index for a relatively small investment.

Worked example: Using index futures to set up a portfolio hedge

The investment manager of Moonstar Pensions Fund is concerned that share prices will fall over the next month and wishes to hedge against this using FTSE100 June stock index futures. The fund's pension portfolio comprises investments which have a market value of £7 million on 1 June 20X3.

On 1 June 20X3 the following prices are observed:

The prevailing value (ie, spot value) of the FTSE100 index is 7,000. The price quote for June FTSE100 index futures is 6,970.

The face value of a FTSE100 index contract is £10 per index point.

Using the futures price of the FTSE100 index, this gives a contract value of 6,970 × £10 = £69,700

Requirement

Demonstrate what hedge should be undertaken to protect the portfolio against falls in share prices.

Solution

Calculate number of contracts

We should **sell** futures to protect the value of the portfolio.

If the stock market index falls, the fund manager will make a profit by closing the futures position and buying futures at a lower price than the original selling price. The gain on the futures position will offset the loss incurred from the fall in the stock market index (and so a

fall in the value of shares in the pension fund's portfolio).

Number of contracts = Market value of portfolio / Value of one contract

= £7,000,000/£69,700

= 100.4 rounded to 100 contracts

We can assess the results of the hedge by examining the position at a later date.

Worked example: How index futures provide a hedge if the market falls

On 30 June 20X3, the settlement date for the June futures contract, the FTSE100 index and the futures settlement price were both 6,700. The market value of the shares in the portfolio changed exactly in line with the change in the index ie, (6700/7000) × £7,000,000 = £6.7 million.

Requirement

Calculate the outcome of the hedge that Moonstar has undertaken.

Solution

Step 1 Position in spot market

Loss on portfolio = £6.7 million – £7 million

= £0.30 million

Step 2 Calculate gain or loss on futures

Buy futures at lower price than we sold them for (closing out). The price to close out the position is 6,700.

Gain on futures = (6,970 – 6,700) × £10 × 100 contracts

= £270,000

Step 3 Calculate net position

Net position = £270,000 gain on futures – £300,000 loss on share portfolio

= £(30,000) loss overall

Note: The hedge is less than 100% efficient because of basis (ie, the 1 June FTSE index value and the futures price on 1 June are different) and the rounding of the number of contracts. See section 2.6 below.

Worked example: The impact of hedging if the market rises

Suppose in the previous example that on 30 June 20X3, the market value of the shares in the portfolio was £7.2 million.

The FTSE100 index and the index futures settlement price were both 7,200 on that date.

Requirement

Explain what happens as a consequence of the hedge.

Solution

Step 1 Position in spot market

Gain on portfolio = £7.2million – £7 million = £0.2 million

Step 2 Calculate gain or loss on futures

Initially sold futures for: 6,970

Now buy futures for: 7,200

Loss on closing out futures: (230) × £10 × 100 contracts = £230,000

Step 3 Calculate net position

Net position: 200,000 gain on portfolio

(230,000) loss on futures

£(30,000) loss overall

2.5 The impact of a futures hedge

The objective of a futures hedge is to remove price risk by fixing the price in advance. The benefit is that downside risk is eliminated; the disadvantage is that any upside is also removed.

To summarise the above worked examples:

	If market rises	If market falls
Value of portfolio	7,200,000	6,700,000
Gain (loss) on futures market	(230,000)	270,000
Net effect	£6,970,000	£6,970,000

In each situation, the value of the portfolio stays more or less the same, close to the £7 million value when the futures position was opened. The hedge is not 100% efficient.

2.6 The main elements of futures transactions

The contract size	The **contract size** is the fixed quantity which can be bought or sold with one futures contract. Dealing on futures markets must be in a whole number of contracts. The implication of this is that the amount of an exposure and the amount covered by a futures hedge may not match exactly.

The contract price	The **contract price** is the price at which the futures contract is bought or sold. Prices for futures change continually, which means that holders of positions in futures will make a gain or loss on their position when they eventually close it. The gain or loss on a position is the difference between the original buying or selling price to open the position and the price obtained to close it at a later date (or to settle the contract at the settlement date).
The settlement date	The **settlement date** (or delivery date, or expiry date) is the date when trading on a particular futures contract stops and all accounts are settled. For example, the settlement dates for all currency futures are at the end of March, June, September and December.
The initial margin	When futures contracts are bought or sold, a **deposit** known as the **initial margin** must be paid to the futures exchange. The size of this margin depends on the futures contract but may typically amount to about 5% of the value of contracts dealt in. This deposit is refunded when the contract is closed out. The objective of the initial margin is to cover any possible losses made from the first day's trading. Thereafter, any variations in the contract price are covered by a **variation** margin. Profits are advanced to the trader's account but losses must be covered by advancing further margin. This process is known as **marking to market**.
Basis	The price of a futures contract will normally be different from the spot price on any given date. This difference is called the **basis**. The exception is on the settlement date for the contract date, when the basis is zero (because the exchange settlement price and the spot market price are the same on this date). **Basis** = spot price – futures price The effect of basis is to **prevent** hedges from being 100% efficient, and the change in the spot **over a period** is not matched exactly by the change in the futures price. This means that there is basis risk for anyone hedging a position with futures. You will not be asked to calculate basis in the examination, but just to recognise that it causes hedges to be less than 100% efficient.
Hedge efficiency	The only risk to hedgers is that the futures market does not always provide a perfect hedge. (a) The first reason is that the value of the commodity being hedged (whether it is shares, currency or interest) must be **rounded to a whole number of contracts**, causing inaccuracies. (b) The second reason is **basis risk** as noted above. A measure of **hedge efficiency** compares the profit made on the futures market with the loss made on the cash or commodity market, or vice versa.

Professional skills focus: Concluding, recommending and communicating

You are expected to be able to make evidence-based recommendations which can be justified by reference to supporting data and other information. A recommended hedging strategy must therefore be based on the information provided in the question, and your analysis of this.

3 Options

Section overview

- An option gives its holder the right, but not the obligation, to buy or sell an item on or before a future date, at a fixed price.
- An option is bought by the option holder from an option seller (option writer) and the purchase price is called the option premium.
- Options can be exchange-traded options or over-the-counter (OTC) options.
- Traded options are standardised.
- Options have an intrinsic value and a time value.
- The option premium should reflect the time value and intrinsic value of the option at the time of its purchase. The value of an option then changes in the period up to its expiry/ exercise.

3.1 The nature of an option

Definition

Option: An agreement giving the buyer of the option the **right, but not the obligation,** to buy or to sell a specific quantity of an item (such as a quantity of shares in a company, a quantity of one currency in exchange for another, or a quantity of a commodity) at a fixed price on or before a specified date, after which the option expires if not exercised.

An option to buy an underlying item is called a call option and an option to sell an underlying item is called a put option.

Options offer the holder a choice between:

- **Exercising** the right to buy or sell at the pre-determined price (known as the **exercise price**, or **strike price**); and
- Not exercising this right: allowing the option to lapse, sometimes known as **abandoning** the option. With exchange-traded options, it may be possible to sell the option to somebody else (at a gain or loss) before its expiry date.

It is this element of **choice** which is the **distinction between options and futures.**

Worked example: Share options

What is the effect on an investor owning a call option which gives the right to buy a share in company X for £2.00?

Current share price of company X is £2.00

Consider the impact of the share price of company X:

(1) rising to £2.50; and

(2) falling to £1.70.

Solution

Currently, the option has no intrinsic value, as exercising the option means:

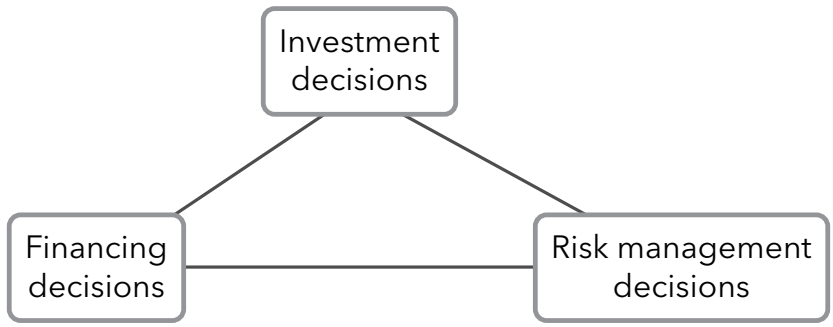
	£
Cost of Co X share, if purchased using the option	(2)
Current value of Co X share =	2
	0

Note: The intrinsic value of an option is the difference between the exercise price for the option and the current spot market price of the underlying item.

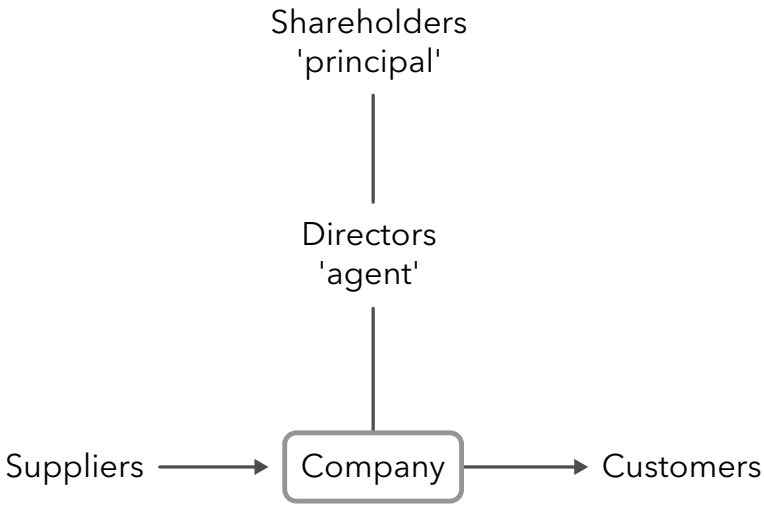
If the share price changes

	Company X share price rises	Company X share price falls
Can sell the share for the prevailing price	£	£
	2.50	1.70
Cost of company X share via option to buy	2.00	2.00
Exercise if a gain, otherwise abandon	+ 0.50	Abandon

In summary, holding an option gives upside to the option holder but removes the downside price risk.



Note: If the share itself had been owned, rather than the share option, a drop in the share price to



Interactive question 1: Impact of a put option

Quantify the effect for an investor of purchasing a put option on a share in company X, given the following:

	£
Current share price	1.70
Exercise price	2.00
Premium	0.10

(1) If the share price rises to £2.00

(2) If the share price rises to £2.50

See **Answer** at the end of this chapter.

3.2 Options terminology

The following paragraphs use share options to illustrate the different types of options and the terminology involved.

Over the counter options	A company or an investor can arrange a tailor-made option for their specific needs with a financial institution, and this is called an **over-the-counter** (OTC) option. OTC share options may be for any number of shares or other stocks.
Puts and calls	• A **call option** means an investor is entitled to **buy** the shares at the exercise price within the specified period. • A **put option** means an investor has the right to **sell** the shares at the exercise price within the specified period. • The price written into the option is called the **exercise price** or **strike price**.

Relationship between strike price and spot price	• An option is said to be **in-the-money** when, if it is exercised today, a profit would be made. The exercise price is more favourable than the current market price for the underlying share. • An option is said to be **out-of-the-money** when, if it were exercised today, a loss would be made. The exercise price is less favourable than the current market price for the underlying share; consequently, it would not be exercised if the exercise date were 'today'. • An option is said to be **at-the-money** if the exercise price equals the market price of the underlying share.

3.3 Examples of options

3.3.1 Share options

Share options can be issued by a company as a way of rewarding employees. The feature of **share options** is that they give the **right to apply for shares** at a date in the future, at a specified price that will probably be favourable to the option holder.

For example, a public company whose shares are currently traded at £2 on the stock market might award share options to some of its employees, giving them the right to apply for a quantity of shares at a date in the future at a price of, say, £2. Provided that the market price of the shares rises above

£2 by the time the options can be exercised, the employees would then be able to:

- obtain some shares, and so get an equity interest in their company; or
- obtain some shares and then sell them at a profit – the share options would then, in effect, give the employee a cash bonus that is paid for by investors in the stock market.

3.3.2 Pure options

These are options to buy or sell assets that **already exist.**

For example, if a pure option to buy a company's shares is exercised then the company does not issue new shares, but rather the seller of the option must buy shares in the company on the stock market at the prevailing price and sell them to the option holder.

Similarly, a currency option is an option to buy or sell currency which already exists. No new currency is issued by the government.

3.4 Option writers and option purchasers: the option premium

A pure option is created by an **option writer.** This will typically be a large financial organisation such as an investment bank.

Worked example: Writing a call option

Suppose that the writer drafts an option contract and gives it to another party (whom we will call the holder) which allows the holder to buy one hundred shares in Fonex plc (a fictional company) at 400 pence each on 30 June. The company's share price is at the moment 390 pence. Consider the holder's position if the share price on 30 June:

Requirements

1 rises to 450 pence;

2 falls to 330 pence.

Solution

1 The option holder exercises the right to buy 100 shares at 400p each and immediately sells them on the market for 450 pence each, making a total gain of £50. Where does the holder buy the shares at 400p? No new shares are issued, so the option holder must buy them from the option writer. If the option writer does not own Fonex shares, he must buy them on the market for 450p and sell them to the option holder for 400p, making a loss of 50p × 100 = £50. So, in situation (a), the option holder makes a profit out of the option writer.

   Alternatively, we could say the writer has lost 50p.

2 The holder does not exercise the option, but allows it to lapse. Both the holder and the writer have made no gain and no loss.

The option holder will clearly be very happy with this option agreement. If Fonex shares rise she makes a gain, but if they fall she makes no loss. The writer, however, is in a no-win situation. If the shares rise, he loses, and if they fall he makes no gain.

3.5 Premium

So why would anybody want to write options?

Banks and other financial institutions are prepared to write options to earn income from selling them. The buyer of the option purchases a worst-possible price for the underlying item, but the option writer receives income whenever an option is written. Taking their transactions in options as a whole, option writers expect to make a profit from the difference between their income from option premiums and the losses they incur when holders exercise their options.

In order to **acquire an option**, then, you have to **purchase** it. Note that this is different from a future. You have to **purchase** an **option** because it gives you a **powerful choice**, which you can use to limit your risk. The **option writer** accepts the **price risk** which the purchaser is avoiding. The writer therefore needs to be paid **compensation.**

The cost of an option to a purchaser is known as the option premium – this is the same term as is used for the price of a general insurance policy.

3.6 Traded options

One of the disadvantages of OTC options is that because they are all different, there is no market for them. This problem is overcome by **traded options:** these are standardised contracts which are traded on NYSE. Liffe and similar exchanges.

An **American-style option** is an option that can be exercised on any day up to the expiry date.

A **European-style option** is one which can be exercised only on its expiry date. This terminology is however potentially misleading, since most options traded in the UK and Europe are in fact American options.

- There are two parties to each traded option contract:
- The seller or writer, who receives the option premium in exchange for granting an option, as noted above in section 3.4; and the person who buys the option.

Context example: Prices of traded options

Prices of traded share options are typically published or quoted in tables, such as the following for options on shares in Reuters.

Reuters – underlying security price 679 pence (7 May) (a)

	Calls (b)				Puts (c)		
Exercise price (pence)	July	October	January		July	October	January
(d) 650	52	67	84		14½	24	31½
700	25	41	58	(e)	37½	44½	55

This table shows the following.

(a) Reuters shares are trading at 679 pence on 7 May.

(b) **Call** or **buy** options are available with expiry dates at the end of July, October and January.

(c) **Put** or **sell** options are also available with expiry dates at the end of July, October and January.

(d) Two possible **exercise prices** exist, one below the current share price (650p) and one above the current share price (700p).

(e) The figures in the table show the **price** (premium) per share of each option contract in pence.

(1) A **call option** is in the money if the **exercise price** is **below** the underlying security price. All the 650 call options are in-the-money, and all the 700 call options are out-of-the-money.

(2) A **put option** is in the money if the exercise price is **above** the underlying security price. All the 700 put options are in-the-money, and all of the 650 put options are out-of-the-money.

If the Reuters share price were to rise to 700p, all the 700 options would be at-the-money.

For all traded options there will be at least one **exercise price** above the current share price and another below it. If the Reuters share price were to rise above 700p (for at least three days) a new series of options with an exercise price 750p would be created.

3.7 Intrinsic value

The value of an option at any time before its expiry is the sum of its:

- **intrinsic value**; and
- time value.

The **intrinsic value** of an option is computed by assuming that its expiry date is today. The intrinsic value of a share option depends on the exercise price and the current share price with a minimum value of zero (it can never be negative).

'In-the-money' options would be exercised: their intrinsic value is equal to the difference between the exercise price and the current market price of the underlying item.

'Out-of-the-money' options would not be exercised: their **intrinsic value is zero.**

The intrinsic value of calls and puts on shares can be summarised in the following formulae.

(a) The intrinsic value of a call option is the higher of (1) current share price minus exercise price; and (2) zero.

(b) The intrinsic value of a put option is the higher of (1) exercise price minus current share price; and (2) zero.

Context example: Intrinsic values

Intrinsic values of the Reuters options as at 7 May in a particular year are shown in the table below.

Intrinsic values – Reuters share options (underlying share price = 679 pence)

	Calls			Puts		
Exercise price (pence)	July	October	January	July	October	January
650	29	29	29	0	0	0
700	0	0	0	21	21	21

3.8 Time value

By comparing with the original table of quoted premiums for Reuters shares, we can see that in all cases the **actual option prices** are higher than the intrinsic value. This is because options also have a **time value** or **time premium**.

In the period between today (in this example, 7 May) and the expiry date of the options there is a chance that the share price might rise, giving greater gains for call options, or it might fall, benefiting put options.

- The time value for a call option depends on the expectation that the market price of the underlying item will rise in the remaining time to the option's expiry date (and by how much).
- The time value for a put option depends on the expectation that the market price of the underlying item will fall in the remaining time to the option's expiry date (and by how much).

The time value can be computed for each option as the difference between the option's **actual value** and its **intrinsic value.**

Context example: Time values

Returning to the example of the Reuters traded share options, the time values of the options would be computed as follows.

Time values – Reuters share options (underlying share price = 679 pence)

	Calls			Puts		
Exercise price (pence)	July	October	January	July	October	January
650	23	38	55	14½	24	31½
700	25	41	58	16½	23½	34

Note: The time value of all options increases with the time period to expiry. The time value actually depends on a number of factors, which include:

- The **time period to expiry of the option** – the longer the time to expiry, the more the option is worth
- The **volatility of the market price** of the underlying item – a more volatile share price for example increases the likelihood of the share option becoming an in-the-money option (or becoming even more in-the-money than it is already): this increases the value of the option
- The **general level of interest rates** (the **time value of money**) – the exercising of the option will be at some point in the future, and so the value of the option depends on the present value of the exercise price. For example, for a call option, if interest rates rise the present value of the exercise price falls and the option is more valuable.

3.9 Index options

Traded options are available on the FTSE100 share index.

The **contract** size is for a notional value of the exercise price multiplied by £10. Thus, if the exercise price stands at 6,500, the notional value of a contract is £65,000 (as for futures). Exercise prices are set at intervals of 50 index points (eg, 6,400, 6,450, 6,500, 6,550 etc).

Index options can be useful to an investor in a number of ways, either for **speculative purposes** or as a **'hedge'** against risk of adverse movements in market prices generally.

Worked example: Index options

The investment manager of Moonstar Pensions Fund is concerned that share prices will fall over the next month and wishes to hedge against this using June FTSE100 stock index options. The FTSE100 index currently stands at 7,000.

The fund's pension portfolio comprises investments, which have a value of £7 million on 1 June 20X3.

On 1 June 20X3 the following options are available.

FTSE 100 INDEX OPTION (*7,000) £10 per full index point										
	6900		6950		7000		7050		7100	
	C	P	C	P	C	P	C	P	C	P
June	135	30	100	44	70	66	45	95	30	130
July	210	90	180	110	150	130	120	155	100	185
August	270	130	240	150	215	175	185	195	160	220

FTSE 100 INDEX OPTION (*7,000) £10 per full index point										
	6900		6950		7000		7050		7100	
	C	P	C	P	C	P	C	P	C	P
*Underlying index value										

Requirement

(1) Demonstrate what happens if either of the following two situations arises on 30 June.

(2) The portfolio value falls to £6.8 million, and the FTSE index drops to 6,800.

The portfolio value rises to £7.1 million and the FTSE index rises to 7,100.

Solution

Step 1 Set up the hedge

What sort?

The concern is that the value of the portfolio held by the fund will fall, so an option to sell is required. Thus, a June put option with an exercise price of 7,000 is purchased (ie, the 7,000 exercise price is chosen to maintain the existing value of the portfolio).

How many?

The portfolio value is £7 million

The exercise price of the option is 7,000

The value of one contract is 7,000 × £10 = £70,000

The number of option contracts required to cover a portfolio of £7 million is therefore £7 million/£70,000 = 100 contracts

Step 2 What does it cost?

The premium payable for 100 June puts at 7,000 is 66 points per contract. 66 points × £10 per point × 100 contracts = £66,000

Step 3 Do we exercise?

	Index rises	Index **falls**
FTSE100 index	7,100	6,800
Put option gives right to sell		
at	7,000	7,000
	Abandon	Gain 200 on exercising
		200 × £10 = 2,000 × 100

Value of options **0 contracts = £200,000**

Step 4 Overall position

	£	£
Value of portfolio	7,100,000	6,800,000
Gain on option		200,000
Note that the option removes the downside risk but leaves the upside potential	7,100,000	7,000,000
Cost of the premium	(66,000)	(66,000)
Net value	£	£
	£7,034,000	£6,934,000

4 Interest rate risk

Section overview

- Interest rate movements create risks for companies with interest-paying liabilities or interest-earning assets.
- Hedges available include forward rate agreements (FRAs), futures, options and swaps.

4.1 Introduction

Corporate treasurers will be responsible for managing the company's cash and borrowings so as to be able to repay debts as they fall due and to minimise the risks surrounding interest payments and receipts.

Where the magnitude of the risk is **immaterial** in comparison with the company's overall cash flows, one option is to **do nothing** and to accept the effects of any movement in interest rates which occur.

4.2 Risks from interest rate movements

Fixed rate versus floating rate debt	A company may get caught paying **higher interest rates** by having fixed rather than floating rate debt, or floating rather than fixed rate debt, as market interest rates change.
Term of loan	A company may be exposed by having to **repay a loan earlier** than it can afford to, resulting in a need to re-borrow, perhaps at a higher rate of interest.
Term loan or overdraft facility	A company may prefer to **pay for borrowings only when it needs the money** as with an overdraft facility. Alternatively, a term loan might be preferred, but this will cost interest even if it is not needed in full for the whole term.
Deposit at floating rates	If interest rates fall then a company would suffer a loss of interest

4.3 Reducing interest rate risk

Methods of reducing interest rate risk include:

- Pooling of assets and liabilities
- Forward rate agreements (FRAs)
- Interest rate futures
- Interest rate options (or interest rate guarantees)
- Interest rate swaps

4.4 Pooling of assets and liabilities

Some of the interest rate risks to which a firm is exposed may **cancel each other out**, where there are both assets and liabilities which both have exposure to interest rate changes. If interest rates rise, more interest will be payable on loans and other liabilities, but this will be offset by higher interest received on assets such as money market deposits.

Professional skills focus: Applying judgement

Hedging strategies for interest rate risk are based on an expectation of future movements in interest rates. You are expected to recognise that the calculation of the outcome achieved from a hedging strategy is only an estimate at a given point in time and will change as the underlying variables of market prices change.

4.5 Forward rate agreements (FRAs)

Forward rate agreements allow lenders or borrowers to fix a rate of interest on a deposit or borrowing with a term that starts in the future and lasts for several months. For example, an FRA may be arranged for a term starting in three months' time and lasting for six months to the end of month 9.

So a borrower wanting to hedge their interest rate risk for a period of six months starting in three months' time would purchase a '3–9' FRA – this shows that the FRA period starts three months from now and finishes nine months from now. The FRA is purchased over-the-counter from a bank.

- If the actual interest rate in three months' time is higher than the rate fixed by the FRA, agreed, the bank pays the customer the difference.
- If the actual interest rate is lower than the rate fixed by the FRA, the customer pays the bank the difference.

The overall effect is to leave the rate paid by the borrower fixed at the rate in the FRA. Thus an FRA is the equivalent of a forward contract on short-term interest rates.

4.6 Features of FRAs

A borrower will buy a FRA to fix a future rate on borrowing, whilst an investor will sell a FRA to fix a rate on a future deposit.

FRAs are contracts on an interest rate. They are not tied to a specific loan or deposit, and

they are not themselves a loan or deposit. The 'loan' or 'deposit' in an FRA is a notional amount of money, and an FRA is simply an agreement to exchange interest payments on this notional principal.

FRA terminology

- FRA rates are quoted for different future time periods.
- A '3–6' forward rate agreement is one that starts after three months and ends at the end of month 6, so the interest period is for three months.
- 5.75–5.70 means that a bank customer can fix a borrowing rate at 5.75% and a deposit rate at 5.70%.

Limitations of FRAs

- They are usually only available for amounts of at least £500,000.
- They are also likely to be difficult to obtain for interest periods of over 12 months. This problem can be overcome by using an interest rate swap. See section 7 below.
- They remove any upside potential: an FRA is a contract that fixes a future interest rate. This provides protection against an adverse movement in the rate, but means that it is not possible to take advantage of any favourable movement in the rate between 'now' and the beginning of the FRA interest period.

Advantages of FRAs

- For the period of the FRA at least, they **protect the borrower/investor** from adverse market interest rate movements.
- FRAs are over-the-counter agreements. They can be tailored to the amount and duration required, whereas some other hedge instruments such as interest rate futures are standardised contracts.

Worked example: Forward rate agreement (FRA)

It is 30 June. Lynn plc will need a £10 million six-month loan from 1 October. Lynn wants to hedge the risk of a rise in interest rates in the next three months, using an FRA. The relevant FRA rate on 30 June is 6%.

Requirements

1 State what FRA is required.

2 Explain the result of the FRA and the effective loan rate if the six-month FRA benchmark rate has moved to:

- 5%
- 9%

Solution

1 The Forward rate agreement to be bought by the borrower is '3–9' (or 3v9).

2 At 5% because interest rates have fallen, Lynn plc will pay the bank:

	£
FRA payment £10 million × (5% – 6%) × $^{6}/_{12}$	(50,000)
Payment on underlying loan 5% × £10 million × $^{6}/_{12}$	(250,000)
Total payments	(300,000)
Effective interest rate	6%

At 9% because interest rates have risen, the bank will pay Lynn plc:

	£
FRA receipt £10 million × (9% – 6%) × $^{6}/_{12}$	150,000
Payment on underlying loan at market rate 9% × £10 million × $^{6}/_{12}$	(450,000)
Total payments	(300,000)
Effective interest rate	6%

5 Interest rate futures

Section overview

Interest rate futures are standardised FRAs.

- Interest rate futures are priced at (100 – rate of interest).
- Buying an interest rate future equates to investing in debt.
- Selling interest rate futures equates to borrowing.

5.1 Futures contracts

Interest rate futures are similar in effect to FRAs, except that the terms, amounts and periods are **standardised.** Interest rate futures contracts are traded on a futures exchange.

Like FRAs, short-term interest rate futures are contracts on an interest rate. The underlying item is a notional bank deposit or loan for a term that begins at a future date. It is not a contract to acquire or provide an actual bank deposit or loan.

As has been explained in section 2.3 above, the **standardised nature** of futures is a limitation on their use by the corporate treasurer as a means of hedging, because they **cannot always be matched** with specific interest rate exposures. Futures contracts are frequently used by banks and other financial institutions as well as large (often multinational) companies as a means of hedging their portfolios: such institutions are often not concerned with achieving an exact match with their underlying exposures to risk.

5.2 Entitlement with contracts

With interest rate futures what we **buy** is the entitlement to **interest receipts** and what we **sell** is the promise to make **interest payments**.

- Borrowers wishing to hedge against an interest rate rise will **sell futures now**. They will **close their position** at any time up to and including the settlement date for the futures contract by **buying futures**. The difference between the original selling price and the buying price to close the position creates a gain or a loss. If interest rates have risen, there will be a gain on closing out the futures position. The borrower will have to borrow at the higher interest rate, but the gain on the futures position offsets this higher interest cost, which means that the borrower has hedged the risk of higher interest through the futures trading. (But if interest rates have fallen, there will be a loss on the futures position.)
- **Lenders** or **depositors** wishing to hedge against the possibility of falling interest rates will **buy futures now** and **sell futures** to close the position on the on the date that the actual lending or deposit starts. The gain or loss on the futures position will offset the fall or rise in interest rates between the time the futures position is opened and the time it is closed.

5.3 Other factors to consider

The interest rate futures described in this chapter are **short-term interest rate futures (STIRs).** There are also bond futures for hedging risks with bond prices and bond portfolios.

Short-term interest rate futures contracts (STIRs) are contracts on notional deposits or loans for a three-month period, beginning on a standard future date (the expiry date for the futures contract).

The contract size depends on the type of future and the market on which it is traded, so there is some variation.

So, for example:

- a 3-month SONIA future contract size would typically be: (£2,500 x contract-grade international money market index)
- a 2-year GBP interest rate future contract size would typically be £100,000 face value.
- a US treasury contract size would typically be $100,000 face value.
- Eurodollar-based contracts typically have a contract size of $1m, with a handle size of $2,500.

Only sterling interest rate futures will be examinable. Throughout your FM workbook and question bank we will generally assume a standard contract size of £500,000 unless you are told otherwise.

- As with all futures, a **whole number of contracts** must be dealt with. Note that the notional **period of lending or borrowing starts** when the **contract expires**, at the **end of March**.
- On NYSE Liffe, futures contracts are available with **expiry dates** at the end of March, June, September and December.

5.4 Pricing futures contracts

The **pricing** of an interest rate futures contract is determined by the interest rate (r) and is calculated as (100 – r).

For example, if the interest rate fixed in a futures contract is 8%, the contract will be priced at 92.00 (100.00 – 8.00). If the interest rate is fixed at 11%, the contract price will be 89.00 (100 – 11.00).

This means that if three-month interest rates increase, the price of the futures will fall. Similarly, futures prices will rise if interest rates fall.

So a borrower wanting to hedge the risk of a future increase in interest rates will sell futures. If the interest rate subsequently increases, the price of the futures contracts will fall. The borrower can then close the futures position by buying futures at a lower price than the original selling price, to make a profit. The profit on the futures position offsets the effect of the higher interest rate for the borrower, thus providing the hedge that the borrower wanted.

Worked example: Standardised interest rate futures

If an investor buys one three-month sterling £500,000 March contract for 93.00, what have they done?

What would happen if interest rates dropped by 2%?

Solution

The features of this futures contract can be broken down as follows:

Three-month March contract	This notional investment will pay interest for three months only, from March.
Sterling	The currency in which interest will be paid, and in which the notional investment is being made.
£500,000	The standard contract size. An investment of less than this is not possible, and more than this will be only possible in multiples of £500,000.
Buying a contract	Interest rate futures are notional debt securities eg, like bonds. Buying a future means investing, and thus receiving interest.
Buying a future for 93.00	The price of a future = 100 – r Therefore, a price of 93 implies a rate of 7% These are three-month contracts, so the 7% refers to the annual rate of interest on a three-month deposit.

If interest rates in the March futures contract dropped by 2% to 5%, because market interest rates have fallen, the futures price would rise.

Price = 100 – 5.00 = 95.00

The investor could then close out his position by selling a March contract

Buy at	93.00
Sell at	95.00
Gain	2.00%

The interest rate used to determine the price of a future is an annual rate, whereas the contract is for three months.

In the example, the 2% refers to the change in the annual rate for three-month deposits. As these are three-month contracts, the gain on one contract is:

2% × 3/12 × £500,000 = £2,500

5.5 Maturity mismatch

Maturity mismatch occurs if the actual term of lending or borrowing does not match the notional period of the futures contract (three months). The number of futures contracts used has to be adjusted accordingly. Since fixed interest is involved, the number of contracts is adjusted in proportion to the time period of the actual loan or deposit compared with three months. For example, if the period of borrowing is **six months** the number of contracts is **doubled**. This leads to the following formula.

$$\text{Number of futures contracts} = \frac{\text{Amount of actual loan or deposit}}{\text{Futures contract size}} \times \frac{\text{Length of loan}}{\text{three months}}$$

For example, suppose that a company wants to hedge the risk of a rise in interest rates for a six- month loan of £6 million, starting on 25 November. It can hedge with futures by selling December sterling interest rate futures. The number of contracts it should sell is:

£6 million/£500,000 per contract × 6 months/3 months = 24 contracts.

Remember that it is the term of the interest period that determines how many futures contracts are needed. The period between today's date and the start of the loan or deposit is **not** relevant; we are hedging over the **life** of the loan or deposit.

Interactive question 2: Maturity mismatch

On 5 June, a corporate treasurer decides to hedge a short-term loan of £17 million which will be required for two months from 4 October to 3 December. Three-month sterling futures, December contract, are trading at 98.15. The contract size is £500,000.

Requirement

How many contracts are required?

See **Answer** at the end of this chapter.

Worked example: Interest rate futures

The following futures price movements were observed during a week in October.

Contract	Price at start of week	Price at end of week
December sterling STIR	90.40	91.02

Hawthorn plc had previously sold ten December short sterling contracts (standard contract size £500,000).

Requirement

Calculate the profit or loss to the company for the week on the sterling futures contracts.

Solution

Increase in price (91.02 – 90.40 = 0.62) 0.62%

Hawthorn has sold futures (and will eventually close the position by buying futures). The increase in the futures price represents a fall in the interest rate, so Hawthorn has made a loss on the futures position this week.

Increase in value of one contract (0.62% × 3/12 × £500,000) = £775

The company is a seller of ten contracts and so has lost (£775 × 10 contracts) = (£7,750)

Interactive question 3: Interest rate hedge using futures

It is 1 January, and a company has identified that it will need to borrow £10 million on 31 March for six months.

The spot rate on 1 January is 8% and March 3-month interest rate futures with a contract size of £500,000 are trading at 91.00.

Requirements

Demonstrate how futures can be used to hedge against interest rate rises. Assume that at 31 March the spot rate of interest is 11% and the March interest rate futures price has fallen to 89.00.

Method

1.1 Set up the hedge

1.2 Outcome in futures market

1.3 Outcome in spot market

See **Answer** at the end of this chapter.

5.6 Hedging lending

In the language of interest rate futures, lending equals buying. The treasurer hedges against the possibility of falling interest rates by buying futures now and selling futures on the date that the actual lending starts.

Interactive question 4: Hedging by a lender

A US company will have a surplus of £2 million for three months starting in August. The cash will be placed on fixed interest deposit, for which the current rate of interest is 5% pa. How can the risk of a fall in interest rates on future deposit income be hedged using futures contracts? The September three-month sterling futures contract is currently trading at 94.00. It has a standard contract size of

£500,000.

See **Answer** at the end of this chapter.

Professional skills focus: Assimilating and using information

One of the professional skills assessed in the CA exams considers your ability to evaluate the relevance of information provided. Questions covering interest rate hedging will include an abundance of information. It is therefore important that you can identify the relevant information needed from the scenario to allow you to calculate the impact of the hedging strategy stated in the requirement.

6 Interest rate options

Section overview

- **Interest rate options** allow an organisation to limit its exposure to adverse interest rate movements, while allowing it to take advantage of favourable interest rate movements.
- **Borrowers** can set a **maximum** on the interest they have to pay by buying **put** options.
- **Lenders/depositors** can set a **minimum** on the interest they receive by buying **call** options.

6.1 Interest rate options (guarantees)

An **interest rate option** grants the buyer of the option the right, but **not the obligation**, to deal at an agreed interest rate (strike rate) at a future maturity date. On the date of expiry of the option, the buyer must decide whether or not to exercise the right.

For example, an interest rate put option on a six-month notional loan of £2 million at an exercise price (strike rate) of 6% gives its holder the right, but not the obligation, to borrow £2 million for six months at an annual interest rate of 6%, starting from the exercise date for the option. If the interest rate in the money market is 7%, the option holder will exercise the option. If the market interest rate is 5.5%, the option holder will abandon the option and will not exercise it, and instead will borrow at the available market rate.

Conversely, an **option to lend/deposit** (a call option) will not be worth exercising if market rates have risen above the rate specified in the option by the time the option has expired.

An **interest rate guarantee (IRG)** is a term for an interest rate option which hedges the interest rate for a single period of up to one year. These options may also be called **short-term interest rate caps** (put options) or **short-term interest rate** floors (a call option).

Tailor-made **over-the-counter interest rate options** can be purchased from major banks, with specific principal amounts, periods of maturity, denominated currencies and rates of agreed interest (strike rates). The cost of the option is the 'premium'. Interest rate options offer more flexibility than FRAs, which are binding contracts that fix the interest rate. However, interest rate options are more expensive than FRAs because of the premium paid to buy the option.

6.2 Traded interest rate options

Exchange-traded interest rate options are available as **options on interest rate futures**, which give the holder the right to buy (call option) or sell (put option) one futures contract on or before the expiry of the option at a specified price. The best way to understand the pricing of options on interest rate futures is to look at a schedule of prices.

Worked example: Traded option pricing

UK futures options £500,000

Strike price	Calls			Puts		
	November	December	January	November	December	January
95.00	0.87	1.27	1.34	0.29	0.69	1.06
95.50	0.58	0.99	1.10	0.50	0.91	1.32
96.00	0.36	0.76	0.88	0.77	1.18	1.60

Requirements

1 Explain the components of the table.

2 Illustrate how a borrower would use the table to hedge against an interest rate rise.

Solution

1 The components of the table are as follows.

- The **contract size** is £500,000.
- The **strike price** is the price that will be **paid for the futures contract** (if the option is exercised).
- A price of 96.00 represents an interest rate of 100 – 96 = 4% pa
- The numbers under each month represent the **premium** (in % terms) that must be paid for the options.

For example, the cost of a November put option with an exercise price of 95.50 is: 0.50% × £500,000 × 3/12 = £625

As with interest rate futures, the rates are expressed as annual interest rates, but as these are three-month contracts, the rates have to be adjusted to reflect this.

2 Hedging a rate increase

Consider a borrower who is concerned that short-term interest rates may rise in the near future. He could hedge the risk by selling interest rate futures. A rise in interest rates from say 4% to 6% would cause interest rate futures to fall in price from 96.00 to 94.00, and the borrower would make a gain on the futures position.

However, the borrower may not want to commit to selling futures, and would instead like an option to sell futures.

The borrower might therefore want to have the right to sell a future at 96.00 (which equates to borrowing at 4%). In the event that interest rates increased, the option would be exercised. The borrower would exercise the right to sell futures at 96.00 and would then close out by buying at the current price of 94.00.

On the other hand, if interest rates fall to, say, 3% the futures price would rise to 97.00 and so the option to sell futures at 96.00 would be abandoned.

	Rate increase to 6%	Rate fall to 3%
Option to sell a future	96	96

Prevailing price of future		**Rate increase to 6% (94)**	**Rate fall to 3% (97)**
Effect	exercise and gain	2%	abandon

Thus the option will remove the downside to a borrower if interest rates rise, but leave the upside if interest rates fall.

Using traded interest rate options for **hedging**

(a) To use traded interest rate options for hedging, note the following specific points:

(b) If a company needs to **hedge borrowing** at some future date, it should **purchase put options**. Instead of selling futures now and buying futures later, it **purchases** an option to **sell futures** and only exercises the option if interest rates have risen causing a fall in the price of the futures contract.

Similarly, if a company needs to **lend/deposit money**, it should **purchase call options** (an option to buy futures).

Worked example: Traded interest rate options

Panda Ltd wishes to borrow £4 million fixed rate in June for nine months and wishes to protect itself against rates rising above 6.75%. It is 11 May and the spot rate is currently 6%. The data is as follows:

Short sterling options **(STIR)**

£500,000

Strike price	**Calls**			**Puts**		
	June	**September**	**December**	**June**	**September**	**December**
93.25	0.16	0.19	0.21	0.14	0.92	1.62
93.50	0.05	0.06	0.07	0.28	1.15	1.85
93.75	0.01	0.02	0.03	0.49	1.39	2.10

Panda negotiates the loan with the bank on 12 June (when the £4 million loan rate is fixed for the full nine months) and closes out the hedge.

Requirement

What will be the outcome of the hedge and the effective loan rate if prices on 12 June are as follows:

Closing prices

	Case 1	**Case 2**
Spot market interest rate	7.4%	5.1%
Futures price	92.31	94.75

Solution

The following method should be used.

Step 1: Setup

- Which contract? June
- What type? future) As paying interest need a put option (the right to sell a
- Strike price 93.25 (100 – 6.75) Cap needed at 6.75%
- How many? £4m/£0.5m × 9/3 = 24 contracts
- Premium At 93.25 (6.75%) June Puts = 0.14%

Total premium cost:

Contracts × premium × contract size × contract duration = 24 × 0.14% × £500,000 × 3/12 = £4,200

Note: As these are three-month contracts, the premium – which is quoted as an annual rate – needs to be adjusted to reflect this.

Step 2: Closing prices

	Case 1	Case 2
Spot market interest rate	7.4%	5.1%
Futures price	92.31	94.75

Step 3: Outcome

	Case 1	Case 2
(a) Options market outcome		
Strike price right to sell (Put) at	93.25	93.25
Closing price buy at	92.31	94.75
Exercise?	Yes	No
If exercised, gain on future	0.94%	–
Outcome of options position	0.94% × £500,000 × $^{3}/_{12}$ × 24 = £28,200	–
	£	£
(b) Net position		
Borrow spot: interest = £4m × 9/12 × 7.4% or 5.1%	222,000	153,000
Gain on options position	(28,200)	–
Option premium	4,200	4,200

Net outcome	198,000	157,200
(c) Effective interest rate	198,000 / 4,000,000 × 12/9 = 6.6%	157,000 / 4,000,000 × 12/9 = 5.24%

Professional skills focus: Structuring problems and solutions

You are expected to be able to identify and apply relevant technical knowledge and skills to analyse a specific problem. When setting up a hedge using traded interest rate options you need to be able to identify from the question the date of the contract, the type (put or call), the most appropriate strike price, how many contracts are required and the cost of the premium.

7 Interest rate swaps

Section overview

- **Interest rate swaps** are where two parties agree to exchange interest rate payments at intervals over a period of years.
- Interest rate swaps can act as a means of **switching** from paying one type of interest to another (for example from fixed to floating rate or vice versa), **raising less expensive loans** and **securing better** deposit **rates.**

Definition

Interest rate swap: An interest rate swap is an agreement whereby the parties to the agreement exchange interest payments on a notional amount of principal at intervals over a period of years.

7.1 Swap procedures

Interest rate swaps involve two parties agreeing to exchange interest payments over an agreed period of at least one year and typically longer. In practice, the major players in the swaps market are banks although many other types of institution can become involved, for example national and local governments, international institutions and major non-bank corporates.

In a simple interest rate swap (a 'plain vanilla' swap) two parties agree to exchange payments of 'interest' on a notional amount of principal at regular intervals over the term of the swap. The rate of 'interest' payable by each swap counterparty has different characteristics.

The most common arrangement in a vanilla swap is for one party to pay interest at a fixed rate of interest and the counterparty to pay interest at a variable rate of interest, usually the London Interbank Offered Rate (LIBOR). (LIBOR is a benchmark rate of interest representing the rate of interest at which one major bank will be prepared to deposit funds with another major bank.)

During 2021/2022 LIBOR will be replaced by SONIA (the Sterling overnight index average) in the UK. Like all financial instruments, swaps can be used for speculation as well as hedging.

7.2 Interest rate swaps

7.2.1 Advantages

Interest rate swaps can be used to hedge an exposure to changes in interest rates over a long period of time.

They can also be used to change net payments of interest from fixed to floating rate or from floating to fixed rate, and this allows corporate treasurers to change the balance between their company's fixed and floating rate commitments without having to change any of the company's actual loans.

This separates the management of interest rates from the management of the loans themselves.

- The **arrangement costs** are **significantly less** than terminating an existing loan and taking out a new one.
- They may possibly be used to make **interest rate savings**, either out of the counterparty or out of the loan markets, by using the principle of comparative advantage.
- They are available for **longer periods** than the short-term methods of hedging risk (FRAs, futures, options) that we have considered in this chapter. Some swaps have a term in excess of 10 years.
- They are flexible since they can be arranged for tailor-made amounts and periods, and are reversible. (For example, having made a swap agreement to pay a fixed interest rate and receive a floating rate, a company can reverse this by making another swap agreement to pay a floating rate and receive a fixed rate.)
- It is also possible to arrange a cross-currency interest rate swap, where the parties agree to exchange 'interest' on equivalent amounts of two different currencies.

Context example: Interest rate swaps

Company A has borrowed £10 million at a fixed interest rate of 9% per annum. Company B has also borrowed £10 million but pays interest at SONIA + 1%. SONIA is currently 8% per annum.

The directors of company A feel that interest rates are going to fall and would prefer to be paying floating rate interest rather than fixed interest. The best floating rate A could obtain without a swap is SONIA + 2%. The feeling at company B is that it would prefer to pay a fixed rate of interest on its debt rather than a floating rate because fixed interest will facilitate cash planning. The best fixed rate that B could obtain without a swap is 10%.

The two companies agree to swap interest payments. (In practice, both companies would arrange a swap with a bank, but for simplicity of illustration, the intermediary role of the bank is excluded from this example.)

(a) pays SONIA to B

(b) pays 8% to A

There is no exchange of loan principal, and no exchange of commitments on existing loans. Both parties retain the obligation to repay their original loans.

A summary of the arrangements can be shown as follows:

	Company A		Company B
Interest paid on original loan	**(9%)**		**(SONIA + 1%)**
In the swap:			
A pays to B	(SONIA)	→	SONIA
B pays to A	8%	←	(8%)
Net payment after swap	(SONIA + 1%)		(9%)

Both parties have achieved their objective of switching the nature of their interest payments. Comparing the rate paid with the swap to the rate without, it can be seen that the swap has benefited both parties. Company B is paying 9% fixed instead of 10% fixed. Company A is paying SONIA + 1% instead of SONIA + 2%.

Summary	**Company A**	**Company B**
Before swap	9% fixed	SONIA + 1% floating = 8 + 1 = 9%
After swap	SONIA + 1%	9% fixed
Without swap	SONIA + 2%	10% fixed

7.2.2 How do swaps work?

The gain in the above example arises due to the principle of comparative advantage. This allows two companies to work together to their mutual benefit and arrange borrowing more cheaply with swaps than by borrowing directly in the loans or bond market.

In practice, this sort of arrangement is rarely possible. The main reason why non-bank companies arrange swaps with banks is to adjust the balance between the fixed and floating rate commitments on their debts.

For example, suppose that a medium-sized company wants to borrow £10 million for five years at a fixed rate of interest. It can borrow £10 million from a bank, but only at a floating rate of SONIA plus 2% (or base rate plus 2%). A bank specialising in swaps is prepared to arrange a fixed-year swap in which it will receive 5% fixed in exchange for SONIA.

The company can borrow for five years at SONIA plus 2% and arrange a five-year swap in which it pays 5% and receives SONIA on notional principal of £10 million. The net effect is to borrow £10 million at an effective fixed rate of 7%.

Context example: How interest rate swaps work

Goodcredit plc has been given a high credit rating. It can borrow at a fixed rate of 11%, or at a variable interest rate equal to SONIA, which also happens to be 11% at the moment. It would like to borrow at a variable rate. Secondtier plc is a company with a lower credit rating, which can borrow at a fixed rate of 12.5% or at a variable rate of SONIA plus 0.5%. It would like to borrow at a fixed rate.

A swap allows both parties to end up paying interest at a lower rate via a swap than is obtainable from a bank. Where does this gain come from? To answer this question, set out a table of the rates at which both companies could borrow from the bank.

	Goodcredit	**Secondtier**	**Difference**
Can borrow at fixed rate	11%	12.5%	1.5%
Can borrow at floating rate	SONIA	SONIA + 0.5%	0.5%
Difference between differences			1.0%

Goodcredit has a **better credit rating** than Secondtier in both types of loan market, but **its advantage** is **comparatively higher** in the fixed interest market. The 1% differential between Goodcredit's advantage in the two types of loan may represent a market imperfection or there may be a good reason for it. Whatever the reason, it represents a potential gain which can be made out of a swap arrangement.

	Goodcredit	Secondtier	Sum total
Company wants	**Variable**	**Fixed**	
Would pay (no swap)	(SONIA)	(12.5%)	(SONIA + 12.5%)
Could pay	(11%)	(SONIA + 0.5%)	(SONIA + 11.5%)
Potential gain			1%

Assume that the potential gain of 1% is split equally between Goodcredit and Secondtier, 0.5% each. Then Goodcredit will be targeting a floating rate loan of SONIA less 0.5% (0.5% less than that at which it can borrow from the bank). Similarly, Secondtier will be targeting a fixed interest loan of 12.5% – 0.5% = 12%. These are precisely the rates which are obtained by the swap arrangement illustrated below.

	Goodcredit	Secondtier	Sum total
Split evenly	0.5%	0.5%	1%
Expected outcome	(SONIA – 0.5%)	(12%)	(SONIA + 11.5%)

The rate that each company expects to pay after the swap is thus 0.5% less than it would pay without a swap.

Eg, Goodcredit would pay SONIA, so will pay SONIA – 0.5%. Secondtier would pay 12.5% fixed so will pay 12% fixed

Swap terms	**Goodcredit**	**Secondtier**	**Sum total**
Could pay	(11%)	(SONIA + 0.5%)	(SONIA + 11.5%)
Swap floating	(SONIA + 0.5%)	SONIA + 0.5%	
Swap fixed	12%	(12%)	
Net paid	(SONIA – 0.5%)	(12%)	(SONIA + 11.5%)
Would pay	(SONIA)	(12.5%)	(SONIA + 12.5%)
Gain	0.5%	0.5%	1%

To construct a simple swap:

Let Goodcredit pay all of Secondtier's interest.

ie, SONIA + 0.5% paid to Secondtier, as shown above.

Secondtier must then reciprocate by paying fixed interest to Goodcredit. However, Secondtier will only pay 12% as calculated and shown above, in order to be 0.5% better off under the swap.

The overall effect of this is to leave each party 0.5% better off.

The results of the swap are that Goodcredit ends up paying variable rate interest, but at a lower cost than it could get from a bank, and Secondtier ends up paying fixed rate interest, also at a lower cost than it could get from investors or a bank.

Note that for the swap to give a gain to both parties:

(a) each company must borrow in the loan market in which it has **comparative advantage**. Goodcredit has the greatest advantage when it borrows fixed interest. Secondtier has the least disadvantage when it borrows floating rate; and

(b) the parties must actually **want** interest of the opposite type to that in which they have comparative advantage. Goodcredit wants floating and Secondtier wants fixed.

Once the target interest rate for each company has been established, there is an infinite number of swap arrangements which will produce the same net result. The example illustrated above is only one of them.

Interactive question 5: Construct a swap

We illustrated above one way in which the swap could work. (Swap fixed 12%, swap floating (SONIA

+ 0.5%.)

Requirement

Suggest an alternative arrangement for the swap by entering swap interest payments into this pro-forma to move from the original interest paid to the desired result.

	Goodcredit	Secondtier
Could pay	(11%)	(SONIA + 0.5%)
Swap floating		
Swap fixed		
Net interest cost	(SONIA – 0.5%)	(12%)

See **Answer** at the end of this chapter.

Interactive question 6: Practise creating a swap

A plc wishes to borrow fixed but, because of its credit rating, the best rate it can obtain is 11% pa. It can borrow variable at SONIA +2%. B plc can borrow fixed at 9% or variable at SONIA +1%. B plc is happy to borrow variable.

Assume both wish to borrow £10 million.

Requirement

Illustrate how a swap would benefit both parties, assuming the following:

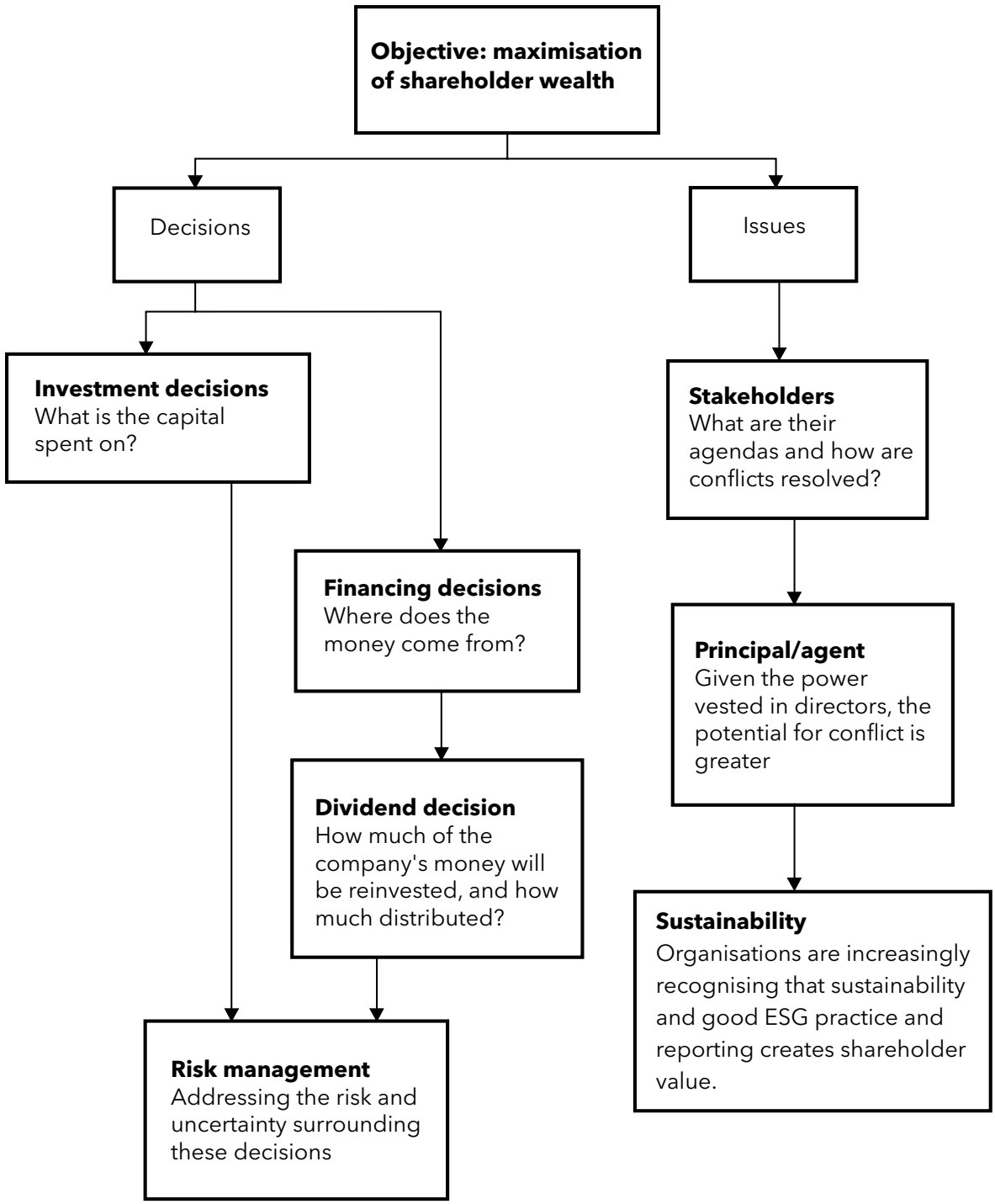
- A plc borrows £10 million variable at SONIA +2%
- B plc borrows £10 million fixed at 9%

See **Answer** at the end of this chapter.

7.3 Risks of swaps

Risks associated with swaps	
Counterparty risk	Risk that counterparty to swap will default before completion of agreement. This risk is lessened by using a reputable intermediary.
Position or market risk	Risk of unfavourable market movements of interest or exchange rates after the company enters a swap
Transparency risk	Risk that swap activity may lead to accounts of party involved being misleading

Summary


Objective: maximisation of shareholder wealth
Decisions
Issues
Investment decisions
What is the capital spent on?
Financing decisions
Where does the money come from?
Dividend decision
How much of the company's money will be reinvested, and how much distributed?
Risk management
Addressing the risk and uncertainty surrounding these decisions
Stakeholders
What are their agendas and how are conflicts resolved?
Principal/agent
Given the power vested in directors, the potential for conflict is greater
Sustainability
Organisations are increasingly recognising that sustainability and good ESG practice and reporting creates shareholder value.

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Do you know how a forward contract works? (Topic 2)
2.	Can you use index futures to set up a portfolio hedge? (Topic 2)
3.	Can you distinguish between a put and a call option? (Topic 3)
4.	Can you set up an interest rate futures hedge for a borrower? (Topic 4 & 5)
5.	Can you set up an interest rate options hedge for a borrower? (Topic 6)
6.	Can you explain how swaps work? (Topic 7)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
6	This is a good introductory question covering FRAs and interest rate options. It will help you to understand how these hedging strategies work before tackling more complex exam-standard questions.
7	This is a good introductory question covering swaps. Work through each of the two scenarios carefully, making sure that you understand the process of setting up a swap arrangement.
9	A good introductory question covering index futures. This is a popular requirement in the exam so use this question to practice the basic calculations before moving into exam-standard questions.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the learning in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Self-test questions

Answer the following questions.

1 A company wants to secure minimum earnings on deposits of £10 million it will be making in four months' time (mid-December) for an investment period of three months (to mid-March).

Requirement

Which of the following would be suitable methods of hedging the exposure to a fall in interest rates over the next four months?

A Selling September short sterling futures

B Buying a call option on December sterling futures C Buying a put option on September sterling futures D Buying December short sterling futures

2 The treasurer of a US-based multinational expects to deposit about £30 million in cash in May for a number of months, and is worried that short-term interest rates on sterling will soon fall. It is now December.

Requirement

Which of the following would be an appropriate hedging transaction with futures?

A Sell June sterling futures

B Sell March sterling futures

C Buy March sterling futures

D Buy June sterling futures

3 A bank has quoted the following rates for dealing in FRAs.

	Bid	Offer
3 v 6	4.59	4.56

It is 24 March and your company wants to fix an interest rate for borrowing £1 million for three months from 24 June.

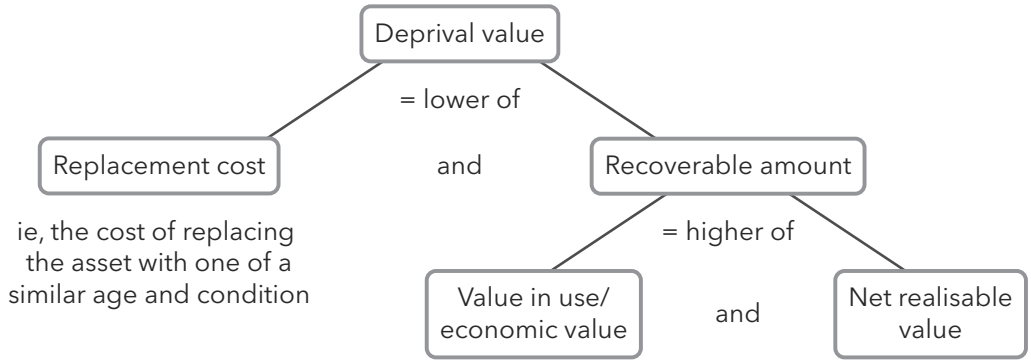
Requirement

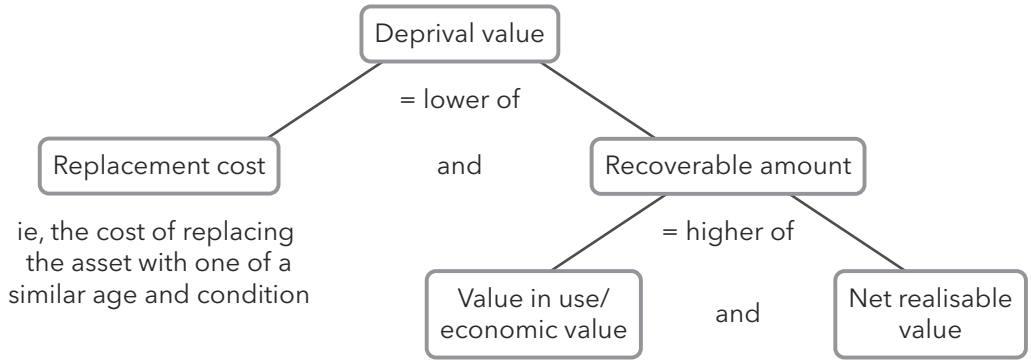
What is the payment to be made on the FRA if the company entered a 3 v 6 FRA with a bank, assuming that interest rates rise to 4.65% from their current level of 4.5%?

4 An investor holds put options giving him the right to sell shares in a company for £2 each.

Requirement

Which of the following graphs correctly shows how the value of the put options at expiry date will depend on the share price?





A Graph A

B Graph B

C Graph C

D Graph D

5 Mover Investments Ltd wants to secure minimum earnings on deposits of £15 million it will be making in four months' time (mid-December) for an investment period of three months (to mid-March).

Requirement

Which of the following would be suitable methods of hedging the exposure to a fall in interest rates over the next four months?

A Buying December short sterling futures

B Buying a 3 v 7 FRA

C Selling December short sterling futures

D Selling a 4 v 7 FRA

E Buying a call option on September short sterling futures

6 A company needs to borrow £50 million for one year starting in three months' time at SONIA. The company's bank makes the following offers:

- A '3–15' FRA at 5% interest (ie, an FRA starting in three months and lasting 12 months)
- An option at 5% interest for a premium of 1% pa

Requirement

Assuming interest rates move to either 3%, 4%, 5% or 6%, illustrate the effective rate paid by the company assuming it:

(1) has no hedge;
(2) uses an FRA; and
(3) uses an option.

Total: 6 marks

7 High Risk plc and Sound Co plc both wish to borrow £10 million indefinitely. They are considering entering into a swap arrangement under which any gains would be shared equally between the two companies.

Requirement

Show the effect of a swap arrangement between the two companies if:

(1) High Risk plc borrows £10 million variable at SONIA. It prefers fixed, which it can raise at 9%.

(2) Sound Co plc borrows £10 million fixed at 8%. It prefers variable, which it can raise at SONIA

+1%.

Total: 8 marks

8 It is late March and a corporate treasurer has identified the need to borrow £10 million for a three- month period commencing at the end of June. Current (ie, spot) interest rates are 6% per annum. Three-month sterling interest rate futures for June are trading at 93. Futures contracts size is £500,000.

Requirement

Explain how futures will provide a hedge. Assume the spot rate moves to 6%, 7% and 8% to help illustrate your answer.

Total: 8 marks

9 An investor holds a portfolio of FTSE 100 shares with a value of £24 million at the end of March. He is worried that by the end of June, when he plans to sell his shares to raise cash, share prices will have fallen. He is considering FTSE 100 index futures to hedge against this risk of capital loss.

The current value of the FTSE 100 index is 6,000.

The index value for contracts to be completed at the end of June is 5,900 and the price of futures is £10 per full index point.

Requirement

Illustrate how a hedge helps protect against a drop in equity values. Assume that at the end of June the portfolio value has dropped to £23.58 million, and the June future is quoted at 5,795.

Total: 8 marks

10 Cleff 1

It is 31 December. Cleff plc needs to borrow £6 million in three months' time for a period of six months. For the type of loan finance which Cleff would use, the rate of interest is currently 13% per year and the corporate treasurer is unwilling to pay a higher rate.

The treasurer is concerned about possible future fluctuations in interest rates, and is considering the following possibilities:

(1) Forward rate agreements (FRAs)

(2) Interest rate futures

(3) Interest rate guarantees or short-term interest rate caps

Requirement

Explain briefly how each of these three alternatives might be useful to Cleff plc.

Total: 8 marks

11 Cleff 2

The corporate treasurer of Cleff decides on 31 December to hedge the interest rate risk on the £6 million to be borrowed in three months' time for six months by using interest rate futures. Her expectation is that interest rates will increase from 13% by 2% over the next three months.

The current price of March sterling 3-months futures is 87.25. The standard contract size is £500,000.

Requirements

11.1 Set out calculations of the effect of using the futures market to hedge against movements in the interest rate:

(1) if interest rates increase from 13% by 2% and the futures market price moves by 2%;

(2) if interest rates increase from 13% by 2% and the futures market price moves by 1.75%; and

(3) if interest rates fall from 13% by 1.5% and the futures market price moves by 1.25%.

The time value of money, taxation and margin requirements can be ignored.

(5 marks)

11.2 Calculate, for the situations above, whether the total cost of the loan after hedging would have been lower with the futures hedge chosen by the treasurer or with an interest rate guarantee which she could have purchased at 13% for a premium of 0.25% of the size of the loan to be guaranteed.

Again, the time value of money, taxation and margin requirements are to be ignored.

(5 marks)

Total: 10 marks

12 Rutini

12.1 It is September 20X9. Rutini's corporate treasurer has identified the need to invest £20m sterling for a three-month period commencing at the end of December. Current interest rates are 3% per annum.

Three-month December sterling interest rate futures are trading at 3.375%. Three-month put options with an exercise price of 3.375% cost £500 per contract; calls of a similar denomination cost £350 per contract. The contract size is £500,000.

Requirement

Demonstrate the results of covering the treasurer's exposure using:

- futures
- options

under the following December spot interest rates:

(1) 3.25%

(2) 3.375%

(3) 3.5%

Ignore basis risk at end of December for the purposes of this illustration.

(4 marks)

12.2 It is September 20X0. The corporate treasurer of another company has identified the need to borrow £20 million of sterling for three months, commencing end of December. The same data apply as for Rutini's treasurer in 12.1.

Requirement

Demonstrate the results of covering the treasurer's exposure using:

- futures
- options

under the following December spot interest rates:

(1) 3.25%

(2) 3.375%

(3) 3.5%

(4 marks)

12.3 Rutini's treasurer holds 2,000 X plc shares, current market price £13.00 per share. He intends to sell them in three months' time but is worried about their price volatility. The following three- month options are available:

Exercise price £	Premium per share £
12.00	0.50
13.00	1.00
14.00	1.50

Requirement

Calculate the treasurer's net receipt in three months' time if he takes no hedging action or if he employs each of the options.

Tabulate your results for the following three-month prices:

£10 £11 £12 £13 £14 £15

Comment on which policy appears most suitable.

(4 marks)

1.4 One of Rutini's directors believes that X plc's share price will be exceptionally volatile over the next three months. He buys:

- 1,000 X plc call options exercise price £13.00, premium 50p per share
- 1,000 X plc put options exercise price £13.00, premium 50p per share

Requirement

Calculate his profit under the following three-month share prices:

£11 £12 £13 £14 £15

Comment on your result.

(4 marks)
Total: 16 marks

13 Swapit plc and Badcred plc

Swapit plc has a high credit rating. It can borrow fixed at 10% or variable at SONIA + 0.3%. It would like to borrow variable.

Badcred plc has a lower credit rating. It can borrow fixed at 11% or variable at SONIA + 0.5%. It would like to borrow fixed.

Requirement

Show how a swap arrangement would benefit both parties if Swapit plc were to borrow fixed, paying Badcred plc SONIA, and Badcred plc were to borrow variable, paying 10.1% fixed to Swapit plc.

Total: 5 marks

14 Swapper plc

Swapper plc has a fixed rate loan of £10,000,000 at 14%, which must be redeemed one year hence. The company is considering an interest rate swap with Mover plc, which has a floating rate loan of the same size at SONIA plus 1%. If the swap goes ahead, Mover plc will pay Swapper plc 13% and Swapper plc will pay Mover plc SONIA plus 1½%. Swapper plc could issue floating rate debt at SONIA plus 2% and Mover plc could issue fixed rate debt at 13½%.

There would be legal fees of £10,000 for each company if the swap is made.

Requirements

14.1 Would the swap benefit Swapper plc:

(1) if SONIA is 12% for the next year; if

(2) SONIA is 12% for the next six months, and 10% thereafter?

14.2 Could an alteration in the terms of the swap make it beneficial to both companies? Any benefit would be shared equally between them.

Total: 10 marks

15 Dubois Ltd

Dubois Ltd is a consumer electronics wholesaler with a highly seasonal business.

In one half year, the business is highly cash generative but in the other half year, the company needs to borrow to cover its costs.

Dubois will move into this borrowing period in three months' time and expects to need to borrow £5 million for the entire low season half year. The directors are concerned that interest rates are expected to rise over the next few months.

Interest rates and FRAs are currently quoted as follows.

- spot 5.75 – 5.50
- 3–6 FRA 5.82 – 5.59
- 3–9 FRA 5.94 – 5.64

The three-month £500,000 sterling future maturing in three months is quoted at 94.15.

Requirements

15.1 Explain how a forward rate agreement (FRA) may be useful to the company. Illustrate this on the basis that interest rates:

- rise to 6.5%;
- fall to 4.5%.

(8 marks)

15.2 Explain how the three-month £500,000 sterling future may be useful to the company and illustrate its usefulness under the same two interest rate scenarios of a rise to 6.5% or a fall to 4.5%.

(9 marks)

15.3 Explain how interest rate guarantees or short-term interest rate caps could be used.

(3 marks)
Total: 20 marks

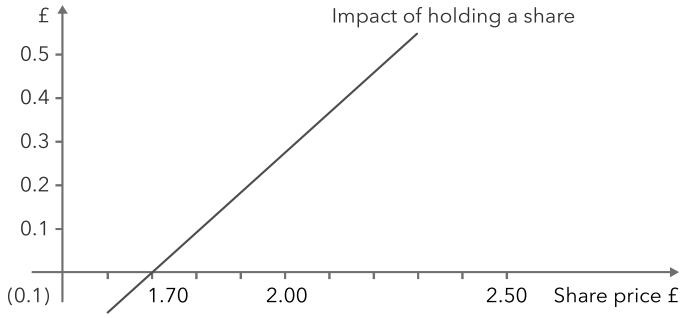
Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

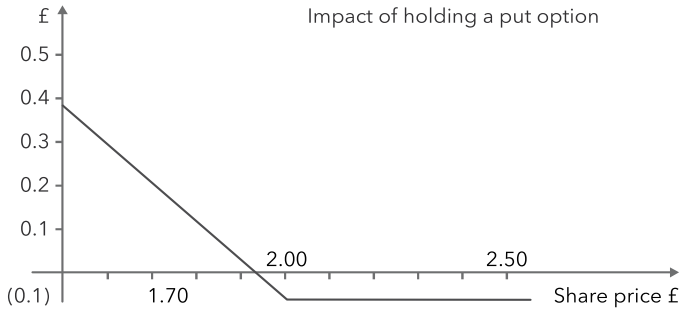
Answers to Interactive questions

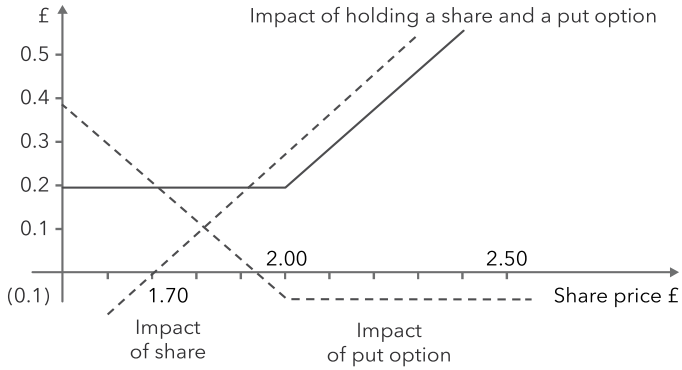
Answer to Interactive question 1

	£	£	£
Share price	**(1.70)**	**(2.00)**	**(2.50)**
Sell at exercise price	2.00	2.00	2.00
Gain if exercise	0.30	0	0
			Abandon
Less premium	(0.10)	(0.10)	(0.10)
	0.20	(0.10)	(0.10)

The above answers can be illustrated graphically as follows:







Answer to Interactive question 2

Number of futures contracts = £17 million / £0.5 million × 2 months / 3 months

= 22.67 contracts, rounded to 23.

Answer to Interactive question 3

3.1 Setup

- What contract: three-month contract
- What type? sell (as rates expected to rise)
- How many contracts?: Exposure/Contract size × Loan period/Length of contract = 10m/0.5m

  × 6/3 = 40 contracts

3.2 Futures outcome

At opening rate:	91 sell
At closing rate:	89 buy
Gain:	2%
Futures outcome: 2% × £0.5m × 3/12 × 40 contracts = £100,000	£

3.3 Net outcome

Payment in spot market £10m × 11% × 6/12	(550,000)
Receipt in futures market	100,000
Net payments	(450,000)

Spot rate at 1 January = 8%

Spot rate at 31 March = 11%

Increase in interest on spot market = 3% Increase in cost= 3% × £10m × 6/12 = £150,000

Hedge efficiency: Gain on future/Loss on spot market = 100,000/150,000 × 100% = 67%

Answer to Interactive question 4

The target interest to be earned is £2 million × 5% × $^{3}/_{12}$ = £25,000. To hedge lending, buy four three-month sterling September futures contracts now and sell four contracts in August.

Suppose that by August, interest rates have fallen by 1%. The £2 million is deposited at 4% for three months, yielding £20,000, a shortfall on target of £5,000. If the futures market has also moved by 1%, the contract price will have risen to 95.00, giving a gain of 1%. The gain from selling four contracts at the higher price is 1% × 3/12 × £0.5m × 4 contracts = £5,000. This compensates for the shortfall in actual interest.

Answer to Interactive question 5

Enter any figure into any slot of the pro-forma and the other figures must automatically balance out. Here is one of many possible solutions.

	Goodcredit	Secondtier
Could pay	(11%)	(SONIA + 0.5%)
Swap floating	(SONIA – 0.5%)	SONIA – 0.5%
Swap fixed	11%	(11%)
Net interest cost	(SONIA – 0.5%)	(12%)

Answer to Interactive question 6

A pays 2% more for fixed debt, but only 1% more for variable debt. There is therefore a 1% possible gain from a swap, that we will split evenly between the two participants.

	A plc	B plc
Borrow	**(SONIA + 2%)**	**(9%)**
Swap floating	SONIA + ½%	(SONIA + ½%)
Swap fixed	(9%)	9%
Net interest cost	(10½%)	(SONIA + ½%)

Answers to Self-test questions

1 Correct answer(s):

B Buying a call option on December sterling futures

D Buying December short sterling futures

The exposure to a fall in short-term interest rates can be obtained by selling a 4 v 7 FRA, buying December futures or buying a call option on December futures. Dealing in September futures or options does not provide sufficient cover against the interest rate exposure.

2 Correct answer(s):

D Buy June sterling futures

An exposure to a decrease in short-term interest rates can be hedged by purchasing short-term interest rate futures. June futures are more appropriate than March futures because with March futures, there will be an exposure to a fall in the interest rate after the contract expires in March and before the deposit of cash is made in May. The company will close its position in May by selling sterling futures.

3 A company is borrowing, therefore it will buy an FRA which locks it into a fixed borrowing rate. The spread offered by the bank will allow the bank to make a profit, thus:

- Depositors will receive the lower rate: 4.56%
- Borrowers will pay the higher rate: 4.59%

If interest rates in June rise to 4.65% the bank will reimburse the company: (4.65% – 4.59%) × 3/12 × £1 million = £150

4 Correct answer(s):

B Graph B

Put options give the right to sell shares at a fixed price, here £2 per share. The option has value for the investor at the expiry date provided that the actual market value is less than the exercise price of £2 per share giving the investor the ability to 'profit' by exercising the option. This is shown by Graph B.

Graph A shows how the value at expiry date of a call option at £2 per share varies with the actual share price. Graph D shows the combined value of the option plus the share: the put option safeguards the investor against a fall in price of the shares below £2, which illustrates the advantage of put options to an investor seeking to hedge against share price falls.

For put options and call options before their expiry date, the lines in Graph B and Graph A respectively show the minimum values at which the options will be traded.

5 Correct answer(s):

A Buying December short sterling futures

D Selling a 4 v 7 FRA

The exposure to a fall in short-term interest rates can be obtained by selling a 4 v 7 FRA, buying December futures or buying a call option on December futures. Dealing in September futures or options does not provide sufficient cover against the interest rate exposure.

6 The answer is as follows.

SONIA in three months	**6%**	**5%**	**4%**	**3%**
	%	%	%	%
(1) No hedge – pay the rate of interest	6	5	4	3
(2) FRA				

SONIA in three months	**6%**	**5%**	**4%**	**3%**
Pay at the rate of interest	**%**	**%**	**%**	**%**
	6	**5**	**4**	**3**
(Paid by)/Paid to bank (SONIA v 5%)	(1)	(0)	1	2
Effective rate	5	5	5	5
(3) Option				
Exercise?	Yes	No	No	No
Rate	5	5	4	3
Premium	1	1	1	1
Effective rate	6	6	5	4

7 The no hedge position has the greatest risk as shown by a much wider spread of outcomes. The FRA gives a fixed rate, and the option provides a cap. The effective cost of the option is increased significantly by the premium.

The correct answer is as follows.

High Risk	**Sound Co.**	
Assume wants fixed	**Assume wants variable**	**Combined**
9% fixed	SONIA + 1% =	SONIA +10%
SONIA	8% fixed =	SONIA + 8%
		Gain = 2%
	Assuming gain of 2% is shared equally, rates with swap:	
9 – 1% = 8% fixed	SONIA + 1% – 1% = SONIA	

	High Risk		**Sound Co**		
• Borrow where comparative advantage lies	(SONIA)	+	(8% fixed)	=	SONIA + 8%
• Swap: Sound Co pays High Risk's interest.	SONIA		(SONIA)		
High Risk pays Sound Co.	(8%) fixed		8% fixed		

• Rate with swap	(8%) fixed +	(SONIA)	=	SONIA + 8%
• Rate without swap	(9%) fixed +	(SONIA+ 1%)	=	SONIA + 10%
• Overall gain				1% + 1% = 2%

A variety of swaps are possible. This is just one of them.

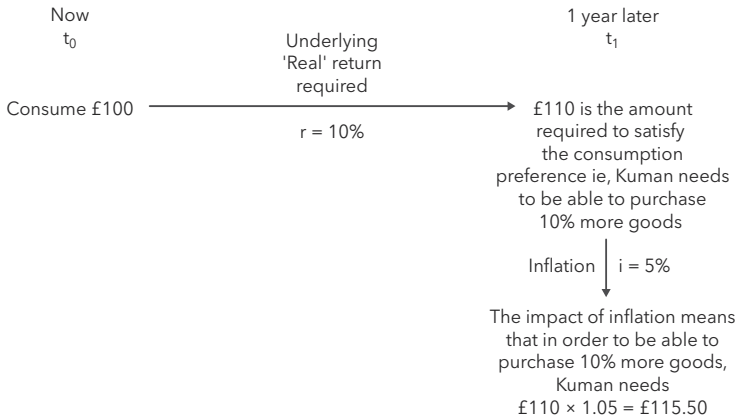
Each now has cheaper borrowing in the preferred form (fixed or variable). This is simply an example of comparative advantage.

8 The underlying instrument for an interest rate future is normally a bond ie, a piece of debt. Selling futures is equivalent to selling (or issuing) debt ie, borrowing money.

If each futures contract is for £500,000 the treasurer should sell £10m ÷ £500,000 = 20 contracts. Each contract enables the treasurer to effectively borrow £500,000 for a three-month period from the end of June.

Profits/losses on futures contracts

Spot rate r	6%	7%	8%
Sell a future (note: a price of 93 implies a rate of 7%)	93	93	93
Close out, by buying the future back at the closing rate ie: 100 – r	(94)	(93)	(92)
Effect of futures	(1%)	–	1%
Borrow at spot rate	(6%)	(7%)	(8%)
Overall effect	(7%)	(7%)	(7%)



At 7% spot Agreed to borrow £10m for three months at 7%, spot is 7% ∴ no gain/no loss

At 6% spot Agreeing to pay extra 1% on £10m for three months = £10m × 3/12 × 1% = £25,000At 8% spot Saving 1% on £1m for three months = £25,000

9 To illustrate how the trading in futures helps the investor to hedge against the risk of adverse price movements, consider the following:

Number of contracts required

Value of portfolio at March = £24,000,000

Value of contract

- Futures price of FTSE 100 index = 5,900
- Value of each point = £10
- Value of a contract = £59,000

Number of contracts = £24 million/£59,000 = 406.8 round to 407

Futures position

March – Investor will sell 407 June contracts: 5900

June – Investor will close out and buy June contracts: 5795Drop in price of FTSE Index futures: 105 points

Value of futures gain = 105 × £10 × 407 contracts = £427,350

Overall position in June

Value of portfolio = £23,580,000

Gain on futures = £427,350

Overall value = £24,007,350

Efficiency = Gain on future / Loss on portfolio × £427,355 / £24m – £23.58m = 101.75%

The hedge is more than 100% efficient because of basis and rounding of the number of contracts.

10 Cleff 1

Forward rate agreements (FRAs)

Entering into an FRA with a bank will allow the treasurer of Cleff plc effectively to lock in an interest rate for the six months of the loan. This agreement is independent of the loan itself, upon which the prevailing rate will be paid. If the FRA were negotiated to be at a rate of 13%, and the actual interest rate paid on the loan were higher than this, the bank will pay the difference between the rate paid and 13% to Cleff plc. Conversely, if the interest paid by Cleff turned out to be lower than 13%, they would have to pay the difference to the bank. Thus, the cost to Cleff will be 13%.

Interest rate futures

Interest rate futures have the same effect as FRAs, in effectively locking in an interest rate, but they are standardised in terms of size, duration and terms. They can be traded on an exchange (such as LIFFE in London), and they will generally be closed out before the maturity date, yielding a profit or loss that is offset against the loss or profit on the money transaction that is being hedged. So, for example, as Cleff is concerned about rises in interest rates, the treasurer can sell future contracts now; if that rate does rise, their value will fall, and they can then be bought at a lower price, yielding a profit which will compensate for the increase in Cleff's loan interest cost. If interest rates fall, the lower interest cost of the loan will be offset by a loss on their futures contracts.

Interest rate guarantees

Interest rate guarantees (or short-term interest rate options) give Cleff the opportunity to benefit from favourable interest rate movements as well as protecting them for their effects on adverse movements. They give the holder the right but not the obligation to deal at an agreed interest rate at a future maturity date. This means that if interest rates rise, the treasurer would exercise the option, and 'lock in' to the predetermined borrowing rate. If, however, interest rates fall, then the option would simply lapse, and Cleff would feel the benefit of lower interest rates.

11 Cleff 2

11.1

Hedge using the futures market

		(1)	(2)	(3)
Setup				
Which contract?		March		
What type?		Sell		
How many contracts		Exposure/Contract size) × (Loan period/Length of contract) = £6,000,000/£500,000 × 6/3 = 24 contracts		
Closing prices		**(87.25 – 2) 85.25**	**(87.25 – 1.75) 85.50**	**(87.25 + 1.25) 88.50**
	Outcome			
(1)	Futures outcome			
	At opening rate	87.25	87.25	87.25
	At closing rate	85.25	85.50	88.50
	Futures movement	2% profit	1.75% profit	1.25% loss
	Futures outcome	2% × 3/12 × £500,000 × 24 contracts = £60,000 profit	1.75% × 3/12 × £500,000 × 24 contracts = £52,500 profit	(1.25%) × 3/12 × £500,000 × 24 contracts = £37,500 loss
	Outcome			
(2)	**Net outcome**	**£**	**£**	**£**
	Payment in spot market	(450,000)	(450,000)	(345,000)
	£6 million × 6/12 × 15% ((a) and (b))/11.5% (c)			
	Receipt in futures			

	market	60,000	52,500	(37,500)
	Net payment	(390,000)	(397,500)	(382,500)
(3)	Hedge efficiency	60,000 / 60,000* = 100%	52,500 / 60,000*= 87.5%	37,500 / 45,000** = 83.3%

* 60,000 = £6m × 6/12 × (15 – 13)%

** 45,000 = £6m × 6/12 × (13 – 11.5)%

11.2 Future hedge costs

(1) Interest £6m × 15% × $^{6}/_{12}$ =£450,000

Less gain £60,000 = **£390,000**

(2) Interest (as in (a)) =£450,000

Less gain £52,500 = **£397,500**

(3) Interest £6m × 11.5% × $^{6}/_{12}$ = £345,000

Add loss £37,500 = **£382,500**

IRG hedge costs

The premium for the guarantee is:

£6m × 0.25% = £15,000

The guarantee would be used in cases (1) and (2) when interest rates increase.

Then, total cost limiting interest rates to 13% is:

£6m × 13% × $^{6}/_{12}$ = £390,000

Plus premium £15,000 equals £405,000

This costs more than the futures contracts hedge in cases (1) and (2).

In case (3), the guarantee is not used.

Interest costs at 11.5% are:

£6m × 11.5% × $^{6}/_{12}$ = £345,000

Plus £15,000 premium = £360,000

This costs less than the futures hedge, reflecting the fact that declining to take up the interest rate option in the case of the guarantee has allowed the company to take advantage of the lower interest rates in the cash market.

12 Rutini

12.1 Rutini's treasurer

Buying futures gives an obligation to buy bonds (ie, invest money) at 3.375%. No matter what the spot interest rate in December is, assuming the futures are held to maturity, the funds will yield 3.375%.

Impact of hedging with futures	Interest rate at end of December		
	3.25%	3.375%	3.5%
September – Buy futures at 100 – 3.375%	(96.625)	(96.625)	(96.625)
December – Sell future at closing price	96.75	96.625	96.50
(100 – spot rate)	0.125%	0	(0.125%)
	Gain		loss
Overall effect			
Borrow at spot rate	3.25%	3.375%	3.5%
Impact of futures rate	0.125%	0	(0.125%)
	3.375%	3.375%	3.375%

The interest received is 3.375% × 3/12 × £20 million invested = 168,750

Call options will give the right, but not the obligation, to invest at 3.375%. If interest rates rise above this level the options will be abandoned. Below this level they will be exercised.

Number required = £20m/£0.5m

= 40 contracts

The value of the call option – the right to buy a future for 96.625 – is apparent from the above table. The option will be exercised if a gain can be made ie, if rates drop, but will be abandoned if rates rise to 3.5%. In this case, the interest received on a £20 million investment would be:

£20 million × 3.5% × 3/12 = £175,000

The cost of the option is £350 × 40 contracts = £14,000.

Future spot rate	Action	Net pay off on three-month investment £m	% return
3.25%	Exercise option	0.16875 – 0.014 = 0.15475	3.095
3.375%	Exercise or abandon option	0.16875 – 0.014 = 0.15475	3.095
3.5%	Abandon option	0.175 – 0.014 = 0.161	3.22

12.3 Another treasurer

Selling futures gives the obligation to sell bonds (ie, borrow money) at 3.375%. No matter what the spot interest rate is in December, the treasurer could borrow at 3.375%.

Put options give the right, but not the obligation, to borrow at 3.375%. If interest rates rise above this they will be exercised; below this they will be abandoned. Again, 40 contracts will be needed.

Future spot rate	Action	Net cost of three-month loan £m	% cost
3.25%	Abandon option	0.1625 + 0.02 = 0.1825	3.65
3.375%	Exercise or abandon option	0.16875 + 0.02 = 0.18875	3.775
3.5%	Exercise option	0.16875 + 0.02 = 0.18875	3.775

12.3 **X plc shares**

Strategy	£10	£11	£12	£13	Pay offs: £14	Share price £'000 £15
No cover	20	22	24	26	28	30
£12.00 option	23	23	23	25	27	29
£13.00 option	24	24	24	24	26	28
£14.00 option	25	25	25	25	25	27

The suitability of the strategy depends upon the treasurer's attitude to risk and the probability of each share price. The higher the exercise price of the option the greater the protection given, but the smaller the participation in favourable price movements.

12.4 Rutini director

Three-month share

price	Profit/(loss) on call	Profit/(loss) on put	Net pay off
£	£	£	£
11	(500)	1,500	1,000
12	(500)	500	0
13	(500)	(500)	(1,000)
14	500	(500)	0
15	1,500	(500)	1,000

Comment

The treasurer has employed a 'straddle'. He will profit if the share price rises above £14.00 or falls below £12.00. Otherwise he will lose.

Note: The writer of the straddle will profit from stability.

13 Swapit plc and Badcred plc

The correct answer is as follows.

	Swapit plc	Badcred plc
Borrows at	10%	SONIA + 0.5%
Receives	(10.1%)	(SONIA)
Pays	SONIA	10.1%
	SONIA – 0.1%	10.6%
	↓	↓

Overall saving 0.8%

14 Swapper plc

14.1 With SONIA at 12% for the next year, the cost with the swap would be as follows.

	£'000
Interest: 10,000 × (14 – 13 + 12 + 1½)%	1,450
	£'000
Fee	10
	1,460

With SONIA at 12% for six months and at 10% thereafter, the cost with the swap would be as follows.

	£'000
Interest: 10,000 × (14 – 13 + (12 + 10)/2 + 1½)%	1,350
Fee	10
	1,360

Without the swap, the cost would be £10,000,000 × 14% = £1,400,000.

The swap would therefore be disadvantageous to Swapper plc if SONIA were to remain at 12% throughout the year, but advantageous were SONIA to fall to 10% after six months.

14.2 Possible new terms would be for Swapper plc to receive 13% and pay SONIA + ¾%. The net cost would be SONIA + ¾% + (14 – 13)% = SONIA + 1¾%, which is ¼% less than the rate at which the company could raise floating rate debt.

Mover plc would then effectively have fixed rate debt at 13% + (1 – ¾)% = 13¼%, which is ¼% less than the rate at which it could otherwise have such debt.

15 Dubois Ltd

15.1 Forward rate agreement

Entering into an FRA will allow the company to effectively lock in an interest rate for a specified future period, here for a six-month period starting in three months' time and ending in nine months' time. That is, we should use a 3 – 9 FRA which should lock us in to a borrowing rate of 5.94%.

The FRA is independent of the loan itself upon which the prevailing rate must be paid,

however any difference between the actual rate and the FRA rate will result in a cash flow from the FRA that offsets the higher or lower interest cost.

Net outcome

	Fixed Interest Rate	
	4.5%	**6.5%**
Actual rate	4.5%	6.5%
FRA rate	5.94%	5.94%
Gain/(loss)	(1.44%)	0.56%
FRA Receipt/(Payment)	£5m × 1.44% × $^{6}/_{12}$	£5m × 0.56% × $^{6}/_{12}$
	(£36,000)	£14,000
Interest on £5m for 6 months	(£112,500)	(£162,500)
Net payment	(£148,500)	(£148,500)

Net payment at 5.94% is £5m × 5.94% × $^{6}/_{12}$= £148,500 Hence the FRA has locked us in to a rate of 5.94%.

15.2 Interest rate futures

Interest rate futures have the same effect as FRAs, in effect locking into an interest rate. Unlike FRAs, however, they are standardised in terms of size, duration and term and they are tradable on exchanges (such as NYSE Liffe).

They are generally closed out prior to maturity with any gain or loss offsetting any higher or lower interest cost when borrowing.

The standardisation in terms of size, duration and term may appear to make them limited compared to FRAs, however the ability to trade them means that any hedge can be easily released at any time if conditions change which is not the case for FRAs.

Since we, as borrowers, are concerned that rates may rise we are looking for a profit on these futures to offset the interest cost.

If rates rise, then futures prices fall (futures price = 100 – rate) hence to gain we must sell interest rate futures.

Number of contracts = Actual amount of loan / Contract size × Length of loan / 3 months

= £5,000,000 / £500,000 = 20 contracts

Net outcome

	Fixed Interest Rate	
	4.5%	**6.5%**
Futures action		
Sell to open	94.15	94.15
Buy to close	95.50 (100 – 4.5)	93.50 (100 – 6.5)
Gain/(loss)	(1.35%)	0.65%
Futures cash		

receipt/(payment)	£500,000 × 20 × 1.35% × $^{3}/_{12}$	£500,000 × 20 × 0.65% × $^{3}/_{12}$
	(£33,750)	£16,250
Interest on £5m for 6 months	(£112,500)	(£162,500)
Net interest cost	(£146,250)	(£146,250)

The net payment at 5.85% (100 – 94.15) is £5m × 5.85% × $^{6}/_{12}$ = £146,250, hence the interest rate future has locked us in to a rate of 5.85%.

15.3 Interest rate guarantees or short-term interest rate caps offer the opportunity to limit the impact of any adverse movement in interest rates whilst still benefiting from any favourable rate movement.

They represent an interest rate option giving the holder the right, but not the obligation, to deal at an agreed interest rate at a future maturity date.

This means that if rates rise the option would be exercised by Dubois, locking the rate. If rates fall, however, Dubois would allow the option to expire without exercising it, and benefit from the lower interest rate in the market.

Chapter 10
Managing financial risk: overseas trade

Introduction

Learning outcomes

Students will be able to identify the main price and overseas trading risks facing a business and the principal methods of managing those risks.

Students will be able to apply investment appraisal techniques and calculate the value of shares and businesses.

This will involve being able to:

- identify and describe the key price risks facing a business in a given scenario;
- explain how financial instruments (eg, derivatives, hedging instruments) can be used to manage price risks and describe the characteristics of those instruments;
- discuss different methods of managing currency (including cryptocurrency) risks appropriate to a given situation, perform calculations to determine the cost of hedging that risk and select the most suitable methods of hedging;
- explain the additional risks of trading abroad and outline the methods available for reducing those risks; and
- identify in the business and financial environment factors that may affect investment in a different country.

Syllabus links

The reporting and auditing of hedging techniques is explored in **Financial Accounting and Reporting** and in **Audit and Assurance**. The techniques introduced in this chapter are taken further at Advanced Level in assessing a business' overarching hedging strategy.

Examination context

In the exam, you may be asked to consider a situation where exchange rate risk has arisen as a result of overseas trade, and to advise how it can be managed. Risk reduction methods are based upon matching receipts and payments. As an example, a question may be asked about a range of methods to hedge against a foreign currency receipt:

- using an OTC currency option
- using a forward contract
- using a money market hedge

This is a typical set of requirements. You need to be comfortable with the calculations in this chapter so that you can advise on the best strategy (which might include not hedging at all) and on the relative advantages or disadvantages of each method. Foreign exchange rate risk and its various hedging techniques is regularly examined.

Chapter study guidance

Use this schedule and your study timetable to plan the dates on which you will complete your study of this chapter.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
1	**Exchange rates** You need to have a good understanding of the way exchange rates are quoted to make sure you can deal with the hedging techniques covered in later sections.	**Approach** Work through this section carefully and make sure you understand the terminology fully before moving onto the next sections, especially how to interpret a spread. Stop and think Can you identify the correct buying or selling rate from a question?	In the exam, you may be asked to consider a situation where exchange rate risk has arisen as a result of overseas trade, and to advise how it can be managed.	**IQ1:** **Exchange rates** It is important that you complete the worked example before attempting this question.
2	Risk and foreign exchange Many companies generate growth by developing export markets and consequently may need to manage their exposure to foreign currency risk. However, whether a business chooses to manage risk (hedge) depends on a number of factors.	Approach Work through the definitions of each type of currency risk. The section on internal hedging methods is important as companies will aim to hedge internally first before entering into external contracts. Stop and think If a business starts trading overseas, what are the key risks faced by the business and how will these be managed?	You may be asked to explain the additional risks of trading abroad and outline the methods available for reducing those risks.	IQ2: Transaction risk This is a good question to test your understandin g of transaction risk. You need to complete the worked example first.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
3	Forwards and futures In order to report on hedging techniques or to comment on how they are reported in financial statements, it is important to have an understanding of how hedging transactions work. In this section we look at using forward contracts and futures to manage foreign currency risk.	Approach The principles of the hedging techniques are the same as the techniques covered in Chapter 9, so you should find most of this chapter follows on logically from the previous chapter. The sections on IRP and PPP are new and important so work through the worked examples carefully. **Stop and think** Do you know how to predict an exchange rate using IRP and PPP?	In the exam you may be asked to explain different methods of managing currency (including cryptocurrency) risks appropriate to a given situation and perform non-complex calculations to determine the cost of hedging that risk. Knowledge of how to construct a hedge and how to choose between different hedging strategies may be tested.	IQ3: Interest rate parity A good question to practice predicting an exchange rate using IRP in a simple scenario.
4	**Hedging using the money markets** Because of the close relationship between forward exchange rates and the interest rates in the two currencies, it is possible to 'manufacture' a forward rate by using the spot exchange rate and money market lending or borrowing.	You need to be comfortable with the calculations in this section so that you can advise on the best strategy and on the relative advantages or disadvantages of each method. **Stop and think** What are the four steps to set up a money market hedge for a foreign currency payment?	You may be asked to explain different methods of managing currency risks appropriate to a given situation and perform non-complex calculations to determine the cost of hedging that risk.	**IQ4: Money market hedge** A good question to practice setting up a MMH. Make sure you complete the worked example before attempting this question.

Topic	Practical significance	Study approach	Exam approach	Interactive questions
5	**Currency options** Currency options protect against adverse movements in the exchange rate while allowing the investor to take advantage of favourable exchange rate movements. They are particularly useful in situations where the cash flow is not certain to occur, for example, when tendering for overseas contracts.	The principles of the hedging with currency options are the same as the interest options covered in Chapter 9, so you should find most of this section follows on logically from the previous chapter. Go through the worked examples carefully. **Stop and think** What are the major drawbacks of currency options?	In the exam you could be asked to explain different methods of managing exchange rate risk appropriate to a given situation and perform non-complex calculations to determine the cost of hedging that risk. A typical set of requirements may ask you to hedge against a foreign currency transaction using a: • currency option • forward contract • money market hedge You could then be asked to advise on an appropriate hedging strategy.	
6	**Hedging economic and translation exposures** Economic and translation risk were	**Approach** In this final section make sure you cover section 6.3 in detail as a question	In the exam you may be asked to identify the business and financial environment factors that may affect	
	introduced in section 2. In this final section of the chapter we look specifically at how to hedge these risks.	may ask you to suggest ways to hedge economic exposure. **Stop and think** Given that translation losses don't impact on cash flow, do they matter?	investment in a different country.	

Once you have worked through this guidance you are ready to attempt the further question practice included at the end of this chapter.

1 Exchange rates

Section overview

- The rates at which dealers buy and sell currency are known as the bid and offer prices.
- Most currencies are quoted in indirect terms from a UK perspective.
- Changes in exchange rates create risk to importers and exporters.

1.1 Quoting exchange rates

An **exchange rate** is the rate at which one country's currency can be traded in exchange for another country's currency.

The **spot rate** is the exchange rate offered on a particular currency for **immediate delivery** of the currency. The **forward rate** is an exchange rate for the exchange of currencies at a future date.

Every traded currency has an exchange rate with every other traded currency on the foreign exchange markets. Foreign exchange dealers make their profit by buying currency for less than they sell it, and so they quote two exchange rates, **a buying rate and a selling rate**.

These are known as the bid and offer prices (or the bid and ask prices) respectively. In the financial press, an exchange rate is quoted as the average of these two (the mid-point) although no trading takes place at the mid-point.

Context example: Foreign exchange quotes

A UK bank quoted a spot spread for US dollars of $1.5935 – $1.6075 which allows it to make a gain on any buying or selling of the currency as follows.

A trading company has imported goods for which it must now pay US$10,000.

(a) The company will ask a bank to sell it US$10,000. If the company is buying currency, the bank is selling it.

(b) When the bank agrees to sell US$10,000 to the company, it will tell the company what the spot rate of exchange will be for the transaction. If the bank's selling rate (the 'offer', or 'ask' price) is, say $1.5935 for the currency, the bank will charge the company:

$10,000/$1.5935 per £1 = £6,275.49

Similarly, if an exporter is paid, say, US$10,000 by a customer in the USA, she will ask her bank to buy the dollars from her. Since the exporter is selling currency to the bank, the bank is buying the currency.

If the bank quotes a buying rate (the bid price) of, say $1.6075, for the currency the bank will pay the exporter:

$10,000/$1.6075 per £1 = £6,220.84

A bank expects to make a profit from selling and buying currency, and it does so by offering a rate for selling a currency which is different from the rate for buying the currency.

Interactive question 1: Exchange rates

Calculate how much an exporter would receive or how much an importer would pay, ignoring the bank's commission, in each of the following situations, if they were to exchange the overseas currency and sterling at the spot rate.

(1) A UK exporter receives a payment from a Danish customer of 150,000 kroner which it wants to convert into sterling.

(2) A UK importer buys goods from a Japanese supplier and pays 1 million yen, which it must obtain from its bank.

Spot rates are as follows:

	Bank sells (offer)		Bank buys (bid)
Danish Kr/£	9.4340	–	9.5380
Japan ¥/£	173.6500	–	175.7810

See **Answer** at the end of this chapter.

1.2 Direct and indirect currency quotes

A **direct quote** is the amount of domestic currency which is equal to one foreign currency unit. An **indirect quote** is the amount of foreign currency which is equal to one domestic currency unit.

In the UK indirect quotes are invariably used but, in most countries, direct quotes are more common.

Currencies may be quoted in either direction. For example, the US dollar and euro might be quoted as €/$ = 0.7745 or $/€ = 1.2912. In other words, 0.7745€ = $1 and 1.2912$ = €1. One rate is simply the reciprocal of the other.

2 Risk and foreign exchange

Section overview

- Currency movements create different types of risk – economic, translation and transaction risk.
- Direct risk reduction methods are based on matching receipts and payments on assets and liabilities.

2.1 Currency risk

Currency risk arises from the possible effect of future movements in an exchange rate. Currency risk is a two-way risk: future movements in an exchange rate may be favourable as well as adverse.

The following different types of currency risk may be distinguished.

Definitions

Transaction risk: This is the risk of adverse exchange rate movements occurring in the course of **normal international trading transactions.**

This arises when the prices of imports or exports are fixed in foreign currency terms and there is movement in the exchange rate between the date when the price is agreed and the date when the cash is paid or received in settlement.

Translation risk: This is the risk that the organisation will make exchange losses when the accounting results of its foreign branches or subsidiaries are translated into the home currency.

Translation losses can result, for example, from restating the book value of a foreign subsidiary's assets at the exchange rate at the balance sheet date.

Economic risk: This refers to the effect of exchange rate movements on the **international competitiveness** of a company.

For example, a UK company might use raw materials which are priced in US dollars, but export its products mainly within the EU. Both a depreciation of sterling against the dollar or an appreciation of sterling against other EU currencies will erode the competitiveness of the company. Economic exposure can be difficult to avoid, although **diversification of the supplier and customer base** across different countries will reduce this kind of exposure to risk.

2.2 Managing transaction exposure

We shall now look at the various means by which a business can manage its exposure to exchange rate risk. We are principally concerned here with the risk that has a direct effect on immediate cashflows – transaction risk. This risk is illustrated in the following example and question.

Worked example: Changes in exchange rates

Bulldog Ltd, a UK company, buys goods from Redland which cost 100,000 Reds (the local currency). The goods are re-sold in the UK for £32,000. At the time of the import purchase the exchange rate for Reds against sterling is 3.5650 – 3.5800.

Requirement

What is the expected profit on the re-sale?

Solution

Bulldog must buy Reds to pay the supplier, and so the bank is selling Reds. The expected profit is as follows:

	£
Revenue from re-sale of goods	32,000.00
Less cost of 100,000 Reds in sterling (÷ 3.5650)	28,050.49
Expected profit	3,949.51

Interactive question 2: Transaction risk

Calculate the actual profit earned by Bulldog Ltd in the above example if the spot rate at the time when the currency is received has moved to:

(a) 3.0800 – 3.0950

(b) 4.0650 – 4.0800

Note: Ignore bank commission charges.

See **Answer** at the end of this chapter.

2.3 Should we hedge?

While the idea of reduced risk may sound appealing, it is of course possible to do nothing and leave the business exposed to future changes in the foreign exchange rate. There are a number of factors to consider before getting involved in hedging activities.

Costs	Using hedges often means incurring costs. Many hedges require use of a third party, such as a bank or an exchange, which means transaction costs of various types.
Exposure	The extent of the risk faced – for example, if the amount is not material in the context of the firm's business then incurring the costs of hedging the risk may not be worthwhile.
Attitude to risk	A firm may benefit from exchange rates moving in a favourable direction. Many of the hedges explained in this chapter simply fix the exchange rate, thus removing any upside potential as well as downside risk.
Portfolio effect	For many international businesses, the nature of the trade may be such that they trade with many different countries, in a wide range of currencies. In such circumstances the overall effect of different currency movements needs to be assessed, as the strengthening in some may be cancelled by a weakening in others.
Shareholders	If shareholders are fully diversified, it can be argued that this should take account of the strengthening – and consequent weakening – of individual currencies. A currency can only strengthen relative to another, and therefore an increase in the value of an asset in one currency can only happen if there is a decrease in the value of an asset held in another currency. If such a situation exists, there is no benefit to hedging, as fully diversified investors' exposure to systematic risk will not be affected. That being said, the above comments regarding diversified shareholders only apply in a perfect capital market and many investors are not fully diversified internationally. In practice managers will know the actual exposure of a firm in a way that shareholders will not, and therefore the shareholders may well benefit from a firm's hedging activities.

Insolvency risk and cost of capital	Following on from the above, because hedging does reduce the volatility of cash flows for a business and thus the risk of insolvency, there should be a reduction in the cost of capital to reflect this.

While there are many factors to consider before hedging currency risk, it needs to be put into context – if the risk derives from an import or export trade, given the many additional trading risks that are a feature of this (see section 6.5 below), the presence of currency risks on top of this is generally fairly unwelcome. Combined with the fact that simple hedges such as forward contracts are not that expensive, many companies do make use of hedges. (On the other hand, many do not and choose instead to make spot foreign currency transactions when the need to do so arises.)

2.4 Direct risk reduction methods

The forward exchange contract is perhaps the most important method of obtaining cover against currency risks, where a firm decides that it does not want exposure to the risk of adverse foreign exchange movements. This is discussed later in section 3 of this chapter. However, there are other methods of reducing currency risk which we shall consider first.

2.5 Invoice currency

One way of avoiding exchange risk is for an exporter to invoice his foreign customer in his domestic currency, or for an importer to arrange with his foreign supplier to be invoiced in the importer's domestic currency.

However, although either the exporter or the importer can avoid any exchange risk in this way, only one of them can deal in his domestic currency. The other must accept the exchange risk, since there will be a period of time elapsing between agreeing a contract and paying for the goods (unless payment is made with the order).

2.6 Matching receipts and payments

A company can reduce or eliminate its foreign exchange transaction exposure by **matching** (or netting off) receipts and payments. Wherever possible, a company that expects to make payments and have receipts in the same foreign currency should plan to **offset its payments against its receipts in the currency**.

Since the company will be setting off foreign currency receipts against foreign currency payments, it does not matter whether the currency strengthens or weakens against the company's 'domestic' currency because there will be no purchase or sale of the currency.

How to do this?

The process of matching is made simpler by having **foreign currency accounts** with a bank. UK residents are allowed to have bank accounts in any foreign currency. Receipts of foreign currency can be credited to the account pending subsequent payments in the currency. (Alternatively, a company might invest its foreign currency income in the country of the currency – for example, it might have a bank deposit account abroad – and make payments with these overseas assets/deposits.)

Since a company is unlikely to have exactly the same amount of receipts in a currency as it makes payments, it will still be exposed to the extent of the net difference between income and payments, and so the company may wish to avoid exposure on this net difference by arranging forward exchange cover.

Why do this?

Offsetting (matching payments against receipts) is **cheaper than arranging a forward contract** to buy currency and another forward contract to sell the currency, provided that receipts occur before payments, and the time difference between receipts and payments in the currency is not too long.

Any material differences between the amounts receivable and the amounts payable in a given currency should be covered by a forward exchange contract to buy/sell the amount of the difference.

2.7 Matching assets and liabilities

A company which expects to receive a substantial amount of income in a foreign currency will be concerned that this currency may weaken in value. It can hedge against this possibility by borrowing in the foreign currency and using the foreign receipts to repay the loan.

For example, US dollar receivables can be hedged by taking out a US dollar overdraft. In the same way, US dollar trade payables can be matched against a US dollar bank account which is used to pay the creditors.

A company which has a long-term foreign investment, for example an overseas subsidiary, will similarly try to match its foreign assets (property, plant etc) with a long-term loan in the same foreign currency.

2.8 Leads and lags

- Companies might try to use:
- **lead payments** (payments in advance); or
- **lagged payments** (delaying payments beyond their due date)

in anticipation of future adverse currency movements.

A UK company may choose to pay a supplier in advance (in a foreign currency), without taking any credit, in the expectation that the foreign currency will soon strengthen in value against sterling, and the cost of the payment in sterling would therefore increase. With a lead payment, paying in advance of the due date, there is a finance cost to consider. This is the interest cost on the money used to make the payment, but early settlement discounts may be available.

Delaying payments in a foreign currency beyond the due settlement date may be a tactic where the currency of payment is expected to fall in value. However, taking more than the agreed period of credit is questionable business practice.

It should be noted that leading or lagging is effectively speculating on expected currency movements, which may not materialise.

3 Forwards and futures

Section overview

- Forward exchange contracts fix an exchange rate for a currency transaction for settlement at a future date.
- Option forward exchange contracts allow for flexibility on the settlement date.
- Forward contracts can be closed out.

- Forward exchange rates are quoted at either a premium or a discount to the spot rate.
- Interest rate differentials explain the difference between the spot and the forward rate.
- Currency futures are standardised exchange-traded forward exchange contracts.

3.1 Forward exchange contracts

Forward exchange contracts hedge against transaction exposures by allowing the importer or exporter to arrange 'now' for a bank to sell or buy a quantity of foreign currency for settlement at a future date, at a **rate of exchange determined** when the **forward contract is made**. The importer or exporter will know in advance either how much local currency they will receive (if they are selling foreign currency to the bank) or how much local currency they must pay (if they are buying foreign currency from the bank).

A forward exchange contract is:

- an immediately firm and binding contract, for example between a bank and its customer;
- for the purchase or sale of a specified quantity of one currency in exchange for another;
- at a rate of exchange fixed at the time the contract is made;
- for performance (delivery of the currency and payment for it) at a future time which is agreed when making the contract. (This future time will be either a specified date, or any time between two specified dates.)

Context example: Forward exchange contract

A UK importer knows on 1 April that she must pay a foreign seller 26,500 Swiss francs in one month's time, on 1 May. She can arrange a forward exchange contract with her bank on 1 April, whereby the bank undertakes to sell the importer 26,500 Swiss francs on 1 May, at a fixed rate of say 1.5200 to the £.

The UK importer can be certain that whatever the spot rate is between Swiss francs and sterling on 1 May, she will have to pay on that date, at this forward rate:

26,500/1.5200 = £17,434.21

(a) If the spot rate in one month is **lower than 1.5200**, the importer would have successfully protected herself against a weakening of sterling (strengthening of the Swiss franc), and would have avoided paying more sterling to obtain the Swiss francs.

(b) If the spot rate is **higher than 1.5200**, sterling's value against the Swiss franc would mean that the importer would pay more under the forward exchange contract than she would have had to pay if she had obtained the francs at the spot rate on 1 May. She cannot avoid this extra cost, because a forward contract is a binding contract.

Summary

Thus, the impact of a forward contract is to remove both upside potential **and** downside risk. It gives a fixed exchange rate.

3.2 Fulfilling a forward contract

3.2.1 What happens if a customer cannot satisfy a forward contract?

A customer might be unable to satisfy a forward contract for any one of a number of reasons.

- An **importer** might find that:
  - their supplier **fails to deliver the goods** as specified, so the importer will not accept the goods delivered and will not agree to pay for them;
  - the **supplier sends fewer goods** than expected, perhaps because of supply shortages, and so the importer has less to pay for;
  - the supplier is **late with the delivery**, and so the importer does not have to pay for the goods until later than expected.
- An **exporter** might find the same types of situation, but in reverse, so that they do not receive any payment at all, or they receive more or less than originally expected, or they receive the expected amount, but only after some delay.

3.2.2 Close-out of forward contracts

If a customer cannot satisfy a forward exchange contract, the bank will make the customer fulfil the contract.

- If the customer has arranged for the bank to buy currency but the customer is unable to deliver the currency, the bank will:
  - sell currency to the customer at the spot rate (when the contract falls due for performance);
  - buy the currency back, under the terms of the forward exchange contract.
- If the customer has contracted for the bank to sell him currency which the customer no longer needs, the bank will:
  - sell the customer the specified amount of currency at the forward exchange rate;
- buy back the unwanted currency at the spot rate.

Thus, the bank arranges for the customer to perform his part of the forward exchange contract by either selling or buying the 'missing' currency at the spot rate. These arrangements are known as **closing out** a forward exchange contract.

3.3 Option forward exchange contracts

Option forward contracts are forward exchange contracts where the customer has the option to call for performance of the contract:

- at any date **from the contract** being made, up to a specified date in the future; or
- at any date **between two dates** both in the future.

Performance must take place at some time; it cannot be avoided altogether.

Option forward contracts are normally used to cover whole months straddling the likely payment date, where the customer is not sure of the exact date on which they will want to buy or sell currency. (The purpose of an option forward contract is to avoid having to renew a forward exchange contract and extend it by a few days, because extending a forward contract can be expensive.)

Worked example: Option forward contract

A UK company must pay $100,000 in approximately 1.5 months' time and takes out an option forward exchange contract to eliminate the foreign currency transaction risk.

Exchange rate details are:

- Today's spot rate $1.5500 to the £
- One-month forward rate $1.5475 to the £
- Two-month forward rate $1.5450 to the £

Requirement

Explain how the foreign debt will be settled in 1.5 months' time.

Solution

The bank will offer an option forward exchange contract to the company, allowing the company to choose when, between one month's time and two months' time, the currency is needed. The rate will be either the one-month rate or the two-month rate, whichever is more beneficial to the bank.

At one-month rate cost = $100,000 ÷ 1.5475 = £64,620.36 At two-month rate cost = $100,000 ÷ 1.5450 = £64,724.92

The bank is selling the dollars and receiving sterling in exchange. Therefore, the rate chosen will be the two-month rate, as that is more beneficial to the bank (earning the bank more sterling income).

3.4 How are forward exchange rates set?

How are forward rates determined? The next section explores how and why forward rates are different from spot rates.

A forward rate might be higher or lower than the spot rate. For example, if the spot rate for dollars is $1.5500/£, the forward rate could be:

Higher – $1.5600 – the forward rate is said to be at **a discount** to the spot rate. Lower – $1.5300 – the forward rate is said to be at **a premium** to the spot rate.

Forward rates may be quoted as a discount or premium to the spot rate (although it is now more common for the actual forward rates to be published, rather than discounts and premiums).

3.5 The rule for adding or subtracting discounts and premiums

Forward rates as adjustments to spot rates	
Forward rate for the overseas currency is weaker than spot	Quoted at discount
Forward rate for the overseas currency is stronger than spot	Quoted at premium

A **discount** is therefore **added** to the spot rate, and a **premium** is **subtracted** from the spot rate. (The mnemonic **ADDIS** may help you to remember that we ADD DISCOUNT and so subtract premiums.) The longer the duration of a forward contract, the larger will be the quoted premium or discount.

Worked example: Adjusting for a premium or discount

1 January:	Spot rate US $	$1.5500	–	1.5610
	One-month forward discount:	0.0020	–	0.0022
	Three-month forward premium:	0.0022	–	0.0018

Requirement

What are the forward rates quoted for one- and three-month contracts respectively?

Solution

Spot rate: $1.5500 – $1.5610

One-month forward: 1.5520 – 1.5632 Obtained by adding the discount to the spot. Three-month forward: 1.5478 – 1.5592

Obtained by deducting the premium from the spot.

3.6 Interest rate parity

The principle of **interest rate parity** (IRP) links the currency and money markets. Money market interest rates explain the differences between **forward and spot rates**.

The basic idea behind IRP is that if an investor places money in a currency with a high interest rate, they will be no better off after conversion back into their domestic currency using a forward contract than if they had simply left the money invested at the domestic interest rate.

This is a realistic idea. If it were possible to make profits by switching deposits between two currencies and arranging forward contracts, banks would do it until the pricing anomaly ended. Spot exchange rates, forward exchange rates and money market rates in the two currencies are directly related to each other.

Worked example: Interest rate parity

A treasurer has £1 million available to place on deposit for 12 months.

- Spot rate is $1.5234/£
- Forward rate is $1.5407/£
- Annual UK rate of interest is 6%
- Annual US rate of interest is 7.2%

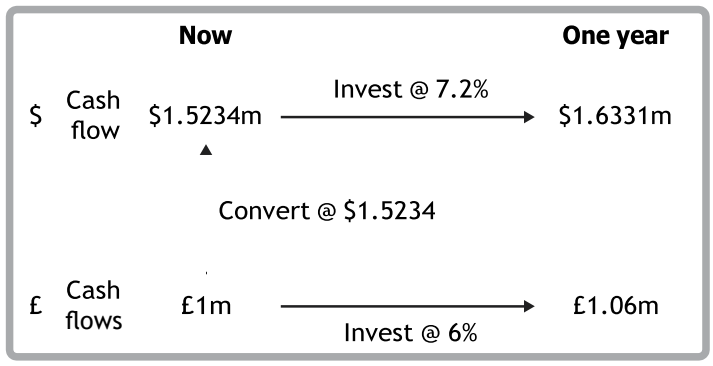
Requirements

1 What would happen if the £1 million was deposited in either the UK or the US?

2 What is the implication of this for the forward exchange rate?

Solution

1 The treasurer could convert the £1 million into dollars, and put it on deposit in the US at 7.2%. After a year, the dollar amount would be converted back to sterling:



The two alternative investments would give $1.6331 million and £1.06 million respectively.

Which of these is preferable depends on the exchange rate in one year. If the exchange rate stays at $1.5234, then the US deposit converts into:

($1.6331m @ $1.5234/£) = £1.072 million ie, a 7.2% return instead of a 6% return.

2 Interest rate parity predicts that there will be no benefit after the impact of the exchange rate is taken into account.

Thus the forward rate of exchange predicted by IRP is $1.6331/£1.06 = $1.5407/£.

If the forward rate were not set at $1.5407/£, a disequilibrium position would be created. For example, if the forward rate were set equal to the spot rate of $1.5234, the implications are that investors would be keen to sell dollars in the forward market and buy sterling. These forces of supply and demand would cause dollars to weaken and sterling to strengthen, and thus the forward rate would change.

Note that is what the example has shown; a forward rate of $1.5407 is a weaker dollar rate than the spot rate of $1.5234.

3.7 Use of interest rate parity to forecast future exchange rates

The relationship between the spot and forward rates is shown algebraically as follows:

$$\text{Spot rate} \times \frac{1 + i_f}{1 + i_{uk}} = \text{Forward rate}$$

Where:

i_f is the foreign interest rate

i_{uk} the domestic UK interest rate (Domestic currency can be changed based on scenarios)

and where the spot and forward rates are quoted as indirect quotes.

The **interest rate parity** formula links the forward exchange rate with interest rates in an exact relationship, because risk-free gains are possible if the rates are out of alignment. The forward rate tends to be an unbiased predictor of the future exchange rate.

So, does this mean that future exchange rates can be predicted using interest rate parity?

The simple answer is 'yes', but of course the prediction is subject to very large inaccuracies, because events which arise in the future can cause large currency swings in the opposite direction to that predicted by interest rate parity.

Interactive question 3: Interest rate parity

A UK company is expecting to receive $1 million in one year's time. The spot rate is $1.5750/£. The company could borrow in dollars at 6% or in sterling at 5%.

Requirement

Predict what the exchange rate is likely to be in one year.

See **Answer** at the end of this chapter.

3.8 Purchasing power parity (PPP)

Definition

Purchasing power parity: The theory that in the long term, exchange rates between currencies will tend to reflect the relative purchasing power of the currency of each country.

This theory is based on the idea that a basket of goods in one country will – after the effect of the exchange rate – cost the same no matter where it is traded. It is sometimes **called the law of one price**.

Worked example: Purchasing power parity

Consider a collection of goods that sell for £1,000 in the UK.

If the exchange rate is $1.80/£, what are the implications of the same goods selling for $2,000 in the US?

Solution

In principle, if the same goods cost $2,000 in the US, instead of (£1,000 @ $1.80) = $1,800, then consumers would buy from the UK (requiring £) and not in the US (therefore selling $).

These forces of supply and demand would ultimately cause the exchange rate to alter with dollars weakening to $2.00/£, at which point the prices are effectively the same.

Different inflation rates

The impact of different inflation rates will cause prices to change at different speeds. So even if parity has been achieved (as above) a disequilibrium will be created.

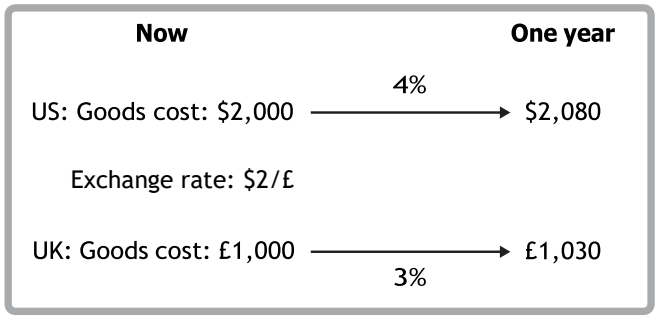
Purchasing power parity predicts that the disequilibrium will be removed by changes in the exchange rate.

Worked example: Different inflation rates

Taking the situation above ie, where an equilibrium rate of $2/£ exists, show what would happen if:

- expected inflation in the UK is 3%; and
- expected inflation in the US is 4%.

Solution



A disequilibrium is created in one year which is then removed by the exchange rate changing. The new equilibrium exchange rate would be $2,080/£1,030 = $2.0194/£.

Note: This is the application of the same relationship as set out above:

$$\text{Spot rate} \times \frac{1 + 1f}{1 + iuk} = \text{Forward rate}$$

$$\$2/£ \times \frac{1.04}{1.03} = \$2.0194$$

3.9 Currency futures

Definition

Currency futures: A currency future is a standardised exchange-traded contract to buy or sell a quantity of one currency in exchange for another, for notional delivery at a set date in the future.

Futures as standardised forward contracts were explained in Chapter 9. Currency futures are similar in concept, except that the underlying item is a notional amount of a currency. The Chicago Mercantile Exchange (CME) trades sterling futures contracts with a standard size of £62,500. Only whole number multiples of this amount (whole contracts) can be bought or sold. Other contract sizes also exist, depending on the exchange. Contract sizes will be specified in the exam question.

As with interest rate futures, contracts have a final settlement date; for example, sterling futures have contract settlement dates (expiry dates) dates in March, June, September or December.

Positions in currency futures must either be closed before the settlement date or are settled at the settlement date when the contracts expire.

Whilst currency futures achieve a similar outcome to forward exchange contracts, by fixing a fixed rate of exchange for future settlement, the mechanics are different.

Worked example: Currency futures

A UK exporter expects to receive $225,000 in December. It is currently August.

- The spot rate now is: $1.2000/£
- The quote for December futures is: $1.2000/£

The UK company uses futures to hedge its currency risk. Contract size is £62,500.In December, the company receives $225,000.

- The spot rate in December had moved to $1.2500
- The futures rate in December was also $1.2500

Requirement

Show the outcome of a futures hedge.

Solution

First work out the number of futures contracts.

$225,000 is worth (at December's quoted future rate of $1.2000/£) £187,500.

£187,500 ÷ £62,500 = 3 contracts. Note that only whole contracts can be entered into.

The UK exporter needs to sell dollars in exchange for sterling: the futures are for a quantity of sterling, therefore the UK exporter will buy sterling futures (ie, sell $s to buy £s).

In August – the hedge is set up by:

Buying (3 contracts × £62,500) = £187,500 for December delivery at $1.2000In December – the futures position is closed:

Selling (3 contracts × £62,500) = £187,500 for December delivery at $1.2500Summary of futures position

	$
Open the position: Buy £ futures at	1.2000
Close the position: Sell £ futures at	(1.2500)
Gain per £	0.0500

The UK exporter has made a gain on the futures position by buying sterling at $1.20 and then selling sterling at $1.25. If you are not sure about this, a contract for £62,500 is worth $75,000 at a rate of 1.20 and is worth $78,125 at 1.25. Buying for $75,000 and selling for $78,125 results in a gain of $3,125 per contract (and therefore a total gain of $3,125 × 3 contracts = $9,375).

Total gain on the futures position can be calculated as: $0.05/£ × (£62,500 × 3 contracts) = $9,375. This is converted at the spot rate in December into £s at the rate of 1.25 so that it is worth £7,500.

The $225,000 received by the UK exporter is then sold in December at the prevailing spot rate:

$225,000 @ $1.2500 = £180,000.

Sterling strengthened in the spot rate over the period, causing a decrease in the value of the actual transaction as follows:

	£
Value of $225,000 – in August @ 1.2000	187,500
Value of $225,000 – in December @ 1.2500	180,000
Decrease in value	7,500

Summary

	£
Decrease in value of actual transaction	(7,500)
Gain due to futures position	7,500
Net effect of futures hedge	0

Thus the futures hedges remove risk – both upside potential and downside (as above) risk.

UK exporter's position	£
Money received from selling $225,000 spot at $1.2500 in December	180,000
Gain on futures position	7,500
Total income	187,500

UK exporter's position	£
Effective exchange rate achieved: $225,000 ÷ 187,500 =	$1.2/£

This is the rate fixed by the futures hedge.

The above simplified example shows a perfect hedge. **In reality this is unlikely to happen**, due to basis risk and the standardised nature of futures contracts.

3.10 Choosing between forward contracts and futures contracts

A futures market hedge attempts to achieve the same result as a forward contract, that is to fix the exchange rate in advance for a future foreign currency payment or receipt.

Advantages of futures over forward contracts

- **Transaction** costs should be **lower**.
- The **exact date** of **receipt** or **payment** of the currency does **not have to be known**, because the futures contract does not have to be closed out until the actual cash receipt or payment is made. In other words, the futures hedge gives the equivalent of an 'option forward' contract, limited only by the expiry date of the contract.

Disadvantages of futures compared with forward contracts

- The **contracts cannot be tailored** to the user's exact requirements.
- **Hedge inefficiencies** are **caused** by having to deal in a whole number of contracts and by basis risk ie, pricing differences between spot markets and futures markets.
- **Only a limited number of currencies** are the subject of futures contracts (although the number of currencies is growing, especially with the rapid development of Asian economies).
- The **procedure for converting** between two currencies neither of which is the US dollar is more complex for futures than for a forward contract. Futures are traded in a fairly limited number of currency pairs, most involving the US dollar.

In general, the disadvantages of futures mean that the market is much smaller than the currency forward market.

Professional skills focus: Assimilating and using information

Questions covering currency risk hedging will include an abundance of information. It is therefore important that you can identify the relevant information needed from the scenario to allow you to calculate the impact of the hedging strategy stated in the requirement; a key point is the nature of the foreign currency transaction (receipt or payment) as this will dictate

which side of a foreign currency spread to use.

3.11 Cryptocurrencies

Cryptocurrencies are simply computer files which owners can transfer to others electronically as a means of paying people for goods and services. Bitcoin is the oldest and best-known **cryptocurrency**, a type of currency that does not have a physical form – it is entirely virtual, purely existing online.

Bitcoins are based on blockchain (or distributed ledger) technology, they are created by mining (processing data to solve complex problems). Once mined, the Bitcoin is available to be used. Every time a Bitcoin is transferred, the transaction is recorded on the blockchain. This allows the transaction history of all Bitcoins to be recorded, making it possible to ensure owners can only spend or transfer Bitcoins that they actually own and preventing Bitcoins from being copied or illegally generated.

Cryptocurrencies can be particularly useful for transactions involving foreign currency. Instead of managing currency risk by using foreign currency hedging techniques, both parties to a transaction could agree that payment will be made in Bitcoin (BTC).

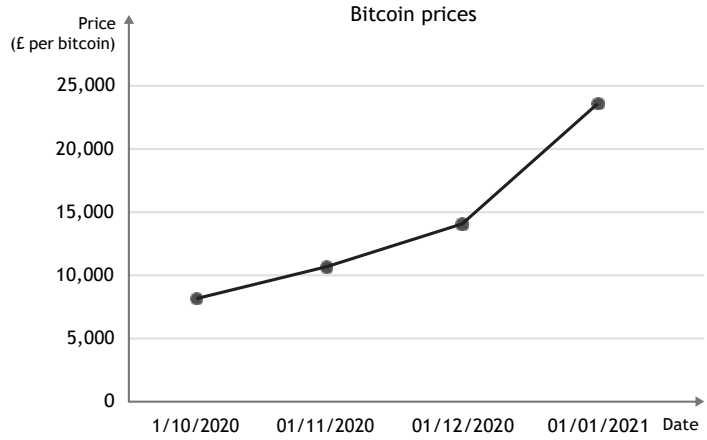
For example, if a UK business is due to make a payment to a German supplier, it would exchange UK pounds for BTC and sends BTC to the German business, which would then exchange BTC for Euros.

Alternatively, businesses can run BTC accounts, converting to and from their respective currencies when the BTC exchange rate is in their favour. Businesses that send and receive payments in multiple currencies could find that using BTC for settlement helps to streamline cash flow management.

Using cryptocurrencies for international transactions presents two key problems:

(a) **Exchangeability**. Cryptocurrency exchanges are only likely to exchange Bitcoins (or other cryptocurrencies such as Ethereum and Litecoin) for a narrow range of major currencies eg, USD, Japanese yen and Euros. So, if an Australian business owes Argentinian Peso to an Argentinian supplier but wishes to pay in a cryptocurrency that is bought for USD, this creates additional FX risk.

(b) **Price volatility**. Cryptocurrency exchange rates are extremely volatile. Bitcoin, for example, was worth £8,236 in October 2020 increasing to £24,433 in January 2021. However, increasingly there are opportunities to hedge this risk using OTC agreements such as forward contracts and derivative agreements such as futures.



Definition

Cryptocurrency: A digital currency that uses cryptography to make sure payments are sent and received safely.

3.11.1 Hedging price volatility - forward contracts

Earlier in the chapter we learned that a forward contract is a binding agreement to buy or sell an item for settlement at a future date, at a price agreed today.

Forward contracts allow businesses to hedge the value of a cryptocurrency in advance. Unlike a future contract, forward contracts are tailored to an individual transaction.

Worked example: Using forwards to set up a cryptocurrency hedge

Wallace plc is a UK company that is due to receive a payment from a customer of 10 Bitcoin (BTC) in two months' time.

It is now 30 April 20X0, the current (spot) value of a Bitcoin is £31,770 and the forward market price quote for June £31,820.

Requirement

Demonstrate the outcome of a forward hedge.

Solution

Position in forward market

10 Bitcoin × £31,820= £318,200

This will be received in two months' time.

3.11.2 Quotation of forward rates

In the exam you may be given both the buying rate and the selling rate for the cryptocurrency, it is important that you can select the correct rate.

Exchange rates can be quoted directly or indirectly:

Direct quote (the amount of domestic currency which is equal to one foreign currency unit) 1 Bitcoin = £31,820

Indirect quote (amount of foreign currency which is equal to one domestic currency unit) 0.00314 Bitcoin = £1

Although we would normally use indirect quotes when dealing with foreign currency, to make the calculations easier, the exam will use **direct quotes when dealing with cryptocurrency**.

Remember that where exchange rates are given as a spread, the company will always be offered **the least attractive part** of the spread (ie, the lower price if selling Bitcoin and the higher price if buying Bitcoin).

Worked example: Selecting the correct forward rate

Wallace plc is a UK company that is due to receive a payment from a customer of 10 Bitcoin in two months' time.

It is now 30 April 20X0, the following rates apply:

Spot rate: 1 Bitcoin = £31,720 – £31,820

Two-month forward rate: 1 Bitcoin = £31,770 – 31,870

Requirement

Demonstrate the outcome of a forward hedge.

Solution

Position in forward market

The company will sell Bitcoin so the lower price of £31,770 will be offered. 10 Bitcoin × £31,770 = £317,700

This will be received in two months' time.

Remember that foreign exchange dealers make their profit on the spread so companies will always lose out, we therefore select the forward rate in this example that will result in the lower receipt for Wallace plc.

3.11.3 Hedging price volatility - futures contracts

Bitcoin futures are standard contracts for a set number of Bitcoin eg, 5 Bitcoin. These have recently started to be offered by some major futures exchanges, such as the Chicago Mercantile Exchange, to fix the value of a Bitcoin against the US dollar. Exam questions will be based on contracts that are in UK pounds.

Bitcoin futures contracts can be used to protect investors against future changes in the value of Bitcoin.

Worked example: Using futures to set up a cryptocurrency hedge

Wallace plc (from the previous example) is now considering the use of Bitcoin futures to hedge the risk of its receipt of 10 Bitcoin (BTC) in two months' time. It is 30 April 20X0, the current value of a Bitcoin is £31,770 and the price quote for June Bitcoin future is £31,865. Bitcoin futures contract are available in a standard contract size of 5 Bitcoin.

Requirement

Demonstrate what hedge should be undertaken to protect the company against a fall in the £ value of Bitcoin.

Solution

Calculate number of contracts

We should **sell** futures to protect the value of the transaction.

If the value of the Bitcoin falls, the company will make a profit by closing the futures position and buying futures at a lower price than the original selling price. The gain on the futures position will offset the loss incurred from the fall in the value of Bitcoin.

Number of contracts = 10 (transaction size) ÷ 5 (standard contract size) = 2 contracts We can assess the results of the hedge by examining the position at a later date.

Worked example: How Bitcoin futures provide a hedge if the market falls

On 30 June 20X0, the settlement date for the June futures contract, the market value (and June futures value) of a Bitcoin was £25,000.

Requirement

Calculate the outcome of the hedge that Wallace has undertaken.

Solution

Step 1 Position in spot market

Loss on transaction = 10 bitcoin × (£31,770 – £25,000) = £67,770

Step 2 Calculate gain or loss on futures

Buy futures at lower price than we sold them for (closing out). The price to close out the position is £25,000.

Initially sold futures for: 31,865

Now buy futures for: 25,000

Gain on closing out futures: 6,865 × 5 Bitcoin × 2 contracts = £68,650

Step 3 Calculate net position

Net position = £68,650 gain on futures – £67,770 loss on actual

= £880 gain overall

The final outcome is that 10 Bitcoin are received and sold at the spot rate of £25,000 per Bitcoin (10

× market price of £25,000 = £250,000) and compensation is received from the futures market (£68,650) so total revenue is £250,000 + £68,650 = £318,650.

Note: The hedge is less than 100% efficient because of basis (ie, the spot and futures prices for Bitcoin have moved by different amounts).

Worked example: The impact of hedging if the market rises

Suppose in the previous example that on 30 June 20X0, the market (and June futures) value of Bitcoin rises to £32,000.

Requirement

Calculate the outcome of the hedge that Wallace has undertaken.

Solution

Step 1 Position in spot market

Gain on transaction = 10 bitcoin × (£32,000 – £31,770) = £2,300

Step 2 Calculate gain or loss on futures

Initially sold futures for: £31,865

Now buy futures for: £32,000

Loss on closing out futures: £135 × 5 Bitcoin × 2 contracts = £1,350

Step 3 Calculate net position

Net position:

£2,300 gain on spot market

(£1,350) loss on futures

950 gain overall

The final outcome is that 10 Bitcoin are received and sold at the spot rate of £32,000 per Bitcoin (10 × market price of £32,000= £320,000) and a loss is made on the futures market (£1,350) so total revenue is £320,000 – £1,350 = £318,650 (ie, the same outcome is achieved whether Bitcoin prices rise or fall).

The impact of a futures hedge

The objective of a futures hedge is to remove price risk by fixing the price in advance. The benefit is that downside risk is eliminated; the disadvantage is that any upside is also removed.

3.11.4 Choosing between forward contracts and futures contracts

The factors influencing the choice between forward contracts and futures contracts are the same as those outlined in the previous section in the context of currency hedging.

4 Hedging using the money markets

Section overview

- A money market hedge achieves the same end as a forward contract.
- A money market hedge matches assets and liabilities in the same currency.
- The choice of hedge is determined by which is cheapest.

4.1 Money market hedges

Because of the close relationship between forward exchange rates and the interest rates in the two currencies, it is possible to 'manufacture' a forward rate by using the spot exchange rate and money market lending or borrowing. This technique is known as a money market hedge or synthetic forward.

4.2 Setting up a money market hedge for a foreign currency payment

Suppose a British company needs to pay a Swiss creditor in Swiss francs in three months' time. It does not have enough cash to pay now, but will have sufficient in three months' time. Instead of negotiating a forward contract, the company could:

Step 1 Borrow the appropriate amount in pounds now.

Step 2 Convert the pounds to francs immediately.

Step 3 Put the francs on deposit in a Swiss franc bank account.

Step 4 When the time comes to pay the company:

(a) Pay the creditor out of the franc bank account

(b) Repay the pound loan account

The effect is exactly the same as using a forward contract, and will usually cost almost exactly the same amount. If the results from a money market hedge were very different from a forward hedge, speculators could make money without taking a risk. Therefore, market forces ensure that the two hedges produce very similar results.

Worked example: Money market hedge

A UK company owes a Danish creditor Kr 3,500,000 in three months' time. The spot exchange rate is Kr/£ 7.5509 – 7.5548. The company can borrow in Sterling for three months at 8.60% per annum and can deposit kroner for three months at 10% per annum.

Requirement

What is the cost in pounds with a money market hedge and what effective forward rate would this represent?

Solution

The interest rates for three months are 2.15% to borrow in pounds and 2.5% to deposit in kroner. The company needs to deposit enough kroner now so that the total including interest will be Kr3,500,000 in three months' time. This means depositing:

Kr3,500,000/(1 + 0.025) = Kr3,414,634.

The kroner will cost £452,215 (spot rate 7.5509). The company must borrow this amount and, with three months' interest of 2.15%, will have to repay:

£452,215 × (1 + 0.0215) = £461,938.

Thus, in three months, the Danish creditor will be paid out of the Danish bank account and the company will be paying £461,938 to satisfy this debt. The effective forward rate which the company has 'manufactured' is 3,500,000/461,938 = 7.5768. This effective forward rate shows the kroner at a discount to the pound because the kroner interest rate is higher than the sterling rate.

4.3 Setting up a money market hedge for a foreign currency receipt

A similar technique can be used to cover a foreign currency receipt from a debtor. To manufacture a forward exchange rate, follow the steps below.

Step 1 Borrow an appropriate amount in the foreign currency today.

Step 2 Convert it immediately to home currency.

Step 3 Place it on deposit in the home currency.

Step 4 When the debtor's cash is received:

(a) Repay the foreign currency loan

(b) Take the cash from the home currency deposit account

Interactive question 4: Money market hedge

A UK company is owed SFr 2,500,000 to be paid in three months' time by a Swiss company. The spot exchange rate is SFr/£ 2.2498 – 2.2510. The company can deposit in sterling for three months at 8.00% per annum and can borrow Swiss francs for three months at 7.00% per annum.

Requirement

What is the receipt in pounds with a money market hedge and what effective forward rate would this represent?

See **Answer** at the end of this chapter.

4.4 Choosing the hedging method

When a company expects to receive or pay a sum of foreign currency in the next few months, it can choose between using the forward exchange market and the money market to hedge against the foreign exchange risk. Other methods may also be possible, such as making lead payments. The cheapest method available is the one that ought to be chosen.

Interactive question 5: Choosing the cheapest method

Trumpton plc has bought goods from a US supplier, and must pay $4,000,000 in three months' time. The company's finance director wishes to hedge against the foreign exchange risk, and the three methods which the company usually considers are:

- using forward exchange contracts;
- using money market borrowing or lending; and
- making lead payments.

The following annual interest rates and exchange rates are currently available.

	US dollar		Sterling	
	Deposit rate	Borrowing rate	Deposit rate	Borrowing rate
	%	%	%	%
1 month	7	10.25	10.75	14.00
3 months	7	10.75	11.00	14.25

	$/£ exchange rate ($ = £1)
Spot	1.8625 – 1.8635
1 month forward	0.60c – 0.58c pm
3 months forward	1.80c – 1.75c pm

Requirement

Which is the cheapest method for Trumpton plc between the following?

- Forward contract
- Money market hedge
- Lead payment

See **Answer** at the end of this chapter.

4.5 Comparison of hedging methods

	Forward	Money Market	Futures
Tailored	✔	✔	✘
Secondary market to 'unwind' hedge	✘	✔	✔
Transaction cost	Via spread	Via spreads on interest and spot rate	Brokerage fees
Complexity	Low	Medium	High
Management costs	Low	Medium	High
Volume/popularity	Small/medium companies	Banks	May be used by companies with large currency exposures

Professional skills focus: Structuring problems and solutions

Questions on currency risk often require you to use a number of different hedging strategies. It is therefore important that you can apply relevant technical knowledge efficiently and in an orderly manner.

5 Currency options

Section overview

- Options remove downside risk but leave upside potential.
- A premium must be paid.
- Options are used in situations where there is uncertainty over the future outcomes.

5.1 Introduction

Currency options protect against adverse movements in the exchange rate while allowing the investor to take advantage of favourable exchange rate movements.

Forwards futures and money market hedges involve binding contracts to buy or sell currency (or deposit or lend currency). This can be problematic in situations where the cash flow is not certain to occur, for example, when tendering for overseas contracts. Currency options are particularly useful in this type of situation.

Definition

Currency option: An agreement involving a right, but not an obligation, to buy or to sell a certain amount of currency at a stated rate of exchange (the **exercise price**) at some time in the future.

As with other types of option, **buying** a currency option involves **paying a premium**, which is the most the buyer of the option can lose. **Selling** (or 'writing') options, unless covered by other transactions, is risky because the seller ('writer') bears the whole of the cost of the variation and can face potentially unlimited losses.

5.2 Currency option terminology

Some terminology relating to traded options was explained in the previous chapter in the context of options to buy and sell shares. Much of the same terminology applies to currency options.

5.3 Currency option quotations

A company wishing to purchase an option to buy or sell sterling might use over the counter currency options from its bank or those traded on the important Philadelphia Stock Exchange. The schedule of prices for £/$ options is set out in tables such as the one shown below.

Philadelphia SE £/$ options £10,000 (cents per pound)

	Calls			Puts		
Strike price	Aug	Sept	Oct	Aug	Sept	Oct
1.5750	2.58	3.13	–	–	0.67	–
1.5800	2.14	2.77	3.24	–	0.81	1.32
1.5900	1.23	2.17	2.64	0.05	1.06	1.71
1.6000	0.50	1.61	2.16	0.32	1.50	2.18
1.6100	0.15	1.16	1.71	0.93	2.05	2.69
1.6200	–	0.81	1.33	1.79	2.65	3.30

Notes

1 The contract size is £10,000.

2 If a firm wished to have the **option to buy pounds** (selling dollars) in September, it can buy a **call option on sterling**. To have the option to buy pounds at an exchange rate of $1.5800/£, it would need to pay a premium of 2.77 cents per pound. For a higher exchange rate, the premium is lower, since the higher exchange rate is less favourable to the buyer of the option: more dollars are needed to buy the same number of pounds.

3 A **put option** here is the **option to sell sterling** in exchange for dollars. Note that a put option with a strike price of 1.6000 $/£ exercisable in September is, at 1.50 cents per pound, cheaper than a September put option exercisable at 1.6100 $/£, which is available at a premium of 2.05 cents per pound. The premium on put options is higher for the higher exchange rate since the purchaser will receive more dollars for each pound sold than with the lower exchange rate.

4 Note that a call option with a strike price of 1.6000 $/£ exercisable in September will **cost more** than an option with the same strike price which is exercisable in August. This difference reflects the fact that for the September option there is a **longer period** until the exercise date and consequently the likelihood of it being beneficial to exercise the option is increased (ie, it is more likely to be 'in-the-money' at the exercise date). The difference also reflects the market's view of the direction in which the exchange rate is likely to move between the two dates.

5.4 Using currency options

The main purpose of currency options is to **reduce exposure** to **adverse currency movements**, while allowing the holder to profit from favourable currency movements. They are particularly useful for companies in the following situations:

- Where there is **uncertainty** about **foreign currency receipts** or **payments**, either in timing or amount. Should the foreign exchange transaction not materialise, the option can be sold on the market (if it has any value) or exercised if this would make a profit.
- To **allow the publication of price lists** for its goods in a foreign currency. In this situation, the company would not know whether it had won any export sales or would have any foreign currency income at the time that it announces its selling prices. It cannot make a forward exchange contract to sell foreign currency without becoming exposed in the currency.
- To **protect the import or export** of price-sensitive goods. If there is a favourable movement in exchange rates, options allow the importer/exporter to profit from the favourable change (unlike forward exchange contracts, when the importer/exporter is **tied** to a fixed **rate of exchange** by the binding contract). This means that the gains can be passed on in the prices to the importer's or exporter's customers.

5.5 Comparison of currency options with forward contracts and futures contracts

Earlier in this chapter, we saw that a hedge using a currency future will produce approximately the same result as a currency forward contract, subject to hedge inefficiencies. When comparing currency options with forward or futures contracts we usually find the following.

- If the currency movement is adverse, the option will be exercised, but the hedge will not normally be quite as good as that of the forward or futures contract: this is because of the **premium cost of the option**.
- If the currency movement is favourable, the option will not be exercised, and the result will normally be better than that of the forward or futures contract: this is because the option allows the holder to **profit from the improved exchange rate**.

These points are illustrated by the next series of examples.

Worked example: Over-the-counter currency options

Sugar plc is expecting to receive 20 million South African rands (R) in one month's time. The current spot rate is R/£ 19.3383 – 19.3582. Compare the results of the following actions.

(1) The receipt is hedged using a forward contract at the rate 19.3048.

(2) The receipt is hedged by buying an over-the-counter (OTC) option from the bank, exercise price R/£ 19.30, premium cost of £24,000.

(3) The receipt is not hedged.

Requirement

In each case compute the results if, in one month, the exchange rate moves to:

(1) R 21.00/£

(2) R 17.60/£

Solution

The target receipt at today's spot rate is 20,000,000/19.3582 = £1,033,154.

(1) The receipt using a forward contract is fixed with certainty at 20,000,000/19.3048 = £1,036,012. This applies to both exchange rate scenarios.

(2) The cost of the option is £24,000. This must be paid at the start of the contract. The results under the two scenarios are as follows:

Scenario	(a)	(b)
Amount received at exchange rate	R 20 million @ R21.0/£ = £952,382	@ 17.60 = £1,136,364
Amount received at exercise price	R 20 million @ R19.30/£ = £1,036,269	@ 19.30 = £1,036,269

Does the company exercise the option?

	YES	**NO**
	(a)	(b)
	£	£
Pounds received	1,036,269	1,136,364
Less option premium	(24,000)	(24,000)
Net receipt	1,012,269	1,112,364

(3) The results of not hedging under the two scenarios are as follows:

Scenario	**(a)**	**(b)**
Exchange rate	21.00	17.60
Pounds received	£952,381	£1,136,364

- **Summary.** The option gives a result between that of the forward contract and no hedge.
- If the South African rand weakens to 21.00, the best result would have been obtained using the forward market (£1,036,012).
- If it strengthens to 17.60, the best course of action would have been to take no hedge (£1,136,364).

In both cases the option gives the second-best result, being £24,000 below the best because of its premium cost.

Worked example: Traded currency options

Prices (premiums) on 1 June for Sterling traded currency options on the Philadelphia Stock Exchange are shown in the following table.

Sterling £10,000 contracts (cents per £)

Exercise price	Calls		Puts	
$/£	September	December	September	December
1.5000	5.55	7.95	0.42	1.95
1.5500	2.75	3.85	4.15	6.30
1.6000	0.25	1.00	9.40	11.20

Prices are quoted in cents per £.

On 1 June, the current spot exchange rate is $1.5404 – $1.5425 and September futures are quoted at $1.5425 with a standard contract size of £62,500.

Stark Plc, a UK company, is due to receive $3,825,400 from a debtor in four months' time at the end of September. The treasurer decides to hedge this receipt using either September £ traded options or September futures.

Requirement

Compare the results of using an option to hedge with a futures contract.

Illustrate the results with an option exercise price of $1.55 if by the end of September the spot exchange rate moves to (1) $1.4800; (2) $1.5700.

Assume that at the end of September the quote for September futures is the same as the spot exchange rate.

Solution

The target receipt is $3,825,400/1.55* = £2,468,000.

*This is the option exercise price of $1.55.

A receipt of £2,468,000 will require 247 option contracts (£2,468,000/£10,000 = 246.8 rounded to 247).

Using options, the treasurer will purchase 247 September call options (ie, needs to buy £ as the underlying option is in £s). Using an exercise price of 1.55, the cost of the premium on 1 June is $67,925 (247 × 2.75/100 × 10,000).

This is paid on 1 June, therefore at spot rate of 1.5404 (which is the relevant part of the spread for this transaction) this costs £44,096.

Assuming an exercise price of 1.55 is chosen (which is the rate closest to the current spot), the cost of the premium on 1 June is $68,200. This is paid on 1 June, therefore at spot rate of 1.5404 (which is the relevant part of the spread for this transaction) this costs £44,274.

Impact of options

Scenario	(1)	(2)
Prevailing exchange rate ($/£) in September	1.48	1.57
Have right to buy sterling for	1.55	1.55
Intrinsic value of option ($ per £)	0.00	0.02
Exercise?	No	Yes
Value of options: $0.02 × £10,000		= $200 per contract
No. of contracts		247
Gain on option		$49,400
Value of sterling receipt at prevailing exchange rate ($3,825,400)	£2,584,730	£2,436,561
Gain on option ($49,400 @1.57 spot in Sept)		£31,465
Less premium	£(44,096)	£(44,096)
Net receipts	£2,540,634	£2,423,930

Impact of futures

The company will want to buy: £2,480,000/£62,500 = approximately 40 contracts.

The hedge position will be to buy the September sterling futures at $1.5425 on 1 June, and then close out at the end of September.

Scenario	(1)	(2)
Closing futures price	(1.48)	(1.57)
Bought futures at	1.5425	1.5425
Gain/(loss) on future	$(0.0625)/£	$0.0275/£
	× £62,500	× £62,500
	× 40 contracts	× 40 contracts
Overall futures position =	$(156,250)	$68,750
Actual transaction	$3,825,400	$3,825,400
Net position in $s	$3,669,150	$3,894,150
Net receipts (at prevailing spot rate – 1.48 scenario 1 and 1.57 scenario 2)	£2,479,155	£2,480,350

The future gives a fixed outcome unless the number of contracts has to be rounded to the nearest whole number (as here), in which case there is a very small (ie, immaterial) difference.

Note: Option contracts may also need to be rounded to the nearest whole number, although this is rare.

Summary

The future gives a fixed exchange rate whereas the option removes the downside risk leaving the upside potential. Which gives the better outcome depends on the value of the closing exchange rate.

5.6 The drawbacks of currency options

The major drawbacks of currency options are as follows.

- The **cost is about 5%** of the **total amount** of **foreign exchange covered**, although the exact amount depends on the expected volatility of the exchange rate and the particular option chosen.
- Options must be paid for as soon as they are bought.
- **Tailor-made options lack negotiability**.
- Traded options are **not available** in every currency.

6 Hedging economic and translation exposures

Section overview

- Economic exposure can be hedged by matching assets and liabilities and diversification.
- Translation exposure, the risk of apparent losses appearing when accounting results are translated, probably does not need to be hedged.

6.1 Economic exposure

Definition

Economic exposure: The risk that longer-term exchange rate movements might reduce the international competitiveness of a company.

It is the risk that the present value of a company's future cash flows might be reduced by adverse exchange rate movements.

Overseas subsidiary:

Suppose a UK company invests in setting up a subsidiary in South East Asia. The currency of the Asian country depreciates continuously over a five-year period. The cash flows remitted back to the UK are worth less in sterling terms each year, causing a reduction in the value of the investment project.

Importer-exporter:

Another UK company buys raw materials that are priced in US dollars. It converts these materials into finished products that it exports mainly to Spain. Over a period of several years, the pound depreciates against the dollar but strengthens against the euro. The sterling value of the company's income declines while the sterling cost of its materials increases, resulting in a drop in the value of the company's cash flows.

The value of a company depends on the present value of its expected future cash flows. If there are fears that a company is exposed to the sort of exchange rate movements described above, this may reduce the company's value. Protecting against economic exposure is therefore necessary to protect the company's share price.

Domestic producers:

A company need not even engage in any foreign activities to be subject to economic exposure. For example, if a company trades only in the UK but the pound strengthens appreciably against other world currencies, it may find that it loses UK sales to a foreign competitor who can now afford to charge cheaper sterling prices.

6.2 Economic exposure and inflation

None of these examples are as simple as they seem, however, because of the compensating actions of economic forces. For example, if the exchange rate of a South East Asian country depreciates significantly, it is probably because of its high inflation rate.

So, if the Asian subsidiary of a UK company increases its prices in line with inflation, its cash flows in the local currency will increase each year. However, under **purchasing power parity** the currency will depreciate. The cash flows will therefore be converted at the depreciating exchange rate to produce a fairly constant sterling value of cash flows. Alternatively, if the subsidiary does not increase its prices, it may increase its sales volume by selling at more competitive prices.

Worked example: Economic forces

A UK company has an overseas US subsidiary which remits all $ cashflows back to the UK.

Consider a situation in which inflation rates in the US are higher than in the UK, for example 5% and 3% respectively.

Assuming a spot rate of $1.50/£ illustrate what would happen if the:

- US subsidiary did not increase prices in year 1;
- US subsidiary increased prices by inflation in year 2.

Solution

			Year 1		Year 2
$ cash flow	100		100		105
Exchange rate	$1.50	× 1.05/1.03 =	$1.53	× 1.05/1.03 =	$1.56
£ cash flows	66.67		65.36		67.31

Economic exposure is illustrated in year 1. The effect of higher US inflation causes the dollar to weaken and therefore sterling remittances fall.

In year 2, the increase in the US prices of 5% more than compensates for the decline in the currency (being approximately 2%) resulting in the sterling remittance going up by 3% (the UK rate of inflation).

Thus, the effects of economic exposure may be reduced by changes in prices, which mean the real exchange rate changes little if at all. However, there may be timing differences involved, and if exchange rate movements are very large, the business might suffer for a while before compensating economic forces take effect.

6.3 Hedging economic exposure

It can be difficult to hedge against economic exposure in the short term. Measures can be taken only in the longer term, where sales prices and resource costs can change, and new strategies can be developed and implemented.

- **Diversifying operations world-wide**

  On the principle that companies which confine themselves to one country suffer from economic exposure, international diversification is a method of reducing risk. Companies may look to diversify any or all of sales, production, raw material supplies and finance sources across different countries and currencies.

- **Market and promotional management**

  Having taken the decision to diversify, the company must then carefully decide in which markets to operate. This decision will link in with strategic objectives, and weigh the economic exposure against the earnings that the market is reckoned to be able to generate.

- **Product management**

  High levels of economic exposure may mean high-risk product decisions, particularly the decision to launch new products.

- **Pricing**

  Pricing strategy must respond to the risk of fluctuations in exchange rates, but this must also tie in with other objectives. Reducing prices may maintain market share but may result in a reduction in profits. Changing prices to combat exchange rate movements may also cause complications in the company's own local markets, particularly if competitors respond.

- **Production management**

  As indicated above, levels of economic exposure may influence supply and location of production decisions. Complications can arise when changing the mix of inputs; this may reduce economic exposure but there may be costs involved in becoming more flexible. However, it will be much easier to shift production to countries with falling exchange rates and lower relative production costs if the company already has facilities in these places and it is feasible to shift production to them.

6.4 Translation exposure

Definition

Translation exposure: The risk that the organisation will make **exchange losses** when the **accounting results** of its foreign branches or subsidiaries are **translated** into the **home currency**.

Translation losses can result, for example, from re-stating the book value of a foreign subsidiary's assets at the exchange rate on the balance sheet date. Such losses will not have an impact on the firm's cash flow unless the assets are sold.

Does it matter?

Professional skills focus: Concluding, recommending and communicating

There are opposing arguments as to whether translation exposure is important. The arguments centre on whether the reporting of a translation gain or loss will affect the

company's share price. There is a powerful argument that, to the extent that cash flows are not affected, translation exposure can be ignored. On the other hand, those who believe that accounting results are an important determinant of share price argue that translation losses should be reduced to a minimum.

It is important to lay out your workings clearly for each hedging technique use, underlining key numbers and drawing rational conclusions that are based on your own calculations.

6.5 Overseas trade – trading risks

Both importers and exporters will face trading risks which are greater than those faced by domestic traders as a consequence of political and cultural risk as well as the increased distances and times involved. Types of trading risk include:

- **Physical risk** – The risk of goods being lost or stolen in transit, or the documents accompanying the goods going astray.
- **Credit risk** – The possibility of payment default by the customer. With foreign trade, the length of credit given to customers may be fairly long, and longer periods of credit will increase the credit risk.
- **Trade risk** – The risk of the customer refusing to accept the goods on delivery (due to sub- standard/inappropriate goods), or the cancellation of the order in transit.
- **Liquidity risk** – The inability to finance the credit given to customers.

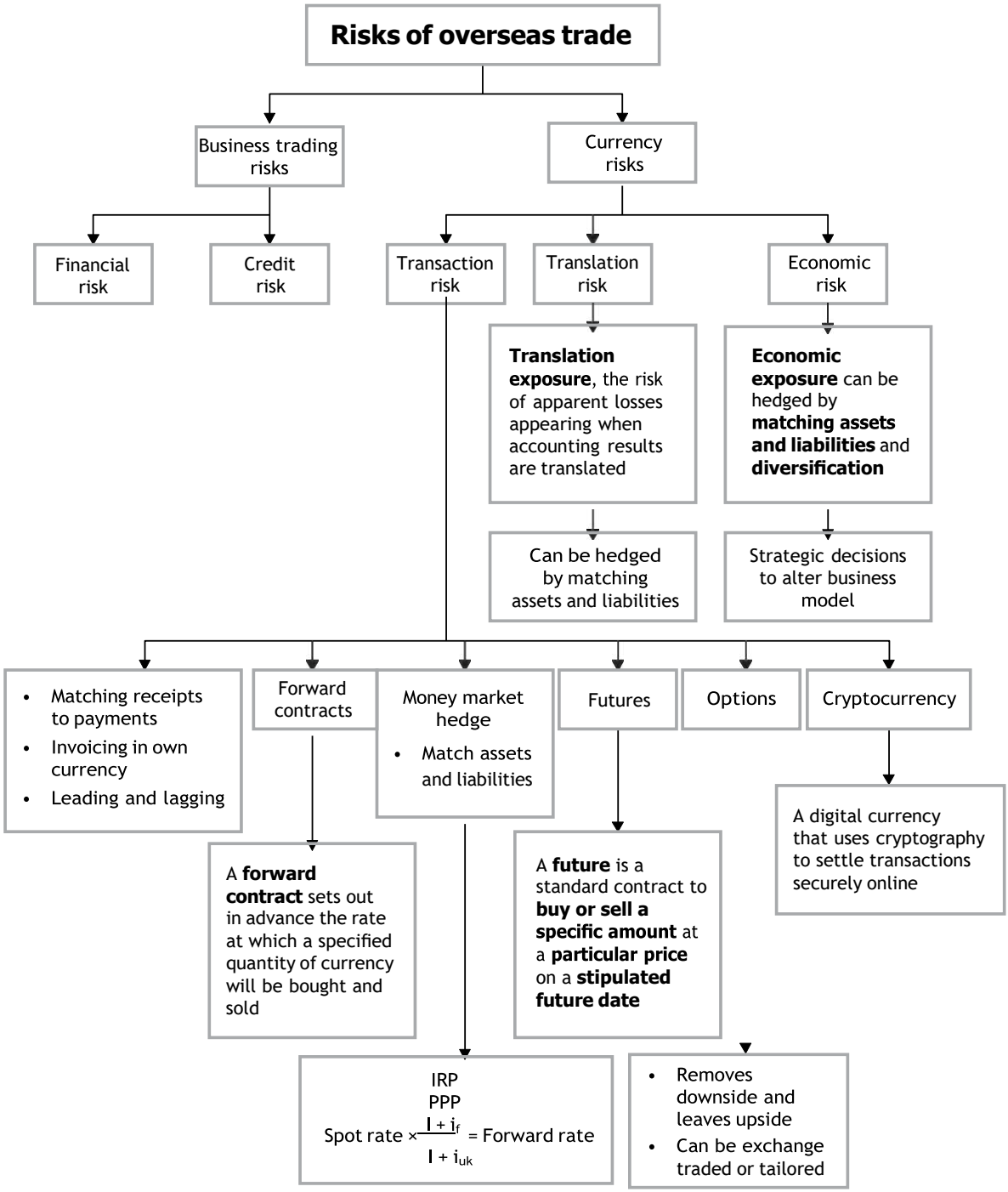
Such risks may be reduced with the **help** of **banks, insurance companies, credit reference agencies** and **government agencies** such as the UK's Export Credits Guarantee Department (ECGD).

Other ways to reduce these risks include risk **transfer**. A business shipping parcels overseas may agree a contract obligating the courier to pay for losses in excess of its statutory liability.

Professional skills focus: Applying judgement

In managing currency risk and concluding on an appropriate hedging strategy, critical thinking is a requirement. The potential drawbacks of a currency hedging technique may need to be considered before making a recommendation on which technique to use.

Summary


Risks of overseas trade
Business trading risks
Currency risks
Financial risk
Credit risk
Transaction risk
Translation risk
Economic risk
Translation exposure, the risk of apparent losses appearing when accounting results are translated
Economic exposure can be hedged by matching assets and liabilities and diversification
Can be hedged by matching assets and liabilities
Strategic decisions to alter business model
Matching receipts to payments
Invoicing in own currency
Leading and lagging
Forward contracts
Money market hedge
Match assets and liabilities
Futures
Options
Cryptocurrency
A digital currency that uses cryptography to settle transactions securely online
A forward contract sets out in advance the rate at which a specified quantity of currency will be bought and sold
A future is a standard contract to buy or sell a specific amount at a particular price on a stipulated future date
IRP
PPP
Spot rate × (1 + i_f) / (1 + i_{uk}) = Forward rate
Removes downside and leaves upside
Can be exchange traded or tailored

Further question practice

1 Knowledge diagnostic

Before you move on to question practice, confirm you are able to answer the following questions having studied this chapter. If not, you are advised to revisit the relevant learning from the topic indicated.

Confirm your learning	
1.	Can you select the correct exchange rate to use from a bid-offer spread? (Topic 1)
2.	Can you explain three internal hedging techniques? (Topic 2)
3.	Can you predict an exchange rate using IRP and PPP? (Topic 3)
4.	Can you set up a MMH for a foreign currency payment and receipt? (Topic 4)
5.	Can you prepare calculations to show the outcome of using an option to hedge foreign currency risk? (Topic 5)
6.	Can you explain the difference between transaction, translation and economic risk? (Topic 6)

2 Question practice

Aim to complete all self-test questions at the end of this chapter. The following self-test questions are particularly helpful to further topic understanding and guide skills application before you proceed to the next chapter.

Question	Learning benefit from attempting this question
1	This is a good introductory question to practice using futures to manage currency risk. Work through this question carefully before attempting exam-standard questions.
2 Milligan	This is a good introductory question to practice using options to manage currency risk. Work through this question carefully before attempting exam-standard questions.
4 Leonard Hastings Engineering Ltd	This is similar to the style of question you may see in the exam. You are asked to calculate the sterling receipt under a number of different hedging strategies. You are also asked to advice on the implications of using each of the techniques. This is a very good question to attempt before moving on to additional question practice in the Question Bank.

Once you have completed these self-test questions, it is beneficial to attempt the questions from the Question Bank for this module. These questions will introduce exam-style scenarios that will help you improve your knowledge application and professional skills development before you start the next chapter.

Refer back to the learning in this chapter for any questions which you did not answer correctly or where the suggested solution has not provided sufficient explanation to answer all your queries. Once you have attempted these questions, you can continue your studies by moving on to the next chapter.

Self-test questions

Answer the following questions.

1 Sterling futures

On 12 July, the following figures are quoted.

Sterling futures: contract size £62,500: price in $ per £

	12 July price
September	1.5552
December	1.5556
March	1.5564

Requirements

1.1 Your company, based in Britain, will receive US $2,000,000 on 13 December. How should you hedge the receipt using futures? Assume that on 13 December the spot rate is quoted at 1.6502 and there is no basis risk.

(5 marks)

1.2 Starburst plc, a British company, expects to pay $5 million in eight months' time. How can it hedge this payment on the futures market? It is currently 12 July and the data in the above table applies. Assume that in eight months' time the spot rate is quoted at 1.5504 and there is no basis risk.

(5 marks)
Total: 10 marks

2 Milligan

Milligan, a UK company which trades frequently with the USA, has to make a net payment of $25 million in three months' time.

Market traded option prices (£10,000 contract size) in the USA are as follows. (The options relate to the purchase or sale of sterling.)

	June contracts		September contracts	
Exercise price ($/£)	**Calls**	**Puts**	**Calls**	**Puts**
1.98	1.65	0.41	2.38	0.71
2.00	0.56	1.20	1.01	1.57
2.02	0.17	2.65	0.48	3.45

Option premiums are in cents per pound and are payable up front. The options are American style. Assume that it is now 1 June and the current spot rate is $1.99/£.

Requirements

2.1 How many options contracts should Milligan enter into to hedge the transaction given, assuming a strike price of $2.00/£ is chosen?

2.2 Should Milligan enter into put or call options?

2.3 Which date options should Milligan enter into?

2.4 What will be the cost, expressed to the nearest dollar, of the premium to obtain the required number of contracts to hedge the transaction at a rate of $2/£?

2.5 Assuming a strike price of $2, illustrate the impact of an options hedge assuming spot rates in three months of either:

(1) $1.98/£

(2) $2.02/£

Total: 10 marks

3 Johnston Hennessy Lockhart Ltd

You should assume that the current date is 30 September 20X2.

Johnston Hennessy Lockhart Ltd (JHL) is a UK engineering firm. The majority of JHL's sales are in the UK, but lately JHL has taken on an increasing number of international customers. Over the past year JHL has been involved in a major project with an Italian company, Lansoni Pozzallo (LP). This will be completed in December 20X2 and it has been agreed that JHL will receive the project fees of €5.3 million on 31 December 20X2.

Because of the scale of the project JHL's board is considering hedging the €5.3 million receipt. On the advice of its bankers, the company is considering four possible strategies:

(1) Use an over-the-counter currency option

(2) Use a money market hedge

(3) Use a forward contract

(4) Do not hedge

You, a chartered accountant, work for JHL and have been asked to advise the JHL board on this matter. You have gathered the following information:

Spot rate (€/£)	1.1519 – 1.1580
Three-month currency call option on €5.3m – exercise price (€/£)	1.1310
Three-month currency put option on €5.3m – exercise price (€/£)	1.1450
Relevant option premium	£0.50 per €100
Euro interest rate (borrowing)	3.6% pa
Euro interest rate (lending)	2.8% pa
Sterling interest rate (borrowing)	4.8% pa
Sterling interest rate (lending)	4.0% pa
Three-month forward rate	0.89 – 0.57 cents premium
Arrangement fee for forward contract	£5,000

JHL's board is considering investing sterling funds in an interest-bearing account on 31 March 20X3 until a suitable alternative investment opportunity arises. However, the board is concerned that interest rates might fluctuate and has asked you to investigate the possibility of hedging against such fluctuations.

Requirements

1.1 Show the outcome of each of the four possible strategies, assuming that on 31 December 20X2 the exchange rate has moved to:

(1) €1.2115 – 1.2190/£

(2) €1.1220 – 1.1310/£

(11 marks)

1.2 Advise JHL's board whether it is worth hedging against the foreign exchange risk on the receipt from LP. You should support your advice with reference to your calculations in part 3.1.

(8 marks)

1.3 Outline the advantages and disadvantages of the main interest rate hedging techniques that JHL could employ to protect itself against interest rate fluctuations.

(6 marks)

1.4 Outline the five fundamental principles which underpin the financial advice that you, as a Chartered Accountant, offer to JHL.

(5 marks)
Total: 30 marks

4 Leonard Hastings Engineering Ltd

You should assume that the current date is 31 March 20X3.

Leonard Hastings Engineering Ltd (LHE) constructs stages for theatre productions. All of its contracts to date have been in the UK and over the past few years it has built up a very good reputation because of its innovative and high-quality work.

LHE has recently been asked by the Brazilian football association to join the tendering process for the Football World Cup. A number of high-tech stages are required for the opening and closing ceremonies of the tournament in Rio de Janeiro. The stages would need to be constructed by 31 March 20X4 and the Brazilian football association would pay the successful bidder on that date.

LHE's directors are keen to develop LHE's operations outside of the UK. They estimate that the total costs of this contract will be £3.5 million and have tendered a contract price of R$12 million to the Brazilian football association (R$ represents the local currency, the Brazilian real).

LHE has been told that it will learn whether its bid has been successful or not by 30 June 20X3. Its directors are concerned at the foreign exchange rate risk implications of the tender and would like to consider hedging against this risk immediately on 31 March 20X3, even though the outcome of the bid is not yet decided.

You work in LHE's finance team and have been asked to explain the foreign exchange implications of this tender. One particular query put to you at a meeting with the board last week was, "What are the implications if the Brazilian currency weakens against sterling by, say, 5% over the next 12 months?"

You have collected the following information:

Spot rate (R$/£)	3.205 – 3.217
12-month forward rate (R$)	0.021 – 0.019 premium
Cost of forward contract	£30,000
UK interest rate (lending)	3.8% pa
UK interest rate (borrowing)	4.6% pa
Brazilian interest rate (lending)	2.4% pa
Brazilian interest rate (borrowing)	3.3% pa

12-month call option on R$12m – exercise price	R$3.196/£
12-month put option on R$12m – exercise price	R$3.205/£
Relevant option premium	£45,000

Requirements

4.1 **Assuming that LHE's tender bid is successful,** calculate the amount it would receive in sterling on 31 March 20X4 if, on 31 March 20X3, it uses:

(9 marks)

(a) No hedging instrument and the Brazilian currency weakens against sterling by 5%

(b) A forward contract

(c) A money market hedge

(d) A currency option

4.2 With reference to your calculations in part 4.1 above, advise LHE's board of the issues that they should consider regarding the proposed hedging of the Brazilian receipt, assuming that the tender bid is successful.

(8 marks)

4.3 Advise LHE's board of the implications of using each of the hedging instruments in parts 4.1(2), (3) and (4) above, if LHE's tender bid is not successful.

(6 marks)
Total: 23 marks

5 Kellaway plc

Kellaway plc (Kellaway) is a large UK-based engineering company and its main markets are in Europe and North America. Kellaway has recently signed a major contract worth $4.5 million with one of its American customers, LRW Inc. The settlement of this contract is due on 23 September 20X1. On the same day, Kellaway is due to pay $1.1 million as the final instalment of a long-term contract with one of its suppliers in the United States, Colston Digital Inc. Kellaway's board is considering hedging the foreign exchange risk of both of these transactions.

You have been given the following information regarding possible hedging methods that could be employed by Kellaway. All of these figures are stated as at close of business on 23 March 20X1:

Spot rate ($/£)	1.477 – 1.481	
Forward contract rate (for 23 September 20X1)	2.2 – 2.4 cents discount	
US dollar interest rate (borrowing)	5.0% pa	
US dollar interest rate (lending)	4.6% pa	
Sterling interest rate (borrowing)	2.7% pa	
Sterling interest rate (lending)	2.2% pa	
Exercise price of an over-the-counter (OTC) currency option with Blackfriar Bank plc	$1.529/£	
OTC option premium	£32,000	
Prices for sterling futures (contract size £62,500)	June 20X1	$1.526/£
	September 20X1	$1.545/£
	December 20X1	$1.562/£

Requirements

5.1 Using the information above, **and assuming that the spot rate on 23 September 20X1 will be $1.551 – $1.556/£**, calculate Kellaway's net sterling receipt if it uses the following to hedge its foreign exchange transaction risk:

(a) A forward contract

(b) A money market hedge

(15 marks)

(c) Sterling futures (you should assume that the relevant sterling futures will be priced at $1.549/£ on 23 September 20X1.)

(d) An over-the-counter currency option

5.2 Advise Kellaway's management of the implications of hedging or not hedging its foreign exchange transactions on 23 September 20X1, showing supporting calculations.

(7 marks)

5.3 Explain briefly how a company might hedge the economic risk element of foreign exchange.

(4 marks)
Total: 26 marks

6 Wharton Ltd

Wharton Ltd (Wharton) is a manufacturer of men's clothing, which it sells to a wide range of customers in the retail sector. Based in the West Midlands, Wharton sources its raw materials from a large number of suppliers both in the UK and overseas, and has a policy of extracting as much credit as possible from these suppliers. Annual demand for Wharton's products is relatively stable, although there can be some unpredictability as to when during the year this demand arises.

Historically, Wharton has sold only to customers within the UK. However, on 31 May 20X1 it completed negotiations on a contract with a US company under which it will ship a consignment of goods to the US on 1 July 20X1. It is considering whether or not to hedge the foreign currency exposure arising from this sale and, if so, whether a forward contract or an option contract would be more appropriate.

The variable cost of the goods to be shipped is £1.5m while the contractually agreed selling price is $2.7 million, to be received on 31 August 20X1. As at 31 May 20X1 the $/£ spot exchange rate was $1.50/£, while the three-month $/£ forward exchange rate was $1.4956/£.

$ put/£ call options with a maturity date of 31 August 20X1 are available with a range of exercise prices, including $1.50/£ and $1.55/£.

Requirements

6.1 Briefly outline the advantages and disadvantages of trade credit as a source of finance.

(3 marks)

6.2 If the $/£ spot exchange rate on 31 August 20X1 is $1.53/£, calculate the contribution (ie, sales proceeds less variable costs) from the sale under each of the following two scenarios:

(a) No hedging

(b) Hedging using a forward contract.

(2 marks)

6.3 If the $/£ spot exchange rate on 31 August 20X1 is $1.53/£ and Wharton had chosen to hedge using an option, explain with reasons whether the option should be exercised if it had an exercise price of:

(a) $1.50/£

(b) $1.55/£

(2 marks)

6.4 Briefly discuss the factors which Wharton should take into account when deciding whether or not to hedge.

(2 marks)

6.5 Indicate the relative advantages and disadvantages of the two option contracts and the forward contract available to Wharton.

(2 marks)
Total: 11 marks

7 Scottwing plc

Scottwing plc is a large UK conglomerate which owns a number of subsidiary UK companies. Information about two of those companies, Farmoor Ltd (Farmoor) and Stocker plc (Stocker), is given below:

7.1 Farmoor has regular receipts and payments in euros. Farmoor's board wishes to understand the implications of possibly hedging its euro transactions that mature on 30 April 20X9. Assume that any hedging takes place on 1 April 20X9. The following information is relevant:

Receivables due at 30 April 20X9	€1.2m
Payables due at 30 April 20X9	€(1.6m)
Spot rate at 1 April 20X9 (€/£)	1.2640–1.3060
One-month forward contract premium (€/£)	0.0045–0.0035
Forward contract arrangement fee (per euro converted)	£0.0125
Over the counter (OTC) option, exercise price (€/£)	1.269
OTC option premium cost (per euro converted)	£0.02

Requirements

(a) Advise Farmoor's senior management of the implications of hedging (or not hedging) its foreign exchange transactions on 1 April 20X9 if the spot rate (in €/£) at 30 April 20X9 is:

- 1.2350 – 1.2780
- 1.3065 – 1.3440

Your advice should be supported by relevant calculations.

(10 marks)

(b) Explain how a money market hedge could be constructed and its implications for the principle of interest rate parity.

(5 marks)

CHAPTER 10

7.2 Stocker borrowed £8.5 million in March 20X7 at a variable rate of SONIA plus 2%. The loan is due to be repaid in March 20Y1. SONIA at March 20X9 is 10% per annum and Stocker's board feels that interest rates will increase during the next two years and would like to explore the possibility of an interest rate swap. Coleby plc (Coleby) has a similar sized loan, secured at a fixed rate of 9.5% per annum. The best fixed interest rate that Stocker could obtain is 11% per annum, whilst Coleby is able to borrow at SONIA plus 1.5%. Coleby is willing to enter into an interest rate swap and has proposed the following:

- Stocker pays Coleby 10% fixed per annum
- Coleby pays Stocker SONIA plus 1%

One of Stocker's directors has questioned this proposal, commenting, "Do the terms of this swap offer us the best possible deal? I think that Coleby might be taking advantage of us here as we should be expecting half of any savings that are made available."

Requirements

(a) Assuming that the swap goes ahead on the original terms proposed by Coleby and by calculating actual interest receipts and payments, advise Stocker's board if the swap is worthwhile, assuming that SONIA remains at its current level for the next six months and then increases to 11% per annum for the next 18 months.

(5 marks)

(b) Advise Stocker's board on the fairness of the terms of the proposed swap and identify an alternative swap arrangement which may be more acceptable to Stocker's board.

(6 marks)

Total: 26 marks

8 Jetair plc

The finance director of JetAir plc, a rapidly expanding short haul airline company operating across Europe, is considering how to hedge sales revenues of €60 million, which are due to be received in180 days. The company has been quoted the following exchange and interest rates by one of its relationship banks:

Spot rate (euro/£)	1.5642 – 1.5669
180-day forward rate (euro/£)	1.5808 – 1.5830
Euro interest rate	5% per annum
Sterling interest rate	4% per annum

A foreign currency dealer at the relationship bank has also provided an estimate for the finance director of the euro/£ spot rate in 180 days. This estimate is 1.5622 – 1.5649. The bank is also quoting the following 180-day currency option strike prices each with an option premium of £20,000:

- A put option on €60 million euros at an exercise price (euro/£) of 1.5700
- A call option on €60 million euros at an exercise price (euro/£) of 1.5650

Requirements

8.1 Calculate the hedged value of the company's euro receivables and explain, with reasons, which hedging strategy is preferable, if it decides to:

(7 marks)

(a) use a forward market hedge to manage its foreign currency exposure;

(b) use a money market hedge to manage its foreign currency exposure.

8.2 Given the estimated spot rate provided by the foreign currency dealer, discuss, with reasons:

- whether the company should hedge the receipt of its euro receivables in this situation; and
- your opinion on the ability of forecasters to outperform the forward market.

(4 marks)

8.3 Explain to the finance director how a currency option contract might be used to hedge the company's euro receivables exposure in this situation and advise him of what action to take, having purchased the appropriate currency option, if in 180 days the spot rate for euro/£ is:

- in line with forward market expectations;
- in line with the foreign currency dealer's estimate.

(6 marks)

8.4 Advise the finance director of the implications for financial management of the key financial risks arising from the company's recent rapid expansion into the European market.

(8 marks)

Note: Assume there are 360 days in a year.

Total: 25 marks

9 TawTorr International plc

9.1 TawTorr International plc (TawTorr) is a large UK-based engineering company and the majority of its sales are made in Europe and North America. The company's suppliers are mostly British, but one, Grupo MBV (MBV), is based in Spain and invoices TawTorr in euro. A contract worth €3.1 million was agreed with MBV on 29 February 20X2. The value of sterling has been volatile in the past six months and has depreciated against the euro by almost 5% since August 20X1. Because of this and the scale of this transaction, TawTorr's board is keen to investigate how the €3.1 million payment might be hedged in order to reduce the risk from adverse movements in the sterling/euro exchange rate. The €3.1 million is due to be paid by TawTorr on 31 May 20X2 and you have been asked to provide information for the board.

You should assume that the current date is 29 February 20X2.

Following discussions with TawTorr's bank you have collated the following data:

Spot rate (€/£)		1.145 – 1.150
Over-the-counter (OTC) option on €3.1 million		
	Put (€/£)	1.160
	Call (€/£)	1.155
OTC option premium payable		£30,000
Sterling interest rate (lending)		4.2% pa
Sterling interest rate (borrowing)		4.8% pa
Euro interest rate (lending)		6.9% pa
Euro interest rate (borrowing)		7.8% pa

Forward rate at 31 May 20X2	€0.008 – €0.010 discount
Cost of forward contract	£5,000

Requirements

(a) Calculate the impact on TawTorr's sterling payment to MBV of a 2.5% change in the spot value of sterling against the euro (both strengthening and weakening) over the next three months.

(3 marks)

(b) Calculate the sterling payment that would be made on 31 May 20X2 if TawTorr made use of:

- an OTC currency option;
- a money market hedge;
- a forward contract.

(7 marks)

(c) Taking into account your calculations in parts (a) and (b) above, discuss the issues that should be taken account of by TawTorr's board when considering whether it should hedge the payment to MBV.

(6 marks)

9.2 Over the past five years TawTorr has also been investing in large company UK shares and at 29 February 20X2 had a portfolio worth £3.6 million. The spot value of the FTSE100 index on that date is 4,800. TawTorr's finance team is considering the use of traded FTSE100 index options to protect the current value of the portfolio in anticipation of share prices falling over the next three months. The team has collected the following information from Euronext.Liffe:

FTSE 100 INDEX OPTION (£10 per full index point)

Exercise price		4750		4800		4850		4900		4950
	Call	Put	Call	Put	Call	Put	Call	Put	Call	Put
March 20X2	148	42	112	59	83	78	57	108	43	142
April 20X2	223	104	193	124	163	144	134	168	113	199
May 20X2	285	144	254	165	230	189	199	210	175	234

Requirement

Explain, with supporting calculations, the outcome of hedging using FTSE100 index options if on 31 May 20X2:

- the portfolio value falls to £3.45 million and the FTSE100 index falls to 4,600; and
- the portfolio value rises to £3.675 million and the FTSE100 index rises to 4,900.

(7 marks)
Total: 23 marks

10 Deep Drill Supplies plc

Deep Drill Supplies plc (DDS) is a UK company which manufactures and sells large-scale components for the oil and gas industries. As the majority of its customers are international, the DDS board is considering whether the company should be hedging its exposure to foreign exchange risk. One of its key customers is NSDF, a Norwegian oil exploration company.

DDS and NSDF have recently agreed a contract (DDS/12/57) for the supply of a large consignment of components. DDS will start manufacturing these at the end of September 20X1 and the work will be completed in the summer of 20X2. DDS will receive the agreed contract price, 16.75 million Norwegian kroner (NKr), on 30 September 20X2.

DDS currently has substantial sterling funds on deposit.

Information regarding the British and Norwegian currencies is given in the table below:

(1) Recent research paid for by DDS produced the following forecast spot rates for NKr/£ at 30 September 20X2:

	Probability
9.200 – 9.230	10%
9.300 – 9.330	10%
9.400 – 9.430	40%
9.500 – 9.530	40%

(2) Spot rate (NKr/£) 9.300 – 9.325

(3) Forward rate at 30 September 20X2 offered by DDS's bank: 0.10 – 0.13 NKr discount

Current interest rates

	Borrowing	Depositing
NK	6.60% pa	5.70% pa
Sterling (£)	5.40% pa	4.30% pa

DDS's bank has quoted the following 12-month currency over-the-counter options each with a premium of £25,000:

A put option on 16.75 million NKr at an exercise price (NKr/£) of 9.300 A call option on 16.75 million NKr at an exercise price (NKr/£) of 9.250 Looking ahead, the DDS board has identified a continued surplus of funds denominated in sterling. It is planning to invest this in March 20X2 in an interest-bearing UK deposit account for a period of six months. It would like to investigate how it might hedge against adverse interest rate movements.

Requirements

10.1 Assuming the current date is 30 September 20X1, calculate the sterling amount receivable by DDS on 30 September 20X2 if it uses:

(10 marks)

(a) the expected spot rate in 12 months' time;

(b) a forward contract;

(a) a money market hedge;

(b) an option.

10.2 Making reference to your calculations in part 10.1, discuss the issues that should be taken into account by the DDS board when it considers whether it should hedge the NSDF receipt.

(8 marks)

10.3 Advise the DDS board as to the effectiveness of employing the following methods of hedging the company's exposure to interest rate risk on the proposed investment of the surplus funds in March 20X2:

(8 marks)

(a) A Forward Rate Agreement (FRA)

(b) An interest rate future

(c) An interest rate option

(d) An interest rate swap

(8 marks)
Total: 26 marks

11 The Buckle Trading Company

The Buckle Trading Company Ltd (Buckle) manufactures footwear and the past 10 years have seen a continual expansion in its level of operations in Europe. It has developed a strong relationship with a major footwear wholesaler in Germany and a key supplier of Buckle's leather is based in Spain.

Buckle's management has concerns that the company should start to manage its exposure to exchange rate risk.

Buckle has arranged that, for administrative convenience, it will invoice its German customer on a quarterly basis and its Spanish supplier was happy to agree to the same terms ie, it will invoice Buckle every three months.

You should assume that it is now 1 March 20X8. Buckle has just settled its most recent transactions in euros at the spot rate. The estimated sales and purchases for the next six months are:

	German customer	Spanish supplier
March to May 20X8	Sales €100,000	Purchases €76,000
June to August 20X8	Sales €120,000	Purchases €132,000

Relevant foreign exchange rates and interest rates are listed below:

Exchange rates

	€/£
Spot rates	1.455 – 1.470
Three months forward rates	0.28-0.25 cents premium
Six months forward rates	0.59-0.55 cents premium

Interest rates

	Lending	Borrowing
Euro	5.0% p.a.	6.5% p.a.
UK sterling	5.8% p.a.	7.2% p.a.

Additionally, to help finance a major capital investment Buckle has recently borrowed £2 million over a five-year period at SONIA. Its management is now unsure whether it should

hedge against future interest rate movements over the coming year. Buckle's bank has offered the company either (1) a Forward Rate Agreement (FRA) at 7% interest or (2) an option at 7% plus a premium of 1%. Buckle's management is also investigating the possible use of an interest rate swap.

Requirements

11.1 Advise Buckle's board whether it should use either:

- a forward contract; or
- a money market hedge when managing each of its dealings in euros over the next six months.

(8 marks)

11.2 Explain the principle of interest rate parity and, using the information provided above, calculate the forward rate of exchange for €/£ in 12 months' time ie, March 20X9. Candidates should use the average current spot and borrowing/lending rate for each country for the purposes of this calculation.

(4 marks)

11.3 Assuming that SONIA immediately moves to either 6% or 10%, show, for both of these rates, how the effective annual interest rate paid by Buckle would be determined if it:

(1) uses an FRA to hedge;

(2) uses the option to hedge;

(3) does not hedge at all.

Comment on your results.

(6 marks)

11.4 Prepare explanatory notes for Buckle's management which outline how an interest rate swap works and discuss why, in the circumstances described, a swap might be more suitable for hedging than an FRA and an option.

(7 marks)
Total: 25 marks

12 Pyllon

Pyllon manufactures and sells self-drive cars. One of its customers would like to make a payment of £200,000 in a cryptocurrency such as Bitcoin instead of sterling.

The Pyllon board is worried about the volatility of the Bitcoin price between the time that the

£200,000 is received and the time that the Bitcoins are subsequently sold.

You have the following information available to you on 31 December 20X1.

31 December 20X1 Time	£ equivalent of one Bitcoin
13:00	£37,256.89
14:00	£37,265.18
15:00	£37,185.34

Requirements

12.1 Calculate the gains or losses if the customer had paid in Bitcoins at 13:00 on 31 December 20X1 and those Bitcoins had then been sold for sterling at either 14:00 or 1500.

(3 marks)

12.1 Advise Pyllon on whether to accept the payment for the cars in sterling or Bitcoin.

(2 marks)
Total: 5 marks

13 Nicol plc

It is now 1st January 20X1.
Nicol plc is considering the use of Bitcoin to make a payment to one of its suppliers in three months' time, it has proposed a payment of 30 Bitcoins on 31st March 20X1.
The directors are worried about the volatility of the Bitcoin price and are considering using either a forward contract or the futures market to hedge the risk.
The following rates are relevant:
Spot rate: 1 Bitcoin = £37,300 – £37,400
Three-month forward rate: 1 Bitcoin = £37,350 – £37,450
Bitcoin futures (standard contract size 5 Bitcoins) are currently priced as follows: February: £37,410
March: £37,460
April: £37,560

Requirements

Calculate the expected sterling payment that Nicol can expect in three months' time if it hedges its Bitcoin exposure using:

(a) The forward market.

(2 marks)

(b) The futures market (assuming that the market value and futures value for Bitcoin on 31st March 20X1 is £37,650

(3 marks)

Total: 5 marks

14 Atherton plc and Tyldesley Inc

13.1 Atherton plc (Atherton) is a UK manufacturer of trains, which it sells to many EU countries as well as to countries further a field. In three months' time, Atherton is due to receive €8 million from a Belgian customer. At a board meeting today, the directors will be discussing whether or not there is a need to hedge the foreign exchange exposure associated with this transaction and, if so, how best this might be achieved. At the board meeting, three possible alternatives will be considered:

(1) Not to hedge this transaction.

(2) Use a forward contract. Exchange rates quoted by Atherton's bank today are:

Spot	€1.1648 – 1.1708/£
Three-months forward	€0.0110 – 0.0100 premium

(3) Use an over-the-counter currency option on euro which is available through Atherton's bank. Current premiums at an exercise price of €1.1750/£ are £1.10 per €100 for a call option and £1.25 per €100 for a put option.

Requirements

(a) Discuss why a firm might reasonably choose not to hedge its exposure to exchange rate risk.

(5 marks)

(b) Show the effect of each of the three alternatives being considered, assuming that the spot exchange rate in three months' time is either (1) €1.1950 – 1.1980/£ or (2) €1.1395 – 1.1420/£.

(7 marks)

(c) Describe **four** methods available to firms to reduce their exposure to foreign exchange risk which do not involve the use of financial contracts.

(4 marks)

13.2 Tyldesley plc (Tyldesley) is a UK company which provides parts and maintenance services to both public and private sector transport operations throughout the UK. In order to broaden its geographical reach, Tyldesley has recently entered into negotiations to buy Remedia Inc, a company jointly owned by a group of local authorities in the US. A price of $20,000,000 has been agreed, but conclusion of the deal must await the approval of the local authorities who must each consult their elected bodies to have the deal ratified. Unanimous support from all the local authorities will be required and Tyldesley is aware that there has been some resistance to the sale of this company to an overseas firm. However, the vendors have agreed that, subject to ratification, the deal will be finalised in six months' time.

In light of these developments, the company accountant at Tyldesley is proposing to hedge the company's foreign exchange exposure by using futures contracts. The relevant £ futures contracts are currently priced at $1.6436/£. The £ futures contract size is £62,500. The current spot rate is $1.6520/£.

Requirements

(a) Calculate the cost of the purchase if futures contracts are used and if in six months' time the following scenarios occurred:

- A spot rate of $1.6630/£ and a £ futures price of $1.6610/£
- A spot rate of $1.6420/£ and a £ futures price of $1.6400/£

(8 marks)

(b) In light of your answers to (a), discuss the weaknesses of futures contracts as a means of hedging in this scenario.

(2 marks)

Total: 26 marks

Now go back to the Introduction and ensure that you have achieved the Learning outcomes listed for this chapter.

Answers to Interactive questions

Answer to Interactive question 1

(1) The bank is being asked to buy the Danish kroner and will give the exporter: 150,000/9.5380 = £15,726.57 in exchange

(2) The bank is being asked to sell the yen to the importer and will charge for the currency: 1,000,000/173.650 = £5,758.71

Answer to Interactive question 2

(a) If the actual spot rate for Bulldog to buy and the bank to sell the Reds is 3.0800, the result is as follows:

	£
Revenue from re-sale	32,000.00
Less cost (100,000 ÷ 3.0800)	32,467.53
Loss	(467.53)

If the actual spot rate for Bulldog to buy and the bank to sell the Reds is 4.0650, the result is as follows:

	£
Revenue from re-sale	32,000.00
Less cost (100,000 ÷ 4.0650)	24,600.25
Profit	7,399.75

This variation in the final sterling cost of the goods (and thus the profit) illustrates the concept of transaction risk.

Answer to Interactive question 3

Using interest rate parity, dollar is the numerator and sterling is the denominator. So, the expected future exchange rate dollar/sterling is given by:

$$\$1.5750/£ \times \frac{1.06}{1.05} = \$1.5900/£$$

This prediction is subject to great inaccuracy, but note that the company could 'lock into' this exchange rate, working a money market hedge by borrowing today in dollars at 6%, converting the cash to sterling spot and putting them on deposit at 5%. When the dollars are received from the customer, the dollar loan is repaid.

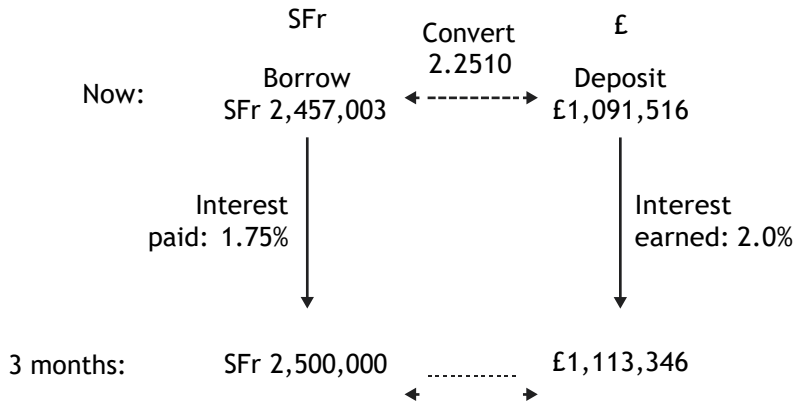
Answer to Interactive question 4

The interest rates for three months are 2.00% to deposit in pounds and 1.75% to borrow in Swiss francs. The company needs to borrow SFr 2,500,000/1.0175 = SFr 2,457,003 today. These Swiss francs will be converted £ at 2,457,003/2.2510 = £1,091,516. The company must deposit this amount and, with three months interest of 2.00%, will have earned:

£1,091,516 × (1 + 0.02) = £1,113,346

Thus, in three months, the loan will be paid out of the proceeds from the debtor and the company will receive £1,113,346. The effective forward rate which the company has 'manufactured' is

2,500,000/1,113,346 = 2.2455. This effective forward rate shows the Swiss franc at a premium to the pound because the Swiss franc interest rate is lower than the sterling rate.



Money market hedge

Answer to Interactive question 5

The three choices must be compared on a similar basis, which means working out the cost of each to Trumpton either now or in three months' time. In the following paragraphs, the cost to Trumpton now will be determined.

Choice 1: the forward exchange market

Trumpton must buy dollars in order to pay the US supplier. The exchange rate in a forward exchange contract to buy $4,000,000 in three months' time (bank sells) is:

	$
Spot rate	1.8625
Less three months premium	0.0180
Forward rate	1.8445

The cost of the $4,000,000 to Trumpton in three months' time will be:

$4,000,000/1.8445 = £2,168,609.38

This is the cost in **three months**. To work out the cost now, we could say that by deferring payment for three months, the company is:

- saving having to borrow money now at 14.25% a year to make the payment now; or
- avoiding the loss of interest on cash on deposit, earning 11% a year.

The choice between (a) and (b) depends on whether Trumpton plc needs to borrow to make any current payment (a) or is cash rich (b). Here, assumption (a) is selected, but (b) might in fact apply.

At an annual interest rate of 14.25% the rate for three months is 14.25/4 = 3.5625%. The 'present cost' of £2,168,609.38 in three months' time is:

£2,168,609.38/1.035625 = £2,094,010.26

Choice 2: the money markets

Using the money markets involves:

(1) **borrowing in the foreign currency**, if the company will eventually receive the currency;

(2) **lending in the foreign currency**, if the company will eventually pay the currency. Here, Trumpton will pay $4,000,000 and so it would lend US dollars.

It would lend enough US dollars for three months, so that the principal repaid in three months' time plus interest will amount to the payment due of $4,000,000.

(1) Since the US dollar deposit rate is 7%, the rate for three months is approximately 7/4 = 1.75%.

(2) To earn $4,000,000 in three months' time at 1.75% interest, Trumpton would have to lend now:

$4,000,000/1.0175 = $3,931,203.93

These dollars would have to be purchased now at the spot rate of (bank sells) $1.8625. The cost would be:

$3,931,203.93/1.8625 = £2,110,713.52

By lending US dollars for three months, Trumpton is matching eventual receipts and payments in US dollars, and so has hedged against foreign exchange risk.

Choice 3: lead payments

Lead payments should be considered when the currency of payment is expected to strengthen over time, and is quoted forward at a premium on the foreign exchange market. Here, the cost of a lead payment (paying $4,000,000 now) would be $4,000,000 ÷ 1.8625 = £2,147,651.01.

Summary

	£
Forward exchange contract	2,094,010.26 (cheapest)
Currency lending	2,110,713.52
Lead payment	2,147,651.01

Answers to Self-test questions

1 Sterling futures

1.1 Set up the hedge:

The receipt of dollars is hedged by buying sterling futures now (12 July) and selling sterling futures on 13 December. The September contract will be no use because it expires on 30 September. Either of the other two contracts can be used. It is usual to choose the contract which expires next after 13 December. This is the December contract which expires on 31 December.

Assuming the December contract is chosen, the receipt of $2,000,000 converts, using the futures contract price, to $2,000,000/1.5556 = £1,285,678. The contract size is £62,500. The number of contracts to be bought is £1,285,678/£62,500 = 20.57, rounded to 21 contracts.

On 12 July, buy 21 December sterling contracts at $/£ 1.5556. On 13 December, sell 21 December sterling contracts.

Futures position

	$
12 July – buy sterling at	1.5556
13 December – sell sterling at	1.6502
	$0.0946/£

Gain on futures trade = $0.0946 × £62,500 × 21 contracts
= $124,163

	$
Receipt from customer	2,000,000
Gain on futures market	124,163
	2,124,163
Sold at prevailing spot rate	$1.6502/£
	£1,287,215

1.2 The British company can hedge the payment of $5 million as follows:

Set up hedge

- Buying dollars equates to selling sterling.
- Eight months from July includes February. The March future is therefore most appropriate, as the December future will close out too soon.
- The company will therefore sell March sterling contracts at $1.5564.

$5 million @ 1.5564= £3,212,542 sterling sold ÷ £62,500
= 51.4 contracts – rounded to 51 contracts

Future positions

	£
Sell sterling at	1.5564
Buy sterling at	1.5504
Gain on futures	$0.0060/£ × £62,500
	£
	× 51 contracts
Overall gain on futures	$19,125
Spot market	
	$
Value of gain on futures	19,125
Payment to customer	(5,000,000)
Total amount required	(4,980,875)
Bought at prevailing spot rate	1.5504/£
Overall cost	£3,212,639

(Works out to be the equivalent of $1.5564/£ – so matches the future rate.)

2 Milligan

2.1 Number of contracts:

$25 million @ $2/£ = £12,500,000

£12,500,000/£10,000 = 1,250 contracts

2.2 The company needs to buy $ and therefore needs to sell sterling – a put option.

2.3 It is currently 1 June – the payment is required in three months ie, at the end of August. June options will close out too soon, September contracts are required.

2.4 The cost of a September put option at $2/£ is $0.0157/£.

The total cost of 1,250 contracts is

1,250 × £10,000 × $0.0157/£ = $196,250

Paid now @ $1.99 = £98,618

2.5 The answer is as follows.

	(1)	**(2)**
	$/£	**$/£**
Prevailing rate	1.98	2.02
Option – right to sell sterling for	2.00	2.00
Value of option	$0.02/£	zero
	∴ Exercise	∴ Abandon
Total value of option	$0.02/£	
	× £10,000	
	× 1,250 contracts	
	$250,000	

Position in spot market	**$**	**$**
Amount due to supplier	25,000,000	25,000,000

Position in spot market	**$**	**$**
Gain on option	(250,000)	–
Total currency required	24,750,000	25,000,000
Prevailing spot	$1.98/£	$2.02/£
Cost at prevailing spot	£12,500,000	£12,376,237
Plus cost of premium	£98,618	£98,618
Total cost	£12,598,618	£12,474,855

3 Johnston Hennessy Lockhart Ltd

3.1

Sterling equivalent at current spot rate	€5.3m/1.1580		£4,576,857
(1) Option			
December 20X2 spot rate	€1.2190/£		€1.1310/£
Exercise option (put)?	Yes		No
Put option (sell) exchange rate is	€1.1450/£	Spot rate	€1.1310/£
Sterling receipt	€5.3m/1.1450	Sterling receipt	€5.3m/1.1310
	£4,628,821		£4,686,118
Less: Premium cost (€5.3m/€100 × £0.50)	(26,500)		(26,500)
Sterling receipt – net	£4,602,321		£4,659,618
(2) Money market hedge			
€ borrowed now (@ 3.6% pa)	€5.3m/(1 + 0.9%) = €5.3m/1.009		€5,252,725
Sterling receipt, converted at spot rate	€5,252,725/1.1580		£4,536,032
Sterling invested at 4.0% pa	£4,536,032 × (1 + 1.0%)		£4,581,392
(3) Forward contract			
Sterling receipt: €5.3m × (1.1580 – 0.0057)	= €5.3m/1.1523		£4,599,497
less: Arrangement fee			(£5,000)
			£4,594,497

(4) No hedge			
December 20X2 spot rate	€1.2190/£		€1.1310/£
€5.3m/1.2190	£4,347,826	€5.3m/1.1310	£4,686,118

3.2 The directors' attitude to risk will be an important factor. Weaker sterling at 31 December would suit JHL.

With an exchange rate of €1.2190/£

The option produces a sterling receipt of £4,602,321, which is a higher sterling receipt than the forward contract and the money market hedge (in that order). Both of these latter two hedging methods will produce a fixed sterling amount, known at the start of the hedging period, which may be preferred by JHL's management.

The option (once the fee of £26,500 is taken into account) represents an exchange rate of €1.1516/£. If sterling were to drop below this figure, then it would not be worthwhile taking up the option.

With an exchange rate of €1.1310/£

3.3 No hedge would be necessary.

- FRA – This would fix the rate of interest receivable by JHL. Upside potential is therefore removed. It can be tailored to the exact amount to be invested by JHL.
- Interest rate future – JHL would buy interest rate futures, but these are for standardised amounts, which could be impractical.
- Interest rate option – JHL would have the right to deal at an agreed interest rate at maturity date. JHL would buy traded call options, but these are for standardised amounts and may not be suitable. So, for more flexibility, JHL could purchase a tailored over the counter (OTC) option.
- Interest rate swap – It would be impractical as a long-term hedge for a large deposit. It would be difficult to find a counterparty.

3.4 The five fundamental principles are:

- **Integrity** – This implies honesty, fair dealing, truthfulness and being straightforward. In this context this would mean clearly laying out hedging advice with reference to honest and clear calculations.
- **Objectivity** – This implies no bias, conflict of interest or undue influence from others. In this context, hedging calculations should be performed, and advice presented purely with reference to unbiased information and accepted theory, and not be influenced by any of the recipients' (or my own) priorities, preferences or expectations.
- **Professional competence and due care** – It should be ensured that the principles behind the calculations are understood and that they have been accurately prepared with reference to theory and current standards. In this instance this means understanding how the hedging calculations work, checking them to ensure no errors, and ensuring that the base data is correct for these purposes (eg, the forward rate adjustment, being a premium, needs to be deducted from the spot rate).
- **Confidentiality** – Information should not be disclosed to anyone other than the intended recipient. Calculations should be stored in a password-protected file on my workplace network to ensure it cannot be accessed inappropriately.

Professional behaviour – Allotted tasks should be executed diligently, courteously and in a timely manner. In this case it should be ensured the advice is given in good time to allow the hedge to be set up effectively.

4 Leonard Hastings Engineering Ltd

4.1 (a) No hedge

If sterling strengthens by 5% against the Brazilian real: 3.217 × 1.05 = R$3.378/£

Sterling receipt: R$12.0m/3.378 = £3,552,398

(b) Forward contract

Sterling receipt: R$12.0m/(3.217 – 0.019) = R$12.0m/3.198 = $3,752,345

less: Cost of forward contract: (£30,000)

Net sterling receipt: £3,722,345

(c) Money market hedge

Real borrowed now: R$12.0m/(1+[3.3%]) = R$12.0m/1.033 = R$11,616,650
So sterling receipt, converted at spot rate R$11,616,650 = £3,611,019 Sterling invested at 3.8% £3,611,019 × 1.038 = £3,748,238

(d) Option

Put option (sell R$) exchange rate is R$3.205/£ Sterling receipt: R$12.0m/3.205 = £3,744,150 less: Option premium cost: (45,000)

Sterling receipt: £3,699,150

4.2 Summary of four strategies in order of income:

	Sterling receipt (£)
Money market hedge (MMH)	3,748,238
Forward contract (FC)	3,722,345
Currency option (CO)	3,699,150
No hedge (NH)	3,552,398

Range of outcomes = £195,840 (£3,748,238 – £3,552,398). Management's attitude to risk will be important.

MMH gives best result – this is a fixed outcome as is FC.

The estimated costs of the project are £3.5 million. The 5% weakening of the Brazilian real (which is contra to market expectations) leaves a small profit for LHE of just over £50,000). Were the Brazilian real to strengthen by 1% then this would give the best result (higher than MMH):

R$12m/(3.217/1.01) = R$12m/3.185 = £3,767,486

With the option, if the Brazilian real strengthened by approx. 2% to R$3.163/£ then this would exceed the MMH sterling receipt:

	R$12.0m/3.163 =	£3,793,867
Less: Option premium cost		(45,000)
Sterling receipt		£3,748,868

So it may be worth not hedging.

4.3 Forward contract (FC) – If the tender bid is unsuccessful then LHE will have to buy R$ in order to sell to the bank.

Money market hedge (MMH) – LHE would have to repay the R$ borrowing, but would need to convert back from sterling.

Any profit or loss on FC or MMH depends on the spot rate on 31 March 20X4.

Currency option – At worst, this would not be taken up, but LHE would incur the £45,000 cost. LHE may exercise option if profitable to do so on 31 March 20X4 – this depends on spot rate at that date.

5 Kellaway plc

5.1 Net receipt = $4.5m – $1.1m = $3.4m

(a) Forward contract

Receipt in sterling would be: $3.4m/(1.481 + 0.024) = $3.4m/1.505 = £2,259,136

(b) Money market hedge

Receipt in sterling would be $3.4m/[1 = (5.0%/2)] = $3.4m/1.025 = $3,317,073 borrowed Converted at spot rate: $3,317,073/1.481 = £2,239,752

Invested at 2.2% pa: £2,239,752 × [1 + (2.2%/2)] = £2,264,389

(c) Sterling futures

No. of contracts = ($3,400,000/1.545)/£62,500 = 35.2

therefore 35 contracts

			$
Futures position	March 20X1	Buy sterling at	(1.545)
	September 20X1	Sell sterling at	1.549
Gain			0.004

		$
Gain on futures trade	$0.004 × 35 × 62,500	8,750
Dollar receipt due		3,400,000
		$3,408,750
Sold at spot rate		$1.556/£
Sterling receipt due		£2,190,713

(d) **Currency option**

OTC exercise price = $1.529/£		
Spot rate at 23/9/X1 = $1.556/£		
Thus choose to exercise the option		
Receipt in sterling would be	$3.4m/1.529 =	£2,223,676
Less option premium		
(ignoring interest)		(32,000)
Net sterling receipt		£2,191,676

5.2 Sterling receipt with March 20X1 spot rate: $3.4m/1.481 = £2,295,746

Sterling receipt with September 20X1 spot rate: $3.4m/1.556 = £2,185,090

Thus, sterling would strengthen against the dollar by (1.556/1.481) = 5.1% between these two dates.

The four hedging methods all produce a net sterling receipt that is between the two outliers above. If sterling remains constant against the dollar over the next six months, then the best outcome would be not to hedge.

If management decides to hedge, then the money market hedge (MMH) provides the best outcome. This is a certain figure.

Also, the forward contract will be a certain outcome – the net sterling receipt is slightly less than the MMH.

The OTC option provides flexibility and if the spot rate in September is low enough ($/£) then this could be the best choice. However, the fixed cost of the premium needs to be taken into account and any interest effect as the premium is paid at the start.

The outcome from the sterling futures will be dependent upon the price of the September futures and the September spot rate (ie, the level of basis risk).

Management's attitude to risk will influence its decision regarding hedging.

5.3 Economic exposure is the risk that longer-term exchange rate movements might reduce the international competitiveness of a company.

It can hedge against economic exposure in the long term by:

- diversification
- market and promotional management
- product management
- pricing
- production management

6 Wharton Ltd

6.1 Advantages/disadvantages of trade credit

Advantages

- Convenient and informal
- Can be used if more formal sources of finance unavailable
- Can be used with little planning to overcome short-term cash flow difficulties

Disadvantages

- May be expensive (can involve not taking prompt payment discounts)
- Can damage supplier goodwill if abused

(a) Contribution calculations

No hedging

2.7/1.53 – 1.5 = £0.265m

(b) **Contribution calculations Hedging with forward**

2.7/1.4956 – 1.5 = £0.305m

6.3 Option 1

(a) **Hedging with 1.50 option**

Exercise – better to convert at 1.50 than at spot rate of 1.53.

(b) Hedging with 1.55 option

Not exercise – better to convert at spot rate of 1.53 rather than 1.55.

6.4 Hedging

Need to consider corporate objectives and level of corporate risk aversion. Hedging is zero NPV if instruments are fairly priced, so should be a priori indifferent.
However, factors such as managerial compensation contracts, tax, bankruptcy costs, etc, may create a role for hedging.

6.5 Relative advantages/disadvantages

Forward – no premium but locked in ie, have to use even if would prefer to sell at spot.
Option – pay premium but have option to sell at spot if beneficial.

7 Scottwing plc

7.1

(a) **Net payment due at 31 March 20X9 (1,600,000 – 1,200,000) = €400,000**

	Spot rate 1.2350	Spot rate 1.3065
	£	**£**
Forward contract (1.2640–0.0045)		
€400,000/(1.2595)	(317,586)	
plus: Arrangement fee	(5,000)	
	(322,586)	(322,586)

OTC option (€1.2690/£)

	Spot rate 1.2350		**Spot rate 1.3065**
	£		£
Exercised		Not exercised	
€400,000/1.2690	(315,209)	€400,000/1.3065	(306,162)
Premium cost (£0.02 × 400,000)	(8,000)		(8,000)
	(323,209)		(314,162)
Spot rate			
€400,000/1.2350	(323,886)		(306,162)

If Farmoor's management chooses to buy a forward contract, then the sterling payment (£322,586 in both cases) will be set. Thus, cash budgeting will be made easier. If sterling weakened and the spot rate did fall to €1.2350 then the forward would be the cheapest option. Conversely, at €1.3065/£ it becomes the most expensive.

With the OTC option the premium cost is a significant fixed cost and means that even when the option is exercised (with spot rate at €1.2350/£) it is almost the most expensive method. Similarly, at the higher spot rate the premium makes it less attractive than no hedging at all.

In both cases the option ranks second.

By not hedging, Farmoor would lose out (just) at the lowest spot rate and have the best result if sterling strengthened to €1.3065/£.

The decision will depend on management's attitude to risk. The forward contract gives a fixed figure, the option sits between the two alternatives and no hedging leaves Farmoor open to big changes in the expected outcome at 31 March.

(b) The principle of interest rate parity (IRP) links the currency and money markets and explains differences between the forward and spot rates. The IRP formula is:

Spot rate × ([1+r_f]/[1+r_{uk}]) = Forward rate

So future exchange rates can be predicted using the IRP. However, future events can have a massive effect on currency rates and make prediction very difficult.

A money market hedge (MMH) is also known as a synthetic forward. Because of the close relationship between exchange rates and interest rates it is possible to manufacture a forward rate by using the spot exchange rate and money market lending or borrowing via an MMH.

- So, for a foreign currency payment eg, in euros:
- borrow the appropriate amount in sterling now;
- convert the sterling to euros now;
- put the euros into a euro bank account; and
- at the end of the contract period, pay the creditor in euros and repay the sterling loan.

7.2 **(a) Current borrowing rate (SONIA + 2%)**

		£	**£**
Interest payable	£8,500,000 × [10% + 2%] × (6/12)	(510,000)	
	£8,500,000 × [11% + 2%] × (18/12)	(1,657,500)	
			(2,167,500)

		£	**£**
Proposed swap **agreement**			
Stocker pays (as above)			(2,167,500)
Stocker pays Coleby	(£8,500,000 × 10%) × 2 (years)		(1,700,000)
Coleby pays Stocker	£8,500,000 × [10% + 1%] × (6/12)	467,500	
	£8,500,000 × [11% + 1%] × (18/12)	1,530,000	
	Or £8.5m × 11% × 2 years =		(1,870,000)
Interest payable saved			297,500

As Stocker saves £297,500 of interest the interest rate swap is, with hindsight, worthwhile.

(b)

	Stocker	Coleby	Difference
Fixed	11%	9.5%	1.5%
Variable	SONIA + 2	SONIA + 1.5	0.5%
Difference between differences			1.0%

Coleby's proposal results in these net payments:

	Stocker	Coleby
Currently pays	(SONIA + 2)	(9.5%)
Coleby pays Stocker	SONIA + 1	(SONIA +1)
Stocker pays Coleby	(10%)	10%
New net payment	(11%)	(SONIA +0.5%)

Thus, Coleby's proposal means that Stocker gets none of the potential gain and the swap should be renegotiated if possible.

This potential gain can be split evenly ie, 0.5% to each party, which means that Stocker would pay 10.5% fixed (11% – 0.5%) and Coleby would pay SONIA+ 1% (SONIA + [1.5% – 0.5%]).

The interest rate swap would look like this:

	Stocker	Coleby
Currently pays	(SONIA + 2)	(9.5%)
Coleby pays Stocker	SONIA + 2	(SONIA + 2)
Stocker pays Coleby	(10.5%)	10.5%
New net payment	(10.5%)	(SONIA + 1%)

Note: If a candidate produced an alternative swap that worked, full marks would have been awarded. Stocker and Coleby would both pay at less (0.5% in each case) than their available fixed and variable (respectively) rates that are available.

8 Jetair plc

8.1 (a) By selling the receipts forward, the company can lock in a sterling value of 60,000,000/1.5830 = £37,902,716.

(b) The company can also hedge its euro receivables by borrowing €58,536,585 (the present value of €60,000,000 at a 180-day interest rate of 2.5% (5.0% × 180/360)); sell the proceeds in the spot market at a rate of 1.5669 euro/£ (giving £37,358,213); and invest the sterling proceeds at a 180-day interest rate of 2.0% (4.0% × 180/360) to produce £38,105,377. Using a money market hedge, therefore, the company can lock in a sterling value of [60,000,000/(1 + 0.025)]/1.5669 × (1 + 0.02) = £38,105,377.

The money market hedge yields a higher sterling value for the euro receipts and so is preferable.

8.2 Based on the advice that the future spot rate will be lower than the current forward rate, it would appear that the company would be better off waiting to convert its sales at the future spot rate.

However, the finance director should consider whether the dealer has private information that is not yet reflected in the current market rates and why he or she is willing to give it to the company. Without such information, it would in general be difficult to outperform the foreign exchange market, as if the market was efficient the forward rate would reflect the most likely value of the future spot rate.

8.3 A currency option contract gives the holder the right but not the obligation to buy or sell currency at some future time at a pre-determined rate of exchange. Here the company would buy a put option on the euro (or a call option on the £), which would give the company the right to sell euros and receive £s. If the spot exchange rate moves against the company, the option can be exercised in order to limit the company's loss. However, if the spot exchange rate moves in favour of the company, the option can be allowed to lapse with the company dealing at the prevailing spot rate. Downside risk is, therefore, eliminated whilst upside potential is retained, although, of course, an option premium is the price paid to benefit from this flexibility.

If the future euro/£ spot rate = 1.5830 (forward market expectations), the company should exercise the option @ 1.5700 yielding £38,216,560 – 20,000 = £38,196,560 (which exceeds the spot value of £37,882,716 net of the premium assuming the premium is payable after 180 days).

If the future euro/£ spot rate = 1.5649 (dealer's estimate), the company should let the option lapse and deal at the spot rate, yielding £38,321,108 net.

8.4 **(1) Transaction risk** – The uncertainty caused by fluctuations in exchange rates between the date of entering into a foreign currency-denominated contract and the date of settlement of that contract.

This gives rise to the need to decide upon an invoicing strategy – whether to invoice in sterling, thereby removing all transaction risk but potentially putting sales in jeopardy, or to invoice in the customer's currency (or some other acceptable currency), thereby potentially winning business but exposing the business to transaction risk, when shareholders are unlikely to want the company to speculate on market movements.

This gives rise to the need to develop a suitable hedging strategy in respect of the company's export sales using, potentially, forward contracts, money market hedges, options and futures contracts, foreign currency bank accounts and borrowings (which would be repaid from foreign currency receivables) and matching/netting of foreign currency assets and liabilities.

(2) **Economic risk** – This is the long-term version of transaction risk and arises from variations in the overall value of the business (the PV of future cash flows) due to unexpected changes in exchange rates.

(3) **Credit/Trading risk** – Selling on credit in overseas markets is often riskier than doing so domestically and also often involves granting extended credit terms. Both of these increase the risk of bad debts. There is also political risk (potential exchange control legislation and the like). These risks give rise to the need to consider credit insurance covering both commercial and political risks through organisations such as ECGD and NCM.

(4) **Increased financial requirements** – Increased sales overseas will create a need for increased working capital which gives rise to a need to consider various export credit facilities such as bills of exchange, discounted letters of credit, export factoring and ECGD/NCM-guaranteed loan finance.

9 TawTorr International plc

9.1 (a)

Spot rate at 29 February 20X2 = €1.145/£	
Sterling payment at current spot rate = €3.1m/1.145	£2,707,424
If the euro strengthened by 2.5%, the spot rate would be 1.145 × 0.975	1.116
So the sterling payment = €3.1m/1.116	£2,777,778
If the euro weakened by 2.5%, the spot rate would be 1.145 × 1.025	1.174
So the sterling payment = €3.1m/1.174	£2,640,545

(b) **OTC currency option**

Call option (buy) exchange rate is €1.155/£ Sterling payment: €3.1m/1.155 = £2,683,983

Plus option premium cost: 30,000

Sterling payment: £2,713,983

Money market hedge

Euro invested now €3.1m/(1 + [6.9%/4] = €3.1m/1.01725 = €3,047,432

So sterling payment, converted at spot rate: €3,047,432/1.145 = £2,661,513

Sterling borrowed at [4.8%/4]: £2,661,513 × 1.012 = £2,693,451

Forward contract

Sterling payment: €3.1m/(1.145 + 0.008) = [(€3.1m/1.153) + £5,000] =	£2,693,638

(c) Considering the spot rate, if the euro weakens then this will benefit TawTorr. A 2.5% reduction in the value of the euro against sterling will give a net payment of £2,640,545, whilst a stronger euro gives a sterling equivalent of £2,777,778. The difference between these figures is quite considerable – £137,233.

So it might be wise to consider using the hedging instruments, but the directors' attitude to risk would influence that decision.

The money market hedge (MMH) and the forward contract (both of which give a fixed outcome) produce similar results, but the MMH is a better outcome (very marginal). The OTC option is less attractive, mainly because of the cost of the option premium. However, if sterling had strengthened sufficiently by 31 May it would be worth not exercising the option. The break-even exchange rate for this to occur would be €3.1m/[£2,693,638 – £30,000] ie, €1.164/£. If the rate was above this, then using the spot rate and ignoring the option would produce a lower sterling payment than that for the MMH.

9.2 As TawTorr wishes to hedge against the FTSE Index falling it would buy May 20X2 put option contracts at an exercise price of 4,800.

The number of contracts = £3.6m/(4,800 × £10) = 75 contracts

	Portfolio and FTSE index falls	**Portfolio and FTSE index rises**
	£	**£**

Portfolio value @ 31/5/X2	3,450,000		3,675,000
Option exercised ([4800 – 4600] × 75 × £10)	Not exercised	150,000	0
		3,600,000	3,675,000
Cost of option (165 × 75 × £10)		(123,750)	(123,750)
		3,476,250	3,551,250
Current value of portfolio (29/2/X2)		3,600,000	3,600,000
Decrease in value of portfolio		123,750	48,750

10 Deep Drill Supplies plc

10.1 (a) **Possible spot rates** at 30 September 20X2

9.230 ×	10%	0.923
9.330 ×	10%	0.933
9.430 ×	40%	3.772
9.530 ×	40%	3.812

Expected spot rate at 30 September 20X2 (NKr/£) 9.440

So sterling receipt if no hedging (ie, spot rate at 30/9/X2) 16.75m N Kr/9.440 £1,774,364

(b) Forward contract

Sterling receipt: 16.75m NKr/(9.325 + 0.13) = 16.75m NKr/9.455 = £1,771,549

(c) Money market hedge

NKr borrowed now = 16.75m NKr/(1 = 6.6%) = 16.75m NKr/1.066 = 15,712,945 NKr
Sterling receipt, converted at spot rate = 15,712,945 NKr/9.325 = £1,685,034 Sterling invested at 4.3% pa = £1,685,034 × (1 + 4.3%) = £1,757,490

(d) Option

Put option (sell NK) exchange rate is: 9.300 NKr/£

Sterling receipt	16.75m NKr/9.300	1,801,075
Less premium cost		
	£25,000 × 1.043 (on deposit)	(26,075)
Sterling receipt – net		£1,775,000

1.2 The directors' attitude to risk will be an important factor.

Sterling receipt with current spot rate (9.325NKr/£) (16.75m NKr/9.325) = £1,796,246

The forward contract (assuming that there is no arrangement fee) produces a higher sterling receipt than the money market hedge. Both of these hedging methods will produce a fixed sterling amount, known at the start of the hedging period.

If the research paid for is accurate then it would be better to not hedge at all as the spot rate in 12 months' time will produce a sterling receipt of £1,774,364. If the current spot rate remains constant (unlikely bearing in mind the comparative interest rates in the UK and Norway) this would produce an even higher sterling receipt of £1,796,246. However, if the future spot rate is 9.53 (as per the question) the receipt is only £1,757,608 ie, worse than the forward contract.

The put option at the strike price of 9.30NKr/£ produces an attractive amount of sterling £1,775,000 and management might consider paying the £25,000 premium and also have the chance to benefit from a low exchange rate in September 20X2. At a future spot rate of 9.23 (as per the question) the option would be abandoned with a receipt of (£1,814,735 – 26,075) £1,788,660.

10.3 (a) FRA – This would fix the rate of interest receivable by DDS. Upside potential is therefore removed. It can be tailored to the exact amount to be invested by DDS.

(b) Interest rate future – DDS would buy interest rate futures, but these are for standardised amounts, which could be impractical.

(c) Interest rate option – DDS would have the right to deal at an agreed interest rate at maturity date ie, March 20X2. DDS would buy traded call options, but these are for standardised amounts and may not be suitable. So, for more flexibility, DDS could purchase a tailored over the counter (OTC) option.

(d) Interest rate swap – It would be impractical as a long-term hedge for a large deposit. The hedge is only for six months. It would be difficult to find a counterparty.

11 The Buckle Trading Company

11.1 Forward exchange contract

31 May 20X8 net receipt

Netting off

Receipt due = €100,000

Payment due = €(76,000)

Net receipt due = €24,000

€24,000/(1.470 – 0.0025)

€24,000/1.4675 = £16,354

Money market hedge

31 May 20X8 net receipt

€24,000/(1 + (6.5%/4))

€24,000/1.01625 = €23,616 borrowed

€23,616/1.470 = £16,065 received now

£16,065 × (1 + (5.8%/4) = £16,298 in 3 months

31 August 20X8 net payment

Netting off

Receipt due = €120,000

Payment due = €(132,000)

Net payment due = €12,000

Forward exchange contract

31 August 20X8 net receipt

€12,000/ (1.455-0.0059)

€12,000/1.4491 = £8,281

Money market hedge

31 August 20X8 net receipt

€12,000/(1 + (5%/2))

€12,000/1.025 = €11,707

€11,707/1.455 = £8,046 paid now

£8,046 × (1 + (7.2%/2)) = £8,336 in 3 months

For the 31 May net receipt Buckle would be better off with a forward exchange contract, as it would receive more sterling than with a money market hedge.

For the 31 August net payment, a forward exchange contract produces a lower net payment in sterling.

11.2 The principle of interest rate parity explains differences between the forward and spot rates. If an investor places money in a currency with a high interest rate they will be no better off after conversion back into their domestic currency using a forward contract than if they had left the money invested at their domestic interest rate.

Average spot rate March 20X8 = ([1.455 + 1.470]/2) = €1.4625/£ The average interest rate for euros = ([5.0% + 6.5%]/2) = 5.75% The average interest rate for sterling = ([5.8% + 7.2%]/2) = 6.50% Using interest rate parity, the forward rate at March 20X9 = 1.4625 × 1.0575/1.065 = 1.4522€/£

11.3

SONIA rate	**6%**	**10%**
(1) **FRA**	6%	10%
Pay at the rate of interest		
Paid to/(paid by) bank	1%	(3%)
Effective rate	7%	7%
(2) **Option**		
Exercise?	No	Yes
Rate	6%	7%
Premium	1%	1%
Effective rate	7%	8%
(3) **No hedge** – pay at the rate of interest	6%	10%

The option gives a maximum cost of 8% but is relatively expensive because of the premium. It is as good as or worse than the FRA given the two spot interest rates, so on the basis of these figures the FRA is preferable. If rates fell to say 5% then the option looks more attractive. The FRA eliminates downside risk (rates rising) as well as upside risk (rates falling).

11.4 Interest rate swaps involve two parties agreeing to exchange interest payments with each other over an agreed period. Mostly these swaps involve banks, but other large institutions can be involved.

A would agree to pay the interest on B's loan and vice versa. However, the loans must have different characteristics ie, they enable a switch from a fixed rate to a floating rate and vice versa. No loan principals are swapped and both parties retain the obligation to repay their original loans. The gain arises due to the principle of comparative advantage, which allows two companies to work together to their mutual benefit.

Swaps have the following risks.

- The counterparty might default before the agreement is completed.
- Interest or exchange rates might move unfavourably once the swap has commenced.
- Financial accounts might be misleading because of the nature of the swap.
- Swaps tend to be for the longer term, compared to FRA's or options (which are typically less than 12 months). Thus, in this situation a swap would suit Buckle best as its loan is for a five- year period.

12 Pyllon

12.1 13:00 The receipt in Bitcoin will be = B5.37(£200,000 ÷ 37,256.89) 14:00 Sale proceeds = £200,114 (5.37 × 37,265.18). A gain of £114. 15:00 Sale proceeds = £199,685 (5.37× 37,185.34). A loss of 315.

12.2 It can be seen from the calculations above that in a matter of only two hours the volatility of the price of Bitcoin is high moving from either a gain of £114 to a loss of £315.

Unless Pyllon can hedge the risk of the Bitcoin price moving against it, it is not recommended that the company accepts payment in Bitcoin.

13 Nicol plc

(a) 30 Bitcoins × £37,450 = £1,123,500

The spot rate is irrelevant if a forward hedge is used.

£37,450 is the correct forward rate to use for **buying** Bitcoin in three months' time.

(b) Given that Nicol are due to pay Bitcoin they should **buy** futures to protect the value of the transaction.

Number of contracts = 30 (transaction size) ÷ 5 (standard contract size) = 6 contracts Nicol should use **March** futures to cover the transaction date of 31 March.

Step 1: Position in spot market

Loss on transaction = 30 Bitcoin × (£37,400 – £37,650) = £7,500

Step 2: Calculate gain or loss on futures Initially committed to buy futures for: £37,460 Now sell futures for: £37,650

Gain on closing out futures: £190 × 5 Bitcoin × 6 contracts = £5,700

Step 3: Calculate net position

Net position = £7,500 loss on spot – £5,700 gain on future = £1,800 loss overall.

The final outcome is that 30 Bitcoin are bought at the spot rate of £37,650 per Bitcoin (30 × market price of £37,650 = £1,129,500) and compensation is received from the futures market (£5,700), so total payment is £1,129,500 – £5,700 = £1,123,800.

14 Atherton plc and Tyldesley Inc

14.1 (a) Costs (direct and implicit) Materiality of the exposure

Attitude to risk may lead the firm to decide to leave the upside potential open Portfolio

effect

If shareholders are fully diversified, their exposure to systematic risk will not be affected, so there will be no benefits for them from hedging.

(b) (1) €8,000,000/1.1980 = £6,677,796 (2) €8,000,000/1.1420 = £7,005,254

Forward contract: Forward rate €1.1608

€8,000,000/1.1608 = £6,891,799

OTC Option:

Need to sell € so a put option is required at a premium of £1.25 per €100 = £100,000

(1) If spot is €1.1980/£, exercise the option – 8,000,000/1.1750 = £6,808,511, net £6,708,511

(2) If spot is €1.1420/£, let the option lapse – 8,000,000/1.1420 = £7,005,254, net £6,905,254

(b) Appropriate choice of invoice currency

Matching payments and receipts (eg, creating payables and receivables in same currency) Matching assets and liabilities (eg, creating overdraft borrowing in respect of a receivable) Leading and lagging payments
Maintaining currency accounts

14.2 (a) Futures price $1.6436/£ Contract size £62,500 Current spot $1.6520/£

$20,000,000 @ 1.6436 = £12,168,411

So needs to buy £12,168,411/62,500 = 195 contracts, (rounded from 194.7)

Scenario 1:

Buy 195 contracts @	1.6436
In 6 months sell 195 contracts @	1.6610
Gain per £	0.0174
Total gain (195 × 62,500 × 0.0174)	$212,063
Purchase of $20,000,000 in 6 months	$20,000,000
Net cost	$19,787,937
@ future spot rate 1.6630	£11,898,940

Scenario 2:

Buy 195 contracts @	1.6436
In 6 months sell 195 contracts @	1.6400
Loss per £	0.0036
Total loss (195 × 62,500 × 0.0036)	$43,875
Purchase of $20,000,000 in 6 months	$20,000,000
Net cost	$20,043,875
@ future spot rate 1.642	£12,206,988

(b) Hedge inefficiency is caused by basis risk, and by rounding the number of futures contracts required to the nearest whole number.

The fact that the buyer of the contract is tied into buying the £ even if the purchase does

not proceed (which appears to be a real possibility) means that a currency option would appear to preferable in this scenario.

Chapter 11

Spreadsheet Formula for Financial Management

Context

You are expected to be able to use a number of spreadsheet functions in your practical life. This chapter summarises each of the functions that are likely to be applicable in business scenario.

1 Spreadsheet formulae in Financial Management

Section overview

There are a number of calculations that can be performed more efficiently using spreadsheet functions. This chapter covers the nine spreadsheet functions that are:

(a) SUM
(b) IRR
(c) NPV
(d) RATE
(e) PV
(f) POWER
(g) AVERAGE
(h) CORREL
(i) STDEV

1.1 SUM

The SUM spreadsheet function adds the values in a range of cells.

1.1.1 SUM formula format

=SUM (cell range)

1.1.2 Using the SUM formula

Type **=SUM (** to begin the function entry. Drag the cursor over the range of cells containing the cash flows or enter the range address.

Alternatively, to access the SUM formula select 'formulas' from the tool bar, click on 'financial' and then choose SUM from the drop-down menu.

Worked example: SUM formula

A company expects the following cash flows for a proposed investment project:

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Revenue £	60,000	60,000	60,000	60,000	84,000
3	Material costs £	(14,000)	(14,000)	(14,000)	(14,000)	(20,000)
4	Labour costs £	(16,000)	(16,000)	(16,000)	(16,000)	(22,000)
5	Variable overheads £	(8,000)	(8,000)	(8,000)	(8,000)	(10,000)

	A	B	C	D	E	F
6	Fixed overheads £	(2,000)	(2,000)	(2,000)	(2,000)	(2,000)

Requirement

Calculate the net cash flows in each year of the project.

Solution

To calculate the net cash flows in a single year the correct instruction would be (for year 1 as an example) **=SUM(B2:B6)**.

=SUM(B2:B6)

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Revenue £	60,000	60,000			84,000
3	Material costs £	(14,000)	(14,000)	(14,000)	(14,000)	(20,000)
4	Labour costs £	(16,000)	(16,000)	(16,000)	(16,000)	(22,000)
5	Variable overheads £	(8,000)	(8,000)	(8,000)	(8,000)	(10,000)
6	Fixed over-heads £	(2,000)	(2,000)	(2,000)	(2,000)	(2,000)
7	**Net cash** flow	**20,000** [1]	20,000	20,000	20,000	30,000

1 Cell B7 could be copied to cells C7, D7, E7 and F7. This will mean that, for example, cell C7 would contain the formula =SUM(C2:C6)

1.2 Internal Rate of Return (IRR)

The IRR spreadsheet function is used to calculate the internal rate of return (IRR) which is covered in Chapter 2 section 1.

The internal rate of return (IRR) is a discounted cash flow (DCF) technique that calculates the percentage return given by a project. If this return is used to discount a projects cash flow, it would deliver an NPV of zero. If the IRR exceeds the cost of capital, the project is worth undertaking.

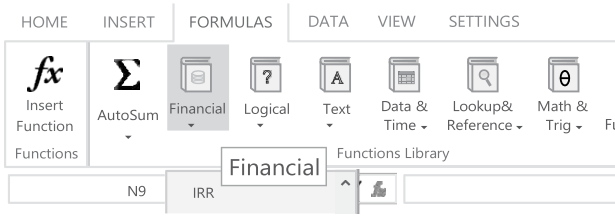
1.2.1 Format of the IRR formula

=IRR(cell range), where the cell range is an array of cell values containing the cash flows to be analysed eg, A3:A10.

1.2.2 Using the IRR formula

Type **=IRR(** to begin the function entry. Drag the cursor over the range of cells containing the cash flows or enter the range address.

Alternatively, to access the IRR formula select 'formulas' from the toolbar, click on 'financial' and then choose IRR from the dropdown menu as illustrated here:



Worked example: IRR formula

The cash flow projections from a project show the following cash flows over the next five years.

	A	B	C	D	E	F	G
1	Year	0	1	2	3	4	5
2	Cash flow £	(80,000)	20,000	20,000	20,000	20,000	30,000

The company's cost of capital is 10%.

Requirement

Calculate the IRR of the project.

Solution

To calculate the IRR the correct instruction would be **=IRR(B2:G2)**.

=IRR(B2:G2)

	A	B	C	D	E	F	G
1	Year	0	1	2	3	4	5
2	Cash flow £	(80,000)	20,000	20,000	20,000	20,000	30,000
3	IRR	11% [1]					

1 This is the IRR. **B3 =IRR(B2:G2)**

Note that the formula does not work if the cash flows are set up as annuities (eg, one cash flow of £20,000 for time period 1–4).

The return generated by the project (IRR) is greater than the company's required return (cost of capital) of 10%, therefore this project would be undertaken.

1.3 Net present value (NPV)

The NPV spreadsheet function is used to calculate the present value of future cash flows and can be used to calculate a net present value (NPV) which is covered in Chapter 2. The net present value (NPV) is a discounted cash flow (DCF) technique that calculates the value created by a project. If the NPV is zero or above, the project is worth undertaking.

1.3.1 Format of the NPV formula

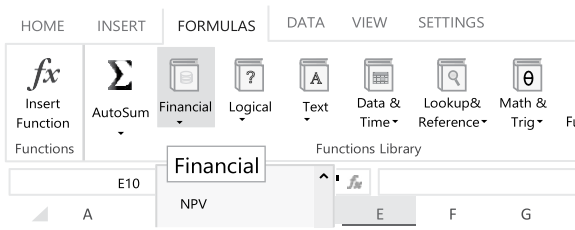
=NPV(discount, cell range), where discount is the discount rate (the cost of capital) and the cell range is an array of cell values containing the cash flows to be analysed eg, A3:A10.

1.3.2 Using the NPV formula

Type **=NPV(** to begin the function entry, then insert the cost of capital followed by a comma, then drag the cursor over the range of cells containing the cash flows or enter the range address, finally insert a closing bracket).

The NPV function calculates the present value of cash flows over a number of years, it assumes the first cell is a cash flow in year 1.

Alternatively, to access the NPV formula select 'formulas' from the toolbar, click on 'financial' and then choose NPV from the dropdown menu as illustrated here:



Cash flows occurring immediately, such as the initial investment, must be adjusted for after the NPV calculation. This is because the NPV function takes into account cash flows from year 1 onwards.

Worked example: NPV formula

A project has an initial outlay of £80,000 at the start of year 1 (time period 0) and shows the following cash flows over the next five years.

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Cash flow £	20,000	20,000	20,000	20,000	30,000

The company's cost of capital is 10%.

Requirement

Calculate the NPV of the project.

Solution

To calculate the NPV the correct instruction would be =NPV(0.1,B2:F2).

=NPV(0.1,B2:F2)

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Cash flow £	20,000	20,000	20,000	20,000	30,000
3	PV@10% T1–5	82,025 [1]				
4	Initial invest-ment	(80,000)				
5	Project NPV	2,025 [2]				

1 This is the present value of the cash flows in cells B2 to F2 ie, for years 1–5. The initial outlay at the start of the first year is excluded from this calculation because the formula assumes the first cash flow is at the end of year 1.

As with IRR, the formula does not work if the cash flows are set up as annuities (eg, one cash flow of £20,000 for time period 1–4).

2 This is the project NPV after subtracting the initial outlay.

The value generated by the project (NPV) is above zero, therefore this project would be undertaken.

Interactive question 1: Delayed cash flow

A company is considering a new project which would require an investment of £0.5 million.

Sales revenue is not expected until year 2, and is forecast to be £200,000 in years 2 and 3 and to rise to £400,000 for years 4 and 5. Year 5 is the final year of the project.

Costs will be 40% of sales revenue in years 2 and 3, and 30% in years 4 and 5. The company's cost of capital is 8%.

Taxation can be ignored.

Requirement

Estimate the internal rate of return and the NPV of this project.

See **Answer** at the end of this chapter.

1.4 RATE

The RATE spreadsheet function is used to calculate the pre-tax yield to maturity on a redeemable bond or debenture (ie, the pre-tax cost of redeemable debt). This is covered in Chapter 5 section 2.

1.4.1 Format of the RATE formula

=RATE (number of periods, payment, present value, future value, type, guess).

The number of periods may be in annual or non-annual terms (eg, six months) depending on whether or not the payments are made annually.

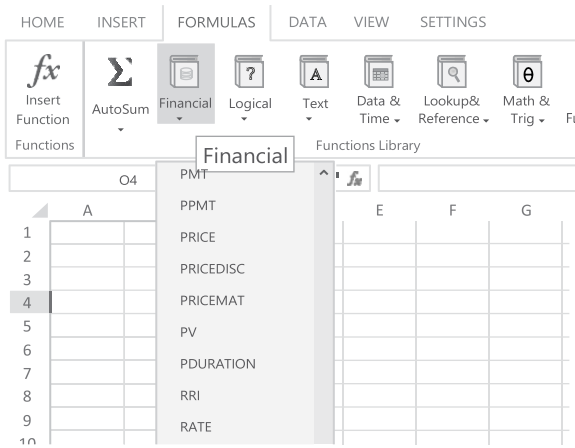
The payment is the amount (of interest) paid in any single period (ie, an annuity).

The present value is the current market value of the asset (the bond) ex interest (**inserted as a negative number)**.

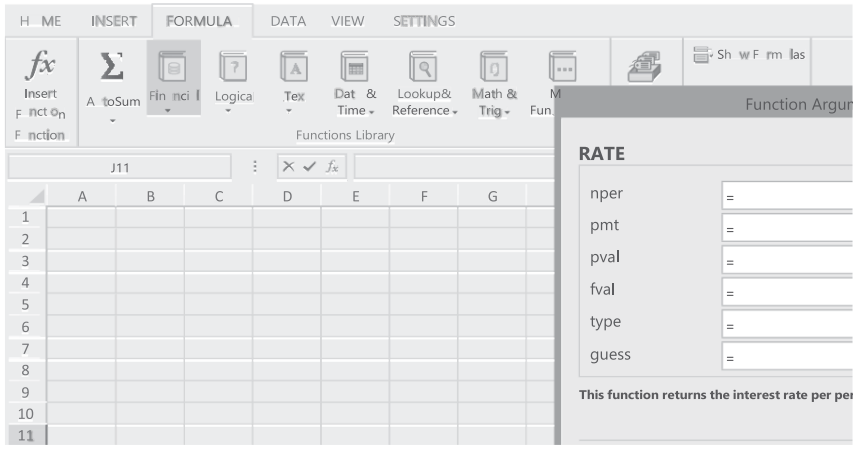
The future value is the redemption value (the amount paid at maturity).

1.4.2 Using the RATE formula

To access the RATE formula, select 'formulas' from the toolbar, click on 'financial' and then choose RATE from the dropdown menu as illustrated here:



After selecting RATE the following information will need to be input:



Nper = the number of periods

Pmt = the amount (of interest) paid in any single period
Pval= the present value of the asset (its market price), **inserted as a negative number**
Fval = the future value (the amount paid at maturity).
This will give the yield to maturity over a given period. To calculate an **annual** yield to maturity the value will need to be multiplied by the number of periods in a year eg, if payments are made over six months, as there are two six-month periods in a year so multiply the RATE calculated by two.

Alternatively, type **=RATE (**to begin the function entry then insert the number of periods, the payment made in each period, the present value (as a negative value) and the future value, and end by inserting a closing bracket).

Worked example: RATE formula

A 6% coupon bond, paying interest on a semi-annual basis, is redeemable in four years' time at its par value of £100. The current market price of this bond is £105 per £100 nominal value.

Requirement

Calculate the annual yield to maturity of this bond.

Solution

To calculate the RATE, the following variables need to be input to the RATE function.

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods	8 [1]
2	Pmt = the amount (of interest) paid in any single period	3 [2]
3	Pval = the present value of the asset (its market price)	–105 [3]
4	Fval = the future value (the amount paid at maturity)	100
5	Yield to maturity	0.02308 [4]
6	Annual yield to maturity	0.04616 [5]

1 This is the number of six-month periods over which payments are made (six months is used as the bond pays interest on a semi-annual basis). (4 years, 2 six-month periods in a year = 8).

2 This is semi-annual coupon, calculated as £6 divided by 2 = £3.

3 This is the market price, inserted as a negative value.

4 This is the yield expressed in terms of the period assessed, which here is six months.

5 This is the annualised yield to maturity, calculated as 0.02308 multiplied by 2 (as there are two six- month periods in a year) = 0.04616 or 4.616%.

1.5 Present Value (PV)

The PV spreadsheet function is used to calculate the present value (PV) of a series of equal cash flows (annuities). The PV spreadsheet function is used to calculate the market price (issue price) of a bond, this is covered in Chapter 5 section 2.

1.5.1 Format of the PV formula

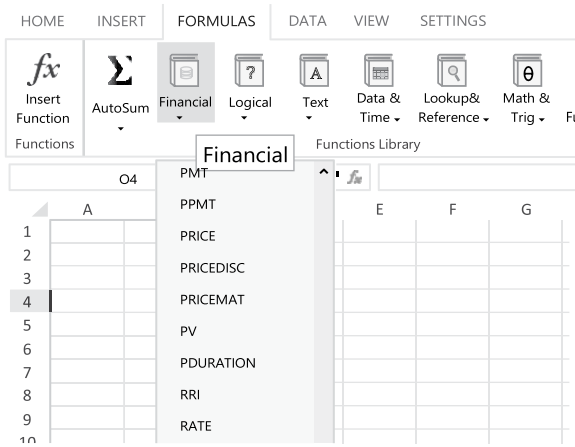
=PV(rate, number of periods, payment, future value, type)

The number of periods may in be years or in six months periods. The payment is the cash paid in each period (ie, an annuity).

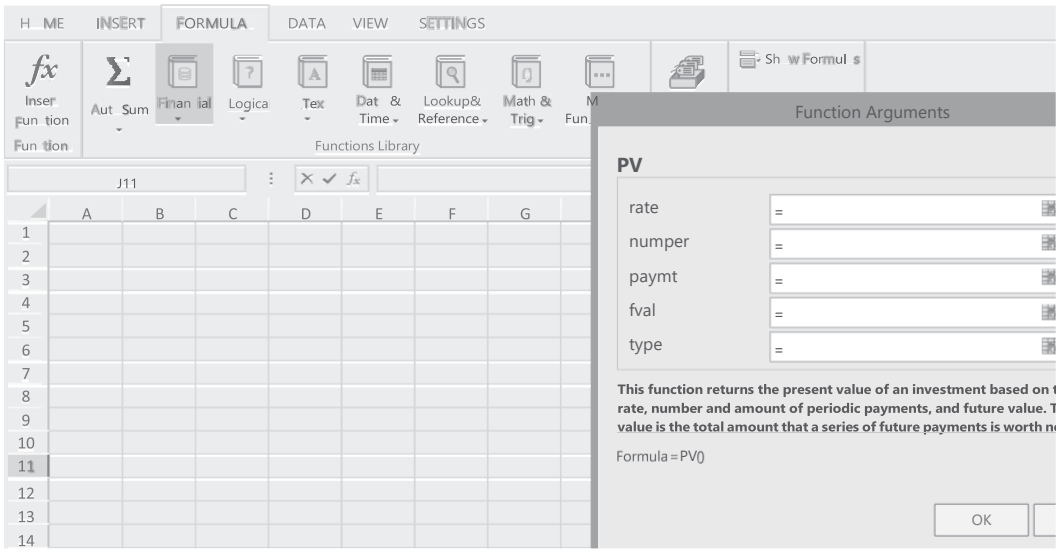
The future value is the redemption value (the value of the bond at maturity).

1.5.2 Using the PV formula

To access the PV formula select 'formulas' from the toolbar, click on 'financial' and then choose PV from the dropdown menu as illustrated here:



After selecting PV the following information will need to be input:



Rate = the yield to maturity for the period that reflects the frequency of the payments Numper = the number of periods

Paymt = the amount (of interest) paid in any single period Fval = the future value (the amount paid at maturity)

This will give the present value (ex interest) of the asset being assessed (eg, a bond).

Alternatively, type **=PV(** to begin the function entry then insert the rate of return required, the number of periods, the payment made in each period and the future value, finally insert a closing bracket **)**.

Worked example: PV formula

A company is planning to issue a 6% coupon bond, paying interest on a semi-annual basis, redeemable in four years' time at its par value of £100. The expected annual yield to maturity for a bond of this type and maturity is 4.616%.

Requirement

Calculate the issue price of this bond.

Solution

=PV(B1,B2,B3,B4)

	A	B
1	Rate of return required over the period	0.02308 [1]
2	Nper = the number of periods	8 [2]
3	Pmt = the amount (of interest) paid in any single period	3 [3]
4	Fval = the future value (the amount paid at maturity).	100
5	Present value (issue price)	-105.00 [4]

1 This is the rate of return over six months, calculated as 4.616% × 6/12 (interest is paid on a semi- annual basis).

2 This is the number of six-month periods over which payments are made (six months is used as the payments are made every six months).

3 This is semi-annual coupon, calculated as £6 divided by 2 = £3.

4 This is the present value ie, the issue price, expressed as a negative number. So the issue price is £105.00

Interactive question 2: Valuing debt

Company A is planning to issue 4% coupon debentures which will be redeemable in five years' time at their par value of £100. Interest will be paid every year on these debentures.

Company B is in the same industry as Company A and has a similar risk profile. Company B currently has 6% semi-annual coupon debentures in issue which are redeemable in eight years' time at their par value of £100. These debentures are currently trading at £110 cum interest.

Requirements

1.1 Calculate the annual yield to redemption on Company B's bonds.

1.2 Using the annual yield to maturity of Company B's bonds, as calculated in the previous question, calculate the issue price for Company A's debenture issue.

1.3 Discuss the validity of using the yield to redemption of Company B's existing bonds to estimate the issue price.

See **Answer** at the end of this chapter.

1.6 POWER

The POWER spreadsheet function allows the geometric average growth rate to be identified for two given values over a given period of time.

This is helpful for estimating the growth rate used in the dividend valuation model as a method of calculating the cost of equity; this is covered in Chapter 2 section 1.

1.6.1 POWER formula format

=POWER(most recent value/ oldest value,1/number of periods of growth)

1.6.2 Using the POWER formula

Type **=POWER (**to begin the function entry then insert the most recent value divided by the oldest value followed by a comma, then insert 1 divided by number of periods of growth, finally insert a closing bracket).

Subtract 1 from this value to obtain the geometric (compound) average growth rate.

Worked example: POWER formula

A company has recently paid a dividend of £0.75 per share. 10 years ago the dividend was £0.40 per share.

Requirement

Calculate the average growth rate over the past 10 years.

Solution

The POWER function can be used to calculate average dividend growth rate.

=POWER(B1/B2,1/B3)–1

	A	B
1	Most recent dividend	0.75
2	Oldest dividend	0.40
3	Time period of growth	10
4	Average annual growth	0.065 [1]

1 Average annual growth over the past 10 years is 6.5%.

This value can be included in the dividend valuation model to calculate the cost of equity.

1.7 AVERAGE

The AVERAGE spreadsheet function calculates the arithmetic mean of a range of values.

1.7.1 AVERAGE formula format

=AVERAGE (cell range)

1.7.2 Using the AVERAGE formula

Type **=AVERAGE (** to begin the function entry. Drag the cursor over the range of cells containing the cash flows or enter the range address.

Worked example: AVERAGE formula

A company expects the following profits from a proposed investment project, costing £120,000:

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Profit £	40,000	60,000	55,000	50,000	35,000

Requirement

Calculate the ARR of the project based on the initial investment.

Solution

To calculate the ARR (accounting rate of return) we need to divide the average profit by the initial investment. To calculate the average profit the correct instruction would be **=AVERAGE (B2:F2)**.

=AVERAGE(B2:F2)

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Profit £	40,000	60,000	55,000	50,000	35,000
3	Average profit £	48,000				
4	Initial investment	120,000				
5	ARR	40%				

1.8 CORRELATION

The CORREL spreadsheet function calculates the correlation coefficient between two data sets.

1.8.1 CORREL formula format

=CORREL (cell range for array 1, cell range for array 2))

1.8.2 Using the CORREL formula

Type **=CORREL (** to begin the function entry. Drag the cursor over the first range of cells then insert a comma followed by the second range of cells.

Worked example: CORREL formula

A company has paid the following dividends over the past five years.

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Dividend per share £	1.10	0.40	1.05	0.25	1.21

The average dividend growth over this period has been correctly calculated as 2.4% by using the POWER formula.

It has been suggested that this should be included in the dividend valuation model to calculate the cost of equity.

Requirement

Calculate the correlation between time and dividend per share, and comment on the implications of the use for the proposed used the average dividend growth rate.

Solution

To calculate the correlation coefficient between time and dividends the correct instruction would be (for year 1 as an example) **=CORREL(B1:F1,B2:F2)**.

=CORREL(B1:F1,B2:F2)

	A	B	C	D	E	F
1	Year [1]	1	2	3	4	5
2	Dividend per share £	1.10	0.40	1.05	0.25	1.21
3	Correlation coefficient	0.03 [2]				

1 This only works if the years are entered as numerical values (ie, 1,2,3 but not 'Year 1', 'Year 2' etc).

2 A correlation coefficient of close to zero indicates that there is no relationship between time and dividend per share.

Given that there is very little correlation between time and dividend per share, using the average dividend growth rate of 2.4% can be misleading in the cost of equity calculation.

1.9 Standard deviation

The STDEV spreadsheet function calculates the standard deviation in a range of cells.

The standard deviation of the cash flows reveals to what extent values vary from the mean. The lower the standard deviation, the lower the variability.

1.9.1 STDEV formula format

=STDEV (cell range)

1.9.2 Using the STDEV formula

Type **=STDEV (** to begin the function entry. Drag the cursor over the range of cells containing the cash flows or enter the range address. Finally, insert a closing bracket).

Worked example: STDEV formula

A company's share price at the end of the past five years is given in the following table.

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Share price £	4.00	6.00	3.75	5.25	5.75

Requirement

Calculate the mean and standard deviation of these share price numbers.

Solution

To calculate the mean the correct instruction would be **=AVERAGE (B2:F2)**.

To calculate the standard deviation the correct instruction would be **=STDEV (B2:F2)**.

=STDEV(B2:F2)

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Share price £	4.00	6.00	3.75	5.25	5.75
3	Mean	4.95				
4	Standard deviation	1.02				

The standard deviation of the company's share price is 1.02. This recognises that, whilst the average share price is £4.95, the actual share price will differ from this. In some years, the share price will be lower and sometimes it will be higher. On average, the difference between the actual share price and the average (or mean) share price will be £1.02.

The lower the standard deviation, the closer the data points are to the mean, indicating a lower level of risk. Conversely a higher standard deviation indicates that the data points are spread out over a wider range of values, indicating a higher level of risk.

1.10 Absolute cell referencing

When entering a formula that uses values from specific cells, a relative cell reference is usually used. This means that if the formula is dragged vertically, the number part of the cell reference will change accordingly. If the formula is dragged horizontally, the letter part of the cell reference will change accordingly.

For example, the formula below is being entered into cell D2 to calculate the profit for year 1. If the formula is dragged downwards to calculate the profit for years 2 to 4, it will change to '=B3–C3' for year 2 and 'B4–C4' for year 3 and so on.

=B2–C2

	A	B	C	D
1	Year	Revenue £	Costs £	Profits £
2	1	150,000	100,000	50,000
3	2	275,000	195,000	
4	3	250,000	225,000	
5	4	425,000	365,000	

There are times when a formula needs to use the contents of a particular cell or cells as part of the calculation. If the formula is dragged to other cells, the references to these particular cells will change and the calculation will be incorrect. However, cell references can be 'fixed' so they do not change as the formula is dragged. These are known as absolute cell references.

To create an absolute cell reference, a '$' is inserted before the letter or number part (or both parts) of the cell reference that needs to be fixed.

If the '$' is inserted before both parts of the reference, the cell reference will not change regardless of the direction the formula is dragged. For example, A2 ensures that neither the column nor row change when copied.

If the '$' is inserted only before the letter part of the cell reference, for example $A2, then the column does not change when copied.

If the '$' is inserted only before the number part of the cell reference, for example A$2, then the row does not change when copied.

The formula below is being entered into cell C2 to calculate the variable cost of product A (sales price multiplied by 60%). By including the '$', cell D2 is fixed and the formula can be dragged down to calculate the variable cost of the other products.

=B2D2

	A	B	C	D
1	Product	Sales price	Variable cost	Variable cost percentage
2	A	£150,000	£90,000	60%
3	B	£275,000		
4	C	£250,000		
5	D	£425,000		

1.11 Formatting

It is important to ensure that values in cells are formatted correctly and consistently so that it is clear to the marker what they are looking at.

The key rules to remember are:

- Large monetary values (for example, a company's quarterly revenue) should be formatted as Accounting £ to 0 decimal places.
- Small monetary values (for example, the sales price of a product) should be formatted as Accounting £ to 0 or 2 decimal places.
- Any calculation resulting in a percentage should be formatted as a percentage cell to 0,1 or 2 decimal places.

2 Further examples of using spreadsheets

Section overview

- In this section we provide some comprehensive worked examples, which demonstrate the formulae you may need to use in practical life .

2.1 Example questions in Financial Management which require spreadsheet functionality

The following series of worked examples illustrate how spreadsheet terminology may be used. It is advised that all students methodically work through each question.

Worked example: Premier Transport Group plc

This question covers the following spreadsheet functions:

(1) The NPV function for calculating the PV of cashflows

(2) The IRR function for calculating the internal rate of return for a project

Premier Transport Group plc (Premier) is a UK transport operator that has two divisions – (1) bus services and (2) express coach services. It has a financial year end of 31 October. Premier's board is investigating capital investment proposals for each of its divisions.

1 Bus division

The bus division is bidding for a three-year contract to operate a number of bus routes in a large tourist resort in the south of England. This contract covers the period from 1 November 20X0 to 31 October 20X3. Your colleagues in Premier's finance team have produced estimates of the incremental income and expenses (in 31 October 20X0 prices) for the period of the contract as shown in the **Exhibit: Incremental income and expenses in 31 October 20X0 prices**.

The following data is not entered in the Exhibit.

Bus hire

Premier is considering hiring eight extra buses to operate on this new contract. The annual hire cost per bus is £45,000 (which is allowable for tax) and this will not increase with inflation.

Bus purchase

As an alternative to the plan to hire the eight new buses, Premier's directors are considering whether it would be preferable to purchase them instead. These would cost £200,000 each on 31 October 20X0 and would have a market value of £50,000 each (in 31 October 20X3 prices) at the end of the contract. It is company policy to write off buses using the straight-line depreciation method.

The buses will attract 18% (reducing balance) capital allowances in the year of expenditure and in every subsequent year of ownership by the company, except the final year. In the final year, the difference between the buses' written down value for tax purposes and their disposal proceeds will be treated by the company either:

- as a balancing allowance, if the disposal proceeds are less than the tax written down value; or
- as a balancing charge, if the disposal proceeds are more than the tax written down value.

Inflation

Premier's directors estimate that all costs (except for hiring and depreciation) will increase by 3% pa, but they will cap fare increases at 2% pa.

Corporation tax

Assume that the rate of corporation tax will be 17% pa for the foreseeable future and that tax flows arise in the same year as the cash flows which gave rise to them.

Cost of capital

Premier uses a money cost of capital of 10% pa for investment appraisal purposes.

Cash flows

Assume that, unless otherwise instructed, all cash flows occur at the end of a financial year.

Requirements

(a) Using money cash flows, calculate the net present values on 31 October 20X0 of the two proposals – bus hiring or bus purchase – and advise Premier's board which of the two proposals it should accept.

(16 marks)

(b) Calculate the market value per bus on 31 October 20X3 that would make Premier indifferent between hiring and purchasing buses.

(4 marks)

(c) Calculate and comment on the internal rate of return of each proposal and explain the advantages and disadvantages of this method of investment appraisal.

Exhibit: Incremental income and expenses in 31 October 20X0 prices

	A	B	C	D
1	Incremental income and expenses in 31 October 20X0 prices			
2				
3	Years to 31October	20X1	20X2	20X3
4		£		£
5	Fares	918,400	2,250,000	3,450,000
6	Fuel costs	(432,000)	(446,400)	(489,600)
7	Other costs	(395,000)	(480,000)	(545,000)
8	Net	91,400 [1]	1,323,600 [2]	2,415,400 [3]

1 =SUM(B5:B7)
2 =SUM(C5:C7)
3 =SUM(D5:D7)

(5 marks)

2 Express coach division

Premier's fleet of medium-sized express coaches operates on long distance routes across the UK. Its board wishes to establish the most cost-effective method of replacing its coaches. Your colleagues in Premier's finance team have produced the following estimates of capital and running costs:

Coach type	Deluxe	Mid-Range	Economy
Purchase price	£260,000	£210,000	£160,000
Annual running costs (in money cash flows)	£57,000	£54,000	£70,000
Estimated life (in years)	6	4	3

The expected life of the Economy coach could be doubled to six years, but this would mean that the coach would require £90,000 of refurbishment costs at the end of the third year and that its annual running costs for years 4 to 6 would be £85,000.It can be assumed that all costs are paid at the end of the year to which they relate, with the exception of the initial purchase price which is paid at the time of purchase. Premier's directors would like to assume that the market value of each type of coach at the end of its life will be nil.

Requirement

Advise Premier's board (showing supporting workings) as to which coach type should be purchased, assuming that Premier wishes to minimise the present value of its costs.

Note: Ignore inflation and taxation when answering this requirement.

Solution

(10 marks)
Total: 35 marks

(a)

	A	B	C	
8	Bus hiring	20X1	20X2	20X3
9		£	£	£
10	Fares (W1)	936,768	2,340,900	3,661,168
11	Fuel costs (W2)	(444,960)	(473,586)	(534,999)
12	Other costs	(766,850)	(869,232)	(955,536)
13	Net	84,958	1,358,082	2,530,632
14	Taxation @ 17%	46,757	(169,674)	(369,008)
15				
16				
17	Net cash flow after taxation	(228,285)	828,408	1,801,625
18				
19	NPV t1–t3@10%	1,830,690.58 [1]		
20				
21	IRR	416% [2]		

1 Formula used in cell B19 is =NPV(0.1,B17:D17)

2 Formula used in cell B21 is =IRR(B17:D17)

	G	H	I	J	K
8	Bus purchase	Year to 31/10/X0	Year to 31/10/X1	Year to 31/10/X2	Year to 31/10/X3
9		£	£	£	£
10	Fares		936,768	2,340,900	3,661,168
11	Fuel costs		(444,960)	(473,586)	(534,999)
12	Other costs (W3)		(406,850)	(509,232)	(595,536)
13	Net		84,958	1,358,082	2,530,632

	G	H	I	J	K
14	Taxation @ 17%		(14,443)	(230,874)	(430,208)
15	Bus (purchase)/sale	(1,600,000)			400,000
16	Tax relief on buses (W5)	48,960	40,147	32,921	81,972
17	Net cash flow after taxation	(1,551,040)	110,662	1,160,129	2,582,397
18					
19	NPV t1–t3@10%	£2,999,579 [3]			
20	Less investment@ **T0**	(1,551,040)			
21	**Project NPV**	£1,448,539			
22					
23	IRR	42% [4]			

3 Formula used in cell H19 is =NPV(0.1,I17:K17)

4 Formula used in cell H23 is =IRR(H17:K17)

Ignore depreciation as it is not a cash flow.

The bus hiring scheme produces the higher NPV and so should be chosen, as this will enhance shareholder wealth more.

WORKING

	Year to31/10/X0 £	Year to31/10/X1 £	Year to31/10/X2 £	Year to31/10/X3 £
W1				
Fares (October 20X0 prices)		918,400	2,250,000	3,450,000
Inflate at 2% pa		× 1.02	× $(1.02)^2$	× $(1.02)^3$
'Money' fares		936,768	2,340,900	3,661,168
W2				
Fuel costs (October 20X0prices)		432,000	446,400	489,600
Inflate at 3% pa		× 1.03	× $(1.03)^2$	× $(1.03)^3$
'Money' fuel costs		444,960	473,586	534,999
W3				

	Year to31/10/X0 £	Year to31/10/X1 £	Year to31/10/X2 £	Year to31/10/X3 £
Other costs (October 20X0 prices)		755,000	840,000	905,000

	Year to31/10/X0	Year to 31/10/X1
	£	£
W1		
Fares (October 20X0 prices)		918,400
Inflate at 2% pa		× 1.02
'Money' fares		936,768
W2		
Fuel costs (October 20X0prices)		432,000
Inflate at 3% pa		× 1.03
'Money' fuel costs		444,960
W3		
Other costs (October 20X0prices)		755,000

less: Hire costs (8 × £45,000)	Year to 31/10/X0 £	Year to31/10/X1 £ (360,000)	Year to 31/10/X2 £ (360,000)	Year to 31/10/X3 £ (360,000)
		395,000	480,000	545,000
Inflate at 3% pa		× 1.03	× $(1.03)^2$	× $(1.03)^3$
'Money' other costs		406,850	509,232	595,536
plus: Hire costs		360,000	360,000	360,000
Total other costs		766,850	869,232	955,536
W4 'Money' fares (W1)		936,768	2,340,900	3,661,168
'Money' fuel costs (W2)		(444,960)	(473,586)	(534,999)
Total other costs (W3)		(766,850)	(869,232)	(955,536)
Taxable profit/(loss)		(275,042)	998,082	2,170,633
Tax (payable)/due @ 17%		46,757	(169,674)	(369,008)
W5 Bus purchase/WDV	1,600,000	1,312,000	1,075,840	882,189
WDA @ 18%/Bal. Allowance	(288,000)	(236,160)	(193,651)	482,189
WDV/sale	1,312,000	1,075,840	882,189	400,000
Tax (17% × WDV/BA)	48,960	40,147	32,921	81,972
W6 'Money' fares (W1)		936,768	2,340,900	3,661,168
'Money' fuel costs (W2)		(444,960)	(473,586)	(534,999)
'Money' other costs (W3)		(406,850)	(509,232)	(595,536)
Taxable profit/(loss)		84,958	1,358,082	2,530,633
Tax payable @ 17%		(14,443)	(230,874)	(430,208)

(b)

Change required in NPV (£1,830,691 – £1,448,539)	
Adjustment required for tax relief on capital allowances (£382,152/83%)	
Adjustment required for time value of money (£460,424/0.751) Total sale price of buses would need to be £613,081 higher, ie,Sale price per bus would need to be (£50,000 + £76,635)	

(c) IRR of hire using spreadsheet function is 416%.

IRR of purchase using spreadsheet function is 42%.

Whilst bus purchase is more sensitive to changes in the discount rate than bus hire, substantial changes would be needed in the discount rate before either proposal was unacceptable.

IRR takes into account cash flows and the time value of money. It represents a break-even point, so an exact cost of capital is not needed. It's easier to use and communicate practically.

However, it may give conflicting advice to that given by NPV (which is technically superior).

2

Deluxe

	£	£
Initial cost (Year 0) Annual running costs		(260,000)
	(57,000)	
	×	
Year 6 annuity factor (@ 10%)	4.355	
		(248,235)
		(508,235)

Equivalent annual running cost: (£508,235)/4.355 = (116,701)

Mid-range

	£	£
Initial cost (Year 0)	(210,000)	
Annual running costs	(54,000)	
	×	
Year 4 annuity factor (@ 10%)	3.170	
		(171,180)
		(381,180)

Equivalent annual running cost: (£381,180)/3.170 = (120,246)

Economy

Three-year cycle Initial cost (Year 0)		(160,000)
Annual running costs	(70,000)	
	×	
Year 3 annuity factor (@ 10%)	2.487	
		(174,090)
		(334,090)

Equivalent annual running cost: (£334,090)/2.487 = (134,334)

Economy

Six-year cycle Initial cost (Year 0)		(160,000)
Annual running costs (Y1–Y3)	(70,000)	
	×	
Year 3 annuity factor (@ 10%)	2.487	
		(174,090)
		(334,090)
plus: Repair costs at Year 3 (£90,000 × 0.751)		(67,590)
plus: Running costs (Y4–Y6) (£85,000 × 2.487 × 0.751)		(158,758)
		(560,438)

Equivalent annual running cost: (£560,438)/4.355 = (128,688)

Thus, the cheapest replacement cycle is for the Deluxe coach and, ignoring any other factors, this coach type should be purchased.

Worked example: Bluesky

This question covers the following spreadsheet functions:

(1) The NPV function for calculating the PV of cashflows

(2) 'What if' analysis of best- and worst-case scenarios

(3) The SUM function for adding cells.

You should assume that the current date is 30 June 20X5.

Bluesky Entertainments plc (Bluesky) is a company listed on the London Stock Exchange (LSE) which operates entertainment facilities throughout the UK. Bluesky is seeking to diversify and expand its activities by opening a new aquatic adventure park called Waterworld and has asked a market research company, for a fee of £100,000, to estimate the number of visitors in the first year of operation and the potential for growth. The Waterworld project would be a major undertaking for Bluesky and, subject to a satisfactory project appraisal, the details will be made public in an announcement to the LSE. One of the Bluesky board members has suggested that it would be a good idea to advise their close family members to buy shares in Bluesky shortly before any public announcement is made.

It has come to the attention of the board that a competitor, Underseaworld, which specialises in sea- based entertainment facilities in the USA, is considering expanding into the UK. Under seaworld has identified a suitable location in the UK and has applied for planning permission to develop the site. However, it will be a year before the planning decision is made as to whether Under seaworld will be allowed to start development of the site.

You are a Chartered Accountant and the finance director of Bluesky. You intend to appraise the Waterworld project at 30 June 20X5 using net present value analysis.

The following three bullet points detail Waterworld's revenue and contribution data that is reproduced in the pre-populated spreadsheet in the **Exhibit**:

- The market research company has produced a report that gives an indication of the forecast numbers of visitors to Waterworld in the first year of operations to 30 June 20X6, together with associated probabilities and the forecast growth in the number of visitors for the next three years.The estimated visitor numbers in the first year are:

Case	Number of visitors	Probability
Best	12,000,000	50%
Medium	9,000,000	30%
Worst	6,000,000	20%

- Visitor numbers in the following three years to 30 June 20X9 would remain at the first year's expected level adjusted for growth of 5% pa.
- The estimated sales revenue per visitor will be £34 in the first year of operations. After 30 June 20X6 sales revenue per visitor is expected to increase by the general rate of inflation of 2.5% pa. Contribution is 40% of sales.

  The following further information is available to you regarding the Waterworld project. This information has **not** been reproduced in the pre-populated spreadsheet.
- Incremental selling and administration expenses in the year to 30 June 20X6 are estimated to be £90 million and will increase at the rate of 4% pa thereafter.
- On 30 June 20X5 the project requires an investment in working capital of £35 million, which will increase at the start of each year in line with sales volume growth and sales price increases. Working capital will be fully recoverable on 30 June 20X9.
- On 30 June 20X5 the project will require an investment in land of £40 million and plant and equipment of £500 million. It is estimated that on 30 June 20X9 (in 30 June 20X9 prices) the land will have a value of £80 million after tax and the plant and equipment will have a value of £120 million before tax. The plant and equipment will attract 18% (reducing balance) capital allowances in the year of expenditure and in every subsequent year of ownership by the company, except the final year.
- In the final year, the difference between the plant and equipment's written down value for tax purposes and its disposal proceeds will be treated by the company either:

  (a) as a balancing allowance, if the disposal proceeds are less than the tax written down value, or

  (b) as a balancing charge, if the disposal proceeds are more than the tax written down value.
- Assume that the rate of corporation tax will be 17% pa for the foreseeable future and that tax flows arise in the same year as the cash flows that gave rise to them.
- Bluesky has a money weighted average cost of capital (WACC) of 8% pa. However, because of the nature and size of the Waterworld project the managing director of Bluesky feels that the rate should be increased by 2%, to 10% pa.
- You intend to include in the net present value analysis a continuing value at the end of four years that will represent the value of the net cash flows after tax beyond the fourth year. This will be calculated as a multiple of nine times the expected after-tax operating cash flows for the year ended 30 June 20X9.
- Unless otherwise stated, you should assume that all cash flows arise at the end of the year to which they relate.

  Information relating to Bluesky excluding the Waterworld project:
- Issued 10p ordinary shares with a total nominal value of £9 million.
- Ex-div share price at 30 June 20X5 is £12 per share.

Requirements

(a) Using money cash flows, complete the pre-populated spreadsheet provided and calculate the expected net present value (ENPV) of the Waterworld project on 30 June 20X5. On the basis of ENPV alone, advise Bluesky's board whether it should accept the project.

(11 marks)

(b) **Ignoring the effects on working capital**, calculate the sensitivity of the Waterworld project's ENPV to changes in sales revenue.

(c) Calculate the Waterworld project's worst case NPV. You must show your full workings.

(3 marks)
(3 marks)

(d) An analyst has calculated that the best case and medium case scenarios for the Waterworld project result in NPVs of £386.24 million and £7.56 million respectively. Discuss whether this information and your calculations in (b) and (c) would change the advice that you gave in (a), which was based on ENPV alone.

(e) Identify and explain **TWO** real options associated with the Waterworld project.

(4 marks)

(f) Discuss whether the managing director of Bluesky is justified in simply adding 2% to the company's current WACC when appraising the Waterworld project and outline an alternative way of arriving at a discount rate for the project.

(4 marks)

(g) Assuming the Waterworld project goes ahead, explain and calculate the likely effect on Bluesky's share price after it makes the public announcement to the LSE.

(3 marks)

(h) Outline the ethical and legal issues for you as a B Chartered Accountant, regarding the suggestion by the board member that their close family members should be advised to buy shares in Bluesky shortly before the announcement of the Waterworld project.

Exhibit: Part pre-populated ENPV for the Waterworld Project

Solution

(a)

(3 marks)
Total: 35 marks

	B	C	D	E	F	G	H
4		Probability	Visitors m	Sales £m	Prob × Sales		
5							
6	Best	0.5	12	408	204		
7	Medium	0.3	9	306	91.8		
8	Worst	0.2	6	204	40.8		
9	Expected Sales				336.6		

	B	C	D	E	F	G	H
10							
11			0.4	134.64			
12	Sales revenue per visitor			34			
13	Growth in sales			0.05			
14	Increase in sales prices			0.025			
15							
16							
17							
18	Year		t0	t1	t2	t3	t4
19							
20	Contributio n			134.64	144.91	155.96	167.85
21							
22	Selling & admin expenses			(90.00)	(93.60)	(97.34)	(101.23)
23							
24	Operating cash flows			44.64	51.31	58.62	66.62
25							
26	Tax 17%			(7.59)	(8.72)	(9.97)	(11.33)
27							
28	After tax cash flows			37.05	42.59	48.65	55.29
29							
30	Property, plant & equipment		(500.00)				120.00
31	Land		(40.00)				80
32	Tax saved on Cas		15.30	12.55	10.29	8.44	18.03
33							

	B	C	D	E	F	G	H
34	Working Capital		(35.00)	(2.67)	(2.87)	(3.09)	43.63
35	Continuing value						497.61
36	**Net cash** flows		(559.70)	46.93	50.01	54.00	814.56
37							
38							
39	PV t1 to t4 at 10%		680.92 [1]				
40	Less t0		(559.70)				
41	ENPV		121.22				

1 The formula used in cell D39 is =NPV(0.1,E36:H36)

On the basis of ENPV the project should be accepted, which will increase shareholders' wealth. The market research of £100,000 should not be included as it is a sunk cost.

	A	B	C	D	E
1		Cost/WDV	CA	Tax	
2					
3	0	500.00	90.00	15.30	
4	1	410.00	73.80	12.55	
5	2	336.20	60.52	10.29	
6	3	275.68	49.62	8.44	
7	4	226.06			
8	Sale	–120.00	106.06	18.03	
9	Growth in sales			0.05	
10	Increase in sales prices			0.025	
11	Working capital				
12	Increase per year1.05 × 1.025 =	1.07625			
13			Total	Increment	
14	t0		–35	–35	
15	t1		–37.67	–2.67	
16	t2		–40.54	–2.87	
17	t3		–43.63	–3.09	
18	t4			43.63	

(b)

		E	F	G	H
71	Contribution X(1 – 0.17)	111.75	120.28	129.45	139.32
72	Continuing value				1253.88
73		111.75	120.28	129.45	1393.20
74					
75	PV@10%	1249.83 [1]			
76					
77	Sensitivity ENPV/ PV	10% [2]			

1 The formula used in cell E75 is =NPV(0.1,E73:H73)

2 The formula used in cell E77 is =(D41/E75)

(c)

		D	E	F	G	H
84	NPV worse- case scenario	0	1	2	3	4
85						
86	Contribution		81.6	87.82	94.52	101.73
87						
88	Selling & admin expenses		(90)	(93.6)	(97.34)	(101.23)
89						
90	Operating cash flows		8.4	(5.78)	(2.82)	0.5
91						
92	Tax 17%		1.43	0.98	0.48	(0.09)
93						
94	After tax cash flows		(6.97)	(4.8)	(2.34)	0.41
95						
96	Property, plant & equipment	(500)				120
97	Land	(40)				80

		D	E	F	G	H
98	Tax saved on Cas	15.3	12.55	10.29	8.44	18.03
99						
100	Working Capital	(35.00)	(2.67)	(2.87)	(3.09)	43.63
101	Continuing value					3.69
102	**Net cash** flows	(559.70)	2.91	2.62	3.01	265.76
103						
104						
105	PV t1 to t4 at 10%	188.59 [1]				
106	Less t0	-559.70				
107	NPV	-371.11				

1 The formulae used in cell D105 is =NPV(0.1,E102:H102)

(d)

	£m	**Probability**
ENPV	121.22	
Best case	386.24	0.5
Medium case	7.56	0.3
Worst case	(371.11)	0.2

At 10% sensitivity the Waterworld project is quite sensitive to change in total revenue. However, the best and medium case scenarios produce positive NPVs and there is an 80% chance of these occurring. Therefore, my advice would not change and the project should be accepted.

However, it must be noted that there is a 20% chance of a substantial negative NPV. The board's attitude to risk should be considered.

(e) Underseaworld has already identified a site to launch its operations in the UK, therefore this will increase the uncertainty of the Waterworld project revenues. In the circumstances Bluesky might consider waiting to start the project until the decision regarding the planning permission that Underseaworld has applied for has been made. The real option regarding the decision to delay the start of the Waterworld project is a Timing option.

Bluesky could start the project at time zero and has the option to abandon the project should Underseaworld commence their project and erodes the profitability of Waterworld.

Bluesky also has the option to continue after four years, this is a Follow-on-option.

(f) Bluesky has a market capitalisation of (£9m/0.10) × £12 = £1,080 million. The Waterworld project requires and investment of (£500 + £40 + £35) = £575 million.

This is over half the current market capitalisation. Raising this amount of finance might affect the company's gearing and financial risk. The Waterworld project is also a diversification from Bluesky's current operations, which will affect its business systematic risk.

Simply adding a 'fudge figure' of 2% to the current WACC of the company is not appropriate and the finance director of Bluesky should consider:

(1) How to accurately measure the systematic risk of the Bluesky project. This can be achieved by adjusting the cost of equity by using an equity beta from a comparable company that reflects the systematic risk of the project. However, gearing adjustments may have to be made.

(2) The size of the Waterworld project may mean that Bluesky's gearing will materially change and it would not be appropriate to use the WACC/NPV project appraisal methodology. Instead, it would be more appropriate to appraise the Waterworld project using the Adjusted Present Value model.

(g) Assuming that the UK stock market is semi-strong form efficient and reacts instantaneously to public information, when Bluesky makes an announcement in the Stock Market regarding the Waterworld project the share price will immediately reflect the new information.

The increase, or decrease, in price will depend on whether the markets have confidence that the project will indeed be successful.

Assuming that the markets believe this project will be successful, using the ENPV the share price will increase by: (£121.22/90) = 135p per share. Giving a new share price of £12 + £1.35 =£13.35.

However, several factors might mean that the price is below £13.35, the presence of the Underseaworld expansion into the UK and the size of the project may make the markets cautious.

(h) The suggestion that close family members of the board should buy shares in Bluesky before the announcement about the Waterworld project is made is highly unethical, since they will be supplied with price sensitive information that has not yet been made public.

It is also insider trading and illegal.

Worked example: Merikan Media

Business valuations

This question covers the following spreadsheet functions:

(1) The NPV function for calculating the PV of cashflows

(2) 'What if' analysis of best- and worst-case scenarios

(3) The SUM function for adding cells

Assume the current date is 31 August **20X2.**

Merikan Media plc (Merikan) is a large, listed media group based in the UK. It currently owns a controlling interest in 35 companies worldwide. Merikan's board is considering altering its UK investment portfolio via:

(1) the purchase of all of the shares in a commercial radio company and

(2) the disposal of all of its shares in a newspaper company.

You work in Merikan's finance team and have been asked to prepare valuations and supporting notes for the board. Details of the two proposed transactions are shown below.

1 **Purchase of all of the shares in a commercial radio company**

Coastal Radio Ltd (Coastal) was formed 19 years ago and has been a very successful radio station. Its listener numbers have increased steadily, as have advertising revenue and annual profits.

Extracts from Coastal's most recent management accounts (together with supporting notes) are shown here:

Income Statement for the year ended 31 August 20X2

	£'000
Sales	28,400
Operating costs	(15,600)
Depreciation	(3,500)
Amortisation	(1,200)
Profit before interest	8,100
Debenture interest	(400)
Profit before tax	7,700
Taxation (at 17%)	(1,309)
Profit after taxation	6,391
Dividends paid	(1,750)
Retained profit	4,641

Balance Sheet at 31 August 20X2

	£'000
Non-current assets	36,310
Current assets	4,316
	40,626
£1 ordinary shares	3,500
Retained earnings	27,206
5% debentures	8,000
Current liabilities	1,920
	40,626

Notes

1 Coastal's non-current assets originally cost £52.8 million. They were valued at £37.8 million on 31 August 20X2 and its current assets were valued at £4.2 million on the same date. Neither of these valuations is reflected in the balance sheet at 31 August 20X2.

2 Coastal's debentures were trading at £110% on 31 August 20X2.

3 Average figures for listed UK commercial radio companies:

P/E ratio	8.5
Dividend yield	5%
Enterprise value multiple	6.5

Requirements

(a) Calculate the value of one Coastal share based on each of the following methods:

- Price earnings ratio
- Dividend yield
- Enterprise value
- Net assets basis (historic cost)
- Net assets basis (revalued)

(12 marks)

(b) Justify and advise the board of the price range within which it should make an offer for Coastal's shares. Refer to your calculations in part (a) above.

(8 marks)

2 Disposal of all of its shares in a newspaper company

Merikan has owned all of the share capital of Albion Newspaper Group Ltd (Albion) for 17 years. Recently Albion's directors have informed Merikan's board that they are willing to make a management buy-out (MBO) of Albion. Accordingly, Merikan's board wishes to value Albion using the shareholder value analysis method (SVA). Merikan's board estimates that Albion has a three-year competitive advantage over its competitors (to 31 August 20X5).

Your assistant has correctly calculated the free cash flows for a SVA analysis (using sales growth, operating margin, tax rate, incremental non-current asset (NCA) investment, incremental working capital (WC) investment and life of cash flows) but has not yet taken account of the cost of capital. The free cash flows, and the initial assumptions made by Merikan's board on which they are based, are shown in the **Exhibit**.

The following additional financial information is available for you to complete the SVA analysis:

Par value of 6% debentures in issue (market value £95%)	£10.0 million
Short-term investments held	£0.7 million
WACC	8%

Albion's directors are concerned about the rates of sales growth and the operating margins assumed by Merikan's board. They believe that the following best- and worst-case scenarios may occur depending on the future competition in their market:

	Best case	Worst case
Sales growth 31 August 20X3 – 20X5	5% pa	1% pa
Operating margin	10%	5%

Requirements

(a) Using the data in the Exhibit and the additional financial information provided, calculate the value of Albion's equity using SVA at 31 August 20X2.

(5 marks)

(b) Using SVA, calculate and comment upon the impact on Albion's equity value of the best- and worst-case scenarios if:

- Only sales growth changes
- Only operating margin changes
- Both sales growth and operating margin change at the same time

(7 marks)

(c) Outline the methods by which Albion's directors might raise the funds necessary for the proposed MBO of the company.

(3 marks)
Total: 35 marks

Exhibit: SVA free cash flows (£m) using SVA inputs – initial assumptions below

	A	B	C	D	E	F
1						
2						
3	Year ended (y/e)	31/08/20X2	31/08/20X3	31/08/20X4	31/08/20X5	31/08/20X6 and beyond
4	Sales	70.0	73.5	75.7	77.2	77.2
5						
6	Operating margin		5.9	6.8	6.9	6.9
7	Tax @ 17%		(1.0)	(1.2)	(1.2)	(1.2)
8	Incremental NCA investment		(0.2)	(0.1)	0.0	0.0
9	incremental WC investment		(0.2)	(0.1)	(0.1)	0.0
10	Free cash flows		4.5	5.4	5.7	5.8
11						
12						

	A	B	C	D	E	F
13	SVA inputs – **initial assumptions**					
14	sales growth factor y/e 31/08/20X3			1.05		
15	sales growth factor y/e 31/08/20X4			1.03		
16	sales growth factor y/e 31/08/20X5			1.02		
17	sales growth factor y/e 31/08/20X6 and			1		
	beyond					
18	operating margin y/e 31/08/20X3			0.08		
19	operating margin y/e 31/08/20X4 and beyond			0.09		
20	Incremental NCA investment y/e 31/08/20X3			-0.06		

	A	B	C	D	E	F
21	Incremental NCA investment y/e 31/08/20X4			-0.05		
22	Incremental NCA investment y/e 31/08/20X5			-0.02		
23	Incremental NCA investment y/e 31/08/ 20X6 and beyond			0		
24	Incremental WC investment y/e 31/08/20X3			-0.05		
25	Incremental WC investment y/e 31/08/20X4			-0.05		
26	Incremental WC investment y/e 31/08/20X5			-0.04		
27	Incremental WC investment			0		
	y/e 31/08/20X6 and beyond					

Solution

1
(a)

	£'000	Total value £'000		Value per share £
P/e ratio £6,391,000 × 8.5 =		54,324	/3,500	**15.52**
Lower marketability (25% discount, say)				**11.64**
Dividend yield £1,750,000/5 % =		35,000	/3,500	**10.00**
Lower marketability (25% discount, say)				**7.50**
Enterprise value				
Profit before interest & tax	8,100			
Depreciation	3,500			
Amortisation	1,200			
EBITDA £12,800 × 6.5 =		83,200		
less: Debt at MV £8,000 × £110% =		(8,800)		
		74,400	/3,500	**21.26**
Lower marketability (25% discount, say)				**15.94**
Net Assets – historic cost				
Ordinary share		3,500		

	£'000	Total value £'000		Value per share £
capital				
Retained earnings		27,206		
		30,706	/3,500	**8.77**
Net Assets - revalued				
Historic cost (as above)		30,706		
Non-current assets (£37,800 - £36,310)		1,490		
Current assets (£4,200 - £4,316)		(116)		
Debentures (£8,000 - £8,800)		(800)		
		31,280	/3,500	**8.94**

Asset valuations are the lowest. Historic figures – Balance Sheet based, no intangibles, buying to run not break up.

P/E and EV are most relevant – forward-looking and based on profits/earnings.

Dividend yield is OK, but it is a 100% purchase and only relevant for minority interests, ignores growth.

Price range of £12 to £16 per share looks about right.

	A	B	C
1		£m	Spreadsheet function (using information in Exhibit 1)
2	PV FCF t1–3	13.3	=NPV(0.08,C10:E10)
3	PV t4 onwards	57.2	=F10/0.08/1.08^3
4	Short-term investments	0.7	
5	Long-term debt	(9.5)	
6	Value of equity	61.8	=SUM(B2:B5) Using the information in this spreadsheet.

Ignoring £70m sales at t0

By entering best and worst data into spreadsheet:

	Best	Worst
Sales alone	5% growth Value of Equity changes to 64.7(+4.6%) Achieved by changing cells D14, D15 and D16 in Exhibit 1 to 1.05 and leaving all other cells as they are.	1% growth Value of Equity changes to 57.7 (–6.6%) Achieved by changing cells D14, D15 and D16 in Exhibit1 to 1.01 and leaving all other cells as they are.
Margin alone	10% margin Value of Equity changes to 70.3(+13.8%) Achieved by changing cells D18 and D19 to 0.10 and leaving all other cells as they are.	5% margin Value of equity changes to 30.4 (–50.8%) Achieved by changing cells D18 and D19 to 0.05 and leaving all other cells as they are.
Both	5% growth and 10% margin Value of equity changes to 73.6(+19%) Achieved by changing cells D14, D15 and D16 in Exhibit 1 to 1.05 and cells D18 and D19 to 0.10. Leave all other cells as they are.	1% growth and 5% margin Value of equity changes to 28.4 (–54%) Achieved by changing cells D14, D15 and D16 in Exhibit 1 to 1.01 and cells D18 and D19 to 0.05. Leave all other cells as they are.

Changes in the assumptions will impact on the price the directors of Albion are willing to pay in the MBO. Clearly varying the sales growth alone has little impact either way on the valuation of the equity. However, changes in the margin have a major impact on the downside reducing the equity value by half. Albion's directors will need to consider how competitive the market is likely to be in future. They are likely to offer significantly less than the £61.8m originally calculated based on this analysis.(c) Methods by which management might fund its MBO:

- From management's equity
- From venture capitalists' equity and debt
- Borrowing from banks' debt

Worked example: Fuelsense

This question covers the following spreadsheet functions:

(1) The NPV function for calculating the PV of cashflows

(2) 'What if' analysis of best- and worst-case scenarios

Assume that the current date is 31 December **20X2.**

Fuelsense plc (Fuelsense) manufactures fuel sensors for the aerospace industry. You work in Fuelsense's corporate finance department and have been asked to assist in the project appraisal of a new type of sensor (the FS342) that has been developed over the last three months at a cost of £124,000. Initially the project will be appraised using NPV on the assumption that production and sales take place in the UK. However, the Managing Director of Fuelsense would also like you to consider appraising the project using shareholder value analysis (SVA) and wants you to identify the risks of producing and selling this new sensor overseas as well as in the UK.

You have gathered the following data as regards the FS342 project:

(1) The FS342 sensor is forecast to have a three-year life cycle. The marketing manager has examined the demand for other similar sensors that Fuelsense has sold in the past and has informed you that demand in the year to 31 December 20X4 is likely to be dependent on the demand in the year to 31 December 20X3 as shown in the table below:

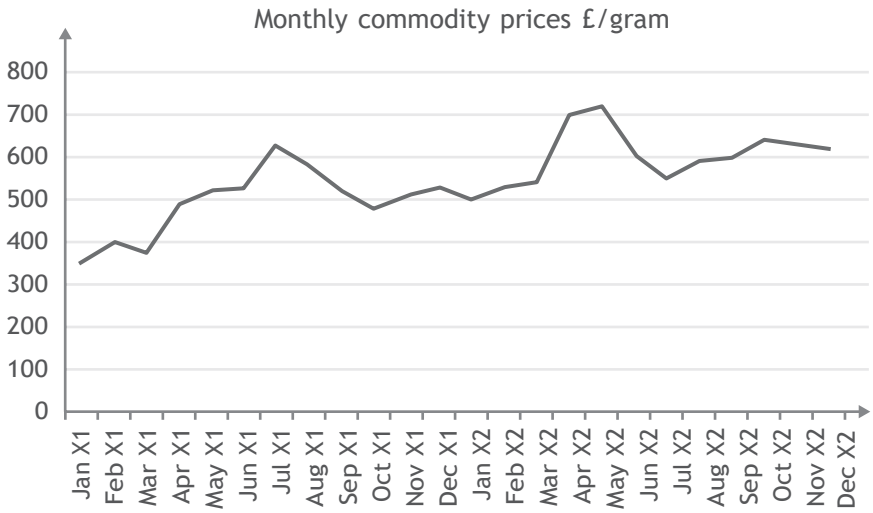
y/e 31 December 20X3		y/e 31 December 20X4	
Demand (units)	**Probability**	**Demand (units)**	**Probability**
10,000	0.6	8,000	0.3
		10,000	0.7
12,000	0.4	12,000	0.5
		15,000	0.5

Demand in the year to 31 December 20X5 is forecast to be half the expected level of demand in the year to 31 December 20X4. The expected level of annual demand is to be used in the NPV calculation.

(2) The price per sensor will be £1,500 in the year to 31 December 20X3 and this is anticipated to increase by 3% pa thereafter.

(3) Each sensor will require 1 gram of a precious metal that Fuelsense has not used in sensor production before. This metal will need to be purchased on a commodities market that is known to be highly volatile. The purchasing manager has gathered monthly cost data for the last 24 months on the cost per gram (**Exhibit 1 Monthly cost per gram over the last 2 years**) and has also provided you with this data graphically as shown below.

Monthly commodity prices £/gram



The purchasing manager has suggested that in view of the volatility in monthly costs, the average cost per gram over the 24-month period should be used in calculating the project's NPV.

(4) Labour costs are expected to be £2,250,000 in the year to 31 December 20X3 and increase by 4% pa thereafter.

(5) Your assistant has begun the NPV calculation by tabulating the project's cash flows (**Exhibit 2 Project cash** flows) and has correctly entered all necessary formulae and the data for price, other materials costs, overheads, asset investment, writing down allowances and working capital flows. Only the parts highlighted require completion.

(6) An appropriate money cost of capital for the project is 10% pa.

The risk of the FS342 project was discussed at the 18 December 20X2 board meeting where the following comments were made:

- Production Director: 'The cost of the precious metal on the commodities market is a key issue for us. I'd like to see the impact of a 5% or 10% increase in the cost per gram used in the NPV calculation.'
- Marketing Director: 'The market for fuel sensors has become very competitive recently. I can't see us being able to raise the price over the product's life cycle.'
- Finance Director: "I'm more concerned about the financing and the cost of capital. What's the maximum discount rate this project could bear?'

Requirements

1 Using money cash flows, complete the table of cash flows in **Exhibit 2 in the pre-populated spreadsheet** and use it to calculate the project's expected NPV on 31 December 20X2. Advise Fuelsense's directors whether to proceed with the project based upon this NPV alone.

(8 marks)

2 Prepare a report on the riskiness of the FS342 project for the directors of Fuelsense. The report should contain:

- relevant calculations which address the points made by the directors at the 18 December board meeting;
- a discussion of these calculations in terms of their impact on the risk of the project, making reference in particular to the data on precious metal costs;

- an assessment of the validity of using expected demand in the calculation of the NPV; and
- a recommendation as to whether Fuelsense's directors should proceed with the project based on this risk analysis.

(12 marks)

3 Define what is meant by 'real options' and with reference to your answer to 2 above explain how the following options could be relevant to the appraisal of the FS342 project:

- Follow on
- Growth
- Abandonment

(6 marks)

4 Outline how shareholder value analysis (SVA) could be used to evaluate the FS342 project.

(4 marks)

5 Excluding foreign exchange rate (forex) risks, outline the potential risks that Fuelsense could face were it to produce and sell the FS342 sensor overseas.

Exhibit 1: Monthly cost per gram over the last 2 years

(5 marks)
Total: 35 marks

	A	B
1		
2		£/gram
3	Jan X1	350
4	Feb X1	400
5	Mar X1	375
6	Apr X1	490
7	May X1	520
8	Jun X1	525
9	Jul X1	630
10	Aug X1	580
11	Sep X1	520
12	Oct X1	480
13	Nov X1	510
14	Dec X1	530
15	Jan X2	500
16	Feb X2	530
17	Mar X2	540

	A	B
18	Apr X2	700
19	May X2	720
20	Jun X2	610
21	Jul X2	550
22	Aug X2	590
23	Sep X2	600
24	Oct X2	640
25	Nov X2	630
26	Dec X2	620

Exhibit 2: Project cash flows

	A	B	C
32	Input variables for NPV		
33			
34	Price inflation factor		1.03
35	Average cost £/gram		

	F	G	H	I	J	K	L
29				31/12/20X2	31/12/20X3	31/12/20X4	31/12/20X5
30				t0	t1	t2	t3
31							
32	Expected demand (units)						
33	Price (£)				1,500	1,545	1,591
34							
35				£	£	£	£
36	Revenue				0	0	0
37	Commodity				0	0	0
38	Other materials				(1,890,000)	(1,970,000)	(1,005,000)

39	Labour						
40	Overheads				(1,575,000)	(1,800,000)	(1,825,000)
41	Development costs						
42	Pre-tax cash flow				(3,465,000)	(3,770,000)	(2,830,000)
43	Tax at 17%				589,050	640,900	481,100
44	Asset investment			(8,000,000)			1,000,000
45	WDAs			244,800	200,736	164,604	579,860
46	Working capital			(500,000)	(124,000)	(133,100)	757,100
47	Net cash flow			(8,255,200)	(2,799,214)	(3,097,596)	(11,940)

Solution

Calculate monthly cost per gram over the last two years using AVERAGE formula and the data in Exhibit 1, as follows:

Average cost £/gram = AVERAGE(B3:B26) = 547.5

Exhibit 2: Project cash **flows**

	G	H	I
4	Input variables for NPV		
5			
6	Price inflation factor		1.03
7	Average cost £/gram		547.5

	L	M	N	O	P	Q
1			31/12/20X2	31/12/20X3	31/12/20X4	31/12/20X5
2			t0	t1	t2	t3
3						
4	Expected demand (units)			10,800	11,040	5,520
5	Price (£)			1,500	1,545	1,591
6						
7			£	£	£	£
8	Revenue			16,200,000	17,056,800	8,784,252
9	Commodity			(5,913,000)	(6,044,400)	(3,022,200)
10	Other materials			(1,890,000)	(1,970,000)	(1,005,000)

	L	M	N	O	P	Q
11	Labour			(2,250,000)	(2,340,000)	(2,433,600)
12	Overheads			(1,575,000)	(1,800,000)	(1,825,000)
13	Development costs		0			
14	Pre-tax cash flow			4,572,000	4,902,400	498,452
15	Tax at 17%			(777,240)	(833,408)	(84,737)
16	Asset investment		(8,000,000)			1,000,000
17	WDAs		244,800	200,736	164,604	579,860
18	Working capital		(500,000)	(124,000)	(133,100)	757,100
19	Net cash flow		(8,255,200)	3,871,496	4,100,496	2,750,675

NPV t1–3 @10% =NPV(0.1,O19:Q19)
NPV t1–3 @10% £8,975,004 t0 (less N19)£(8,255,200)
NPV£719,804
As NPV is positive, accept the project as it increases shareholder wealth. WORKINGS
(1) Expected Value (EV) **demand**

y/e 31/12/X3			y/e 31/12/X4		
Demand (units)	**Probability**	**EV demand (units)**	**Demand (units)**	**Probability**	**EV demand (units)**
10,000	0.6	6,000	8,000	0.3	1,440
			10,000	0.7	4,200
12,000	0.4	4,800	12,000	0.5	2,400
			15,000	0.5	3,000
		10,800			11,040

y/e 31/12/X5 = 11,040 × 0.5 = 5,520 units
(2) Average metal cost per gram
Average (B3:B26) in Exhibit 1 = £547.50
(3) Labour
£2,250,000 × 1.04 = £2,340,000 × 1.04 = £2,433,600 or formula in NPV
(4) Development costs
£nil as sunk

2 Report format

Content – Issues to be covered include:

Metal cost

- If the average cost of metal rises by 5% the project still has a positive NPV
- If the average cost of metal rises by 10% the project has a negative NPV

- So, the project is sensitive to the cost of metal
- The graph of metal prices indicates a trend upwards not reflected in the use of the average cost in the initial NPV
- Using the first and last costs provided there is an increase of 620/350 = 1.77 ie, 77% or 33% pa compound
- The highest price is 720 which is 31.5% above the average – far in excess of the 10% sensitivity tested
- So, use of the average cost is likely to have produced an unreliable NPV
- Unless Fuelsense can hedge against the movements in cost in the commodity market or respecify the sensor (flexibility option) the project is very risky in terms of metal cost

Price inflation

- If the price cannot be raised by 3% pa then the NPV is much lower and the project is more marginal
- The project is therefore sensitive to the sales price which adds to the risk especially if materials **and** metals cost changes occur together rather than the either/or sensitivity approach

Cost of capital

- The IRR is 15% ie, a 50% increase before the project becomes marginal
- The project is not sensitive to the cost of capital

Use of expected values

- Expected values assume the project is repeated many times rather than done once
- Actual demand won't correspond to the expected demand in each year
- If the worst-case levels of demand occur the project loses £3m in NPV terms
- Uses past data for other sensors which might not be reliable

Conclusion

The project appears to be very risky and unless there are real options associated with it (3 below) then it should be rejected.

Appendix: Calculations

Note: Revise input data into spreadsheet into relevant cell/cells after initial NPV has been calculated to determine each sensitivity.

	NPV (£)
Increase average cost +5% to 574.875	195,184
Increase average cost +10% to 602.25	(329,436)
Price factor 1.0 (reduce price inflation to zero)	64,577
Worst case demand 10k,8k,4k (adjust sale volumes in t1, t2, t3)	(2,924,658)
Best case demand 12k 15k 7.5k (adjust sale volumes in t1, t2, t3)	5,580,675
=IRR(N19:Q19)	15%

3 NPV analysis only considers the cash flows related directly to the project. However, there may be options associated with a particular project that outweigh the conventionally calculated NPV so a negative NPV project may be acceptable once the value of any options is added in.

This project is risky and small changes in inputs eg, the cost of precious metal, sales price (part 2 above) produce a negative NPV.

Even though the project has a small ENPV and is risky, it has a follow-on option in the UK market. By launching the FS342, Fuelsense will have later opportunities to launch further versions which could be highly profitable.

Alternatively, there is the option to sell abroad which is not considered in the initial NPV ie, a growth option.

However, should the cost of precious metals rise and/or sales prices cannot be increased and/or the worst-case level of demand occurs, then Fuelsense has the option to abandon the project before 31 December 20X5.

4 SVA is useful to highlight the key drivers of value, namely: Cost of capital; Life of projected cash flows'; Sales growth rate; Investment in working capital; Investment in non-current assets; Corporation tax rate; Operating profit margin. (2 marks for drivers)

This enables managers to set targets of achieving value-enhancing strategies in each area. It helps to focus mangers on value enhancement to ensure that shareholder's wealth is the primary objective. (2 marks for how used)

5 **Political risks**: Political action may restrict opportunities to produce abroad or make this process more expensive eg, tariffs, quotas, remittance restrictions, penal taxes, expropriation.

Cultural risks: The product design may not be compatible with cultural preferences in overseas markets or there may be labour force issues.

Physical risks: Goods may be lost or stolen in transit, or the documents accompanying the goods may be lost or stolen.

Credit risk: The risk of default by the customer.

Trade risk: The risk of the customer refusing to accept the goods on delivery, or cancellation of the order in transit.

Liquidity risk: The inability to finance the credit given to customers.

Worked example: AOS Energy

This question covers three spreadsheet functions:

(1) The power function for calculating the dividend growth rate.

(2) The rate function for calculating the cost of redeemable debt

(3) The correlation coefficient.

Assume that the current date is 1 April 2020.

AOS Energy plc (AOS) manufactures and erects wind turbines. The company has traded since 2002, is listed in the UK and its financial year-end is 31 March. AOS is involved in energy projects across the world, but most of its work is within Europe.

To date the company has increased in size and value by organic growth. AOS's board is now investigating the acquisition of 100% of the share capital of Pentmarine Power Ltd (Pentmarine), a manufacturer of wave energy converters.

You are a member of AOS's finance team and the company's finance director has sent an email to you, extracts from which are shown below:

> …I'm really busy with year-end work and would value your input regarding the Pentmarine acquisition. This would be a big investment for us and owning Pentmarine would mean that AOS was operating in a different technology sector. One of our board members is keen for AOS to develop a portfolio of investments in order to reduce our shareholders' risk. However, two others are worried about this and need some reassurance as they feel that buying Pentmarine is too risky.
>
> Were AOS to buy Pentmarine it would cost in the region of £30 million, which we would need to borrow. Our bankers are willing to lend us that sum, but at an interest rate of 10.5% pa. I want to explain to the board the implications of the investment, based primarily on its estimated NPV. Can you calculate an up to date cost of capital figure for me?
>
> Traditionally, we have calculated a weighted average cost of capital using the dividend valuation model, based on the average dividend growth rate from the last five years. However, as can be seen in the graph of dividend payments per share, AOS's dividends have been erratic. One would normally expect a high correlation coefficient between time and an increase in dividends. I am concerned that this is not the case for AOS's dividends. Therefore, I would be interested to see what difference it would make if we used the CAPM instead…

AOS's management accounts at 31 March 2020 included the following:

	£'000
£1 ordinary shares	20,500
6% £1 preference shares	4,300
4% irredeemable debentures	5,100
3% redeemable debentures	6,800

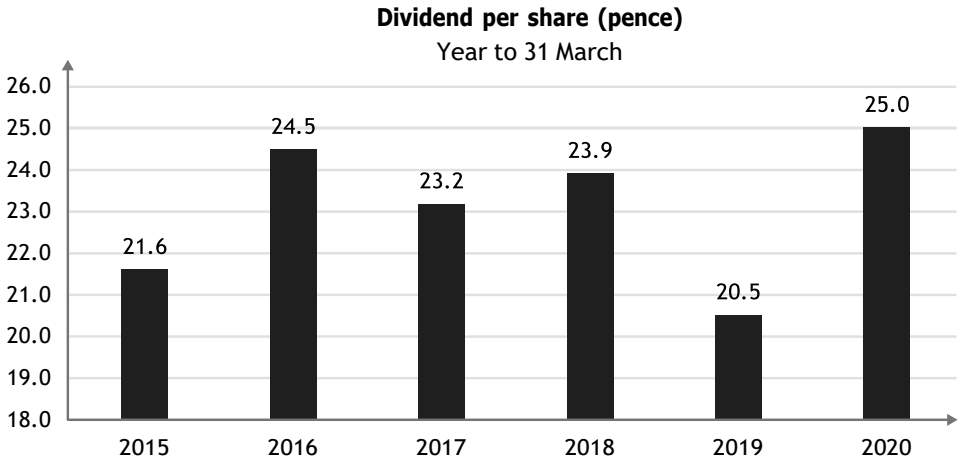
The redeemable debentures are redeemable at par on 31 March 2023.

Market values at 31 March 2020

Ordinary shares	£4.20/share (cum-div)
Preference shares	£1.33/share (ex-div)
Irredeemable debentures	£102% (ex-interest)
Redeemable debentures	£101% (cum-interest)

Ordinary dividend

AOS's ordinary dividend per share from 31 March 2015 to 31 March 2020 is shown in the graph below:



The dividend for the year to 31 March 2020 is due to be paid on 14 April 2020.

Additional information at 31 March 2020

AOS's equity beta	1.30
Expected risk-free return	2.6% pa
Expected return on the market	8.7% pa

You should assume that corporation tax will be payable at the rate of 17% for the foreseeable future and tax will be payable in the same year as the cash flows to which it relates.

Requirements

1 Calculate AOS's WACC on 31 March 2020 using:

(a) The dividend valuation model (based on the compound dividend growth rate from 2015 to 2020)

(b) The CAPM

(13 marks)

(2 marks)

2 Using the data available in the dividend per share graph:

(a) For the years 2015 to 2020, calculate and comment on AOS's correlation coefficient between dividends paid and the years of payment.

(3 marks)

(b) Discuss the suitability of using the dividend valuation model to calculate AOS's WACC (ignoring any concerns relating to the appraisal of the Pentmarine purchase).

(5 marks)

3 Advise AOS's directors whether they should use the WACC figure calculated in question 1 when appraising the Pentmarine purchase.

(4 marks)

4 Explain the adjusted present value (APV) technique and indicate whether it is applicable to the Pentmarine purchase.

(4 marks)

5 Explain the portfolio effect and discuss the board member's contention that AOS's development of a portfolio of investments would reduce the risks to its shareholders.

Solution

1

(4 marks)

Total: 35 marks

(a) Cost of equity (ke)

Dividend growth rate = 25.0p / 21.6p over 5 years = $1.157^{1/5} - 1 = 3\%$ This can be calculated using the spreadsheet POWER function as follows:

=POWER(C2/B2,1/B3)

	A	B	C
1	Year	2015	2020
2	Dividend	21.6	25.0
3	Number of years of growth	5	
4	Dividend growth rate	3% [1]	

[1] =1.03 - 1 = 3%

Ex div market value per share = (£4.20 - £0.25) £3.95

$$\text{Cost of equity (ke)} \frac{(d1)}{MV} + g = \frac{(£0.25 \times 1.03)}{(£3.95)} + 3\% = 9.51\%$$

$$\text{Cost of preference shares (kp)} \frac{d}{MV} \frac{£0.06}{£1.33} = 4.51\%$$

$$\text{Cost of irredeemable debt (kdi)} \frac{(i \times (1-t))}{MV} \frac{(£4 \times 83\%)}{£102} = 3.25\%$$

Cost of redeemable debt (kdr)

This can be calculated using the spreadsheet RATE function as follows:

	=RATE(B1,B2,B3,B4,0)	
	A	B
1	Number of payments	3
2	Annual coupon	£3
3	Ex-interest market value(£101 – £3)	–£98
4	Redemption	£100
5	Annual YTM using the rate function	3.72%

less: Tax at 17% (3.72% × 83%) = 3.09%

WACC

	Total MV's £m	**Cost × weighting**	**WACC**
Equity (20.5m × £3.95)	80.975	9.51% × 80.975/98.560	7.81%
Pref. Shares (4.3m × £1.33)	5.719	4.51% × 5.719/98.560	0.26%
Irredeemable debt (£5.1m × 1.02)	5.202	3.25% × 5.202/98.560	0.17%
Redeemable debt(£6.8m × 0.98)	6.664	3.09% × 6.664/98.560	0.21%
Total market value	98.560		8.45%

(b) **Cost of equity (ke) using the CAPM**

Expected market return	8.70%
less: Expected risk-free return	(2.60%)
Expected risk premium	6.10%
Applying EP's beta to the risk premium 1.30 × 6.1%	7.93%
plus: Expected risk-free return	2.60%
Cost of equity (ke)	10.53%

	Total MV's £m	**Cost × weighting**	WACC

Equity (20.5m × £3.95)	80.975	10.53% × 80.975/98.560	8.65%
Pref. Shares (4.3m × £1.33)	5.719	4.51% × 5.719/98.560	0.26%
Irredeemable debt(£5.1m × 1.02)	5.202	3.25% × 5.202/98.560	0.17%
Redeemable debt(£6.8m × 0.98)	6.664	3.09% × 6.664/98.560	0.21%
Total market value	98.560		9.29%

2

(a) Correlation coefficient

=CORREL(B1:G1,B2:G2)

	A	B	C	D	E	F	G
1	Year to 31 March	2015	2016	2017	2018	2019	2020
2	Dividend per share	21.6	24.5	23.2	23.9	20.5	25.5
3	Correlation coefficient	0.17					

The correlation coefficient is closer to 0 then it is to 1.

There is only a very small correlation between the dividends per share paid each year.

(b) Dividends have not increased at a steady rate between 2015 and 2020.

It can be seen from the graph, that there has been a combination of increases and decreases in the dividend per share during these years.

This makes it difficult to estimate the future dividend growth rate (g).

It also makes it more difficult to predict the dividend paid next year (d1).

The dividend growth model is not suitable to calculate the cost of equity for this company.

3 WACC (DVM) = 8.5%, CAPM = 9.3%.

Bank loan = 10.5%, which exceeds both of these so both WACCs likely to rise. Three assumptions re maintaining WACC:

(1) Historic debt/equity unchanged – NO. Extra gearing via loan (30% of current Total Mkt Value (£98.56m).

The 10.5% bank loan is expensive – is AOS' gearing deemed too high?

(2) Systematic business risk unchanged – possibly, although different technology. Is sea technology riskier?

The two companies might have different cost structures and break-even points. Pentmarine might have higher business risks and higher beta.

(3) Finance not project-specific – OK

It would be unwise to use 8.5% or 9.3% as the discount rate. AOS should be discounting using a risk-adjusted WACC that includes the cost of the new debt.

4 Adjusted Present Value (APV)

AOS' increased gearing (£30 million in extra borrowings) is likely to alter the company's WACC. To find AOS' new WACC requires the new MV of its shares. However, this requires the NPV of the proposed investment in Pentmarine to be known, which needs the new WACC.

To avoid this circular argument, one could use the APV technique to appraise the Pentmarine purchase.

This technique:

(1) Calculates a base case value at ungeared cost of equity

(2) Calculates the PV of the tax shield arising from the extra debt

(3) Adjusts for issue costs

Add 1, 2 and 3 to give APV – if positive then proceed with investment.

5 A portfolio of investments helps to spread risk.

Investors can usually spread risk themselves – they don't need managers to do it for them. However, Pentmarine is not listed and shareholders might not be able to buy shares in sea-based energy.

Increasing the renewable industry investments might be OK for investors, subject to changes in business risks.

Do AOS managers know how to run a wave power business?

There may be synergies which shareholders can't achieve for themselves, but the companies can.

Worked example: Bristol corporate finance

This question covers the following spreadsheet functions:

(1) The RATE function for calculating the yield to maturity of a debenture

(2) The PV function for calculating the issue price of a debenture

You should assume that the current date is 31 December 20X6.

You work for Bristol Corporate Finance (BCF). Two of the clients for whom you are responsible are Middleton plc (Middleton) and the management team of Oldham Ltd (Oldham).

1 Client one: Middleton

Middleton is a listed company and is seeking to raise £70 million to invest in new projects during 20X7. Currently Middleton is financed only by equity. However, at a recent board meeting the finance director stated that, since other companies in Middleton's industry sector have average gearing ratios (measured as debt/equity by market value) of 30% (with a maximum of 40%) and an average interest cover of six times (with a minimum of five times), perhaps the company should access the debt markets. The finance director presented the board with two alternative sources of finance to raise the £70 million.

Equity issue: The £70 million would be raised by a 1 for 2 rights issue, priced at a discount on the current market value of Middleton's shares.

Debt issue: The £70 million would be raised by an issue of 7% coupon debentures (semi-annual coupon payments), redeemable at par in 10 years' time. The yield to redemption of the debentures would be equal to the yield to redemption of the debentures of Wood plc (Wood), another listed company in Middleton's market sector. Wood has a similar risk profile to Middleton and has recently issued its debentures. Wood's debentures have a coupon of 7% (semi-annual coupon payments), will be redeemed in four years at par and their current cum-interest market price is £110 per £100 nominal value.

There were concerns expressed by a number of board members regarding the debt issue, since it has been the long-standing policy of the company not to borrow. Their concerns were how Middleton's shareholders and the stock market would react and that the company's cost of capital would increase as a result of borrowing, leading to a fall in the company's value.

An extract from Middleton's most recent management accounts is shown below:

Income statement for the year ended 31 December 20X6

	£
Operating profit	25.00
Taxation at 17%	(4.25)
Profit after tax	20.75

Additional information:

- Middleton has an equity beta of 1.1
- The risk-free rate is expected to be 3% pa
- The market return is expected to be 8% pa
- Middleton's current share price is £5 per share ex-div
- Middleton has 40 million ordinary shares in issue

Requirements

(a) Calculate, using the CAPM, Middleton's cost of capital on 31 December 20X6.

(b) Assuming a 1 for 2 rights issue is made on 1 January 20X7:

(1 mark)

- calculate the discount the rights price represents on Middleton's current share price
- calculate the theoretical ex-rights price per share
- discuss whether the actual share price is likely to be equal to the theoretical ex-rights price

(c) Alternatively, assuming debt is issued on 1 January 20X7:

(5 marks)

- calculate the issue price and total nominal value of the debentures that will have to be issued to give a yield to redemption equal to that of Wood's debentures.
- discuss the validity of the use of the yield to redemption of Wood's debentures in the above calculation.

(7 marks)

(d) Outline the advantages and disadvantages of the two alternative sources for raising the £70 million, discuss the concerns of the board regarding the debenture issue (using the gearing and interest cover information provided by the finance director) and advise Middleton's board on which source of finance should be used.

(12 marks)

2 Client two: The management team of Oldham

You have been asked to make a presentation to the management team of Oldham, an unlisted company, who are considering a management buyout (MBO) of the company. Your presentation will cover certain aspects of the MBO process and the contents of the financial information section of the business plan that will need to be prepared for potential financiers.

Requirements

Prepare notes for your presentation which include:

(a) An outline of the sources and forms of finance that the management team is likely to need.

(3 marks)

(b)

(c)

The possible exit routes for the financiers that contribute to the funding of the MBO. The content of the financial information section of the business plan.

(2 marks)
(5 marks)
Total: 35 marks

Solution

1

(a) The cost of capital = Ke = 3 + 1.1 × (8 – 3) = 8.5%

(b)

(1) A 1 for 2 rights issue will require 40/2 = **20** million new shares to be issued. The price per share = £70 million / 20 million = £**3.50**.

A discount on the current market price of: 5.00–3.50/5.00 = 30% (or £1.50)

(2) The theoretical ex-rights price is:

	Number of shares	Value per share	Number × Value £
Existing shares	2	5.00	10.00
New shares	1	3.50	3.50
Total shares	3	Total value	13.50

Theoretical ex-rights price = £13.50/3 = £4.50.

The actual share price will depend on the market's reaction to the rights issue eg, fully taken up and whether the proceeds are invested in positive net present value projects.

If we were told the net present value of the projects, this could be incorporated in the theoretical ex-rights price of £4.50 giving a more realistic estimate of the actual share price post rights issue.

(c) The YTM of Wood's four-year debentures Using the RATE function the inputs are:

=RATE(B1,B2,B3,B4,)*2

	A	B
1	Number of payments (4 × 2)	8
2	Payment: six-month coupon(7/2)	3.5
3	Present value (price 110 –3.5)	–106.5
4	Future value (redemption)	100
5	Annual YTM using the RATE function	5.18% [1]

1 We multiply by two in the formula as there are two six-month periods in the year.

The issue price of Middleton's 10-year debentures:

=PV(B1,B2,B3,B4)

	A	B
1	Rate of return required over a six-month period (5.18/2)	0.0259
2	Number of payments (10 ×2)	20
3		3.5

	=PV(B1,B2,B3,B4)	
	A	B
	Payment: semi-annual coupon (7/2)	
4	Future value (redemption)	100
5	The issue price using the PV function	–114.07

To raise £70 million in cash, the total nominal value of the 7% debentures will be equal to (cash required/the issue price per £100 nominal) = £70million/1.1407 = £61.37 million.

The total nominal value is £61.37 million.

Wood plc has similar risk to Middleton so it is reasonable to assume that debenture holders would require the same yield to redemption in return for investing with either company.

Candidates might also mention how comparable Wood is to Middleton in terms of gearing etc.

However, the Wood plc debentures have only four years until redemption whilst the Middleton debentures mature in 10 years. It is likely that debenture holders would require a higher yield to redemption for investing in the Middleton debentures to compensate them for the risk of investing for a further six years.

(d) The gearing and interest cover ratios of Middleton immediately after the debenture issue will be as follows:

Interest cover: Interest 61.37 × 7% = £4.30m. Interest cover = 25.00/4.30 = 5.81 times
Gearing by market values assuming the current market price per share:

Market capitalisation 40 × 5 = £200m. Gearing (D/E) 70/200 = 35%

In time, both interest cover (more operating profits) and gearing (greater equity value) are likely to improve with the acceptance of positive NPV projects and any favourable market reaction to the issuance of debt and its tax shield (see below).

For general advantages and disadvantages of debt v equity, points that candidates might mention include: Control issues; obligation to return capital; interest v dividends (including tax relief); issue costs; liquidation of the investment (can the investor get out easily); risk/reward.

Note: Candidates might also comment on EPS and produce the following figures:

- Current EPS 49.4p (19.75m/40m)
- EPS with a rights issue 32.9p (19.75m/60m)
- EPS with a debenture issues 43p ((25 – 4.30) × 0.83))/40m

Addressing the concerns of the board:

The company will have a gearing ratio of 35% and an interest cover of 5.81 times. Gearing is between the industry maximum and average of 40% and 30% respectively, interest cover is between the industry minimum and average of 5 and 6 respectively. Since this is the first time that Middleton has borrowed, both shareholders and the stock market might be concerned and prefer these ratios to be around the averages or better. Some shareholders

might be attracted to investing in Middleton because currently it has no gearing. However, if the £70 million is to be invested in positive NPV projects both shareholders and the stock market should welcome the company borrowing.

Borrowing should reduce the current 8.5% cost of capital of the company, since debt is generally less expensive than equity because it is less risky than equity for the debt holders. Also, the company receives tax relief on the interest that it pays. Because there is increased financial risk when a company borrows, the shareholders may require a higher return, but this is unlikely to offset the cheaper proportion of debt finance. The company value should increase as a result of the cost of capital reducing and new funds being invested in positive NPV projects.

2

Advice: It would be prudent for the company to restrict its borrowing to the industry average gearing level, especially since its interest cover would be near to the minimum for the industry. I would advise the company not to borrow the full £70 million; perhaps this could be achieved by revising its plans for raising the finance. For example, an issue of both debt and equity to ensure that gearing and interest cover ratios are more favourable, or selling surplus assets.

(a) **The source and form is typically:**

The management team invest in equity (candidates may mention that the funding from this can be raised from various sources, for example: Family; savings; sale of/refinancing of personal assets etc).

(b) A venture capital provider will invest in equity and debt. Other financiers – for example, banks would provide loans.

The various parties who invest in the MBO will require an exit route, typically between three to five years. This may be in the form of:

- selling the company to a third party
- a secondary MBO or MBI
- floating the company on the Stock Exchange
- if the company is not successful, the least desirable exit would be liquidation

(c) The financial information section of the business plan will typically include:

- An historic financial analysis
- The amount and timing of the finance required
- Key risks and a contingency plan
- Anticipated gearing
- The purpose of any finance required

The following forecasts should be included:

- Cash flow in months for the first year of the plan
- Revenue forecasts in months or longer for the first year with evidence
- Financial forecasts in quarterly or annual intervals up to five years

Often a project appraisal and sensitivity analysis will be included.

Worked example: Peel cost of debt

This question covers the following spreadsheet functions:

(1) The POWER function for calculating the dividend growth rate

(2) The RATE function for calculating the cost of redeemable debt

Assume that the current date is 1 December 20X7.

Peel Kitchens plc (Peel) is a quoted wholesaler of kitchen cabinets and worktops and has a financial year end of 30 November.

The board of Peel is considering diversifying into the supply of domestic appliances and would need to raise finance of £200 million during 20X8 should the diversification go ahead. The finance director of Peel, Debbie Harris (Debbie), needs to calculate the weighted average cost of capital (WACC) that will be used to appraise the potential diversification. She is also considering whether the finance required should be raised by debt in the form of 6% debentures issued at par or by equity in the form of an issue of 100 million ordinary shares. Debbie is particularly concerned about how the financial markets and the company's shareholders might react to the impact the additional £200 million finance may have on the company's capital structure.

The board of Peel is also contemplating its dividend policy beyond 20X7. Extracts from Peel's management accounts are produced below:

Year ended 30 November

	20X3	20X4	20X5	20X6	**20X7**
	£m	£m	£m	£m	£m
Profits before interest and tax	81.03	78.86	87.54	85.37	94.04
Interest	(33.32)	(33.32)	(33.32)	(33.32)	(33.32)
	47.41	45.54	54.22	52.05	60.72
Taxation	(8.11)	(7.74)	(9.22)	(8.85)	(10.32)
Profits after tax	39.60	37.80	45.00	43.20	50.40
Ordinary dividends	19.80	18.90	22.50	21.60	25.20
Special dividend					9.00
Total dividends	19.80	18.90	22.50	21.60	34.20

Capital at 30 November 20X7	**£m**
Ordinary shares (50p nominal value)	90.00

Retained earnings	256.60
	346.50
7% (semi-annual coupon payments) debentures at nominal value, which are redeemable at par in five years' time.	476.00
	822.50

The number of shares in issue has not changed during the period from 1 December 20X2 to 30 November 20X7.

Additional information:

- The cum-div share price on 1 December 20X7 is £2.92 per ordinary share. The special dividend was paid in June 20X7.
- The 7% (semi-annual coupon payments) debentures have a cum-interest market value of £111 per £100 nominal value.
- Peel has an equity beta of 1.3.
- A company that supplies domestic appliances has an equity beta of 1.1 and a debt:equity ratio of 40:60 by market values.
- The risk-free rate is expected to be 3% pa.
- The market risk premium is expected to be 6% pa.
- Assume that the rate of corporation tax will be 17% for the foreseeable future.
- An analyst has calculated the gearing ratios (measured as debt/equity by market values) and interest cover for companies that operate in Peel's market sector as follows:

	Maximum	Minimum	Average
Gearing ratio	135%	80%	100%
Interest cover	3	2	2.4

Debbie has asked you to provide her with certain information so that she can prepare a report for the board of Peel.

Requirements

1 Calculate Peel's WACC on 1 December 20X7 using:

(9 marks)

(a) The dividend valuation model (dividend growth should be estimated using the earliest and latest dividend information provided).

(b) The CAPM.

2 Explain and evaluate whether either of the WACC figures calculated in 1 above would be appropriate for appraising Peel's diversification into supplying domestic appliances.

(5 marks)

3 Determine whether the £200 million finance required should be raised from either debt or equity sources. You should discuss the likely reaction of both shareholders and the financial markets, and make reference to the gearing and interest cover data provided and give advice to Debbie on which source of finance should be used.

(13 marks)

4 Assuming that Peel raises the £200 million finance required wholly from debt, identify the most appropriate project appraisal methodology that could be used to appraise the diversification. Also determine the project discount rate that should be used in these circumstances.

(3 marks)

5 Discuss whether Peel's dividend policy over the last five years is appropriate for a listed company.

(5 marks)
Total: 35 marks

Solution

1

(a) Growth can be estimated by past ordinary dividend growth for the past four years, excluding special dividend, as it's a one-off:

Growth = $(25.2/19.80)^{(1/4)} - 1 = 0.0621$ or 6.21%

This can be calculated using the spreadsheet POWER function as follows:

=POWER(F2/B2,1B/3)

	A	B	C	D	E	F
1	Year	20X3	20X4	20X5	20X6	20X7
2	Dividend £m	19.8	18.9	22.5	21.6	25.2
3	Number of years of growth	4				
4	Dividend growth rate	6.21% [1]				

[1] =1.0621 – 1 = 6.21%

Shares in issue = 180m (90 × 2)

20X7 dividends per share = 14p (25.20/180)Ex div share price = 278p (292 – 14)

Ke = (14(1.0621)/278) + 0.0621 = 0.1156 or 11.56%

Kd is calculated as the YTM of the 7% debentures × (1 – t):

This can be calculated using the spreadsheet RATE function as follows:

=RATE(B1,B2,B3,B4,)

	A	B
1	Number of payments (5 × 2)	10
2	Payment: six-month coupon(7/2)	3.5
3	Present value (price 111 –3.5)	–107.5
4	Future value (redemption)	100
5	Annual YTM using the RATE function	2.64% [1]

1 Multiplying this by 2 to annualise it, gives 5.28%

Tax rate = 17%

Kd = YTM (1 – t) = 5.28% (1 – 0.17) = 4.38%

The market value of debt and equity =

Debt £511.7 (476 × 1.075). Equity £500.40 (278p × 180m) Total debt and equity = £1012.1m
WACC = (11.56 × 500.40 + 4.38 × 511.7)/1012.1 = 7.93%

(b) Ke = 3 + 1.3 × 6 = 10.80%

WACC = (10.80 × 500.40 + 4.38 × 511.7)/1012.1 = 7.55%

2 Peels gearing ratio is approximately 50:50 (511.7:500.4)

Ungear existing activities 1.3 = Ba(1 + 50(1 – 0.17)/50) Ba = 0.71 New activity ungeared 1.1 = Ba(1 + 40(1 – 0.17)/60) Ba = 0.71

So systematic business risk doesn't change which may mean existing WACC calculated in 1 applies.

However, the use of WACC/NPV assumes that, over the life of the project the gearing ratio of Peel will remain constant and that the project is marginal. Peel is considering financing a diversification that represents 20% (200/1012) of the company's total market value of debt and equity, which can hardly be considered marginal, by either debt or equity. As gearing is likely to change existing WACC cannot be used. Finance is not project specific (eg, cheap government loan) so that condition for using the existing WACC is met.

3 Gearing (D/E by market values):

The current gearing ratio is 102% (511.7/500.40)

Gearing if the finance is raised with debt = 142% ((200 + 511.7)/500.40) Gearing if the finance is raised with equity = 73% (511.7/(200 + 500.40))

Note: Assuming no change in the share price as a result of the diversification. In the longer term a positive NPV would affect the ratios calculated. **Interest cover: best and worst case as PBIT varies.** Current:

	20X4	20X7
	£m	£m
EBIT	78.86	94.04
Interest	33.32	33.32
Int cover	2.37	2.82

Interest cover if debt is raised:

Total interest will equal £45.32m (33.32 + 200 × 6%)

	20X4	20X7
	£m	£m
EBIT	78.86	94.04
Interest	45.32	45.32
Int cover	1.74	2.08

[**EPS** (although not explicitly required students may also calculate and comment on EPS)

Current	20X4	37.8/180 = 21p
	20X7	50.4/180 = 28p
Equity	20X4	37.8/280 = 13.5p
	20X7	50.4/280 = 18p
Debt	20X4	(78.86 – 45.32)0.83/180 = 15.5p
	20X7	(94.04 – 45.32)0.83/180 = 22.5p]

The decision to raise the finance wholly by debt or equity will radically change Peel's gearing ratio and interest cover.

Interest Cover: Since 20X3 Peel has been operating with an interest cover between the average of 2.4 and maximum of 3 for the industry sector that it operates in. Currently Peel has an interest cover of 2.82, which is near the maximum. Interest cover will be unchanged if Peel raises equity, however if debt is raised the interest cover would have been 2.08, which is near to the minimum of 2 for the industry sector, also in previous years interest cover would have been below the minimum.

Gearing ratio: Peel is currently operating with a gearing ratio of 102%, which is around the average for the industry of 100%. If the company raises debt finance the gearing ratio will rise to 142%, which is above the industry maximum of 135%, and if equity is raised the gearing ratio will fall to 73%, which is below the industry minimum of 80%.

Given the above the likely reaction of the financial markets is likely to be unfavourable if Peel raises the finance by an issue of debentures. The share price could fall and also the cost of debt increase. Shareholders are also likely to be concerned if the finance is raised by debt and it is unlikely that they would approve the diversification if it were financed in such a way.

On the other hand, raising the finance by equity would make the company much safer in terms of financial risk. However, shareholders might be concerned about potential control

issues unless the funds are raised by way of a rights issue. Also, the financial markets might consider that the company is not using spare debt capacity.

Advice: Given the potential financial risks involved it would be prudent for Peel to raise the finance by an issue of shares or a combination of debt and equity to keep gearing ratio and interest cover more in line with the 20X7 figures.

4 If the finance is raised by either debt or equity the gearing of Peel will radically change. In these circumstances WACC/NPV is not a suitable investment appraisal technique to use. An alternative technique would be Adjusted Present Value (APV), which assumes in the first that the project is financed purely by equity. The resultant NPV of cash flows is then adjusted for the actual benefits and costs of the actual finance used. A suitable all equity discount rate, which reflects the systematic risk of the project would be:

Taking the beta equity of a company in the domestic appliance sector we calculate the asset beta and use it in the CAPM (2 above).

The all-equity discount rate using CAPM = 7.26% (3 + 0.71 × 6)

5 Since dividends are rising and falling with profits it would appear that Peel has a policy of maintaining a constant dividend payout ratio. The dividend payout ratios have been:

	20X3 £m	**20X4** £m	**20X5** £m	**20X6** £m	**20X7** £m
Profits after tax	39.60	37.80	45.00	43.20	50.40
Ordinary dividend	19.80	18.90	22.50	21.60	25.20
Payout	50%	50%	50%	50%	50%

Note: Users are not required to calculate the payout ratio for all years. However, a clear identification of 50% payout across the period given is required.

A listed company seeks to give ordinary shareholders a constant dividend with some growth. This cannot be achieved by have in a policy of maintaining a constant payout ratio since dividends rise and fall with profits. Peels current dividend policy is not usually considered appropriate for a listed company and may lead to a fluctuating share price (signalling effect).

Worked example: Roper Newey plc

This question covers the following spreadsheet function:

(1) The RATE function for calculating the cost of redeemable debt

Roper Newey plc (Roper) is a UK engineering company that operates in the oil industry providing support services on oil rigs and at oil terminals. It started trading 20 years ago and it has a financial year end of 31 August.

For a number of years Roper has used a weighted average cost of capital (WACC) figure of 7% pa as its hurdle rate when appraising large-scale investments. At Roper's most recent board meeting it was decided to investigate the possibility of the company diversifying into the UK fracking industry.

Fracking involves extracting oil and gas from beneath the ground via the high-pressure injection of water and sand. It is a very controversial industry in the UK, not least because of concerns about its impact on the natural environment.

Roper's board is considering supplying services to the fracking industry. The finance for this investment would be raised in such a way so as not to alter Roper's current gearing ratio (measured by market values). The debt element of the finance will come from a new issue of 6% irredeemable debentures at par.

Roper's directors are aware that many American companies have been very successful financially when investing in fracking, but are concerned that such a diversification by Roper in the UK would be excessively risky. As a result, you, as Roper's finance director, have agreed to present relevant figures and advice at the next board meeting.

Details of Roper's capital structure at 31 August 20X6 are shown below:

	Total nominal value	Market value
	£m	
Ordinary share capital (£1 shares)	15.5	£5.20/share (ex div)
Preference share capital (£1 shares)	9.0	£1.08/share (ex div)
4% redeemable debentures	6.5	£107% (cum int)
	Total nominal value	**Market value**
(Note 1)		
5% irredeemable debentures		
(Note 1)	10.0	£101% (cum int)

Roper's most recent dividend payments and the interest payments due in the near future are shown below:

Ordinary dividends (Note 2)	£3,797,500	Paid in August 20X6
Preference dividends (Note 2)	£540,000	Paid in August 20X6
4% redeemable debentures interest	£130,000	To be paid in September 20X6
5% irredeemable debentures interest	£500,000	To be paid in September 20X6

Notes

1. The 4% debentures are redeemable at par on 31 August 20X9 and interest is paid semi-annually. The 5% debentures pay interest annually.
2. Ordinary and preference dividends are paid once a year. Ordinary dividend payments have increased at a steady annual rate since August 20X2 at which time the ordinary dividend per share was £0.201. There have been no issues of ordinary shares since August 20X2.

Additional information at 31 August 20X6

Roper equity beta	1.2
Risk free rate (pa)	1.9%
Market premium (pa)	7.6%

Fracking industry – market data at 31 August 20X6

Average equity beta 1.9

Ratio of long-term funds (equity:debt) by market

values 90:25

Assume that corporation tax will be payable at the rate of 17% for the foreseeable future and tax will be payable in the same year as the cash flows to which it relates.

You have asked your new assistant to draft some initial WACC calculations which they have done (**Exhibit: pre-populated spreadsheet**). You are confident that their maths is correct and that they have used the right formulae and functions but have concerns over the inputs to these.

Requirements

1 Ignoring the investment in fracking services, rework your assistant's WACC calculations at 31 August 20X6, correcting any errors made by them, using:

(a) The dividend growth model; and

(b) The CAPM

(12 marks)

2 Ignoring the investment in fracking services, advise Roper's board, giving reasons, whether it should continue using 7% as its hurdle rate when appraising large-scale investments.

(3 marks)

3 Explain the underlying logic for using the CAPM when calculating a company's WACC.

(6 marks)

4 Calculate the WACC that Roper should use when appraising its proposed investment in fracking and explain the reasoning behind your approach.

(10 marks)

5 With reference to the information provided, explain the circumstances in which it would be appropriate to use the adjusted present value approach to investment appraisal.

Exhibit: Pre-populated spreadsheet

(4 marks)

Total: 35 marks

	A	B	C	D	E	F	G	H	I	J	K
1	Exhibit 1 WACC at 31 August 20X6										
2											

	A	B	C	D	E	F	G	H	I	J	K
3	(a) dividend growth model										
4											
5	cost of equity										
6	current dividend		0.245 [1]								
7	oldest divided = do		0.201								
8	growth		0.219 [2]								
9	years		5								
10	average annual growth		0.044 [3]								
11	Po		5.20								
12	Ke = [do(1 + g)/Po] + g		0.084 [4]			WACC		Weight £1m	proportion	cost	Proportion on × cost
13						equity		15.5	0.38 [5]	0.08 [6]	0.0318 [7]
14	cost of preference shares					preference shares		9	0.22 [8]	0.05 [9]	0.0101
15	Dividend=d o		0.06 [10]			redeemables		6.5	0.16 [11]	0.02 [12]	0.0025
16	Po		1.08			irredeemables		10	0.24 [13]	0.05 [14]	0.121
17	tax		0.17					41 [15]			0.0565
18	Kp = do(1 – t)/ Po		0.046								5.65%
19											
20	Cost of redeemable debentures										
21	Coupon payment		4								
22	Ex-interest price		107								
23											

	A	B	C	D	E	F	G	H	I	J	K
24	Number of payments		3								
25	coupon		4								
26	price		-107								
27	redemption		100								
28	Cost using RATE function		0.016 [16]								
29											
30	Cost of irre-deemabl e debentures										
31	coupon		5								
32	Ex-interest price		101								
33	Kd=coupon /price		0.05 [17]								
34											
35											
36	(b) CAPM										
37											
38	rf		0.019			WACC		Weight £m	propor tion	Cost	Proprti on × cost
39	beta		1.2			equity		15.5	0.38	0.09 [18]	0.033
40	rm		0.076			Prefer-ence shares		9	0.22	0.05 [19]	0.0101
41	Ke =rf + beta(rm – rf)		0.0874 [20]			redee-mables		6.5	0.16	0.02 [21]	0.0025
42						irre-deem ables		10	0.24	0.05 [22]	0.0121
43								41			0.0578
44											5.78%

1 =3797500/15500000

2 =C6/C7 – 1

3 =C8/C9

4 =(C7*(1 + C10)/C11) + C10

5 =H13/H17

6 =C12

7 =I13*J13

8 =H14/H17

9 =C18

10 =540000/9000000
11 =H15/H17
12 =C28
13 =H16/H17
14 =C33
15 =SUM(H13:H16)
16 =RATE(3,4,-107,100)
17 =5/101
18 =C41
19 =C18
20 =C38+C39*(C40-C38)
21 =C28
22 =C33

Solution

1

(a) Ordinary dividend per share 20X6 (£3,797,500/15,500,000) = 24.5 pence Ordinary dividend growth rate = £0.201/£0.245, which over four years = 5% p.a.

	A	B	C
3	(a) dividend growth model		
4			
5	Cost of equity		
6	Current dividend		0.245 **1**
7	Oldest dividend = do		0.201
8	growth		0.219 **2**
9	years		4
10	Compound annual growth		0.051 **3**
11	Po		5.20
12	Ke = [do(1+g)/Po]+g		0.10 **4**

1 =3797500/15500000
2 =C6/C7-1
3 =(1+C8)^0.25-1
4 =(C6*(1+C10)/C11)+C10

Workings for clarity:

2 =C6/C7-1

3 =(1+C8)^0.25-1

4 =(C6*(1+C10)/C11)+C10

Workings for clarity:

$$\text{Cost of equity (ke)} = \frac{(d1)}{MV} + g = \frac{(£0.245 \times 1.05)}{£5.20} + 5\% = 10\%$$

Cost of preference Shares (k_p) $\frac{d}{MV}$ = (£540,000/9m) $\frac{£0.06}{£1.08}$ = 5.6%

Shares (k_p) d = (£540,000/9m) £0.06 = 5.6% MV
£1.08

Cost of redeemable debt (k_{dr}) Correct data to be entered is: 6m coupon payment = £2

Ex interest = 107 – 2 = £105 Number of payments = 6

	A	B	C
20	Cost of redeemable debentures		
21	6M coupon payment		2
22	Ex-interest price		105 [1]
23			
24	Number of payments		6
25	Payment (coupon)		2
26	Present value (price)		-105
27	Future value (redemption)		100
28	Cost using RATE function		0.023 [2]
29	AFTER TAX		0.019 [3]

1 =107-2

2 =RATE(6,2,-105,100)*2

3 =C28*(1-C17)

Cost of irredeemable debt (k_{di}) (£5 × 83%)/£96 4.3%

WACC

			Total MV's	Cost × weighting	WACC
			£'000		
Equity	15.5m × £5.20		80,600	10% × 80,600/106,745	7.55%
Preference shares	9m × £1.08	9,720		5.6% × 9,720/106,745	0.51%
Redeemable debt	£6.5m × 105/100	6,825		1.9% × 6,825/106,745	0.12%
Irredeemable debt	£10.0m × 96/100	9,600		4.3% × 9,600/106,745	0.39%
			26,145		1.02%
Total market value			106,745		8.57%

(b)

Cost of equity	(1.2 × (9.5% - 1.9%)) + 1.9 =	11.02%
Weighted cost of equity	11.02% × 80,600/106,745	8.32%
Weighted cost of debt (as above)		1.02%
WACC		9.34%

2 RN is using 7% as its hurdle rate. In fact, a more accurate figure would be 8.57% or 9.34%. This means it could be making poor investment decisions. If it takes on a project with an IRR of 8% this will be destroying shareholder value as the IRR is < the company's cost of capital.

3 CAPM theory:

- Systematic vs unsystematic risk and portfolio theory
- Beta – a measure of systematic risk against market average
- CAPM gives an alternative cost of equity which is used to calculate WACC

4

New market geared beta =			1.9
New market ungeared beta =	1.9 × 90 / (90 + (25 × 83%))	(1.9 × 90) / 110.75	1.54
Better Deal's geared beta	[1.54 × (£80,600m + 9.720 + (£16.295m × 83%))]/ £80.600m		1.98
So, cost of equity =	(1.98 × (9.5% - 1.9%)) + 1.9 =		16.95%
Cost of debt =	6% × 83%		4.98%
WACC	= (16.95% × £80,000/106,745)) + (4.98% × £26,145/£106,745))		14.02%

It would be unwise to use the existing WACC as RN's plan involves diversification and therefore a change in the level of systematic risk. Thus, a new WACC must be calculated. Systematic risk is accounted for by taking into account the beta of the petroleum market and this is then adjusted to eliminate the financial risk (level of gearing) in that market. The resultant ungeared beta is then 're-geared' by taking into account the level of gearing of the new funds being raised. Using this, the WACC can be calculated.

5 Adjusted PV – if capital structure changes maybe the cost of capital will as well. (M&M 63). If new debt is raised to finance/part-finance a new investment, what is the new cost of capital? To find this one needs to know the new MV of the company's shares and to know this one needs to know the NPV. This can't be calculated without the new cost of capital. So, it's a conundrum unless a simplifying assumption is made, as in this question ie, the finance is issued in such a way as to leave the gearing unchanged.

Thus, use the adjusted PV approach:

(1) Calculate the base cost of the project – assume the company is not geared.

(2) Calculate the PV of the tax shield (tax saved via interest payments).

Combine 1 and 2. If APV is positive, then proceed and vice versa.

Worked example: Techno Capital Question

This question covers the following spreadsheet function:

(1) The IRR function to calculate the return generated from an investment

Assume that the current date is 31 March 2022.

Techno Capital LLP (Techno) is a venture capital firm that invests in digital technology companies with high growth potential.

Techno typically invests in technology companies which are in the early stages of their life and require capital to expand operations. These technology companies are often considered to be high- risk investments, which makes it difficult for them to raise funds from banks or other lenders.

Techno's management team have extensive experience of working with digital technology companies. In addition to providing finance, Techno also provides on-going management advice to the owners of the technology companies, who are often less experienced.

Typical funding arrangement

Before Techno invest, the firm must agree a valuation of the technology company with the company's owners. This determines the number of shares that Techno will be given in exchange for funding.

If Techno decide to invest, the technology company will typically issue to Techno a number of convertible preference shares. After an agreed number of years, these shares will be converted into a specified number of ordinary shares.

Usually at the conversion stage, the technology company will either be sold to new owners or floated on the Alternative Investment Market (AIM). Techno can then 'liquidate' the firm's investment by selling all of the ordinary shares that Techno owns. This will end Techno's relationship with the technology company.

Ochera proposal

Ochera Ltd (Ochera) is a privately-owned company providing digital banking services using Artificial Intelligence to maximise savings income.

Ochera's managing director is the cousin of Techno's finance manager and would like Techno to invest in Ochera to help the company to expand. The owners of Ochera would like to float the company on AIM in seven years' time.

Techno's finance manager, who is AB Chartered Accountant, has been in negotiation with the owners of Ochera and the following details have been agreed:

- As at 31 March 2022, Techno's finance manager has calculated an initial valuation of Ochera at £500,000. This is despite the company failing to achieve a profit in the first five years of trading and the lack of experience of the company's owners. The finance manager has forecast that Ochera will make a small profit in the year to 31 March 2023 and believes that Ochera's profits will then grow at a high rate in future years.
- Techno would provide £100,000 of finance to Ochera on 1 April 2022 in exchange for 100,000 convertible preference shares with a nominal value of £1 per share. Techno will receive a fixed dividend of 12p per share pa. Preference dividends will be paid on the 31 March each year, for seven years, until 31 March 2029.
- On 1 April 2029, the 100,000 preference shares would be converted into 50,000 ordinary shares.
- On 2 April 2029, Ochera would be floated on AIM. Techno would sell all of the 50,000 ordinary shares that it owns in Ochera. A market analyst has estimated that the shares could sell for £8.50 per share on 2 April 2029.

Techno appraises finance proposals by calculating the internal rate of return (IRR) of the pre-tax cash flows. A finance proposal must achieve an IRR of at least 30% for Techno to invest.

It was recently reported in the media that some large venture capital firms have started to use predictive and prescriptive analytics models to evaluate proposed investments. A wide range of social media and industry data is used to estimate the likelihood of a company successfully being able to be float on the stock market and to identify the optimum finance structure for the investment.

You are a financial analyst working in Techno's 'deals' department and have been asked to provide further analysis for Techno's management team.

Requirements

1 Calculate the IRR of the pre-tax cash flows of the Ochera finance proposal and advise Techno's management team whether to invest.

(4 marks)

2 Identify the ethical issues for Techno's finance manager of negotiating the finance proposal with Ochera.

(3 marks)

3 Explain the challenges that Techno's finance manager would have had when calculating an initial valuation of Ochera of £500,000.

(5 marks)

4 Explain **two** reasons why Techno would prefer Ochera to issue preference shares instead of ordinary shares when it invests in the company.

(4 marks)

5 Calculate and comment on a revised IRR for the Ochera proposal for each of the following alternatives:

(a) If Techno can only sell Ochera's ordinary shares for £7.50 per share on 2 April 2029;

(6 marks)

(b) If Techno can only sell Ochera's ordinary shares for £7.50 per share on 2 April 2029 **and** Ochera agree to pay a fixed preference dividend of 15p pa until 31 March 2029.

6 Identify the strengths and weaknesses of using IRR to appraise the Ochera finance proposal.

(4 marks)

7 Using the information recently reported in the media, explain the difference between predictive analytics and prescriptive analytics.

8 Identify the benefits for Ochera of agreeing a finance proposal with Techno.

(4 marks)
(5 marks)
Total: 35 marks

Solution

1 Dividends = 100,000 preference shares × £0.12 per share = £12,000Sale of shares = 50,000 ordinary shares × £8.50 per share = £425,000

=IRR(E3:E10)

	A	B	C	D	E
1		Initial	Preference	Sales of	
2	Year	investment	dividends	shares	Total
3	0	–100000			–10000
4	1		12000		12000
5	2		12000		12000
6	3		12000		12000
7	4		12000		12000
8	5		12000		12000
9	6		12000		12000
10	7		12000	425000	437000
11					
12					30.31%

The IRR is above 30%, so Techno should invest.

2 Techno's finance manager has a conflict of interest because their cousin is the managing director of Ochera.

They will want to get a good deal for their cousin but also have a responsibility to negotiate the best deal for Ochera.

The finance manager may overestimate the future profit (or performance) due to a lack of objectivity.

Additionally, the finance manager may have difficulty maintaining confidentiality during the negotiations.

The finance manager should not have been allowed to take part in the negotiations. Another member of Techno's management team should have been responsible for the negotiations instead.

3 It would be difficult to use an asset-based valuation because technology companies usually have digital assets, which are difficult to value.

They would not be able to use an earning-based valuation based on historic profit because Ochera has not yet made a profit.

The valuation is likely to be based on future earnings (or cash flows); however, these may have been over estimated.

Techno has inexperienced management, which may have an impact on the future profitability of the company.

Additionally, the future performance of technology companies can be difficult to predict as they are likely to have:

- unpredictable market acceptance of the products;
- unknown competition.

4 Preference shares will give Techno a fixed return.

This would be paid before any ordinary dividends are paid (if any).

Ordinary dividends would be difficult to predict as there is uncertainty over the company's profitability.

Preference shareholders will be given preference if the company needs to be liquidated at some point in the future.

Ochera would be considered to be a high-risk investment (and has not yet made a profit), which increases the likelihood of a potential liquidation.

(a) Sale of sales = 50,000 ordinary shares × £7.50 per share = £375,000

=IRR(E3:E10)

	A	B	C	D	E
1		Initial	Preference	Sales of	
2	Year	investment	dividends	shares	Total
3	0	-100000			-100000
4	1		12000		12000
5	2		12000		12000
6	3		12000		12000
7	4		12000		12000
8	5		12000		12000
9	6		12000		12000
10	7		12000	375000	387000
11					
12					28.42%

The IRR is below 30%, so Techno should not invest.

(b) Dividends = 100,000 preference shares × £0.15 per share = £15,000

=IRR(E3:E10)

	A	B	C	D	E
1		Initial	Preference	Sales of	
2	Year	investment	dividends	shares	Total
3	0	-100000			-100000
4	1		15000		15000
5	2		15000		15000
6	3		15000		15000
7	4		15000		15000
8	5		15000		15000
9	6		15000		15000
10	7		15000	375000	390000
11					
12					30.43%

The IRR is above 30%, so Techno should invest.

6 Strengths

- Takes into account the time value of money
- Does not need an exact cost of capital
- Considers all cash flows of projects

Weaknesses

- May conflict with NPV decision for mutually exclusive projects
- Assumes cash is reinvested at IRR

7 Predictive analytics

Predictive analytics uses historical and current data to create predictions about the future.

Predictive analytics is being used to estimate the likelihood of a company successfully being able to be float on the stock market.

Prescriptive analytics

Prescriptive analytics combines statistical tools utilised in predictive analytics with Artificial Intelligence and algorithms to calculate the optimum outcome from a variety of business decisions.

These models can be used to identify the optimum finance structure for a proposed investment.

8 Venture capitalists can provide funds to companies who are unable to obtain finance from other sources, such as banks, because they are considered to be a high risk.

Ochera would have difficulty raising finance from other sources due to the company's lack of profitability in the last five years (or inexperience).

The annual return that Techno receives is likely to be lower than other forms of finance as the majority of their return is based on the sale of the shares after flotation.

Techno will have previous experience working with companies who are floating on the stock markets.

Techno has experience working with technology companies and can provide advice to Ochera's managers.

Ochera's management team are inexperienced and would benefit from this advice.

Summary

Formula	Spreadsheet format	Used for
SUM	=SUM(range), where range is formula data, ie, A3:A10	Adding together a range of cell values
IRR	=IRR(range), where range is formula data, ie, A3:A10	Calculating the IRR in project appraisal
NPV	=NPV(discount, range), where range is formula data, ie, A3:A10	Calculating the NPV in project appraisal
RATE	=RATE(number of periods, payment, present value, future value, type, guess)	Calculating the rate of return that is expected (by bond holders) over a given period
PV	=PV(rate, number of periods, payment, future value, type)	Calculating the value of a bond
POWER	=POWER(most recent value/ oldest value,1/number of periods of growth)	Calculating the geometric average growth rate
AVERAGE	=AVERAGE(range), where range is formula data, ie, A3:A10	Calculating the arithmetic mean of a range of values
CORRELATION	=CORREL(cell range of first array, cell range of second array)	Calculating the correlation between two sets of data
STANDARD DEVIATION	=STDEV(RANGE) where range is formula data, ie, A3:A10	Calculating the standard deviation of a range of values

Answers to Interactive questions

Answer to Interactive question 1

To calculate the NPV the correct instruction would be **=NPV(0.08,B4:F4)**.

=NPV(0.08,B4:F4)

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Revenue £		200,000	200,000	400,000	400,000
3	Costs £		(80,000)	(80,000)	(120,000)	(120,000)
4	**Cash** flow £	0 [1]	120,000	120,000	280,000	280,000
5	PV@8% T1–5	594,512 [2]				
6	Initial in-vestment	(500,000)				
7	Project NPV	94,512 [3]				

1 It is important to insert a zero in time period 1 and the first cashflow in time period 2, as the NPV function assumes the first cashflow is at the end of time period 1.

2 This is the present value of the cash flows in cells B4 to F4 ie, for years 1–5. The formula assumes the first cash flow is **at the end of year 1. A column has to be added for year 1 (column B) so that the spreadsheet recognises that the** first **cash** flow **occurs at year 2.**

3 This is the project NPV **after subtracting the initial outlay**.

The value generated by the project (NPV) is above zero, therefore this project would be undertaken. To calculate the IRR the correct instruction would be **=IRR(B2:G2)**.

=IRR(B2:G2)

	A	B	C	D	E	F	G
1	Year	0	1	2	3	4	5
2	Cash flow £	(500,000)	0	120,000	120,000	280,000	280,000
3	IRR	13.1% [1]					

1 This is the IRR. **B3 =IRR(B2:G2)**

Note that a column has to be added for the initial outlay in time period 0 (column B) so that the spreadsheet recognises that the first cash inflow occurs at year 2.

The return generated by the project (IRR) is greater than the company's required return (cost of capital) of 8%, therefore this project would be undertaken.

Answer to Interactive question 2

1.1 To calculate the RATE, the following variables need to be input to the RATE function.

=RATE(B1,B2,B3,B4)

	A	B
1	Nper = the number of periods	16 [1]
2	Pmt = the amount (of interest) paid in any single period	3 [2]
3	Pval = the present value of the asset (its market price)	–107 [3]
4	Fval = the future value (the amount paid at maturity).	100
5	Yield to maturity	0.02465 [4]
6	Annual yield to maturity	0.04930 [5]

1 This is the number of six-month periods over which payments are made (six months is used as they are semi-annual coupon debentures).

2 This is semi-annual coupon, calculated as £6 divided by 2 = £3.

3 This is the market price, inserted as a negative value.

4 This is the yield expressed in terms of the period assessed, which here is six months.

5 This is the annualised yield to maturity, calculated as 0.0465 multiplied by 2 (as there are two six-month periods in a year) = 0.0493 or 4.930%.

1.2 To calculate the PV, the following variables need to be input to the PV function.

=PV(B1,B2,B3,B4)

	A	B
1	Rate of return required over the period	0.0493 [1]
2	Nper = the number of periods	5 [2]
3	Pmt = the amount (of interest) paid in any single period	4 [3]
4	Fval = the future value (the amount paid at maturity)	100
5	Present value (issue price)	–95.97 [4]

1 This is the annualised rate of return for Company B × 2 ie, 2.465% × 2 = 4.93% or 0.0493.

2 This is the number of 12-month periods over which payments are made (12 months is used as the payments are made every 12 months).

3 This is coupon rate.

4 This is the present value ie, the issue price, expressed as a negative number. So the issue price is £95.97.

1.3 Company A has similar risk to Company B so it is reasonable to assume that debenture holders would require the same yield to redemption in return for investing with either company. However, Company A's debentures have only four years until redemption whilst Company B's debentures mature in eight years. It is likely that debenture holders would require a lower yield to redemption for investing in Company A's debentures since the period of the investment is half that of Company B.

Appendices

Formulae

Formulae you may require:

Discounting an annuity

The annuity factor:

$$AF_{1-n} = \frac{1}{r}\left[1 - \frac{1}{(1+r)^n}\right]$$

Where AF = annuity factor
n = number of payments
r = discount rate as a decimal

Dividend growth model:

$$k_e = \frac{D_o(1+g)}{P_o} + g$$

Where k_e = cost of equity
D_0 = current dividend per ordinary share
g = the annual dividend growth rate
P_0 = the current ex-div price per ordinary share

Capital asset pricing model: $r_j = r_f + ß_j (r_m - r_f)$

Where r_j = the expected return from security j
r_f = the risk free rate
$ß_j$ = the beta of security j
r_m = the expected return on the market portfolio

$$\beta_e = \beta_a\left(1 + \frac{D(1-T)}{E}\right)$$

Where β_e = beta of equity in a geared firm
β_a = ungeared (asset) beta

Discount tables

Interest rate p.a.	Number of years	Present value of £1 receivable at the end of n years	Present value of £1 receivable at the end of each of n years
r	n		$\frac{1}{r}\left[1-\frac{1}{(1+r)^n}\right]$
1%	1	0.990	0.990
	2	0.980	1.970
	3	0.971	2.941
	4	0.961	3.902
	5	0.951	4.853
	6	0.942	5.795
	7	0.933	6.728
	8	0.923	7.652
	9	0.914	8.566
	10	0.905	9.471
5%	1	0.952	0.952
	2	0.907	1.859
	3	0.864	2.723
	4	0.823	3.546
	5	0.784	4.329
	6	0.746	5.076
	7	0.711	5.786
	8	0.677	6.463
	9	0.645	7.108
	10	0.614	7.722
10%	1	0.909	0.909
	2	0.826	1.736
	3	0.751	2.487
	4	0.683	3.170

Interest rate p.a.	Number of years	Present value of £1 receivable at the end of n years	Present value of £1 receivable at the end of each of n years
r	n		$\frac{1}{r}\left[1-\frac{1}{(1+r)^n}\right]$
	5	0.621	3.791
	6	0.564	4.355
	7	0.513	4.868
	8	0.467	5.335
	9	0.424	5.759
	10	0.386	6.145
15%	1	0.870	0.870
	2	0.756	1.626
	3	0.658	2.283
	4	0.572	2.855
	5	0.497	3.352
	6	0.432	3.784
	7	0.376	4.160
	8	0.327	4.487
	9	0.284	4.772
	10	0.247	5.019
20%	1	0.833	0.833
	2	0.694	1.528
	3	0.579	2.106
	4	0.482	2.589
	5	0.402	2.991
	6	0.335	3.326
	7	0.279	3.605
	8	0.233	3.837
	9	0.194	4.031
	10	0.162	4.192

Appendix: Additional terminology

Adjusted present value (APV)	A technique for evaluating projects that are financed with new debt, by calculating the net present value (NPV) of the project plus the present value (PV) of any financing benefits
Agency theory	Analysis of the relationship between principals and agents in business, and resolving the conflict that can exist between principals (such as shareholders) and agents (for example, company executives)
American-style option	An option that can be exercised on any day up to the expiry date
Behavioural finance	An attempt to explain the implications of psychological factors behind investor decisions; suggests that irrational investor behaviour may significantly affect share price movements
Beta factor	Index of systematic risk for a particular security. If an investment has more systematic risk than the market average: β is $>$ 1.00
Bonus issue	Shareholders are given shares in proportion to their existing holdings; the total value does not change and the value per share drops accordingly
Business plan	Statement of a company's plan for a given time horizon, including background, history, prospects and a financial assessment
Call option	An option to buy an underlying item
Capital allowance	Tax-allowable depreciation
Covenant	Undertaking by a borrower in order to protect a lender's position
Cum-div share price	The price of a security for a buyer who is entitled to receive a dividend that has been declared, but not yet paid
Current cash flows	Cash flows expressed in today's terms which will be affected by inflation in the future and have not been adjusted
Deprival value	Loss to a business arising from an existing activity being deprived of the use of an asset
Direct quote	The amount of domestic currency which is equal to one foreign currency unit

Dividend decision	Whether or not a firm should pay a dividend and, if so, how much that dividend should be
Earnings retention model	Calculates the expected growth in annual dividends from the proportion of annual earnings that are retained and the rate of return on those retained profits

Economic risk	The effect of exchange rate movements on the international competitiveness of a company
Efficient market hypothesis	Concerned with the information-processing efficiency of stock markets, particularly in terms of share prices
Eurocurrency market	Short-term borrowing and lending by banks in currencies other than that of the country in which the bank is based
European-style option	An option which can be exercised only on its expiry date
EV/EBITDA multiple	The enterprise value of the company divided by earnings before interest, tax, depreciation and amortisation
Exchange rate	The rate at which one country's currency can be traded in exchange for another country's currency
Ex-div share price	Price of a share when its declared dividend belongs to the seller rather than the buyer
Exercise price	The price written in to an option agreement
Expected value	An average of possible outcomes, weighted by the probability of each outcome occurring
Financial gearing	The extent to which debt is used in the capital structure
Forward exchange contract	Contract fixing an exchange rate for a currency transaction for settlement at a future date
Forward rate	The exchange rate for the exchange of currencies at a future date
Forward rate agreement (FRA)	Allows lenders or borrowers to fix a rate of interest on a deposit or borrowing with a term that starts in the future and lasts for several months
Gordon growth model	Calculates the expected growth in annual dividends from the proportion of annual earnings that are retained and the rate of return on those retained profits

Gross redemption yield (GRY)	The estimated future rate of return that you would receive on the principal of the bond if you hold the bond until its maturity date
Index future	A futures contract on a portfolio of shares represented by a stock market index
Indirect quote	The amount of foreign currency which is equal to one domestic currency unit
Interest rate future	Allows lenders or borrowers to fix a rate of interest on a deposit or borrowing, with standardised terms, amounts and periods; traded on a futures exchange
Interest rate option	Grants the buyer of the option the right, but not the obligation, to deal at an agreed interest rate at a future maturity date
Interest rate parity theory	The interest rate differential between two countries is equal to the differential between the forward exchange rate and the spot exchange rate
Internal rate of return (IRR)	A cost of capital at which the NPV of a project would be zero
International bond market	Market in which bonds are issued by large companies and other organisations, including sovereign governments, and sold to international investors
International syndicated loan market	Market for large loans, created when a syndicate of international banks lend money to a borrower; syndicated loans spread the risk among the participating lenders
Intrinsic value	The difference between the exercise price for an option and the current spot market price of the underlying item
Investment decision	How a firm decides to utilise its finance resources
Irredeemable security	A security that can never be redeemed but will continue to attract interest

Leveraged buy-out (LBO)	Buyouts that are mainly financed by debt
Liquidation (winding up)	The passing of the assets, net of liabilities, to the shareholders in proportion to their individual shareholdings
Management buy-in	A business is bought by an external group of managers who have not previously been connected with running it
Management buy-out	A business is bought by existing management from the company
Modigliani & Miller 1958	With no corporation tax there is no advantage for firms to issue debt
Modigliani & Miller 1963	In the presence of corporation tax, it is advantageous for firms to issue debt
Money cash flows	Cash flows where inflationary effects have been taken into account
Money market hedge	A technique for hedging foreign exchange risk using the money market, allowing a company to lock in the value of a currency in advance of an anticipated transaction
Money rate of interest	Rate of interest after adjustment for the effect of general inflation
Monte Carlo simulation	A simulation technique based on the use of random numbers and probability statistics to investigate problems
Mutually exclusive projects	Projects that cannot both be undertaken at the same time, due to resource limitations

Net assets valuation	The value of a share is equal to the net tangible assets, divided by the number of shares
Net present value (NPV)	The sum of the present value of the benefits (revenues or savings) from an investment, less the present value of expenditures; uses discounted cash flows
New issue	Often used at the time a firm obtains a listing on a stock exchange for its shares, and wants to raise a large amount of new capital
Operating gearing	The extent to which a firm's operating costs are fixed, as opposed to variable
Organic growth	The retention of profits and/or the raising of new finance to fund internally-generated projects
Over-the-counter (OTC) option	A tailor-made option for specific needs
Payback period	The time required for the cash inflows from a capital investment project to equal the cash outflows
Portfolio effect	The extent to which the variations in returns on a selection of assets are offset by variations in returns on other assets in the same diversified portfolio
Private equity	Equity capital that is not quoted on an exchange, consisting of investors and funds that invest directly in private companies or conduct buyouts
Put option	An option to sell an underlying item
Real rate of interest	Rate of interest that would be required in the absence of inflation

Redeemable security	A security that can be redeemed prior to maturity
Retained earnings	The main source of new finance for most companies
Risk	Uncertainty about the amount of future returns that will be achieved
Risk management decision	How a business manages risk in relation to investment decisions, financing decisions and liquidity, currency and credit decisions
Scrip dividend	A share issued in lieu of a cash dividend
Secondary buy-out	Occurs when a company owned by private equity and management is acquired by another private equity provider who backs the same management team
Semi-strong form efficiency	Share prices incorporate all publicly available information (published accounts, press releases,
	dividends, new products, government economic data, etc)
Sensitivity analysis	A technique for assessing the sensitivity of a project's return or NPV to a variation in each of the items of cost or benefit in the project
Simulation	A technique which allows the effect of more than one variable changing at the same time to be assessed
Spin-off	Divestment accomplished through the separation of a division or subsidiary from its parent to create a new entity by issuing new shares; these shares are distributed to current shareholders in proportion to their current holdings

Spot rate	The exchange rate offered on a particular currency for immediate delivery
Stakeholder	Someone who has an interest in the performance of a firm or who is in a position to influence decisions by the firm
Strategic planning	The process of deciding the long-term direction of the business, and how the business will achieve its objectives
Strong form efficiency	Share prices reflect all available information, whether or not it has been published; no investor can beat the market by having superior information, as it does not exist
Sunk cost	Money that has already been spent, and so is irrelevant for the purposes of investment appraisal
Sustainability	An approach to development that looks to balance different and competing needs, such as resource utilisation balanced against the future needs of the environment
Synergy	Combined results that generate a better rate of return than would be achieved by the same resources used as separate operations
Time value	The difference between the option's actual value and its intrinsic value
Time value of money	£1 today is worth more than £1 at a future time, because money can be reinvested today to earn more money over time
Unavoidable cost	Money that has already been committed and will not change as a result of an investment decision eg, fixed costs
Weak form efficiency	Share prices reflect information about past price movements

Glossary of terms

Acquisition: A bidder company acquires a target company either in its entirety or by buying sufficient shares to exercise control.

Business risk: The variability in earnings **before** interest and tax associated with the industrial sector in which a firm operates.

It is determined by general business and economic conditions.

Capital asset pricing model (CAPM): A model for measuring the systematic risk of investments.

Capital rationing: The situation where insufficient funds exist to undertake all positive NPV projects, so a choice must be made between projects.

Cash budget (or forecast): A detailed budget of estimated cash inflows and outflows incorporating both revenue and capital items.

Co-efficient of variation: Co-efficient of variation is the ratio of the standard deviation to the mean, calculated as (standard deviation ÷ mean) × 100.

Convertible loans: Fixed return securities – either secured or unsecured – which may be converted, at the option of the holder, into ordinary shares in the same company at a future date (or on any of a series of future dates). Prior to conversion the holders have creditor status, although their rights may be subordinated to those of trade payables.

The interest rate (coupon) on convertible loans is lower than on comparable conventional fixed rate bonds, because of the value of the conversion rights.

Cost of equity: The return required by shareholders.

Cryptocurrency: A digital currency that uses cryptography to make sure payments are sent and received safely.

Currency futures: A currency future is a standardised exchange-traded contract to buy or sell a quantity of one currency in exchange for another, for notional delivery at a set date in the future.

Currency option: An agreement involving a right, but not an obligation, to buy or to sell a certain amount of currency at a stated rate of exchange (the **exercise price**) at some time in the future.

Demerger: Divestment accomplished through the separation of a division or subsidiary from its parent to create a new entity by issuing shares; these shares are distributed to current shareholders in proportion to their current holdings.

Derivative: A financial derivative is a financial instrument whose value is derived from the value and characteristics of an underlying financial item. Option contracts, futures and swaps are types of derivative.

Dividend valuation model: Model that determines a share valuation based upon expected future dividends, discounted at the investors required rate of return.

ESG: (Environmental, social and governance) is a set of criteria used to measure and report sustainability. Therefore, ESG reporting involves disclosing operational data on areas of ESG.

Economic exposure: The risk that longer-term exchange rate movements might reduce the international competitiveness of a company.

It is the risk that the present value of a company's future cash flows might be reduced by adverse exchange rate movements.

Economic risk: This refers to the effect of exchange rate movements on the **international competitiveness** of a company.

For example, a UK company might use raw materials which are priced in US dollars, but export its products mainly within the EU. Both a depreciation of sterling against the dollar or an appreciation of sterling against other EU currencies will erode the competitiveness of the company. Economic exposure can be difficult to avoid, although diversification of the supplier and customer base across different countries will reduce this kind of exposure to risk.

Enterprise value (EV): A measure of a company's total value, often used as an alternative to market capitalisation. It is the price you would pay for the entire business based on the current market price of the company's shares and net debt.

Enterprise value/EBITDA multiple: The enterprise value of the company divided by earnings before interest, tax, depreciation and amortisation. It is a widely used valuation multiple.

Equity: The **ordinary shares** in the business. Equity shareholders are the owners of the business and through their voting rights exercise ultimate control.

Financial risk: The additional variability in returns as a result of having fixed interest debt in the capital structure. Equity holders take this risk in particular, but debt holders also suffer financial risk at high gearing levels (see later in chapter).

Note. Financial risk is narrowly defined here, for the purpose of this chapter, as the risk relating to financial gearing. A wider definition of financial risk might include liquidity risk, interest rate risk, currency risk etc, (see Chapters 9 and 10).

Financial strategy: The detailed financial decisions that will support a business strategy over the short- to medium-term.

Financing decision: How a firm should be financed – solely by equity (shares), or by a combination of equity and debt, and in what proportions.

Forward contract: A binding agreement to buy or sell an item for settlement at a future date, at a price agreed today.

Forward contracts allow businesses to set the price of an item well in advance, although usually not more than several months ahead. They are particularly suitable in commodity markets such as gold, oil and agriculture where prices can be highly volatile and in currency markets (discussed in the next chapter).

Future: A future is a **standardised contract** to **buy** or **sell** a **specific amount** of a commodity, currency or financial instrument at an **agreed price** on a **stipulated future date**.

Interest rate swap: An interest rate swap is an agreement whereby the parties to the agreement exchange interest payments on a notional amount of principal at intervals over a period of years.

Loan stocks and debentures: Typically fixed interest rate borrowings with a set repayment date. Many are secured on specific assets or assets in general, so that lenders are protected (in repayment terms) above unsecured creditors in a liquidation.

Mean: The mean (or average) of a set of data is calculated by taking the sum of all the values and dividing by the number of values in the distribution.

Normal distribution : A frequency distribution which is important because it arises frequently in 'real- life'. It is any distribution that is symmetrical around the mean.

Opportunity cost: The cash flow foregone if a unit of the resource is used on the project instead of in the best alternative way.

Option: An agreement giving the buyer of the option the **right, but not the obligation,** to buy or to sell a specific quantity of an item (such as a quantity of shares in a company, a quantity of one currency in exchange for another, or a quantity of a commodity) at a fixed price on or before a specified date, after which the option expires if not exercised.

An option to buy an underlying item is called a call option and an option to sell an underlying item is called a put option.

Political risk: The risk that political action will affect the position and value of a company.

Preference shares: These form part of the risk-bearing ownership of the business but, since they are entitled to their dividends before ordinary shareholders, they carry less risk. As their return is usually a fixed amount of dividend, they are similar in many ways to debt.

Price-Earnings (P/E) ratio: The share price divided by the earnings per share for a company.

Purchasing power parity: The theory that in the long term, exchange rates between currencies will tend to reflect the relative purchasing power of the currency of each country.

Relevant cash flows: Future, incremental cash flows arising from the decision being made.

Rights issue: An issue of new shares for cash to existing shareholders in proportion to their existing holdings.

Risk-averse investor: One who requires a higher average return in order to take on a higher level of risk.

Shareholder value analysis (SVA): The process of analysing the activities of a business to identify how they will result in increasing shareholder wealth.

Standard deviation: This shows the average amount of variability in a data set, showing how far, on average, each result lies from the mean (or expected value).

The mean (or expected value) does not indicate the level of risk associated with an event. There could be two risks that both have the same mean or expected value, but very different risk profiles. Risk means the variability of outcomes and can be measured using standard deviation.

The lower the standard deviation, the closer the data points are to the mean, meaning the decision being taken has lower variability and therefore lower risk. Conversely, a higher standard deviation indicates that the data points are spread out over a wider range of values, increasing the risk of the expected return.

Sustainability: The ability to meet the needs of the present without compromising the ability of future generations to meet their own needs.

Systematic or market risk: This is investment risk that cannot be eliminated by diversification.

Transaction risk: This is the risk of adverse exchange rate movements occurring in the course of normal international trading transactions.

This arises when the prices of imports or exports are fixed in foreign currency terms and there is movement in the exchange rate between the date when the price is agreed and the date when the cash is paid or received in settlement.

Translation exposure: The risk that the organisation will make **exchange losses** when the **accounting results** of its foreign branches or subsidiaries are **translated** into the **home currency**.

Translation risk: This is the risk that the organisation will make exchange losses when the accounting results of its foreign branches or subsidiaries are translated into the home currency.

Translation losses can result, for example, from restating the book value of a foreign subsidiary's assets at the exchange rate at the balance sheet date.

Underwriting: The process whereby in exchange for a fixed fee, usually 1%–2% of the total finance to be raised, an institution or group of institutions will undertake to purchase any securities not subscribed for by the public.

Unsystematic risk, unique risk or specific risk: This is investment risk that can be eliminated by diversification.

Venture capital: Venture capital is risk capital, normally provided by a venture capital firm or individual venture capitalist, in return for an equity stake.

Weighted average cost of capital (WACC): The cost of the pool of funds, both equity and debt, within a business.

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