Foundation level

Business Finance

2012
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A pass for each exam is based on a determination of the minimum level of knowledge and skills that candidates must acquire to have a good chance at success in the professional level of the CPA Program.

In 2012 you have more opportunities to sit foundation level exams, allowing you to progress through to the professional level of the CPA Program at your own pace.

The material in this study manual has been prepared based upon standards and legislation in effect as at 1 September 2011. Candidates are advised that they should confirm effective dates of standards or legislation when using additional study resources. Exams for 2012 will be based on the content of this study manual.

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A range of quality learning products will be available in the market for you to purchase to further aid your core study program and preparation for exams.

These products will appeal to candidates looking to invest in additional resources other than those provided in this study manual. More information is available on CPA Australia’s website www.cpaaustralia.com.au/learningsupport

You will also be able to source face-to-face and online tuition for CPA Program foundation level exams from registered tuition providers. The tuition provided by these registered parties is based on current CPA Program foundation level learning objectives. A list of current registered providers can be found on CPA Australia’s website. If you are interested you will need to liaise directly with the chosen provider to purchase and enrol in your tuition program.
Contents

Introduction
Welcome to CPA Australia iii
Chapter features vi
Chapter summary viii
Answering multiple choice questions x
Learning objectives xi

Chapter
1 Introduction to investment appraisal 1
2 Advanced investment appraisal 37
3 Capital markets 79
4 Sources of finance 97
5 Working capital and short term financial management 129
6 Cost of capital 147
7 Portfolio theory and CAPM 175
8 Efficient market hypothesis and dividend policy 207
9 Risk management 227
10 Hedging and derivatives 263

Revision questions 279
Answers to revision questions 303
Before you begin questions: Answers and commentary 317
Glossary of terms 329
Formulae and discount tables 339
Index 347
## Chapter features

Each chapter contains a number of helpful features to guide you through each topic.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning objectives</strong></td>
<td>Show the referenced CPA Australia learning objectives.</td>
</tr>
<tr>
<td><strong>Topic list</strong></td>
<td>Tells you what you will be studying in this chapter.</td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
<td>Presents a general idea of what is covered in this chapter.</td>
</tr>
<tr>
<td><strong>Chapter summary diagram</strong></td>
<td>Summarises the content of the chapter, helping to set the scene so that you can gain the bigger picture.</td>
</tr>
<tr>
<td><strong>Before you begin</strong></td>
<td>This is a small bank of questions to test any pre-existing knowledge that you may have of the chapter content. If you get them all correct then you may be able to reduce the time you need to spend on the particular chapter. There is a commentary section at the end of the Study Manual called Before you begin: answers and commentary.</td>
</tr>
<tr>
<td><strong>Section overview</strong></td>
<td>This summarises the key content of the particular section that you are about to start.</td>
</tr>
<tr>
<td><strong>Learning objective reference</strong></td>
<td>This box indicates the learning objective covered by the section or paragraph to which it relates.</td>
</tr>
<tr>
<td><strong>Definition</strong></td>
<td>Definitions of important concepts. You really need to know and understand these before the exam.</td>
</tr>
<tr>
<td><strong>Exam comments</strong></td>
<td>These highlight points that are likely to be particularly important or relevant to the exam. (Please note that this feature does not apply in every Foundation Level study manual.)</td>
</tr>
<tr>
<td><strong>Worked example</strong></td>
<td>This is an illustration of a particular technique or concept with a solution or explanation provided.</td>
</tr>
<tr>
<td><strong>Question</strong></td>
<td>This is a question that enables you to practise a technique or test your understanding. You will find the solution at the end of the chapter.</td>
</tr>
<tr>
<td><strong>Key chapter points</strong></td>
<td>Review the key areas covered in the chapter.</td>
</tr>
</tbody>
</table>
Quick revision questions
A quick test of your knowledge of the main topics in this chapter. Answers are provided at the end of each chapter.

The quick revision questions are not a representation of the difficulty of the questions which will be in the examination. The quick revision MCQs provide you with an opportunity to revise and assess your knowledge of the key concepts covered in the materials so far. Use these questions as a means to reflect on key concepts and not as the sole revision for the examination.

Case study
This is a practical example or illustration, usually involving a real world scenario.

Formula to learn
These are formulae or equations that you need to learn as you may need to apply them in the exam.

Bold text
Throughout the Study Manual you will see that some of the text is in bold type. This is to add emphasis and to help you to grasp the key elements within a sentence and paragraph.
Chapter summary

This section provides a snapshot of each of the chapters, to help you understand the syllabus as a whole and to put the study manual into perspective.

Chapter 1 – Introduction to investment appraisal
Companies will be faced with a variety of possible investment opportunities, ie the possibility of paying out cash now, in the anticipation of receiving cash inflows in the future. Managers at companies need a basis on which to decide whether to accept or reject each possible opportunity. This chapter introduces the key concepts used in investment appraisal (relevant cash flows and time value of money) and considers two particular techniques: the return on capital employed and the payback period.

Chapter 2 – Advanced investment appraisal
Discounted cash flow (DCF) methods of investment appraisal are superior to other methods since they take into account the time value of money. The Net Present Value (NPV) method is conceptually the best since it is directly consistent with the assumed objective of maximisation of shareholder wealth. This chapter looks at the NPV method, the Internal Rate of Return (IRR) method and the discounted payback method of investment appraisal. It also considers a method for taking account of the risk and uncertainty associated with a project, and how to assess projects when capital is a scarce resource. Finally it goes on to consider how inflation and tax can be incorporated into DCF methods of investment appraisal.

Chapter 3 – Capital markets
In this chapter we introduce the framework of markets and institutions through which the financing of a business takes place. Capital markets provide a source of funds and an exit route for investors.

Chapter 4 – Sources of finance
Capital structure refers to the way in which a company is financed. Decisions include choosing a suitable balance between debt capital and equity capital (gearing level), and deciding on the balance between short-term and long-term finance. In this chapter we will look at the distinction between short-term and long-term sources of finance and the various types of finance available.

Chapter 5 – Working capital and short term financial management
This chapter covers the crucial topic of working capital management and the link between working capital and liquidity. It explains the objectives and role of working capital management, the cash operating cycle and its implications for the management of cash, accounts receivable and payable and inventories. Strategies for financing working capital are also considered.

Chapter 6 – Cost of capital
When a company uses the NPV method of investment appraisal it needs to discount the expected cashflows of the project, at its cost of capital. This chapter considers how the company can determine the cost of its various sources of finance and whether the resulting weighted average cost of capital is an appropriate discount rate for investment appraisal purposes.

Chapter 7 – Portfolio theory and CAPM
This chapter looks at portfolio theory and the Capital Asset Pricing Model (CAPM) in the context of investment portfolios. Portfolio theory suggests that an investor should be concerned with their overall position, not with the performance of individual investments. The CAPM is based on the fact that many investors will hold a well-diversified portfolio and should only be concerned with a comparison of the systematic risk of individual investments in relation to the risk of all shares in the market. CAPM can be used to establish a cost of equity, or discount rate, that takes systematic risk into account.
Chapter 8 – Efficient market hypothesis and dividend policy
This chapter deals with market efficiency, the determination of share prices and dividend policy. The efficient market hypothesis provides an explanation of how markets take into account new information. You will also learn about the different theories on whether dividend policy affects shareholder wealth.

Chapter 9 – Risk management
This chapter considers the nature of risk and uncertainty and the different methods of classifying risk. It also considers various approaches that can be adopted in order to reduce risk to acceptable levels. Risks arising from international trade and various methods of hedging foreign currency risk and interest rate risk are discussed.

Chapter 10 – Hedging and derivatives
In this chapter we examine the use of derivatives as a tool for transferring risk, and we consider the costs and benefits of some of the key products you will come across on the Australian Stock Exchange (ASX) (futures, options and warrants).
The questions in your exam will each contain four possible answers. You have to **choose the option that best answers the question**. The three incorrect options are called distractors. There is a skill in answering MCQs quickly and correctly. By practising MCQs you can develop this skill, giving you a better chance of passing the exam.

You may wish to follow the approach outlined below, or you may prefer to adapt it.

**Step 1** Attempt each question – starting with the easier questions which will be those at the start of the exam. Read the question thoroughly. You may prefer to work out the answer before looking at the options, or you may prefer to look at the options at the beginning. Adopt the method that works best for you.

**Step 2** Read the four options and see if one matches your own answer. Be careful with numerical questions, as the distractors are designed to match answers that incorporate common errors. Check that your calculation is correct. Have you followed the requirement exactly? Have you included every stage of the calculation?

**Step 3** You may find that none of the options matches your answer.
- Re-read the question to ensure that you understand it and are answering the requirement
- Eliminate any obviously wrong answers
- Consider which of the remaining answers is the most likely to be correct and select the option

**Step 4** If you are still unsure make a note and continue to the next question. Some questions will take you longer to answer than others. Try to reduce the average time per question, to allow yourself to revisit problem questions at the end of the exam.

**Step 5** Revisit unanswered questions. When you come back to a question after a break you often find you are able to answer it correctly straight away. If you are still unsure have a guess. You are not penalised for incorrect answers, so **never leave a question unanswered!**
CPA Australia’s learning objectives for this Study Manual are set out below. They are cross-referenced to the chapter in the Study Manual where they are covered.

**Business Finance**

**General overview**
This exam covers the understanding of business finance and treasury function including the fundamental concepts of capital, investment, funding and risk assessment and management. It also covers the analysis and management of an entity’s financial position, portfolio management, and short and long term financial management.

**Topics**

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Topic Description</th>
<th>Chapter where covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO1. Capital budgeting: ROCE, payback, IRR, NPV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LO1.1</td>
<td>Explain the term financial mathematics</td>
<td>1</td>
</tr>
<tr>
<td>LO1.2</td>
<td>Calculate and interpret the future and present values of a series of single cash flows and of annuities</td>
<td>1</td>
</tr>
<tr>
<td>LO1.3</td>
<td>Explain the characteristics of major and long-term investments where a ‘capital budgeting’ approach might be required</td>
<td>1</td>
</tr>
<tr>
<td>LO1.4</td>
<td>Identify and apply the different quantitative methods used in project evaluation</td>
<td>1, 2</td>
</tr>
<tr>
<td>LO1.5</td>
<td>Explain why investment decisions should be analysed using the NPV method</td>
<td>2</td>
</tr>
<tr>
<td>LO1.6</td>
<td>Apply the NPV method to investment project scenarios</td>
<td>2</td>
</tr>
<tr>
<td>LO1.7</td>
<td>Compare and contrast the NPV method with the IRR method of project evaluation</td>
<td>2</td>
</tr>
<tr>
<td>LO1.8</td>
<td>Calculate the weighted average cost of capital and apply it in capital budgeting</td>
<td>6</td>
</tr>
<tr>
<td>LO1.9</td>
<td>List the advantages and disadvantages of ROCE, IRR, payback and NPV methods of investment appraisal</td>
<td>1, 2</td>
</tr>
<tr>
<td>LO1.10</td>
<td>Select investment appraisal techniques which are appropriate to the objectives and circumstances of a given organisation</td>
<td>1, 2</td>
</tr>
<tr>
<td>LO1.11</td>
<td>Select appropriate values for investment appraisal purposes, taking account of working capital, inflation and tax</td>
<td>1, 2</td>
</tr>
<tr>
<td>LO1.12</td>
<td>Undertake a sensitivity analysis of diverse projects using appropriate tools</td>
<td>2</td>
</tr>
</tbody>
</table>

**LO2. Capital markets**

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Topic Description</th>
<th>Chapter where covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO2.1</td>
<td>Specify the function and structure of the financial markets and the role of the various market participants</td>
<td>3</td>
</tr>
<tr>
<td>LO2.2</td>
<td>Discuss the role of the government in regulating the capital markets and establishing an appropriate regulatory framework</td>
<td>3</td>
</tr>
<tr>
<td>LO2.3</td>
<td>Describe typical guidelines related to the operation of securities markets</td>
<td>3</td>
</tr>
<tr>
<td>LO2.4 Recognise the impact of the external financial markets and the regulatory framework on an entity's financial strategy</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>LO2.5 Identify the characteristics, terms and conditions of the alternative sources of short, medium and long term finance available to a business, including both debt and equity</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>LO2.6 Evaluate the suitability of different methods of finance in a given scenario</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>LO2.7 Describe the characteristics of derivatives and other hedging instruments</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>LO2.8 Identify the advantages and disadvantages of different hedging strategies</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>LO2.9 Identify different methods of hedging which are appropriate to meeting an organisation's objectives</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

**LO3. The Capital Asset Pricing Model**

| LO3.1 Demonstrate the relationship between systematic risk and expected return of individual securities and portfolios using the CAPM and the security market line relationship | 7 |

**LO4. Cost of funds**

| LO4.1 Analyse capital rationing and draw appropriate conclusions | 2 |
| LO4.2 Analyse the various sources of short term finance | 4 |
| LO4.3 Explain the cost of short and medium term finance | 4 |
| LO4.4 Calculate and interpret the cost of various sources of finance | 3, 4, 6 |
| LO4.5 Describe sources of international finance and their merits or otherwise | 4 |
| LO4.6 Explain the different sources of long term finance | 4 |
| LO4.7 Calculate and interpret the cost of capital associated with leases; and debt and equity | 6, 7 |
| LO4.8 Demonstrate the link between working capital management and corporate cash flow | 5 |
| LO4.9 Describe the operating cycle in working capital management to explain inventory management, debtor management and cash management | 5 |

**LO5. Efficient market hypothesis**

| LO5.1 Distinguish between the weak form test, the semi strong form test and the strong form test of the Efficient Market Hypothesis (EMH) | 8 |
| LO5.2 Explain the implications of market efficiency for both investors and companies | 8 |
| LO5.3 In the context of capital markets distinguish between operating efficiency, allocative efficiency and pricing efficiency | 8 |

**LO6. Long term financing, investment, appraisal and dividend policy**

| LO6.1 Calculate and interpret measures of expected return and risk using the probability distribution approach | 7 |
| LO6.2 Explain the factors which influence the dividend policy decision | 8 |
## LO7. Portfolio management

<table>
<thead>
<tr>
<th>LO7.1</th>
<th>Calculate and interpret rates of return on financial investments</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO7.2</td>
<td>Calculate and interpret measures of expected return and risk for two-security portfolios</td>
<td>7</td>
</tr>
<tr>
<td>LO7.3</td>
<td>Explain the impact of portfolio leveraging and short selling on the risk and expected return of two-security portfolios</td>
<td>7</td>
</tr>
<tr>
<td>LO7.4</td>
<td>Analyse and assess portfolio risk</td>
<td>7</td>
</tr>
</tbody>
</table>

## LO8. Short term financial management

| LO8.1       | Prepare short term finance plans and strategies               | 5 |

## LO9. Valuation of corporate securities

<table>
<thead>
<tr>
<th>LO9.1</th>
<th>Calculate and interpret effective interest rates; and apply the concepts of financial mathematics to loans and debt and equity securities</th>
<th>1, 4, 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO9.2</td>
<td>Calculate and interpret share price in both perfect and imperfect markets</td>
<td>6, 8</td>
</tr>
</tbody>
</table>

## LO10. Risk management and risk assessment

<table>
<thead>
<tr>
<th>LO10.1</th>
<th>Define the term risk</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO10.2</td>
<td>Describe the different types of risk in international trade</td>
<td>9</td>
</tr>
<tr>
<td>LO10.3</td>
<td>Explain the different methods of risk assessment in international trade</td>
<td>9</td>
</tr>
<tr>
<td>LO10.4</td>
<td>Identify the key financial risks facing a business in a given scenario</td>
<td>9</td>
</tr>
<tr>
<td>LO10.5</td>
<td>Apply different methods of managing currency risks to given situations</td>
<td>9</td>
</tr>
<tr>
<td>LO10.6</td>
<td>Select methods of managing interest rate exposure appropriate to a given situation</td>
<td>9</td>
</tr>
</tbody>
</table>

## Topic exam weightings

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Capital budgeting: payback, IRR, NPV</td>
<td>20%</td>
</tr>
<tr>
<td>2</td>
<td>Capital markets</td>
<td>20%</td>
</tr>
<tr>
<td>3</td>
<td>The Capital Asset Pricing Model</td>
<td>10%</td>
</tr>
<tr>
<td>4</td>
<td>Cost of funds</td>
<td>10%</td>
</tr>
<tr>
<td>5</td>
<td>Efficient market hypothesis</td>
<td>5%</td>
</tr>
<tr>
<td>6</td>
<td>Long term financing, investment appraisal and dividend policy</td>
<td>5%</td>
</tr>
<tr>
<td>7</td>
<td>Portfolio management</td>
<td>10%</td>
</tr>
<tr>
<td>8</td>
<td>Short term financial management</td>
<td>3%</td>
</tr>
<tr>
<td>9</td>
<td>Valuation of corporate securities</td>
<td>7%</td>
</tr>
<tr>
<td>10</td>
<td>Risk management and risk assessment</td>
<td>10%</td>
</tr>
</tbody>
</table>

**TOTAL**                                                                                   **100%**
Chapter 1

Introduction to investment appraisal

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
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<tr>
<td>Capital budgeting: ROCE, payback, IRR, NPV</td>
<td>LO1</td>
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<tr>
<td>Explain the term financial mathematics</td>
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<td>Calculate and interpret the future and present values of a series of single cash</td>
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<td>Explain the characteristics of major and long-term investments where a 'capital</td>
<td>LO1.3</td>
</tr>
<tr>
<td>budgeting' approach might be required</td>
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</tr>
<tr>
<td>Identify and apply the different quantitative methods used in project evaluation</td>
<td>LO1.4</td>
</tr>
<tr>
<td>List the advantages and disadvantages of ROCE, IRR, payback and NPV methods of</td>
<td>LO1.9</td>
</tr>
<tr>
<td>investment appraisal</td>
<td></td>
</tr>
<tr>
<td>Select investment appraisal techniques which are appropriate to the objectives and</td>
<td>LO1.10</td>
</tr>
<tr>
<td>circumstances of a given organisation</td>
<td></td>
</tr>
<tr>
<td>Select appropriate values for investment appraisal purposes, taking account of</td>
<td>LO1.11</td>
</tr>
<tr>
<td>working capital, inflation and tax</td>
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</tr>
<tr>
<td>Valuation of corporate securities</td>
<td>LO9</td>
</tr>
<tr>
<td>Calculate and interpret effective interest rates; and apply the concepts of</td>
<td>LO9.1</td>
</tr>
<tr>
<td>financial mathematics to valuing loans and debt and equity securities</td>
<td></td>
</tr>
</tbody>
</table>

Topic list

1 Investments and capital budgeting
2 The investment decision-making process
3 Methods of investment appraisal
4 Return on capital employed
5 Relevant cash flows
6 The payback method
7 The time value of money
8 Discounted cash flow techniques
9 Financial mathematics
Companies are faced with a variety of possible investment opportunities, i.e. the possibility of paying out cash now, in the anticipation of receiving cash inflows in the future. Managers of companies need a basis on which they decide whether to accept or reject each possible opportunity. This chapter introduces the key concepts used in investment appraisal and evaluation (relevant cash flows and time value of money) and considers two particular techniques: the return on capital employed and the payback period.
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What is the difference between capital and revenue expenditure? (Section 1.1)
2. What is capital budgeting? (Section 1.4)
3. Name three different investment appraisal techniques. (Section 3.1)
4. What is return on capital employed, and how is it used in investment appraisal? (Section 4.1)
5. Does investment appraisal focus on profits or cash flows? Explain why. (Section 5.1)
6. What is the definition of relevant cash flows? (Section 5.2)
7. A company is considering an investment in a capital project to increase output and sales of one of its products, Product X. As a result of the investment, sales of Product X would rise by 10,000 units each year. Product X sells for $20 each, and has variable costs of $8 per unit, and the current fixed cost per unit is $6. As a result of the project, fixed cost would rise from $600,000 each year to $680,000.
What would be the relevant annual cash flows to take into account when evaluating this project? (Section 6)
8. What is the payback period? (Section 6.1)
9. What is time value of money? (Section 7)
10. Calculate the present value of $30,000 to be received in three years' time if the cost of capital is 10 per cent per annum. (Section 8.3)
11. Calculate the present value of an annuity of $200,000 which will be received for three years, if the cost of capital is 12 per cent per annum. (Section 8.5)
12. If the annual interest rate is 10 per cent, what is the effective monthly rate? (Section 9.2)
1 Investments and capital budgeting

Section overview

- Investment can consist of both capital expenditure and revenue expenditure and can be made in non-current assets or working capital.
- Capital budgeting is the process of identifying, analysing and selecting investment opportunities in non-current assets whose returns are expected to extend beyond one year.

1.1 Capital and revenue expenditure

Investment is any expenditure in the expectation of future benefits. We can divide such expenditure into two categories: capital expenditure, and revenue expenditure.

Suppose that a business purchases a building for $30 000. It then adds an extension to the building at a cost of $10 000. The building needs to have a few broken windows mended, its floors polished and some missing roof tiles replaced. These cleaning and maintenance jobs cost $900.

The original purchase ($30 000) and the cost of the extension ($10 000) are capital expenditure because they are incurred to acquire and then improve a non-current asset. The other costs of $900 are revenue expenditure because they are operational in nature, and maintain the building and thus the earning capacity of the building.

Definitions

Capital expenditure is expenditure which results in the acquisition of non-current assets, including the cost of getting an asset to operational condition, or an improvement in their earning capacity. It is not charged as an expense in the income statement; the expenditure appears as a non-current asset in the statement of financial position.

Revenue expenditure is charged to the income statement and is expenditure which is incurred:

(a) For the purpose of the trade of the business – this includes expenditure classified as selling and distribution expenses, administration expenses and finance charges.

(b) To maintain the existing earning capacity of non-current assets.

1.2 Non-current asset investment and working capital investment

Investment can be made in non-current assets or working capital.

(a) Investment in non-current assets involves a significant elapse of time between the initial investment (outlay) of funds and recoupment of the investment. Money is paid out to acquire resources which are going to be used on a continuing basis within the organisation.

(b) Investment in working capital arises from the need to pay out money for resources (such as raw materials) before it can be recovered from sales of the finished product or service. The funds are therefore only committed for a short period of time.

Examples of investment by commercial organisations might include:

- Plant and machinery
- Research and development
- Advertising
- Warehouse facilities
1.3 Characteristics of long term investments

Capital investment or capital budget decisions normally involve whether to invest in long-term projects and/or capital equipment. These projects will typically have a major effect on operations for a number of years to come.

They might include some or all of the following decisions:

- The purchase of new or replacement machinery
- Investment in production facilities for a new product line
- The expansion of operations
- Investment in IT equipment to improve processes or efficiency
- The acquisition of another business
- Investment in research and development or other intangibles.

Such major long-term investments usually have the following characteristics:

(i) the project or investment is relatively large and may require significant resources.
(ii) there is often a significant period between the investment outlay and the receipt of benefits.
(iii) future cash inflows and outflows relating to the investment need to be planned over a long period of time.

Major long-term capital investments tend to require significant resources and for many organisations the availability of these resources may be limited, especially in the case of finance. Capital budgeting techniques can be used to decide which projects will make the best use of finite resources and ultimately maximise the return for shareholders.

1.4 Creation of capital budgets

Capital expenditure often involves the outlay of large sums of money, and any expected benefits may take a number of years to accrue. For these reasons it is vital that capital expenditure is subject to a rigorous process of appraisal and control.

Definition

Capital budgeting is the process of identifying, analysing and selecting investment opportunities in non current assets whose returns are expected to extend beyond one year.

1.4.1 Budget process

The capital budget will normally be prepared to cover a period of three to five years. It should indicate the expenditure required to cover capital projects already underway and those that are expected to start in the capital budget period.

The budget should therefore be based on the current production budget, future expected levels of production and the long-term development of the organisation, and industry, as a whole.

Organisations may have defined time periods during which proposals are considered so as to allow for an indication of expected capital expenditure in the forthcoming budget period. Alternatively, proposals may be accepted on a regular basis, allowing greater scope for investment in unanticipated opportunities.

Projects which emerge during a budget period may be disadvantaged compared with those anticipated when the budget was set, as specific funds will not be set aside for them in the budget. If funds are limited, such projects may undergo more rigorous analysis than an anticipated project to justify the allocation of funds.
1.4.2 Budget constraints

Budget limits or constraints might be imposed internally or externally.

(a) The imposition of internal constraints, which are often imposed when managerial resources are limited, is known as soft capital rationing.

(b) Hard capital rationing occurs when external limits are set, perhaps because of scarcity of financing, high financing costs or restrictions on the amount of external financing an organisation can seek.

Capital rationing is discussed further in Chapter 2.

1.4.3 Budget authorisation

The administration of the capital budget is usually separate from that of the other budgets. Overall responsibility for authorisation and monitoring of capital expenditure is, in most large organisations, the responsibility of a Capital Budget or Capital Review committee. The board of directors may delegate authority to individual managers to approve capital expenditure up to a specified limit.

2 The investment decision-making process

Section overview

A typical model for investment decision making has a number of distinct stages.

- Origination of proposals
- Project screening
- Analysis and acceptance
- Monitoring and review

2.1 Origin of proposals

Investment opportunities do not just appear, they must be created. An organisation must therefore set up a mechanism that scans the environment for potential opportunities and gives an early warning of future problems. For example, a technological change that might result in a drop in sales might be picked up by this scanning process, and steps should be taken immediately to respond to such a threat.

The overriding feature of any proposal is that it should be consistent with the organisation’s overall strategy to achieve its objectives. For example, an organisation’s strategy could be to increase revenue by introducing new products, or targeting new customers or markets. Employees from across the organisation can be involved in the evaluation of alternative technologies, machines and project specifications. Some alternatives will be rejected early on, while others will be more thoroughly evaluated.

2.2 Project screening

Each proposal must be subject to detailed screening. Only if the project passes this initial screening will more detailed financial analysis begin.

So that a qualitative evaluation of a proposal can be made, a number of key questions such as those below might be asked before any financial analysis is undertaken.

- What is the purpose of the project?
- Does it ‘fit’ with the organisation’s long-term objectives?
- Is it a mandatory investment, for example to conform with safety legislation?
- What resources are required and are they available, e.g. money, capacity, labour?
- Do we have the necessary management expertise to guide the project to completion?
- Does the project expose the organisation to unnecessary risk?
- How long will the project last and what factors are key to its success?
- Have all possible alternative proposals been considered?
2.3 Analysis and acceptance

2.3.1 Financial analysis

The financial analysis of the project will involve the application of the organisation's preferred investment appraisal techniques. We will be studying these techniques in detail in this chapter and the next. In many projects some of the financial implications will be extremely difficult to quantify, but every effort must be made to do so, in order to have a formal basis for planning and controlling the project.

Here are examples of the type of questions that will be addressed at this stage.

- What cash flows/profits will arise from the project and when?
- Has inflation been considered in the determination of the cash flows?
- What are the results of the financial appraisal?
- Has any allowance been made for risk, and if so, what was the outcome?

Some types of project, for example a marketing investment decision, may give rise to cash inflows and returns which are intangible and difficult to quantify so that a full financial appraisal may not be possible. In this case more weight may be given to a consideration of the qualitative issues.

2.3.2 Qualitative issues

We have already seen that qualitative issues would be considered in the initial screening stage, for example in reviewing the project's 'fit' with the organisation's overall objectives and whether it is a mandatory investment. There is a very wide range of other qualitative issues that may be relevant to a particular project:

- What are the implications of not undertaking the investment, e.g. adverse effect on staff morale, loss of market share, risk to company reputation?
- Will acceptance of this project lead to the need for further investment activity in future?
- Will the organisation be more flexible as a result of the investment, and better able to respond to market and technological changes?

2.3.3 Acceptance decision

The decision as to whether to accept projects may be made at different levels within the organisational hierarchy, depending on:

- the type of investment
- its perceived riskiness
- the amount of expenditure required

For example, an area manager may be authorised to make decisions up to $25,000, a divisional manager up to $150,000 and a group manager up to $300,000, with board approval for greater amounts.

Once the decision to accept or reject has been made, the organisation is committed to the project. The project's success or failure reflects on the decision-maker's ability to make decisions.

2.4 Monitoring and review

During the project's progress, project controls should be applied to ensure the following:

- Capital spending does not exceed the amount authorised.
- The implementation of the project is not delayed.
- The anticipated benefits are eventually obtained.

The first two items are easier to control than the third, because the controls can normally be applied soon after the capital expenditure has been authorised, whereas monitoring the benefits will take place over a longer period of time and require 'control' within the organisation at the managerial level.
3 Methods of project appraisal

Section overview
- Financial methods of project appraisal include return on capital employed (ROCE), payback period, discounted payback, net present value (NPV) and internal rate of return (IRR).

3.1 Financial appraisal

There are several methods for the financial appraisal of a project, and evaluating whether the project would be of value to the organisation:

(a) **The return on capital employed** method (also known as the *accounting rate of return* or *return on investment*). This method calculates the profits that will be earned by a project and expresses these as a percentage return on the capital invested in the project. The higher the rate of return, the higher a project is ranked. A project might be undertaken if its expected return on capital employed exceeds a minimum target amount. This method of project appraisal is based on accounting results rather than cash flows.

(b) **The payback period**. This method of investment appraisal calculates the length of time a project will take to recoup the initial investment, in other words how long a project will take to pay for itself. A capital project might not be undertaken unless it achieves payback within a given period of time. This method of project appraisal is based on the anticipated cash flows.

(c) **A discounted cash flow (DCF) appraisal**. There are three methods of project appraisal using DCF.

(i) The **net present value (NPV) method**. This takes into consideration all the relevant cash flows associated with a project over the whole of its life, and also when the cash flows will occur. Cash flows occurring in future years are then adjusted to a 'present value'. The process of re-valuing all project cash flows to a 'present value' is known as discounting. The present value of benefits (revenues or savings) are then compared with the outlay including any initial costs or investments (present value of expenditure). The difference is the net present value. If the present value of benefits exceeds the present value of costs, the project is financially justified. If the present value of benefits is less than the present value of costs, the project is not justified financially. The NPV method is the recommended method of project appraisal, since it is consistent with the objective of maximising shareholder wealth.

(ii) The **internal rate of return (IRR) method**. This method uses discounting mathematics to calculate the return expected from the project calculated on a discounted cash flow basis. This 'internal rate of return' for the project is then compared with the target rate of return. The project is justified financially if the IRR of the project exceeds the target rate of return.

(iii) The **discounted payback method**. This method converts all the expected cash flows from a project to a present value, and calculates how long it will take for the project to payback the capital outlay on a discounted cash flow basis. It is similar to the non-discounted payback method, except that it uses discounted cash flows.

The return on capital employed method is described in Section 4 of this chapter and the payback method in Section 6. Discounted cash flow techniques are introduced in Section 8 of this chapter and the three methods of DCF appraisal are described in Chapter 2.

3.2 Reliability of forecasts

Before looking at these appraisal methods, it is worth emphasising one problem common to all of them. Capital projects often have an expected commercial life of many years, and project appraisal calls for an estimate of future returns over the project’s life. Forecasting is never easy, but in capital budgeting the problems are particularly acute. Forecasts must always be treated with some suspicion, and a large margin for error may have to be allowed. In Chapter 2 we consider sensitivity analysis which is one technique for assessing which estimates are critical to the successful outcome of a project.
4 Return on capital employed

Section overview

- The return on capital employed (ROCE) method (also called the accounting rate of return (ARR) method or the return on investment (ROI) method) of appraising a capital project is to estimate the accounting rate of return that the project should yield.
- If the ROCE exceeds a target rate of return, the project will be undertaken.
- This method is based on accounting profits not cash flows.
- The ROCE method fails to give any consideration to the timing of cash flows over the life of a project and actual cashflows are not considered.

4.1 Calculation of return on capital employed

A capital investment project may be assessed using the return on capital employed (ROCE) method of appraisal. This method is also known as the accounting rate of return (ARR) or the return on investment (ROI).

The expected return on capital employed for the project is calculated, and compared with a pre-determined minimum target rate of return. The project is justified financially if its expected ROCE exceeds the minimum target.

Definition

The return on capital employed (ROCE) measures the profitability of an investment by expressing the expected accounting profits as a percentage of the book value of the investment.

There are several different possible formulae for calculating ROCE. There is no accepted definition, thus an organisation must define ROCE, and specify how it should be calculated, then ensure that it applies this approach consistently. (An exam question that required you to calculate ROCE would always indicate how the ROCE should be defined).

In each case, profits are accounting profits, and are calculated after deducting a charge for depreciation of the non-current asset(s) and any operational expenses.

Formula to learn

A formula for calculating ROCE that is common in practice is:

\[
\text{ROCE (average investment)} = \frac{\text{Estimated average profits}}{\text{Estimated average investment}} \times 100\%
\]

The average investment is the average of the investment at the start of the project and the investment at the end of the project, allowing for depreciation of the non-current asset or assets. For example, suppose that a capital investment will call for spending of $100 000 on a non-current asset that will have a four-year life and zero value at the end of this time, and for a working capital investment of $20 000. The average investment would be $70 000 (half of $100 000 plus the working capital investment of $20 000).

This method is commonly used because the averaging of profits helps to smooth any irregularity in the flow of earnings and using the value of the investment at the mid-point in the project’s life may be considered to be the most accurate.
Another method of calculating ROCE is based on the total initial investment, rather than the average investment over the life of the project.

**ROCE (initial investment)**

\[
\text{ROCE} = \frac{\text{Estimated average profits}}{\text{Estimated initial investment}} \times 100\%
\]

This will result in a lower return than the average investment method.

A third method of calculating ROCE is using the total expected profits over the life of the project, rather than the average annual profit. This will obviously result in a higher figure.

**ROCE (total profits)**

\[
\text{ROCE} = \frac{\text{Estimated total profits}}{\text{Estimated initial investment}} \times 100\%
\]

### Worked Example: Return on capital employed

A company has a target return on capital employed (based on average investment) of 20%, and is now considering the following project.

- Capital cost of asset: $80,000
- Estimated life: 4 years
- Estimated profit before depreciation:
  - Year 1: $20,000
  - Year 2: $25,000
  - Year 3: $35,000
  - Year 4: $25,000

The capital asset would be depreciated by 25% of its cost each year, and will have no residual value. You are required to assess whether the project should be undertaken.

### Solution

The annual profits after depreciation, and the mid-year net book value of the asset, would be as follows.

<table>
<thead>
<tr>
<th>Year</th>
<th>Profit after depreciation</th>
<th>Mid-year net book value</th>
<th>ROCE in the year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>70,000 (W1)</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>5,000</td>
<td>50,000 (W2)</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>15,000</td>
<td>30,000 (W3)</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>5,000</td>
<td>10,000 (W4)</td>
<td>50</td>
</tr>
</tbody>
</table>

W1: Annual depreciation is 25% of cost = 80,000 x 25% = 20,000
Hence NBV at end of Year 1 = 80,000 - 20,000 = 60,000.
Thus mid-year NBV = (80,000 + 60,000)/2 = 70,000
W2: (60,000 + 40,000)/2 = 50,000
W3: (40,000 + 20,000)/2 = 30,000
W4: (20,000 + 0)/2 = 10,000

As the table shows, the ROCE is low in the early stages of the project, partly because of low profits in Year 1 but mainly because the net book value of the asset is much higher early on in its life.

The project does not achieve the target ROCE of 20% in its first two years, but exceeds it in Years 3 and 4. So should it be undertaken?
When the ROCE from a project varies from year to year, it makes sense to take an overall or 'average' view of the project’s return. In this case, we should look at the return as a whole over the four-year period.

\[
\text{Total profit before depreciation over four years} = 105,000 \\
\text{Total profit after depreciation over four years} = 25,000 \\
\text{Average annual profit after depreciation \((25,000/4\text{ yrs})\)} = 6,250 \\
\text{Original cost of investment} = 80,000 \\
\text{Average net book value over the four year period} = \frac{(80,000 + 0)}{2} = 40,000 \\
\text{ROCE} = \frac{6,250}{40,000} = 15.6\%
\]

The project would not be undertaken because it would fail to yield the target return of 20%.

4.2 **ROCE and mutually exclusive projects**

The ROCE method of capital investment appraisal can also be used to compare two or more projects which are mutually exclusive i.e. only one of the projects can be undertaken. The project with the highest ROCE would be selected (provided that the expected ROCE is higher than the company's target ROCE).

**Worked Example: Return on capital employed and mutually exclusive projects**

A company wants to buy a new item of equipment which will be used to provide a service to customers. Two models of equipment are available, one with a slightly higher capacity and greater reliability than the other. The expected costs and profits of each item are as follows.

<table>
<thead>
<tr>
<th></th>
<th>Equipment item X</th>
<th>Equipment item Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital cost</td>
<td>$80,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>Life</td>
<td>5 years</td>
<td>5 years</td>
</tr>
<tr>
<td>Profits before depreciation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>50,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Year 2</td>
<td>50,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Year 3</td>
<td>30,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Year 4</td>
<td>20,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Year 5</td>
<td>10,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Disposal value</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

You are required to decide which item of equipment should be selected, if any, if the company's target ROCE is 30%; where ROCE is measured as the average annual profit after depreciation, divided by the average net book value of the asset.

**Solution**

<table>
<thead>
<tr>
<th></th>
<th>Item X</th>
<th>Item Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total profit over life of equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before depreciation</td>
<td>$160,000</td>
<td>$280,000</td>
</tr>
<tr>
<td>After depreciation</td>
<td>$80,000</td>
<td>$130,000</td>
</tr>
<tr>
<td>Average annual profit after depreciation</td>
<td>$16,000</td>
<td>$26,000</td>
</tr>
<tr>
<td>Average investment  (= \frac{(\text{Capital cost} + \text{disposal value})}{2})</td>
<td>$40,000</td>
<td>$75,000</td>
</tr>
<tr>
<td>ROCE</td>
<td>40%</td>
<td>34.7%</td>
</tr>
</tbody>
</table>

Both projects would earn a return in excess of 30%, but since item X would earn a bigger ROCE, it would be preferred to item Y, even though the profits from Y would be higher by an average of $10,000 a year.
4.3 The drawbacks to the ROCE method of capital investment appraisal

The ROCE method of capital investment appraisal has the serious drawback that it does not take account of the timing of the profits from an investment. Whenever capital is invested in a project, money is tied up until the project begins to earn profits which pay back the investment. Money tied up in one project cannot be invested anywhere else until the profits come in. Management should be aware of the benefits of early repayments from an investment, which will provide the money for other investments.

There are a number of other disadvantages.

(a) It is based on accounting profits and not cash flows. Accounting profits are subject to a number of different accounting treatments.

(b) It is a relative measure rather than an absolute measure and hence takes no account of the size of the investment.

(c) It takes no account of the length of the project.

(d) Like the payback method, it ignores the time value of money.

There are, however, advantages to the ROCE method.

(a) It is a quick and simple calculation.

(b) It involves the familiar concept of a percentage return.

(c) It looks at the entire project life.

Question 1: ROCE

A company carries out capital project appraisal using the ROCE method. It will not undertake any project unless the expected ROCE is at least 15%. ROCE is measured as average annual profit as a percentage of the average investment over the life of the project.

A project is currently being considered. It would involve expenditure of $150 000 on an asset. The project’s life would be five years and at the end of this time the asset would have no residual value. A working capital investment of $15 000 would be required.

The annual profits before depreciation from the project would be:

<table>
<thead>
<tr>
<th>Year</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 000</td>
</tr>
<tr>
<td>2</td>
<td>40 000</td>
</tr>
<tr>
<td>3</td>
<td>80 000</td>
</tr>
<tr>
<td>4</td>
<td>70 000</td>
</tr>
<tr>
<td>5</td>
<td>50 000</td>
</tr>
</tbody>
</table>

What is the ROCE of the project?

On the basis of the company’s investment criterion, would this project be undertaken?

(The answer is at the end of the chapter)
5 Relevant cash flows

Section overview

- Cash flows and not accounting profits should be used for investment appraisal and decision-making.
- The relevant cash flows for appraisal of a project are the changes in future cash flows that would arise from acceptance of the project.
- Relevant costs are therefore future, incremental cash flows.
- Relevant costs of investment appraisal include opportunity costs, working capital costs and wider costs such as infrastructure and human development costs. Non-relevant costs include past costs and committed costs.
- Relevant benefits from investments include not only increased cash flows, but also savings and better relationships with customers and employees.

5.1 The difference between profits and cash

An investment is the outlay of money with the expectation of getting more money back over the term of the investment. When evaluating an investment, it is more appropriate to consider cash flows (actual money spent and received) rather than accounting profits which do not properly reflect investment returns.

A company might pay out a sum of money to invest in a new business operation with an expected commercial life of several years. Over that period, it will expect to incur running costs to run the business, and to receive cash from sales. The returns on the investment will be the net cash inflows from the business operation.

In the same way, a shareholder’s investment involves paying out cash to buy shares, and the shareholder’s returns are obtained in the form of dividends and the cash received from the eventual disposal of the shares.

Accounting profits are based on the accruals concept of accounting, and do not represent the reality of a company as a portfolio of many different investments. Instead of reporting the cash outlay on an investment, an income statement reports a depreciation charge on capital equipment over the economic life of the asset. Depreciation is a notional accounting charge, and does not represent a cash flow. It is a noncash expense.

Therefore, cash flows and not accounting profits should be used for investment appraisal and decision-making.

It is useful to remember the differences between operational cash flows and operating profit.

\[
\begin{align*}
\text{Operating profit (accounting profit)} & \quad 125\ 000 \\
\text{Add back depreciation} & \quad 60\ 000 \\
\text{Subtract the increase in working capital} & \quad (15\ 000) \\
\text{Net cash flow from operations} & \quad 170\ 000
\end{align*}
\]

In the example above, there are two reasons why cash flows differ from the accounting profit.

(a) Depreciation is not a cash flow item, and to work out the actual cash flow depreciation has to be added back to the accounting profit.

(b) Profit also differs from cash flow by the amount of the change in working capital in the period. Working capital means the investment in inventories and trade receivables, less any investment in trade payables. i.e. Net working capital equals current assets less current liabilities. If there has been an increase in working capital due to larger inventories or more receivables, cash flow will be lower than profit. If working capital has been reduced in the period, e.g. by running down inventories, or extending credit taken from creditors, cash flow will exceed profit.
Question 2: Investment cash flows
A company invests $50,000 in a new item of equipment that has an expected life of five years and no residual value. Depreciation is charged by the straight-line method. The equipment is used to make a new product, and sales in Year 1 produce profits of $14,000. An additional investment in working capital of $3,000 is needed in Year 1.

What are the cash flows for the first year of this project?  
(The answer is at the end of the chapter)

5.2 Relevant cash flows for investment appraisal

Definition
The relevant cash flows for appraisal of a project are the changes in future cash flows that would arise from acceptance of the project.

The cash flows that should be considered in investment appraisals are those which arise as a consequence of the investment decision under evaluation.

(a) Relevant costs are future costs. A decision is about the future; it cannot alter what has been done already. A cost that has been incurred in the past is totally irrelevant to any decision that is being made ‘now’. Costs that have been incurred include not only costs that have already been paid, but also costs that are the subject of legally binding contracts, even if payments due under the contract have not yet been made. (These are known as committed costs.)

(b) Relevant costs are cash flows.

(i) The assumption used in relevant costing is that, in the end, profits earn cash. Accounting profits and cash flow are not the same in any period for various reasons, such as the timing differences caused by giving credit and the accounting treatment of depreciation. In the long run, however, a profit that is earned will eventually produce a net inflow of an equal amount of cash. Hence when decision making we look at cash flow as a means of measuring profits.

(ii) Only cash flow information is required. This means that costs or charges which do not reflect additional cash spending should be ignored for the purpose of decision making. These include depreciation charges.

(c) Relevant costs are incremental costs. A relevant cost is one which arises as a direct consequence of a decision. Therefore, only costs which will differ under some or all of the available opportunities should be considered; relevant costs are therefore sometimes referred to as incremental costs. For example, if an employee is expected to have no other work to do during the next week, but will be paid his basic wage (of, say, $200 per week) for attending work and doing nothing, his manager might decide to give him a job which earns only $140. The net gain is $140 and the $200 is irrelevant to the decision because although it is a future cash flow, it will be incurred anyway whether the employee is given work or not.

The net cash inflows from a project can be calculated as the incremental contribution earned minus any incremental fixed costs which are additional cash items of expenditure (that is, ignoring depreciation and so on).

Definition

Relevant costs are therefore future, incremental cash flows.
5.3 Non-relevant costs

A number of terms are used to describe costs that are *irrelevant for decision making* because they are either not future cash flows or they are costs which will be incurred anyway, regardless of the decision that is taken.

Any costs incurred in the past, or any *committed costs* which will be *incurred regardless* of whether or not an investment is undertaken, are *not relevant cash flows*. They have occurred, or will occur, whatever investment decision is taken. This includes *centrally-allocated overheads* that are not a consequence of undertaking the project.

**Definitions**

A *sunk cost* is a cost which has already been incurred and hence should not be taken account of in decision making. Examples are:

- Research and development costs that have already been incurred, so are not relevant to the current decision making process
- Costs of commissioning a market research survey in a previous accounting period
- The cost of refurbishing a building which has already been incurred but which might now be brought into use for a different purpose

A *committed cost* is a future cash outflow that will be incurred anyway, whatever decision is taken now about alternative opportunities.

**Worked Example: Relevant and non-relevant costs**

A company is planning to embark on production of a new product. It has already undertaken market research at a cost of $5,000. Production will require the purchase of a new machine which will cost $200,000 and which will be depreciated over 5 years. An existing machine which is currently lying idle will also be used and as a result annual depreciation of a further $15,000 will be allocated to the new product. The new product is expected to generate a net additional contribution of $40,000 per annum.

Decide which flows are relevant to the decision to go ahead with the new product and explain the treatment of each one.

**Solution**

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost (in $)</th>
<th>Relevant</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market research</td>
<td>$5,000</td>
<td>Not relevant</td>
<td>This has already been incurred and is a sunk cost</td>
</tr>
<tr>
<td>New machine</td>
<td>$200,000</td>
<td>Relevant</td>
<td>Future incremental cash flow</td>
</tr>
<tr>
<td>Depreciation on new machine</td>
<td>$40,000</td>
<td>Not relevant</td>
<td>Not cash</td>
</tr>
<tr>
<td>Depreciation on currently idle machine</td>
<td>$15,000</td>
<td>Not relevant</td>
<td>Not cash and simply a reallocation of existing overheads</td>
</tr>
<tr>
<td>Additional contribution</td>
<td>$40,000 p.a.</td>
<td>Relevant</td>
<td>Future incremental cash flow</td>
</tr>
</tbody>
</table>

5.4 Relevant costs

Relevant costs can be further refined into the following categories. They are relevant because they make a direct impact on decision-making.
5.4.1 **Opportunity costs**
These are the costs incurred or revenues lost from diverting existing resources from their best use.

**Worked Example: Opportunity costs**
If a salesman, who is paid an annual salary of $30 000, is diverted to work on a new project and as a result existing sales of $50 000 are lost, the opportunity cost to the new project will be the $50 000 of lost sales. The salesman’s salary of $30 000 is *not* an opportunity cost since it will be incurred however the salesman’s time is spent.

5.4.2 **Residual value**
The residual value or disposal value of equipment at the end of its life, or its disposal cost.

5.4.3 **Working capital**
If a company invests $20 000 in working capital and earns cash profits of $50 000, the net cash receipts will be $30 000. Working capital will be released again at the end of a project’s life, and so there will be a cash inflow arising out of the eventual realisation into cash of the project’s inventory and receivables in the final year of the project.

**Worked Example: Working capital**
A company is considering investing in a three year project. In addition to the $200 000 cost of setting up the machine, $10 000 of working capital is required immediately. The working capital requirement is expected to increase by 10% per annum but will be released at the end of the project when the machine will be scrapped.

What are the relevant cash flows?

**Solution**
The amount and timing of the relevant cash flows would be as follows:

<table>
<thead>
<tr>
<th>Timing</th>
<th>Flow</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Machine</td>
<td>(200 000)</td>
</tr>
<tr>
<td>0</td>
<td>Working capital for Year 1</td>
<td>(10 000)</td>
</tr>
<tr>
<td>1</td>
<td>Working capital for Year 2</td>
<td>(1 000)</td>
</tr>
<tr>
<td>2</td>
<td>Working capital for Year 3</td>
<td>(1 100)</td>
</tr>
<tr>
<td>3</td>
<td>Release working capital</td>
<td>12 100</td>
</tr>
</tbody>
</table>

Note that after the initial investment in working capital has been made, only the incremental investment is recorded e.g. if the working capital requirement is increasing by 10% p.a., $11 000 (10 000 x 1.10) is required at the start of the second year of the project. Since $10 000 has already been invested, the relevant cash flow is the incremental $1 000.

The full amount invested in working capital is then released at the end of the project’s life i.e. $10 000 + $1 000 + $1 100.

**Note:** This is the Working Capital Cycle.
5.4.4 **Other relevant costs**

Costs that will often need to be considered include:

(a) **Infrastructure costs** such as additional information technology or communication systems.

(b) **Marketing costs** may be substantial, particularly of course if the investment is in a new product or service. They will include the costs of market research, promotion and branding and the organisation of new distribution channels.

(c) **Human resource costs** including training costs and the costs of reorganisation arising from investments.

5.4.5 **Tax**

The extra taxation that will be payable on extra profits, or the reductions in tax arising from operating losses in any year. The inclusion of tax in investment appraisal is considered in more detail in Chapter 2.

5.5 **Relevant benefits of investments**

The benefits from a proposed investment must also be evaluated. These might consist of benefits of several types:

(a) **Savings** because assets or resources used currently will no longer be required. The savings should include:

   (i) savings in staff costs.
   (ii) savings in other operating costs, such as fuel costs or consumable materials.

(b) Extra savings or revenue benefits because of the improvements or enhancements that the investment might bring:

   (i) more sales revenue and so additional contribution.
   (ii) more efficient system operation.
   (iii) further savings in staff time, resulting perhaps in reduced future staff growth.

(c) Possibly, some one-off **revenue benefits** from the sale of assets that are currently in use, but which will no longer be required.

(d) Some benefits might be **intangible**, or impossible to give a money value to:

   (i) greater customer satisfaction, arising from a more prompt service (e.g. because of a computerised sales and delivery service).
   (ii) improved staff morale from working with higher-quality assets.
   (iii) better decision making may result from better information systems.

**Worked Example: Relevant cash flows**

Elsie is considering the manufacture of a new product which would involve the use of both a new machine (costing $150 000) and an existing machine, which cost $80 000 two years ago and has a current net book value of $60 000. There is sufficient capacity on this machine, which has so far been under-utilised. Annual sales of the product would be 5 000 units, selling at $32 per unit. Unit costs would be as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct labour (4 hours at $2 per hour)</td>
<td>8</td>
</tr>
<tr>
<td>Direct materials</td>
<td>7</td>
</tr>
<tr>
<td>Fixed costs including depreciation</td>
<td>24</td>
</tr>
</tbody>
</table>

The project would have a five-year life, after which the new machine would have a net residual value of $10 000. Because direct labour is continually in short supply, labour resources would have to be diverted from other work which currently earns a contribution of $1.50 per direct labour hour. The fixed overhead absorption rate would be $2.25 per hour ($9 per unit) but actual expenditure on fixed overhead would not alter.
Working capital requirements would be $10,000 in the first year, rising to $15,000 in the second year and remaining at this level until the end of the project, when it will all be recovered. The company’s cost of capital is 20%. Ignore taxation.

You are required to identify the relevant cash flows for the decision as to whether or not the project is worthwhile.

**Solution**

The relevant cash flows are as follows:

$\begin{align*} 
(a) & \quad \text{Year 0} \quad \text{Purchase of new machine} \quad 150,000 \\
(b) & \quad \text{Years 1-5} \quad \text{Contribution from new product} \quad (5,000 \times (32 - 15)) \quad 85,000 \\
& \quad \text{} \quad \text{Less contribution forgone} \quad (5,000 \times (4 \times 1.5)) \quad 30,000 \\
& \quad \text{} \quad \text{Total} \quad 55,000 \\
(c) & \quad \text{The project requires $10,000 of working capital at the end of Year 1 and a further $5,000 at the start of Year 2. Increases in working capital reduce the net cash flow for the period to which they relate. When the working capital tied up in the project is 'recovered' at the end of the project, it will provide an extra cash inflow (for example, debtors will eventually pay up).} \\
(d) & \quad \text{If at the end of the project the new machine is to be sold for $10,000 then this is an incremental cash flow. If the $10,000 represents the expected book value of the machine in the accounts after five years then it is an accounting value and is not relevant.} \\

All other costs, which are past costs, notional accounting costs or costs which would be incurred anyway without the project, are not relevant to the investment decision.

**Question 3: Relevant cash flows**

Bat has spent $2 million developing a new product and a further $800,000 on market research to find out whether a market launch would be worth undertaking. The findings of the market research were as follows:

(a) To launch the product on the market, the company would have to spend a further $800,000 on equipment. This would be depreciated over three years by the straight-line method, and would have an estimated resale value of $200,000 at the end of this time.

(b) The product would have a life of just three years, and profits after depreciation would be $500,000 in the first year, $600,000 in the second year and $300,000 in the third year.

(c) There would be an initial investment of $120,000 in working capital in the first year and a further $140,000 of working capital would be needed in Year 2.

(d) Instead of investing in the product launch, the company could sell the rights to the product to another company for $500,000.

What are the estimated cash flows from this project?

(The answer is at the end of the chapter)

### 6 The payback method

**Section overview**

- The payback period is the time required for the cash inflows from a project to recoup the cash outlays.
- A project would be undertaken if its expected payback is sooner than the maximum allowed. If there are two mutually exclusive investments, the investment with the earlier payback would be chosen.
## 6.1 Payback period

### Definition

The **payback period** is the length of time required before the total of the cash inflows received from a project is equal to the cash outflows, and is usually expressed in years. In other words, it is the length of time the investment takes to pay itself back.

When deciding between two or more competing projects, the usual decision is to accept the one with the shortest payback.

Payback is often used as a 'first screening method'. By this, we mean that when a capital investment project is being considered, the first question to ask is: 'How long will it take to pay back its cost?' The organisation might have a target payback, and so it would reject any capital project unless its payback period were less than a certain number of years.

Having got through the payback test, ideally a project should then be evaluated with a more sophisticated investment appraisal technique (see Section 8).

You should note that when payback is calculated, we take profits **before** depreciation. This is because we are trying to calculate the **cash** returns from a project: profit before depreciation is an estimate of cash flows.

### Worked Example: Payback period

A company is considering an investment in a project to acquire new equipment costing $80 000. The equipment would have a five-year life and no residual value at the end of that time. The straight-line method of depreciation is used. The expected profits after depreciation from investing in the equipment are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15 000</td>
</tr>
<tr>
<td>2</td>
<td>15 000</td>
</tr>
<tr>
<td>3</td>
<td>16 000</td>
</tr>
<tr>
<td>4</td>
<td>24 000</td>
</tr>
<tr>
<td>5</td>
<td>20 000</td>
</tr>
</tbody>
</table>

What is the payback period for the investment?

### Solution

The payback period is calculated from the cumulative annual profits **before** depreciation and we have been given profit after depreciation. Annual depreciation is $16 000, and the profit before depreciation each year is found simply by adding back the $16 000 to the annual profit estimate.

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment</th>
<th>Profit before depreciation</th>
<th>Cumulative profit before depreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(80 000)</td>
<td></td>
<td>(80 000)</td>
</tr>
<tr>
<td>1</td>
<td>31 000</td>
<td>(49 000)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>31 000</td>
<td>(18 000)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>32 000</td>
<td>14 000</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>40 000</td>
<td>54 000</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>36 000</td>
<td>90 000</td>
<td></td>
</tr>
</tbody>
</table>

Payback occurs when the cumulative profits stop being negative and start to be positive. This will happen some time during Year 3 (or after three years if cash flows are assumed to arise at the end of each year).

If it is assumed that profits each year arise at an even rate throughout the course of the year, the payback period can be calculated in years and months:
Payback = \( Y \) years + \( \left( \frac{B}{(B + E)} \times 12 \text{ months} \right) \)

where:
\( Y \) = the number of complete years before payback. This is the year before the one in which payback occurs.
\( B \) = the cumulative profits before depreciation at the beginning of the payback year, ignoring the negative value.
\( E \) = the cumulative profits before depreciation at the end of the payback year.

In this example:
\[
\text{Payback} = 2 \text{ years} + \left( \frac{18000}{18000 + 14000} \times 12 \text{ months} \right)
\]
\[
= 2 \text{ years 7 months (to the nearest month)}
\]

### 6.2 Disadvantages of the payback method

There are a number of drawbacks to the payback method:

- **a** The choice of a maximum payback period for an investment is arbitrary and subjective.
- **b** It ignores all cash flows after the end of the payback period, and so is not concerned with the total expected returns from the investment.

For example, suppose that the maximum payback period that a company selects for its investments is four years, and it is considering two mutually exclusive projects, X and Y, each costing $80,000.

Project X would be expected to make total profits of $100,000 and pay back within two years.

Project Y would be expected to make total profits of $500,000, but only pay back after five years.

On the basis of payback alone, project X would be preferred, despite its lower total profitability.

- **c** It ignores time value of money.
- **d** If the objective of a company is to maximise the wealth of its shareholders, it would be wrong to ignore the future profits from an investment after an arbitrary cut-off date for payback. Using a payback cut-off limit is inconsistent with shareholder wealth maximisation.
- **e** The payback method ignores the timing of cash flows within the payback period and the time value of money (a concept incorporated into the DCF appraisal methods that are considered later). This means that it does not take account of the fact that $1 today is worth more than $1 in one year’s time (see Section 7).
- **f** The method is unable to distinguish between projects with the same payback period.
- **g** It may lead to excessive investment in short-term projects.

### 6.3 The payback method in practice

Despite the theoretical limitations of the payback method, it is widely used in practice. There are a number of reasons for this:

- **a** It is simple to calculate and simple to understand, and this may be important when management resources are limited. It is similarly helpful in communicating information about minimum requirements to managers responsible for submitting projects.
- **b** It is a particularly useful approach for ranking projects where a firm faces liquidity constraints and requires a fast repayment of investments.
- **c** It is appropriate in situations where risky investments are made in uncertain markets that are subject to fast design and product changes or where future cash flows are particularly difficult to predict.
- **d** Most managers see risk as time-related: the longer the period, the greater the chance of failure. The payback method, by concentrating on the early cash flows, therefore uses data in which they have confidence. The justification for this is that cash flows tend to be correlated over time and hence if cash flows are below the expected level in early years, this pattern will often continue.
- **e** The method is often used in conjunction with the NPV or IRR method and acts as a first screening device to identify projects which are worthy of further investigation.
- **f** It provides an important summary method: how quickly will the initial investment be recouped?
**Question 4: Payback period**

A company carries out capital project appraisal using payback. It will not undertake any project unless the payback is within three years.

A project is currently being considered. It would involve expenditure of $150,000 on an asset. The project's life would be five years and at the end of this time the asset would have no residual value. A working capital investment of $15,000 would be required.

The annual profits before depreciation from the project would be:

<table>
<thead>
<tr>
<th>Year</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10,000</td>
</tr>
<tr>
<td>2</td>
<td>40,000</td>
</tr>
<tr>
<td>3</td>
<td>80,000</td>
</tr>
<tr>
<td>4</td>
<td>70,000</td>
</tr>
<tr>
<td>5</td>
<td>50,000</td>
</tr>
</tbody>
</table>

**Required**

(a) What is the payback period for the project?
(b) On the basis of the company's investment criterion, would this project be undertaken?

(The answer is at the end of the chapter)

---

**7 The time value of money**

**Section overview**

- The concept of time value of money recognises that $1 today is worth more than $1 at a future time, because money can be reinvested to earn more money over time.

**Definition**

The **time value of money** describes the concept that the earlier cash is received, the greater value it has to the recipient. Conversely, the later a cash payment is made, the less the cost to the payer.

Investors put money into shares in the expectation of getting back, over time, an amount in excess of their original investment. The idea of investing cash to make more money should be a familiar concept to you.

If you put money into a deposit account, you will expect to get your money back with interest. If the interest is not high enough, you will look somewhere else to invest.

In the same way, an investor buying shares expects a return in the form of dividends plus the eventual disposal price of the shares when he decides to sell them. If the expected returns are not high enough to justify the purchase price of the shares, he will not buy the shares, but put his money into another investment instead.

The same principle applies to investments by companies. The cash returns from long-term investments should be sufficient to provide an adequate return; otherwise, the investment should not be undertaken.

The required return on an investment consists of three elements, for any investor:

(a) **An opportunity cost.** This is the return that could be obtained by investing in something else. In financial management, the opportunity cost of an investment is usually expressed in terms of the return that could be obtained by putting money into a risk-free (and inflation-proof) investment.

(b) **An amount to cover inflation.** Inflation erodes the value of money over time, and an investor will expect the return on investment to cover the effect of inflation as well as to provide a 'real' return.

(c) **An amount to reward the investor for the risk** in the investment. Higher returns are expected from investments with a higher risk element.
An investment return is expressed as a percentage of the amount invested for each year of investment. The longer the investment, the greater the required return. This too should be a familiar idea to you. If you put cash into a deposit account, you will expect to earn interest, and the longer you keep the money on deposit, the more interest you will expect to earn.

We must therefore recognise that if a capital investment is to be worthwhile, it must earn at least a minimum profit or return so that the size of the return will compensate the investor (the business) for the length of time which the investor must wait before the profits are made. For example, if a company could invest $60 000 now to earn revenue of $63 000 in one week’s time, a profit of $3 000 in seven days would be a very good return. If it takes three years to earn the revenue, however, the return would be very low.

When capital expenditure projects are evaluated, it is therefore appropriate to decide whether the investment will make enough profits to allow for the ‘time value’ of capital tied up.

The time value of money reflects people’s time preference for $1 now over $1 at some time in the future. Discounted cash flow (DCF) is an evaluation technique which takes into account the time value of money.

8 Discounted cash flow techniques

Section overview

- In DCF, expected future cash flows (inflows and outflows) are converted into a present value equivalent amount.
- The present value of a future cash flow is the amount that would have to be invested now, at the organisation’s cost of capital, to earn the future cash flow at the future time.
- The cost of capital used in DCF is the cost of funds that a company raises and uses, and the return that investors expect to be paid for putting funds into the company.

Definition

Discounted cash flow (DCF), is an investment appraisal technique which takes into account both the timings of cash flows and also total profitability over a project’s life.

Two important points about DCF are as follows:

(a) Like payback, DCF looks at the cash flows of a project, not the accounting profits (as discussed in Section 5).
(b) DCF takes account of the time value of money (as discussed in Section 7).

The timing of cash flows is taken into account by discounting them.

The effect of discounting is to give a bigger value per $1 for cash flows that occur earlier: $1 earned after one year will be worth more than $1 earned after two years, which in turn will be worth more than $1 earned after five years, and so on.

8.1 Compounding

Suppose that a company has $10 000 to invest, and wants to earn a return of 10 per cent per annum (compound interest) on its investments. This means that if the $10 000 could be invested at 10 per cent, the value of the investment with interest would build up as follows:

(a) After 1 year  $10 000 \times (1.10) = $11 000
(b) After 2 years  $10 000 \times (1.10)^2 = $12 100
(c) After 3 years  $10 000 \times (1.10)^3 = $13 310 and so on.

This is compounding.
Formula to learn

The formula for the future value of an investment plus accumulated interest after n time periods is:

\[
FV = PV (1 + r)^n
\]

where:
- \(FV\) is the future value of the investment with interest.
- \(PV\) is the initial or 'present' value of the investment.
- \(r\) is the compound rate of return per time period, expressed as a proportion (so 10% = 0.10, 5% = 0.05 and so on).
- \(n\) is the number of time periods.

Worked Example: Compounding

What is the future value of $12,500 invested for four years at a compound interest rate of 5% p.a.?

Solution

\[
12,500 \times (1.05)^4 = $15,194
\]

8.2 Discounting

Discounting starts with the future amount of a cash flow and converts it into a present value.

A present value is the amount that would need to be invested now to earn the future cash flow, if the money is invested at the 'cost of capital'.

For example, if a company expects to earn a (compound) rate of return of 10% on its investments, how much would it need to invest now to have the following investments?

(a) $11,000 after 1 year
(b) $12,100 after 2 years
(c) $13,310 after 3 years

The answer is $10,000 in each case, and we can calculate it by discounting.

Formula to learn

The discounting formula to calculate the present value of a future sum of money at the end of n time periods is:

\[
PV = \frac{FV}{(1 + r)^n}
\]

(a) After 1 year, $11,000 \times \frac{1}{1.10^1} = $10,000
(b) After 2 years, $12,100 \times \frac{1}{1.10^2} = $10,000
(c) After 3 years, $13,310 \times \frac{1}{1.10^3} = $10,000

Discounting can be applied to both money receivable and also to money payable at a future date. By discounting all payments and receipts from a capital investment to a present value, they can be compared on a common basis, at a value which takes account of when the various cash flows will take place.
**Worked Example: Discounting**

Stockbridge is due to receive $50,000 in four years’ time. What is the present value of the receipt at an interest rate of 5%?

**Solution**

\[ $50,000 \times \frac{1}{(1.05)^4} = $41,135 \]

**Definition**

**Present value** can be defined as the cash equivalent ‘now’ of a future sum of money receivable or payable at a future date, assuming that money ‘now’ can be invested at a given rate of return (known as the ‘cost of capital’). A present value is calculated by discounting the future cash flow to its present value equivalent amount.

### 8.3 Discount factors

To make it easier to discount future cash flows to a present value, **discount factor** tables are available. These tables give the value of \( \frac{1}{(1+r)^n} \) for any cost of capital (value of \( r \)) and any future year (any value of \( n \)).

**Exam comments**

In your examination, you will be given any discount factors that you might need to use to make a DCF appraisal. You will find the relevant tables at the back of this book.

Any cash flows that take place ‘now’, at the start of a project, take place in Year 0. The discount factor for year 0 is 1.0. This means simply that cash flows occurring ‘now’ do not need to be discounted to convert them to a present value equivalent, because they are already at present value.

**Worked Example: Spender**

Spender expects the cash inflow from an investment to be $40,000 after two years and another $30,000 after three years. Its target rate of return is 12%. Calculate the present value of these future returns, and explain what this present value signifies.

The following discount factors might be relevant:

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.893</td>
</tr>
<tr>
<td>2</td>
<td>0.797</td>
</tr>
<tr>
<td>3</td>
<td>0.712</td>
</tr>
<tr>
<td>4</td>
<td>0.636</td>
</tr>
</tbody>
</table>

**Solution**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor at 12%</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>40 000</td>
<td>0.797</td>
<td>31 880</td>
</tr>
<tr>
<td>3</td>
<td>30 000</td>
<td>0.712</td>
<td>21 360</td>
</tr>
</tbody>
</table>

The present value of the future returns, discounted at 12%, is $53,240. This means that if Spender can invest now to earn a return of 12% on its investments, it would have to invest $31,880 to earn $40,000 after two years plus $21,360 to earn another $30,000 after three years.
8.4 The cost of capital

The cost of capital used in DCF is the cost of funds that a company raises and uses, and the return that investors expect to be paid for putting funds into the company. It is therefore the minimum return that a company should make from its own investments, to earn the cash flows out of which investors can be paid their return.

In Chapter 6 we look at how the cost of capital can be measured by studying the returns required by investors. This cost of capital is then used to derive a discount rate for DCF analysis and investment appraisal.

For the time being, the 'cost of capital' is assumed to be a known figure.

8.5 Annuities

Definition

An annuity is a constant annual cash flow, for a number of years.

An example of an annuity would be, say, cash receipts of $50 000 a year for six years, Years 1 to 6. To save time with calculating the present value of all the individual annual cash flows of an annuity, tables are available for the cumulative discount factors. Annuity tables give the total of all the discount factors for each year in Year 1 to Year n, for a given cost of capital r.

For example, the annuity factor for a cost of capital of 12% for Years 1 to 3 is 2.402. This is simply the sum of the discount factors for Years 1, 2 and 3.

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.893</td>
</tr>
<tr>
<td>2</td>
<td>0.797</td>
</tr>
<tr>
<td>3</td>
<td>0.712</td>
</tr>
<tr>
<td>1 - 3</td>
<td>2.402</td>
</tr>
</tbody>
</table>

If the amount of the annual cash flow for Years 1 to 3 is, say, $10 000 per annum, and the cost of capital is 12 per cent, it is quicker to calculate the present value of these cash flows in one calculation ($10 000 \times 2.402 = $24 020) instead of having to calculate the present value for the cash flow in each individual year and then add up the total.

An alternative to using the tables is to calculate the annuity factor using the following formula:

\[
PV = \frac{\text{Annual cash flow}}{r} \left( \frac{1 - \frac{1}{(1 + r)^n}}{r} \right)
\]

where \( r \) is the discount rate, expressed as a decimal.

Worked Example: Discounting

Stockbridge is due to receive a grant of $10 000 every year for five years. What is the present value of the grant at an interest rate of 8%?

Solution

\[ $10 000 \times \text{AF1-5 @ 8\%} = $10 000 \times 3.993 = $39 930 \]
8.6 Perpetuities

A perpetuity is a constant annual cash flow that continues indefinitely (a perpetual annuity).

Formula to learn

The present value of a perpetuity is given by:

\[ PV = \frac{\text{Annual cash flow}}{r} \]

where \( r \) is the discount rate, expressed as a decimal.

Worked Example: Perpetuity

Therefore the present value of $400 to be received annually, for ever, if the cost of capital is 8 per cent per annum, is:

\[ PV(T_{\infty}) = \frac{400}{0.08} = 5000 \]

Notice that the value of the perpetuity is finite because the cash flows that arise far into the future will have very low present values.

9 Financial mathematics

Section overview

- Financial mathematics refers to a collection of mathematical techniques that can be applied to finance and the financial markets.
- If cash flows occur at non-annual intervals — e.g. a month, week, or day — it is possible to calculate an effective interest rate for the relevant time period. Alternatively, if the interest rate for the period is known, it is possible to calculate the equivalent annual rate.

9.1 Mathematical techniques

You will come across a variety of mathematical techniques in this Study Manual which are applied in the world of finance:

- Discounting techniques (investment appraisal) — Chapters 1 and 2.
- Ascertaining the fair values of shares and securities (investment strategies) — Chapter 6.
- Calculating risk and return (using mean-variance estimates) of asset portfolios to judge investment strategies — Chapter 7.
- Methods of understanding and quantifying risk (risk management) — Chapter 9.
- Pricing of financial instruments and derivatives (hedging) — Chapter 10.
9.2 Effective interest rates

So far we have considered annual interest rates.

With periods of time other than a year – e.g. a month, week, or day – it is possible to calculate an effective interest rate for the relevant time period. Alternatively, if the interest rate for the period is known, it is possible to calculate the equivalent annual rate.

**Formula to learn**

The general relationship is:

\[ r = (1 + i_e)^n - 1 \]

where:

- \( r \) = annual interest rate.
- \( i_e \) = effective interest rate for the subperiod.
- \( n \) = number of subperiods within a year.

or alternatively,

\[ i_e = (1 + r)^{\frac{1}{n}} - 1 \]

**Worked Example: Finding the annual interest rate from an effective monthly interest rate**

Annual interest rate, with monthly effective rate of 1% can be calculated as follows:

Using \( r = (1 + i_e)^n - 1 \)

\[ i_e = 0.01 \]
\[ n = 12 \]

hence:

\[ r = (1 + 0.010)^{12} - 1 \]
\[ = 0.127 \]
\[ = 12.7\% \]

**Worked Example: Finding an effective monthly interest rate from a given annual rate**

If the annual interest rate is 10%, the effective interest rate per month can be calculated as follows:

Using \( i_e = (1 + r)^{\frac{1}{n}} - 1 \)

where: \( r = 0.1 \) and \( n = 12 \)

\[ i_e = (1 + 0.1)^{\frac{1}{12}} - 1 \]
\[ = 0.00797 \]
\[ = 0.797\% \]

So an annual interest rate of 10% is the same as an effective monthly rate of just under 0.8%.

This technique can be developed in order to calculate the present value of cashflows that arise at non-annual intervals.
**Worked Example: PV of non-annual cash flows**

Calculate the present value of $100 to be received monthly in perpetuity, if the annual interest rate is 10%, and the effective monthly rate of interest is 0.797%.

**Solution**

\[ r = 10\% \]
\[ i_e = 0.797\% \text{ as calculated above} \]
\[ \text{PV of perpetuity} = \$100 \times \frac{1}{0.00797} \]
\[ = \$12\,547 \]

---

**9.3 Loan calculations**

The mathematical principles in this chapter can be applied to determine the required repayments for a loan.

**Worked Example: Finding the repayments for a loan**

Chris took out a loan of $200,000 and agreed to repay it over 20 years, through equal monthly instalments. If the interest rate for the loan was fixed at 8% per annum for the term of the loan, what is the amount of each monthly instalment?

**Solution**

If the annual interest rate is 8%, the effective interest rate per month can be calculated as follows:

Using \( i_e = (1 + r)^{1/n} - 1 \)

where: \( r = 0.08 \) and \( n = 12 \)
\[ i_e = (1 + 0.08)^{1/12} - 1 \]
\[ = 0.00643 \]
\[ = 0.643\% \]

Using the annuity formula (Section 8.5):

\[
\text{PV} = \frac{\text{Annual cash flow}}{r} \left( \frac{1 - \frac{1}{(1+r)^n}}{1} \right)
\]

Here we need to derive a monthly cashflow, using an effective monthly discount rate of 0.643% and 240 periods (20 years x 12 months).
\[
200\,000 = \frac{\text{Monthly repayment}}{0.00643} \left( \frac{1 - \frac{1}{1.00643^{240}}}{1} \right)
\]

Annuity factor = 122

\[
200\,000 = \text{Monthly repayment} \times 122
\]

Therefore, monthly repayment = \( \frac{200\,000}{122} = $1\,639 \)
Key chapter points

- Investment is spending with a view to obtaining future benefits, and might be long-term or short-term. It can be divided into capital expenditure and revenue expenditure.

- Capital expenditure is spending on non-current assets. Capital projects involve capital expenditure with a view to obtaining long-term benefits, and there may also be some investment in working capital.

- Capital budgeting is the process of identifying, analysing and selecting investment projects whose returns are expected to extend beyond one year.

- Capital investment or capital budget decisions normally involve whether to invest in long-term projects and/or capital equipment. These projects will typically have a major effect on operations for a number of years to come.

- A typical model for investment decision making has a number of distinct stages.
  - Origin of proposals.
  - Project screening.
  - Analysis and acceptance.
  - Monitoring and review.

- Although capital investment decisions by commercial organisations are largely finance-driven, non-financial factors can affect a decision. Non-financial factors include legal issues, ethical issues, political and regulatory issues, quality issues and employee issues.

- Methods of financial appraisal of capital projects include return on capital employed (ROCE), the payback method and a number of discounted cash flow methods (NPV, IRR, discounted payback).

- ROCE = the accounting profits from the project (after deducting depreciation), expressed as a percentage of the amount invested. It is also known as accounting rate of return (ARR) or return on investment (ROI).

- There are a number of different methods for calculating ROCE. Typically, profit is the average annual profit and the amount invested is measured as the average investment over the life of the project. Alternatives are to base the calculation on the total initial capital investment or to use the total profits over the life of the project.

- The expected return on capital employed for the project is calculated, and compared with a pre-determined minimum target rate of return. The project is justified financially if its expected ROCE exceeds the minimum target.

- If there are two mutually exclusive investments, the investment with the higher ROCE would be chosen.

- The ROCE method fails to give any consideration to the timing of cash flows over the life of a project, and is based on accounting profits, not cash flows. This is a serious weakness and this method should not be used in isolation.

- All other methods of project appraisal (Payback, NPV, IRR) focus on the expected cash flows of the project, not accounting profits. The cash flows to take into consideration are the relevant cash flows of the project. Relevant cash flows are future cash flows arising as a direct consequence of the investment. These may be extra revenues, extra costs, savings in costs or reductions in revenue.

- Relevant costs of investment appraisal include opportunity costs, working capital costs and wider costs such as infrastructure and human development costs. Non-relevant costs include past costs and committed costs.
• Relevant benefits from investments include not only increased cash flows, but also savings and better relationships with customers and employees.

• Payback is the time required for the cash inflows from a project to recoup the initial cash outlays. A project would be undertaken if its expected payback is sooner than the maximum allowed. If there are two mutually exclusive investments, the investment with the earlier payback would be chosen.

• The payback method of investment appraisal is a popular appraisal technique despite the fact that it ignores the total amount of returns from a project over its life and should not be used in isolation. It is a useful first screening tool and helpful for a business concerned about liquidity.

• The concept of time value of money recognises that $1 today is worth more than $1 at a future time, because money can be reinvested to earn more money over time.

• In discounted cashflow (DCF), expected future cash flows (inflows and outflows) are converted into a present value equivalent amount.

• The present value of a future cash flow is the amount that would have to be invested now, at the organisation’s cost of capital, to earn the future cash flow at the future time.

• An annuity is a constant annual cash flow, for a definite number of years.

• A perpetuity is a constant annual cash flow that continues indefinitely (a perpetual annuity).

• The cost of capital used in DCF is the cost of funds that a company raises and uses, which is the equivalent of the return that investors expect to be paid for putting funds into the company.

• Financial mathematics refers to a collection of mathematical techniques that can be applied to finance and the financial markets.

• If cash flows occur at non-annual intervals – e.g. a month, week, or day – it is possible to calculate an effective interest rate for the relevant time period. Alternatively, if the interest rate for the period is known, it is possible to calculate the equivalent annual rate.
Quick revision questions

1 List four possible non-financial factors that might affect an investment decision.

2 In calculating ROCE, the profit figures to be used are before deducting depreciation charges. Is this statement true or false?
   A true
   B false

3 Which of the following can be used to calculate the return on capital employed?
   (i) \[
   \frac{\text{Estimated average annual profits}}{\text{Estimated average investment}} \times 100\%
   \]
   (ii) \[
   \frac{\text{Estimated total profits}}{\text{Estimated initial investment}} \times 100\%
   \]
   (iii) \[
   \frac{\text{Estimated average annual profits}}{\text{Estimated initial investment}} \times 100\%
   \]
   A All of the above
   B None of the above
   C (i) and (iii) only
   D (ii) only

4 Investment in a project would include a requirement for $20,000 of working capital at the start of year 1, rising to $35,000 at the start of year 2. The project would have a six-year life. In carrying out a financial appraisal of this project, what would be the investment 'cash flows' for working capital?
   Year 1  Year 2  Year 6
   A -20,000 -35,000 +55,000
   B +20,000 +35,000 -55,000
   C -20,000 -15,000 +35,000
   D +20,000 +35,000 -55,000

5 White Pty Ltd is about to carry out an investment appraisal on a project. If the project is undertaken, a machine will be used that cost $300,000 when it was purchased two years ago and has a current written down value of $250,000. If the project is not undertaken, the machine could either be sold for $150,000 or used for another purpose. If it is used for another purpose, the company will be spared the cost of acquiring a new machine for $220,000. However, some improvements to the existing machine, costing $20,000, will be necessary.

   What is the relevant cost of the machine for investment appraisal purposes?
   A $300,000
   B $250,000
   C $200,000
   D $150,000

6 Using the payback method, the cash flows from a project are considered after deducting depreciation. Is this statement true or false?
   A true
   B false
Cheshire has developed a revolutionary form of tyre gauge at a cost of $300 000 to date. To produce the tyre gauge, a new machine will be acquired immediately at a cost of $750 000. The machine will be sold at the end of the five years for $350 000 and will be depreciated over its life using the straight-line method.

The tyre gauge has an expected life of five years and estimated future profits from the product are:

<table>
<thead>
<tr>
<th>Years</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$000</td>
<td>$000</td>
<td>$000</td>
<td>$000</td>
<td>$000</td>
<td>$000</td>
</tr>
</tbody>
</table>

Estimated profit:

- 1 year: $80 000
- 2 years: $160 000
- 3 years: $240 000
- 4 years: $140 000
- 5 years: $130 000

What is the payback period for the new tyre gauge? (To the nearest month)

A) 3 years 2 months
B) 4 years 2 months
C) 4 years 3 months
D) 4 years 11 months

What is the future value in four years' time of $10 000 invested today at a compound interest rate of 4 per cent per annum?

A) $10 400
B) $9 600
C) $11 699
D) $11 600
Answers to quick revision questions

1  Factors might include legal issues, ethical issues, regulatory issues, political issues, quality issues, employee issues, environmental factors, or social responsibility factors.

2  B  False. ROCE is based on profits after deducting depreciation

3  A  All three could be used, although (a) Estimated average annual profits Estimated average investment × 100% is generally best.

4  C  Working capital represents an investment in the project and therefore the initial requirement in Year 1 is a negative cash flow of $15,000. In Year 2 we account for the incremental investment only ($20,000). At the end of the project, Year 6, the total amount tied up in working capital is released as a positive cash flow of $35,000.

5  C  The best alternative use for the machine is to use it for another purpose, saving a net $220,000 – $20,000 = $200,000, rather than selling it for $150,000. The project should therefore be charged with the cost of this lost opportunity.

6  B  False. Depreciation is not a cash flow, and must be ignored in the calculation of payback. The cash flows are therefore before deducting depreciation.

7  A  The payback period is calculated as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual inflows</th>
<th>Cumulative inflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>2</td>
<td>240</td>
<td>400</td>
</tr>
<tr>
<td>3</td>
<td>320</td>
<td>720</td>
</tr>
<tr>
<td>4</td>
<td>220</td>
<td>940</td>
</tr>
<tr>
<td>5</td>
<td>560</td>
<td>1,500</td>
</tr>
</tbody>
</table>

The payback period is:

3 years + ((750 – 720)/(940 – 720) × 12) = 3 years 2 months

8  C  $10,000 × 1.044 = $11,699
Answers to chapter questions

1

Annual depreciation = $150 000/5 years = $30 000 per annum

<table>
<thead>
<tr>
<th>Year</th>
<th>Capital expenditure $</th>
<th>Working capital investment $</th>
<th>Net operating profit after depreciation $</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(150 000)</td>
<td>(15 000)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(20 000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10 000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>50 000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>40 000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>15 000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100 000</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>20 000</td>
<td></td>
</tr>
</tbody>
</table>

The average investment = $75 000 in non-current assets + $15 000 in working capital = $90 000

ROCE = ($20 000/$90 000) × 100% = 22.2%

The project exceeds the target return of 15% and would be undertaken.

2

(a) Immediate outlay at the start of the first year: $50 000 on equipment.
(b) The cash profits for the first year, measured as operating profit plus depreciation added back, are $14 000 + $10 000 depreciation = $24 000.
(c) Actual operational cash flows will not be $24 000 in Year 1, however, because of the increase in working capital. Some of the increase in profit is 'invested' in inventories and receivables. The actual cash flow is $3 000 lower.
(d) However, it is generally assumed, in investment appraisal, that an investment in working capital occurs at the start of the year, and it is therefore treated as an initial investment rather than, in this example, as a cash flow in Year 1.

If the start of Year 1 is called Year 0 (i.e. the end of the current year), the cash flows in this example would be:

<table>
<thead>
<tr>
<th>Year</th>
<th>Item</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Purchase of equipment</td>
<td>(50 000)</td>
</tr>
<tr>
<td>0</td>
<td>Additional working capital</td>
<td>(3 000)</td>
</tr>
<tr>
<td>0</td>
<td>Total cash flow</td>
<td>(53 000)</td>
</tr>
<tr>
<td>1</td>
<td>Cash profits</td>
<td>24 000</td>
</tr>
</tbody>
</table>

3

The annual depreciation charge would be $200 000 [($800 000 - $200 000)/3 years]. This should be added back to the annual profit after depreciation, to get the cash profit for each year. The resale value of the equipment is a cash inflow at the end of the project.

Costs already incurred are sunk costs and so irrelevant to the current investment decision. The sunk costs in this example are the development costs of $2 million and the market research cost of $800 000.

A decision to go ahead with the product launch will involve not just the cost of the equipment and the working capital investment. There would also be an opportunity cost by choosing not to sell the product rights.
Study the following cash flows carefully, and make sure that you understand how they have been derived.

<table>
<thead>
<tr>
<th></th>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>$000</td>
<td>$000</td>
<td>$000</td>
<td>$000</td>
</tr>
<tr>
<td>Sale opportunity forgone</td>
<td>(800)</td>
<td></td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Working capital</td>
<td>(120)</td>
<td>(140)</td>
<td></td>
<td>260</td>
</tr>
<tr>
<td>Cash profits</td>
<td></td>
<td>700</td>
<td>800</td>
<td>500</td>
</tr>
<tr>
<td>Total cash flow</td>
<td>(1,420)</td>
<td>560</td>
<td>800</td>
<td>960</td>
</tr>
</tbody>
</table>

(a)  

<table>
<thead>
<tr>
<th>Year</th>
<th>Capital expenditure</th>
<th>Working capital investment</th>
<th>Cash flow</th>
<th>Net cash flow p.a.</th>
<th>Cumulative net cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(150 000)</td>
<td>(15 000)</td>
<td>(165 000)</td>
<td>(165 000)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>10 000</td>
<td>10 000</td>
<td>(155 000)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>40 000</td>
<td>40 000</td>
<td>(115 000)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>80 000</td>
<td>80 000</td>
<td>(35 000)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>70 000</td>
<td>70 000</td>
<td>35 000</td>
</tr>
<tr>
<td>5</td>
<td>15 000</td>
<td>50 000</td>
<td>65 000</td>
<td>100 000</td>
<td></td>
</tr>
</tbody>
</table>

The payback time is 3 years + \( \frac{35}{35 + 35} \times 12 \) months = 3\( \frac{1}{2} \) years

(b) The project fails to pay back within the maximum permitted period of three years. The project would not be undertaken.
Chapter 2

Advanced investment appraisal

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital budgeting: ROCE, payback, IRR, NPV</strong></td>
<td>LO1</td>
</tr>
<tr>
<td>Identify and apply the different quantitative methods used in project evaluation</td>
<td>LO1.4</td>
</tr>
<tr>
<td>Explain why investment decisions should be analysed using the NPV method</td>
<td>LO1.5</td>
</tr>
<tr>
<td>Apply the NPV method to investment project scenarios</td>
<td>LO1.6</td>
</tr>
<tr>
<td>Compare and contrast the NPV method with the IRR method of project evaluation</td>
<td>LO1.7</td>
</tr>
<tr>
<td>List the advantages and disadvantages of ROCE, IRR, payback and NPV methods of investment appraisal</td>
<td>LO1.9</td>
</tr>
<tr>
<td>Select investment appraisal techniques which are appropriate to the objectives and circumstances of a given organisation</td>
<td>LO1.10</td>
</tr>
<tr>
<td>Select appropriate values for investment appraisal purposes, taking account of working capital, inflation and tax</td>
<td>LO1.11</td>
</tr>
<tr>
<td>Undertake a sensitivity analysis of diverse projects using appropriate tools</td>
<td>LO1.12</td>
</tr>
<tr>
<td><strong>Cost of funds</strong></td>
<td>LO4</td>
</tr>
<tr>
<td>Analyse capital rationing and draw appropriate conclusions</td>
<td>LO4.1</td>
</tr>
</tbody>
</table>

1. The net present value method of project appraisal
2. Discounted payback
3. The internal rate of return method of project appraisal (IRR)
4. NPV and IRR compared
5. Multiple methods of investment appraisal
6. Sensitivity analysis
7. Capital rationing
8. Allowing for inflation in investment appraisal
9. Allowing for tax in investment appraisal
Introduction

Discounted cash flow (DCF) methods of investment appraisal, such as the net present value (NPV) method and the internal rate of return (IRR) method, are superior to other methods since they take into account the time value of money. The NPV method is conceptually the best since it is directly consistent with the assumed objective of maximisation of shareholder wealth. This chapter looks at the NPV method, the IRR method and the discounted payback method. It also considers the different methods of assessing and taking account of the risk and uncertainty associated with a project, and how to assess projects when capital is a scarce resource. Finally it goes on to consider how inflation and tax can be incorporated into DCF methods of investment appraisal.
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What does the net present value (NPV) of a project tell us, and how is it useful in making a decision about whether to accept the investment? (Section 1.1)
2. What is discounted payback? (Section 2)
3. Assume that the expected NPV of a project is + $3,000 at a discount rate of 8 per cent and + $1,200 at a discount rate of 10 per cent. (Section 3.1)
   Using these figures, estimate the IRR.
4. Which is better as an investment appraisal technique, NPV or IRR? Why? (Section 4.5)
5. What is sensitivity analysis? (Section 6)
6. What is the difference between hard and soft capital rationing? (Section 7.1)
7. How do you choose between projects if capital is rationed at the start of the project? (Section 7.3)
8. What is the difference between the real and money rate of return? (Section 8.1)
9. Why should projects be discounted at the after tax discount rate? (Section 9.1)
1 The net present value method of project appraisal

Section overview

- With the NPV method of project appraisal, all expected cash inflows and all expected cash outflows from the project are discounted to a present value at the organisation’s cost of capital.
- The net present value is the difference between the present value of total benefits and the present value of total costs. Projects with a positive NPV are financially viable, but projects with a negative NPV are not.
- If the PV of benefits exceeds the PV of total costs, the NPV is positive, and the project is expected to earn a return in excess of the organisation’s cost of capital.
- If the PV of benefits is less than the PV of total costs, the NPV is negative, and the project will earn a return that is lower than the organisation’s cost of capital.

1.1 Understanding net present value

**Definition**

Net present value or NPV is the value obtained by discounting all cash outflows and inflows of a capital investment project by a chosen target rate of return or cost of capital. The sum of the present value of all expected benefits from the project and the present value of all expected cash outlays is the ‘net’ present value amount.

The NPV method compares the present value of all the cash inflows from an investment with the present value of all the cash outflows from an investment. The NPV is thus calculated as the PV of cash inflows minus the PV of cash outflows.

- **If the NPV is positive**, it means that the cash inflows from a capital investment will yield a return in excess of the cost of capital, and so the project should be undertaken.
- **If the NPV is negative**, it means that the cash inflows from a capital investment will yield a return below the cost of capital, and so the project should not be undertaken.
- **If the NPV is exactly zero**, the cash inflows from a capital investment will yield a return which is exactly the same as the cost of capital, and so the organisation will be indifferent about whether it undertakes the project or not.

1.2 Assumptions about cash flows

- **A cash outlay incurred at the beginning of an investment project (‘now’) occurs in Year 0.**
- **Cash flows that occur evenly over the course of a year** are assumed to occur all at once at the end of the year. Receipts of $10 000 during Year 1 are therefore taken to occur at the end of Year 1.
- **A cash flow that occurs at the beginning of a year** is taken to occur at the end of the previous year. Therefore, a cash outlay of $5 000 at the beginning of Year 2 is taken to occur at the end of year 1.

- **An increase in working capital** during a year should normally be treated as occurring at the start of the year, and so is a cash outlay at the start of the year/end of the previous year.
- **A decrease in working capital** during a year should also normally be treated as occurring at the start of the year. However, there is an **important exception** to this general rule. **At the end of a project**, any remaining investment in working capital is no longer required, and working capital will therefore be reduced to zero. This reduction in working capital to zero is treated as a cash inflow occurring at the end of the last year of the project.
1.3 Approach to NPV calculations

**Worked Example: Slogger**

Slogger is considering a capital investment, where the estimated cash flows are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor at 15%</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(100 000)</td>
<td>1.000</td>
<td>(100 000)</td>
</tr>
<tr>
<td>1</td>
<td>60 000</td>
<td>0.870</td>
<td>52 200</td>
</tr>
<tr>
<td>2</td>
<td>80 000</td>
<td>0.756</td>
<td>60 480</td>
</tr>
<tr>
<td>3</td>
<td>40 000</td>
<td>0.658</td>
<td>26 320</td>
</tr>
<tr>
<td>4</td>
<td>30 000</td>
<td>0.572</td>
<td>17 160</td>
</tr>
</tbody>
</table>

**Net present value**

The company's cost of capital is 15 per cent. You are required to calculate the NPV of the project and to assess whether it should be undertaken.

**Solution**

The PV of cash inflows exceeds the PV of cash outflows by $56 160, which means that the project will earn a DCF yield in excess of 15 per cent. It should therefore be undertaken.

---

**Question 1: LCH**

LCH manufactures product X which it sells for $5 per unit. Variable costs of production are currently $3 per unit, and fixed costs 50c per unit. A new machine is available which would cost $90 000 but which could be used to make product X for a variable cost of only $2.50 per unit. Fixed costs, however, would increase by $7 500 per annum as a direct result of purchasing the machine. The machine would have an expected life of four years and a resale value after that time of $10 000. Sales of product X are estimated to be 75 000 units per annum. LCH expects to earn at least 12 per cent per annum from its investments. Ignore taxation.

You are required to decide whether LCH should purchase the machine.

The following discount factors are relevant.

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.893</td>
</tr>
<tr>
<td>2</td>
<td>0.797</td>
</tr>
<tr>
<td>3</td>
<td>0.712</td>
</tr>
<tr>
<td>4</td>
<td>0.636</td>
</tr>
</tbody>
</table>

(The answer is at the end of the chapter)
1.4 NPV calculations including use of annuity tables

Worked Example: IMC

IMC is considering the manufacture of a new product which would involve the use of both a new machine (costing $150 000) and an existing machine, which cost $80 000 two years ago but has no resale value. There is sufficient capacity on this machine, which has so far been under-utilised. Annual profits before depreciation would be $40 000.

The project would have a five-year life, after which the new machine would have a net residual value of $5 000.

Working capital requirements would be $10 000 in the first year, rising to $15 000 in the second year and remaining at this level until the end of the project, when it will all be recovered. The company’s cost of capital is 10 per cent.

You are required to assess whether the project is worthwhile.

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 10%</th>
<th>Working capital</th>
<th>Contribution</th>
<th>Net cash flow</th>
<th>Discount factor</th>
<th>PV of net cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.000</td>
<td>150 000</td>
<td></td>
<td>160 000</td>
<td>1.000</td>
<td>160 000</td>
</tr>
<tr>
<td>1</td>
<td>0.909</td>
<td>5 000</td>
<td>40 000</td>
<td>44 000</td>
<td>0.909</td>
<td>40 000</td>
</tr>
<tr>
<td>2-5</td>
<td>0.826</td>
<td></td>
<td>40 000</td>
<td>40 000</td>
<td>0.683</td>
<td>26 420</td>
</tr>
<tr>
<td>5</td>
<td>0.751</td>
<td>5 000</td>
<td>20 000</td>
<td>25 000</td>
<td>0.621</td>
<td>15 420</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NPV = (485)</td>
</tr>
</tbody>
</table>

The NPV is negative (although not by much) and the project is therefore not recommended for acceptance, because it fails to earn a return of 10 per cent.

1.5 Strengths and weaknesses of the NPV method

The NPV method is the most valid of all the capital project appraisal methods.

(a) It recognises the time value of money, and evaluates cash flows, not accounting profits.

(b) When the cost of capital used in the appraisal is the organisation’s cost of finance, a project with a positive NPV should add to the overall value of the organisation, and (in the case of a company) increase shareholder wealth.

The connection between NPV and creating shareholder wealth is very important, and is explained in more detail later.

Although it is the most appropriate method of project appraisal, the NPV method does have a drawback.
The net present value of a project is a money value. This is often difficult to understand. For example, it is easier to understand the comment: 'Project A will earn a return of 15 per cent per annum' than it is to understand the comment 'Project A has an NPV of +$60 000 at a cost of capital of 10 per cent'.

2 Discounted payback

Section overview

- The NPV method calculates a value for a capital project, taking into account all the expected cash flows over the entire life of the project. A company might want capital projects to earn a positive NPV, but also to pay back within a maximum time period.
- The discounted payback method is a way of combining DCF evaluation with a minimum payback period.

The discounted payback method of project appraisal is similar to the non-discounted payback method, except that payback is measured with the present value of cash flows.

Definition

The discounted payback period is the time it takes to recover the initial project investment in discounted cash flow i.e. present value terms.

A company might have an investment policy of undertaking projects only if:

(a) they have a positive NPV, and
(b) they pay back, in present value terms, within a maximum time limit.

2.1 Calculating discounted payback

Worked Example: Discounted payback

TJ is considering two mutually-exclusive investments, project A and project B. It can undertake one of them, or neither, but it cannot undertake both.

Project A would involve expenditure on a non-current asset of $60 000 and a working capital investment of $5 000. The profits from the project, ignoring depreciation, would be:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash profit $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15 000</td>
</tr>
<tr>
<td>2</td>
<td>20 000</td>
</tr>
<tr>
<td>3</td>
<td>20 000</td>
</tr>
<tr>
<td>4</td>
<td>25 000</td>
</tr>
<tr>
<td>5</td>
<td>20 000</td>
</tr>
<tr>
<td>6</td>
<td>15 000</td>
</tr>
<tr>
<td>7</td>
<td>10 000</td>
</tr>
</tbody>
</table>

Project B would involve expenditure on a non-current asset of $50 000 and a working capital investment of $5 000. The profits from the project, ignoring depreciation, would be:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash profit $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20 000</td>
</tr>
<tr>
<td>2</td>
<td>30 000</td>
</tr>
<tr>
<td>3</td>
<td>20 000</td>
</tr>
<tr>
<td>4</td>
<td>10 000</td>
</tr>
<tr>
<td>5</td>
<td>5 000</td>
</tr>
<tr>
<td>6</td>
<td>2 000</td>
</tr>
</tbody>
</table>
In both cases, the non-current asset would have nil residual value at the end of the project's life. The company's cost of capital is 11 per cent, and the discount factors are:

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 11%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.901</td>
</tr>
<tr>
<td>2</td>
<td>0.812</td>
</tr>
<tr>
<td>3</td>
<td>0.731</td>
</tr>
<tr>
<td>4</td>
<td>0.659</td>
</tr>
<tr>
<td>5</td>
<td>0.593</td>
</tr>
<tr>
<td>6</td>
<td>0.535</td>
</tr>
<tr>
<td>7</td>
<td>0.482</td>
</tr>
</tbody>
</table>

It is company policy to require projects to pay back in discounted cash flow terms within four years. Which project, if either, should be undertaken?

**Solution**

The NPV and discounted payback period for each project are calculated as follows:

**Project A**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor at 11%</th>
<th>Present value</th>
<th>Cumulative present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(60 000 + 5 000)</td>
<td>(65 000)</td>
<td>1.000</td>
<td>(65 000)</td>
</tr>
<tr>
<td>1</td>
<td>15 000</td>
<td>0.901</td>
<td>13 515</td>
<td>(51 485)</td>
</tr>
<tr>
<td>2</td>
<td>20 000</td>
<td>0.812</td>
<td>16 240</td>
<td>(35 245)</td>
</tr>
<tr>
<td>3</td>
<td>20 000</td>
<td>0.731</td>
<td>14 620</td>
<td>(20 625)</td>
</tr>
<tr>
<td>4</td>
<td>25 000</td>
<td>0.659</td>
<td>16 475</td>
<td>(4 150)</td>
</tr>
<tr>
<td>5</td>
<td>20 000</td>
<td>0.593</td>
<td>11 860</td>
<td>7 710</td>
</tr>
<tr>
<td>6</td>
<td>15 000</td>
<td>0.535</td>
<td>8 025</td>
<td>15 735</td>
</tr>
<tr>
<td>7</td>
<td>(10 000 + 5 000)</td>
<td>15 000</td>
<td>0.482</td>
<td>7 230</td>
</tr>
</tbody>
</table>

NPV = + 22 965

Discounted payback period = 4 years + \( \frac{4 150}{4 150 + 7 710} \times 12 \) months = 4 years 4 months

**Project B**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor at 11%</th>
<th>Present value</th>
<th>Cumulative present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(50 000 + 5 000)</td>
<td>(55 000)</td>
<td>1.000</td>
<td>(55 000)</td>
</tr>
<tr>
<td>1</td>
<td>20 000</td>
<td>0.901</td>
<td>18 020</td>
<td>(36 980)</td>
</tr>
<tr>
<td>2</td>
<td>30 000</td>
<td>0.812</td>
<td>24 360</td>
<td>(12 620)</td>
</tr>
<tr>
<td>3</td>
<td>20 000</td>
<td>0.731</td>
<td>14 620</td>
<td>2 000</td>
</tr>
<tr>
<td>4</td>
<td>10 000</td>
<td>0.659</td>
<td>6 590</td>
<td>8 590</td>
</tr>
<tr>
<td>5</td>
<td>5 000</td>
<td>0.593</td>
<td>2 965</td>
<td>11 555</td>
</tr>
<tr>
<td>6</td>
<td>(2 000 + 5 000)</td>
<td>7 000</td>
<td>0.535</td>
<td>3 745</td>
</tr>
</tbody>
</table>

NPV = + 15 300

Discounted payback period = 2 years + \( \frac{12 620}{12 620 + 2 000} \times 12 \) months = 2 years 10 months

Project A has the higher NPV, but does not pay back until after four years four months, which is longer than the minimum acceptable payback period. Project B has a lower NPV but pays back within three years, which is less than the maximum acceptable. On the basis of the investment criteria used by this company, project B would be undertaken.
2.2 Strengths and weaknesses of the discounted payback method

The discounted payback method of project evaluation is similar to the normal payback method, except that it allows for the time value of money.

(a) It establishes a requirement for projects to pay back within a maximum time period, although the maximum discounted payback is a subjective measure, for which there may be no rational justification.

(b) It gives recognition to the fact that for many companies liquidity is important, and projects need to provide returns fairly quickly.

(c) Unlike the non-discounted method of appraisal, it will not recommend any project for investment unless its NPV is expected to be positive.

The main disadvantage of the discounted payback method is that, as with the non-discounted payback method, it ignores all cash flows after payback has been reached. It does not take into consideration all the expected cash flows from the project. In the example above, for example, project B is preferred even though the expected NPV from project A is higher. By ignoring total returns from a project, its use is not consistent with the objective of maximising shareholder wealth.

3 The internal rate of return method of project appraisal (IRR)

Section overview

- With the IRR method of project appraisal, the internal rate of return of the project is calculated.
- The IRR is the cost of capital at which the NPV of the project would be zero, and so is the discount rate of return that the project is expected to earn.
- A project is financially viable if its IRR exceeds the company’s target rate of return (its cost of capital).
- The IRR is sometimes referred to as the break-even discount rate.

Definition

The internal rate of return (IRR) of a project is the discount rate at which the project NPV is zero. For a ‘conventional’ project – initial outflow followed by net inflows – this represents the maximum rate of return the project is able to cover before the NPV turns negative.

Using the NPV method of discounted cash flow, present values are calculated by discounting at a target rate of return, or cost of capital, and the difference between the PV of costs and the PV of benefits is the NPV.

In contrast, the internal rate of return (IRR) method is to calculate the exact DCF rate of return which the project is expected to achieve, in other words the rate at which the NPV is zero.

The rule with the internal rate of return (IRR) method of project evaluation is that a project should be undertaken if it is expected to achieve an IRR in excess of the company’s weighted average cost of capital. A project that has an IRR in excess of the cost of capital must have a positive NPV.

3.1 Estimating the IRR

Without a computer or calculator program, the calculation of the internal rate of return is made using a hit-and-miss technique known as the interpolation method. The interpolation method produces an estimate of the IRR, although it is not arithmetically exact.
The first step is to calculate two net present values, both as close as possible to zero, using rates for the cost of capital which are whole numbers. Ideally, one NPV should be positive and the other negative, although this is not essential.

These are then used to estimate the IRR.

**Worked Example: The IRR method (step 1 – calculate two NPVs)**

A company is trying to decide whether to buy a machine for $80,000 which will save costs of $20,000 per annum for five years and which will have a resale value of $10,000 at the end of Year 5. If it is the company's policy to undertake projects only if they are expected to yield a DCF return of 10 per cent or more, ascertain whether this project should be undertaken.

Use the following discount factors to estimate the IRR of the project.

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 9%</th>
<th>Discount factor at 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>3.890</td>
<td>3.605</td>
</tr>
<tr>
<td>5</td>
<td>0.650</td>
<td>0.567</td>
</tr>
</tbody>
</table>

**Solution**

The IRR is the rate for the cost of capital at which the NPV = 0.

Try 9%:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>PV factor 9%</th>
<th>PV of cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(80,000)</td>
<td>1.000</td>
<td>(80,000)</td>
</tr>
<tr>
<td>1-5</td>
<td>20,000</td>
<td>3.890</td>
<td>77,800</td>
</tr>
<tr>
<td>5</td>
<td>10,000</td>
<td>0.650</td>
<td>6,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>NPV 4,300</strong></td>
</tr>
</tbody>
</table>

This is fairly close to zero. It is also positive, which means that the IRR is more than 9 per cent. We can use 9 per cent as one of our two NPVs close to zero, although for greater accuracy, we should try 10 per cent or even 11 per cent to find an NPV even closer to zero if we can. However, a discount rate of 12 per cent will be used here, to see what the NPV is.

Try 12%:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>PV factor 12%</th>
<th>PV of cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(80,000)</td>
<td>1.000</td>
<td>(80,000)</td>
</tr>
<tr>
<td>1-5</td>
<td>20,000</td>
<td>3.605</td>
<td>72,100</td>
</tr>
<tr>
<td>5</td>
<td>10,000</td>
<td>0.567</td>
<td>5,670</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>NPV (2,230)</strong></td>
</tr>
</tbody>
</table>

This is fairly close to zero and negative. The IRR is therefore greater than 9 per cent (positive NPV of $4,300) but less than 12 per cent (negative NPV of $2,230).

If we were to draw a graph of the NPV at different costs of capital of a 'typical' capital project, with a negative cash flow at the start of the project, and positive net cash flows afterwards up to the end of the project, it would look like Figure 1.
If we use a cost of capital where the NPV is slightly positive, and use another cost of capital where it is slightly negative, we can estimate the IRR – where the NPV is zero – by drawing a straight line between the two points on the graph that we have calculated.

Study the diagram above carefully.

(a) If we establish the NPVs at the two points P, we would estimate the IRR to be at point A.
(b) If we establish the NPVs at the two points Q, we would estimate the IRR to be at point B.

The closer our NPVs are to zero, the closer our estimate will be to the true IRR.

**Worked Example: the IRR method (step 2 – estimate the IRR)**

We shall now use the two NPV values calculated earlier to estimate the IRR.

The interpolation method assumes that the NPV rises in linear fashion between the two NPVs close to 0. The real rate of return is therefore assumed to be on a straight line between NPV = $4,300 at 9 per cent and NPV = −$2,230 at 12 per cent.
Formula to learn

The formula to apply is as follows:

$$\text{IRR} = A + \left[ \frac{N_A}{N_A - N_B} \times (B - A) \right] \%$$

where:
- $A$ is the lower rate of return.
- $B$ is the higher rate of return.
- $N_A$ is the NPV discounted at $A$.
- $N_B$ is the NPV discounted at $B$.

Let us go back to our example.

$$\text{IRR} = 9 + \left[ \frac{4300}{4300 - (-2230)} \times (12 - 9) \right] \% = 10.98\%, \text{ say } 11\%$$

If it is company policy to undertake investments which are expected to yield 10 per cent or more, this project would be undertaken.

Question 2: IRR

Find the IRR of the project given below and state whether the project should be accepted if the company requires a minimum return of 15 per cent.

<table>
<thead>
<tr>
<th>Time</th>
<th>Investment</th>
<th>Receipts</th>
<th>Receipts</th>
<th>Receipts</th>
<th>Receipts</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(4 000)</td>
<td>1 200</td>
<td>1 410</td>
<td>1 875</td>
<td>1 150</td>
</tr>
</tbody>
</table>

Use the following discount factors to estimate the IRR of the project.

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 14%</th>
<th>Discount factor at 16%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.877</td>
<td>0.862</td>
</tr>
<tr>
<td>2</td>
<td>0.769</td>
<td>0.743</td>
</tr>
<tr>
<td>3</td>
<td>0.675</td>
<td>0.641</td>
</tr>
<tr>
<td>4</td>
<td>0.592</td>
<td>0.552</td>
</tr>
</tbody>
</table>

(The answer is at the end of the chapter)
4 NPV and IRR compared

Section overview

- NPV tells us the absolute $ increase in shareholder wealth from a project, assuming a given cost of capital.
- IRR tells us the maximum amount that the company could afford to pay for the project finance, or the expected return of the project in percentage terms.
- Both methods give the same accept or reject decision for individual projects.
- The IRR method is more easily understood by non-financial managers.
- NPV is simpler to calculate than IRR.
- IRR ignores the relative sizes of investments.
- NPV is the preferred method for deciding between mutually exclusive projects.
- Despite the advantages of the NPV method over the IRR method, the IRR method is widely used in practice. Even so, the NPV method is superior because it focuses on the measurement of shareholder wealth.

4.1 Advantages of IRR method

The main advantage of the IRR method is that the information it provides is more easily understood by managers, especially non-financial managers. For example, it is fairly easy to understand the meaning of the following statement:

'The project will be expected to have an initial capital outlay of $100 000, and to earn a yield of 25 per cent. This is in excess of the target yield of 15 per cent for investments.'

It is not so easy to understand the meaning of this statement:

'The project will cost $100 000 and have an NPV of $30 000 when discounted at the minimum required rate of 15 per cent.'

4.2 Disadvantages of IRR method

(a) The main drawback against the IRR method is it ignores the relative size of investments.

Worked Example: Different sized investments

Both the following projects have an IRR of 18%.

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost, year 0</th>
<th>Annual savings, years 1 - 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$350 000</td>
<td>$100 000</td>
</tr>
<tr>
<td>B</td>
<td>$35 000</td>
<td>$10 000</td>
</tr>
</tbody>
</table>

Clearly, project A is bigger (ten times as big) and so more 'profitable' but if the only information on which the projects were judged were to be their IRR of 18%, project B would be made to seem just as beneficial as project A, which is not the case.

(b) Another major weakness of the IRR method is its failure to take account of the total value of a capital project (the project’s NPV).

When there are mutually exclusive investments, the IRR method might favour a project with a higher IRR but a lower NPV. In this case NPV should be used.
### 4.3 Mutually exclusive projects

Mutually exclusive projects are two or more projects from which only one can be chosen. Examples include the choice of a factory location or the choice of just one of a number of machines. The IRR and NPV methods can, however, give conflicting rankings as to which project should be given priority.

**Worked Example: Mutually exclusive investments**

Let us suppose that a company is considering two mutually exclusive options, option A and option B. The cash flows for each would be as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Option A</th>
<th>Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Capital outlay</td>
<td>(10 200)</td>
</tr>
<tr>
<td>1</td>
<td>Net cash inflow</td>
<td>6 000</td>
</tr>
<tr>
<td>2</td>
<td>Net cash inflow</td>
<td>5 000</td>
</tr>
<tr>
<td>3</td>
<td>Net cash inflow</td>
<td>3 000</td>
</tr>
</tbody>
</table>

The company's cost of capital is 16 per cent.

**Solution**

The NPV of each project is calculated below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 16%</th>
<th>Option A</th>
<th>Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cash flow</td>
<td>Present value</td>
<td>Cash flow</td>
</tr>
<tr>
<td>0</td>
<td>1.000</td>
<td>(10 200)</td>
<td>(10 200)</td>
</tr>
<tr>
<td>1</td>
<td>0.862</td>
<td>6 000</td>
<td>5 172</td>
</tr>
<tr>
<td>2</td>
<td>0.743</td>
<td>5 000</td>
<td>3 715</td>
</tr>
<tr>
<td>3</td>
<td>0.641</td>
<td>3 000</td>
<td>1 923</td>
</tr>
</tbody>
</table>

NPV = +610

NPV = +1 026

The DCF yield (IRR) of option A is 20% and the yield of option B is only 18% (workings not shown). On a comparison of NPVs, option B would be preferred, but on a comparison of IRRs, option A would be preferred.

This situation can be illustrated diagrammatically:

![Figure 3](Image)

The fact that A has a higher IRR than B indicates that, if the company's cost of capital were to increase from 16 per cent, A would yield a positive NPV for a larger range of costs than B. (It is 'less sensitive' to increases in the discount rate – see Section 6.)

However, at the company's actual cost of capital, B gives a higher NPV, thereby increasing shareholder wealth by a greater amount than A.
Therefore, in the case of mutually exclusive projects where NPV and IRR rankings appear to conflict, the NPV approach should be used to decide between them.

Of course, if the projects were independent all this would be irrelevant since under the NPV rule both would be accepted and the organisation would be indifferent as to the order in which they were accepted.

4.4 The NPV method and shareholder wealth creation

The NPV method of project appraisal is consistent with the financial objective of maximising shareholder wealth. Given certain assumptions, the value of a company should be expected to increase by the NPV of any projects that it undertakes.

The superiority of the NPV method of investment appraisal is that it provides a measurement of the expected increase in the value of a company, and so the increase in shareholder value, that might be expected from an investment. This is an important point, and is worth studying carefully.

Suppose that you invest $1,000 and want to earn a return of 10% per annum. If you are offered the chance to invest in a one-year project that will pay back $1,100 after one year, the investment will provide the 10% return you are looking for, and you will therefore think that it is worth the $1,000 that it will cost.

Suppose, however, that you are offered an investment with exactly the same risk characteristics that will pay back $1,200 after one year, on a $1,000 investment. This second investment will be more attractive, because it will provide a return higher than the 10% you are looking for. In NPV terms, the investment would have a positive net present value.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor at 10%</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1.000</td>
<td>(1,000)</td>
</tr>
<tr>
<td>1</td>
<td>1,200</td>
<td>0.909</td>
<td>1,091</td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td></td>
<td>91</td>
</tr>
</tbody>
</table>

If you acquire this investment for $1,000, another investor who also wants a return of 10% might immediately offer to buy it from you. He will offer more than $1,000. To obtain a return of at least 10% on his investment, this other investor will be prepared to offer you up to $1,091 ($1,200/1.10). If you sell at this price, you will have made $91 on your investment. In other words, you will have increased your wealth by $91. This increase in wealth is the NPV of the investment.

The same principle applies to investments by companies, for the same reason. If a project earns a return in excess of the returns expected by the providers of finance, the surplus belongs to the shareholders. The shareholders will expect this additional return to be paid to them as dividends, or reinvested by the company to provide even higher returns and dividends in the future. Either way, the perceived value of their investment will go up, and it should be expected to go up by the amount of the project NPV.

4.4.1 The fundamental theory of share values

The connection between a project NPV and changes in the total wealth of shareholders can be stated as a fundamental theory of share values.

**Definition**

The fundamental theory of share values states that the market price of shares reflects investors’ expectations of what the future returns from the shares will be. The share price represents the present value of all future returns, discounted at the investors’ yield requirements (the cost of equity).

We will consider this in more detail in Chapter 6.
4.5 Summary of NPV and IRR comparison

NPV tells us the absolute $ increase in shareholder wealth from a project, assuming a given cost of capital. IRR tells us the maximum amount that the company could afford to pay for the project finance, or the expected return of the project in % terms.

(a) Both methods give the same accept or reject decision for individual projects.
(b) The IRR method is more easily understood by non-financial managers.
(c) NPV is simpler to calculate than IRR.
(d) IRR ignores the relative sizes of investments.
(e) NPV is the preferred method for deciding between mutually exclusive projects.

Despite the advantages of the NPV method over the IRR method, the IRR method is widely used in practice. Even so, the NPV method is superior because it focuses on the measurement of shareholder wealth.

5 Multiple methods of investment appraisal

Section overview

Some businesses employ multiple methods of investment appraisal. They may use payback/discounted payback to demonstrate liquidity, NPV or ROCE to demonstrate commercial viability and IRR to demonstrate the risk inherent in the NPV assessment as a result of the potential for interest rate changes.

Throughout these first two chapters we have considered five different investment appraisal methods and each has its own advantages and disadvantages.

(a) Return on capital employed – The return on capital employed method has the advantages of being easy to calculate, easy to understand and clearly demonstrates profitability. However it takes no account of cash flow timings, differing project lives or the size of initial investment needed.
(b) Payback period – The payback period has the advantages of being easy to calculate and understand. It also considers the earlier (more certain) cash flows and is useful if there are liquidity problems. However, the measure ignores completely all cash flows outside the payback period and completely ignores the timing of cash flows within the period.
(c) Discounted payback period – The discounted payback method of project evaluation is similar to the normal payback method, except that it allows for the time value of money as it will only recommend a project for investment if its NPV is expected to be positive. It gives recognition to the fact that for many companies liquidity is important, and projects need to provide returns fairly quickly, however it still ignores cash flows outside the payback period and hence the overall return from the project.
(d) NPVs – NPVs consider all cash flow returns from a project and their timings, cash being a much less subjective measure than profits. Unfortunately, NPVs are harder to calculate and harder for non-financial managers to understand. In addition, a number of uncertainties arise, e.g. regarding exact cash flow timings or future interest rates, and it is often necessary to make some assumptions to complete any calculations.
(e) IRRs – The IRR or yield is an easier idea for non-financial managers to interpret than the NPV. It gives an indication of the sensitivity of the project to interest rate changes. It cannot, however, be used to decide between mutually exclusive projects as illustrated earlier.

Though the NPV approach is probably considered the primary technique, they all have their uses and limitations.

As a consequence, some businesses employ multiple methods of investment appraisal. They may use accounting returns (ROCE) to demonstrate profitability, payback/discounted payback to demonstrate
liquidity, NPV to demonstrate commercial viability and IRR to demonstrate the risk inherent in the NPV assessment as a result of the potential for interest rate changes.

Where multiple methods are used, however, the question arises of how the results can be assessed to decide on a project or, more awkwardly, how to decide between projects. As we have already seen with mutually exclusive projects the highest IRR and the highest NPV do not necessarily coincide, and this fact can be extended to all of the techniques. The ideal project would have the highest ROCE, the shortest payback period, the highest NPV and highest IRR, but when assessing a range of alternatives this is unlikely to be the case.

If multiple methods are to be used then it will be important to have a pre-determined approach for prioritising the various results, although this will inevitably be somewhat subjective, based on opinions and experience.

6 Sensitivity analysis

Section overview

• Sensitivity analysis assesses how responsive the project’s NPV is to changes in the variables used to calculate that NPV. This helps identify the critical estimates in the project forecast.

6.1 Need for sensitivity analysis

Definition

Sensitivity analysis is one method of analysing the risk surrounding a capital expenditure project and enables an assessment to be made of how responsive the project’s NPV is to changes in the variables that are used to calculate that NPV.

Any investment appraisal technique is based on forecasts or estimates. The NPV could depend on a number of uncertain independent variables:

• Selling price
• Sales volume
• Cost of capital
• Initial cost
• Operating costs
• Benefits

The basic approach of sensitivity analysis is to calculate the project’s NPV under alternative assumptions to determine how sensitive it is to changing conditions.

An indication is thus provided of those variables to which the NPV is most sensitive (critical variables) and the extent to which those variables may change before the investment results in a negative NPV.

Therefore, sensitivity analysis provides an indication of why a project might fail. Management should review critical variables to assess whether or not there is a strong possibility of events occurring which will lead to a negative NPV. Management should also pay particular attention to controlling those variables to which the NPV is particularly sensitive, once the decision has been taken to accept the investment.

6.2 Approach to sensitivity analysis

A simple approach to deciding which variables are critical is to calculate the sensitivity of the NPV to each variable in turn:
Formula to learn

The formula to apply is as follows:

\[
\text{Sensitivity} = \frac{\text{NPV}}{\text{Present value of project variable}} \times 100 \%
\]

The resulting percentage indicates how far the variable can change before the NPV becomes zero.

The lower the percentage, the more sensitive NPV is to that project variable as the variable would need to change by a smaller amount to make the project non-viable.

Worked Example: Sensitivity

Kenney Co is considering a project with the following cash flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Initial investment</th>
<th>Variable costs</th>
<th>Cash inflows</th>
<th>Net cash flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$ 000</td>
<td>(7 000)</td>
<td></td>
<td>(7 000)</td>
</tr>
<tr>
<td>1</td>
<td>(2 000)</td>
<td>6 500</td>
<td>4 500</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(2 000)</td>
<td>6 500</td>
<td>4 500</td>
<td></td>
</tr>
</tbody>
</table>

Cash flows arise from selling 650 000 units at $10 per unit. Kenney Co has a cost of capital of 8%.

Required

Measure the sensitivity of the project to changes in variables.

Solution

The PVs of the cash flow are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor 8%</th>
<th>PV of initial investment</th>
<th>PV of variable costs</th>
<th>PV of cash inflows</th>
<th>PV of net cash flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.000</td>
<td>$ 000</td>
<td>(7 000)</td>
<td>(7 000)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.926</td>
<td>(1 852)</td>
<td>6 019</td>
<td>4 167</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.857</td>
<td>(1 714)</td>
<td>5 571</td>
<td>3 857</td>
<td></td>
</tr>
</tbody>
</table>

The project has a positive NPV and would appear to be worthwhile. The sensitivity of each project variable is as follows:

(a) **Initial investment**

\[
\text{Sensitivity} = \frac{1024}{7 000} \times 100 = 14.6\%
\]

(b) **Sales volume**

\[
\text{Sensitivity} = \frac{1024}{11590 - 3 566} \times 100 = 12.8\%
\]

(c) **Selling price**

\[
\text{Sensitivity} = \frac{1024}{11590} \times 100 = 8.8\%
\]

(d) **Variable costs**

\[
\text{Sensitivity} = \frac{1024}{3 566} \times 100 = 28.7\%
\]
(e) **Cost of capital.** We need to calculate the IRR of the project. Let us try discount rates of 15% and 20%.

<table>
<thead>
<tr>
<th>Year</th>
<th>Net cash flow</th>
<th>Discount factor 15%</th>
<th>PV $'000</th>
<th>Discount factor 20%</th>
<th>PV $'000</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(7 000)</td>
<td>1</td>
<td>(7 000)</td>
<td>1</td>
<td>(7 000)</td>
</tr>
<tr>
<td>1</td>
<td>4 500</td>
<td>0.870</td>
<td>3 915</td>
<td>0.833</td>
<td>3 749</td>
</tr>
<tr>
<td>2</td>
<td>4 500</td>
<td>0.756</td>
<td>3 402</td>
<td>0.694</td>
<td>3 123</td>
</tr>
</tbody>
</table>

NPV = 317
NPV = (128)

\[
\text{IRR} = 0.15 + \left[ \frac{317}{317 + 128} \times (0.20 - 0.15) \right] = 18.56\%
\]

The cost of capital can therefore increase from 8% to 18.56% before the NPV becomes negative.

The elements to which the NPV appears to be most sensitive are the selling price followed by the sales volume. Management should thus pay particular attention to these factors so that they can be carefully monitored.

### 6.3 Weaknesses of this approach to sensitivity analysis

These are as follows:

(a) The method requires that changes in each key variable are isolated. However, management is likely to be more interested in the combination of the effects of changes in two or more key variables.

(b) Looking at factors in isolation is unrealistic since they are often interdependent.

(c) Sensitivity analysis does not examine the probability that any particular variation in costs or revenues might occur.

(d) Critical factors may be those over which managers have no control.

(e) In itself it does not provide a decision rule. Parameters defining acceptability must be laid down by managers.

### Question 3: Sensitivity analysis

Never Ure Co has a cost of capital of 8% and is considering a project with the following 'most-likely' cash flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Purchase of plant $</th>
<th>Running costs $</th>
<th>Savings $</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(7 000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 000</td>
<td>6 000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2 500</td>
<td>7 000</td>
<td></td>
</tr>
</tbody>
</table>

**Required**

Measure the sensitivity (in percentages) of the project to changes in the levels of expected costs and savings.

*(The answer is at the end of the chapter)*
7 Capital rationing

**Section overview**

- Capital rationing refers to a situation in which a company has a limited amount of capital to invest in potential projects.
- Capital rationing may occur due to internal factors (soft capital rationing) or external factors (hard capital rationing).
- When capital rationing occurs in a single period, projects are ranked in terms of a profitability index, by considering the PV of the future cash flows earned per $ invested in the project. This assumes projects are divisible.
- If the projects are not divisible a decision has to be made by examining the absolute NPVs of all possible combinations of complete projects that can be undertaken within the constraints of the capital available.
- If projects can be postponed until Year 1, the optimal investment plan is determined by reference to the loss of NPV from postponement.

**Definitions**

**Capital rationing**: a situation in which a company has a limited amount of capital to invest in potential projects, such that the different possible investments need to be compared with one another in order to allocate the capital available most effectively.

**Soft capital rationing** is brought about by internal factors; **hard capital rationing** is brought about by external factors.

If an organisation is in a **capital rationing** situation it will not be able to enter into all projects with positive NPVs because there is not enough capital for all of the investments.

**7.1 Soft and hard capital rationing**

Soft capital rationing may arise for one of the following reasons:

(a) Management may be reluctant to issue additional share capital because of concern that this may lead to outsiders gaining control of the business.
(b) Management may be unwilling to issue additional share capital if it will lead to a dilution of earnings per share.
(c) Management may not want to raise additional debt capital because they do not wish to be committed to large fixed interest payments.
(d) Management may wish to limit investment to a level that can be financed solely from retained earnings.
(e) The Board may restrict the capital expenditure budget available to individual business units as a means of management control.

Hard capital rationing may arise for one of the following reasons:

(a) Raising money through the stock market may not be possible if share prices are depressed.
(b) There may be restrictions on bank lending due to government control.
(c) Lending institutions may consider an organisation to be too risky to be granted further loan facilities.
(d) The costs associated with making small issues of capital may be too great.
7.2 **Relaxation of capital constraints**

If an organisation adopts a policy that restricts funds available for investment (soft capital rationing), the policy may be less than optimal. The organisation may reject projects with a positive net present value and forgo opportunities that would have enhanced the market value of the organisation.

A company may be able to limit the effects of hard capital rationing and exploit new opportunities.

(a) It might seek joint venture partners with which to share projects.

(b) As an alternative to direct investment in a project, the company may be able to consider a licensing or franchising agreement with another enterprise, under which the licensor/franchisor company would receive royalties.

(c) It may be possible to contract out parts of a project to reduce the initial capital outlay required.

(d) The company may seek new alternative sources of capital (subject to any restrictions which apply to it), for example:
   - Venture capital.
   - Debt finance secured on the assets of the project.
   - Sale and leaseback of property or equipment.
   - Grant aid.
   - More effective capital management.

Sources of finance are considered further in Chapter 4.

7.3 **Single period capital rationing**

7.3.1 **Assumptions**

We shall begin our analysis by assuming that capital rationing occurs in a single period, and that capital is freely available at all other times.

The following further assumptions will be made:

(a) If a company does not accept and undertake a project during the period of capital rationing, the opportunity to undertake it is lost. The project cannot be postponed until a subsequent period when no capital rationing exists.

(b) There is complete certainty about the outcome of each project, so that the choice between projects is not affected by considerations of risk.

(c) Projects are divisible, so that it is possible to undertake, say, half of project X in order to earn half of the net present value (NPV) of the whole project.

7.3.2 **Ranking of projects**

The basic approach is to rank all investment opportunities so that the NPVs can be maximised from the use of the available funds.

Ranking in terms of absolute NPVs will normally give incorrect results. This method leads to the selection of large projects, each of which has a high individual NPV but which have, in total, a lower NPV than a large number of smaller projects with lower individual NPVs.

Ranking is therefore in terms of what is called the profitability index.

This profitability index is a ratio that measures the PV of the future cashflows earned per $ invested in the project, and so indicates which investments make the best use of the limited resources available.

**Definition**

The **profitability index** is the ratio of the present value of the project’s future cash flows (not including the capital investment) divided by the present value of the total capital investment.
**Worked Example: Single period capital rationing**

Suppose that Hard Times Co is considering four projects, W, X, Y and Z. Relevant details are as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Investment required</th>
<th>Present value of cash inflows</th>
<th>NPV</th>
<th>Profitability index</th>
<th>Ranking as per NPV</th>
<th>Ranking as per PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>(10 000)</td>
<td>11 240</td>
<td>1 240</td>
<td>1.12</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>X</td>
<td>(20 000)</td>
<td>20 991</td>
<td>991</td>
<td>1.05</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Y</td>
<td>(30 000)</td>
<td>32 230</td>
<td>2 230</td>
<td>1.07</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Z</td>
<td>(40 000)</td>
<td>43 801</td>
<td>3 801</td>
<td>1.10</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Solution**

Without capital rationing all four projects would be viable investments. Suppose however, that only $60 000 was available for capital investment. Let us look at the resulting NPV if we select projects in the order of ranking per NPV:

<table>
<thead>
<tr>
<th>Project</th>
<th>Priority</th>
<th>Outlay</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>1st</td>
<td>40 000</td>
<td>3 801</td>
</tr>
<tr>
<td>Y (balance)*</td>
<td>2nd</td>
<td>20 000</td>
<td>1 487</td>
</tr>
</tbody>
</table>

Projects are divisible. By spending the balancing $20 000 on project Y, two thirds of the full investment would be made to earn two thirds of the NPV.

Suppose, on the other hand, that we adopt the profitability index approach. The selection of projects will be as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Priority</th>
<th>Outlay</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>1st</td>
<td>10 000</td>
<td>1 240</td>
</tr>
<tr>
<td>Z</td>
<td>2nd</td>
<td>40 000</td>
<td>3 801</td>
</tr>
<tr>
<td>Y (balance)</td>
<td>3rd</td>
<td>10 000</td>
<td>743</td>
</tr>
</tbody>
</table>

By choosing projects according to the PI, the resulting NPV if only $60 000 is available is increased by $496.

**7.3.3 Problems with the profitability index method**

(a) The approach can only be used if projects are divisible. If the projects are not divisible a decision has to be made by examining the absolute NPVs of all possible combinations of complete projects that can be undertaken within the constraints of the capital available. See Section 7.5 below.

(b) The selection criterion is fairly simplistic, taking no account of the possible strategic value of individual investments in the context of the overall objectives of the organisation.

(c) The method is of limited use when projects have differing cash flow patterns. These patterns may be important to the company since they will affect the timing and availability of funds. With multi-period capital rationing, it is possible that the project with the highest profitability index is the slowest in generating returns.

(d) The profitability index ignores the absolute size of individual projects. A project with a high index might be very small and therefore only generate a small NPV.

**Question 4: Single period capital rationing**

A company is experiencing capital rationing in Year 0, when only $60 000 of investment finance will be available. No capital rationing is expected in future periods, but none of the three projects under consideration by the company can be postponed. The expected cash flows of the three projects are as follows:
The cost of capital is 10%. You are required to decide which projects should be undertaken in year 0, in view of the capital rationing, given that projects are divisible.

(The answer is at the end of the chapter)

### 7.4 Postponing projects

We have so far assumed that projects cannot be postponed until Year 1. If this assumption is removed, the choice of projects in year 0 would be made by reference to the loss of NPV from postponement.

#### Worked Example: Option to postpone projects

The figures from Question 4 above will be used to illustrate the method.

The calculation of NPVs and profitability index for single period capital rationing in Year 0, assuming no ability to postpone, generated the following results:

<table>
<thead>
<tr>
<th>Project</th>
<th>Year 0 Future Cashflows</th>
<th>PV of Future Cashflows</th>
<th>NPV</th>
<th>Profitability Index</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$50,000</td>
<td>$55,700</td>
<td>$5,700</td>
<td>1.114</td>
<td>3rd</td>
</tr>
<tr>
<td>B</td>
<td>$28,000</td>
<td>$31,290</td>
<td>$3,290</td>
<td>1.118</td>
<td>2nd</td>
</tr>
<tr>
<td>C</td>
<td>$30,000</td>
<td>$34,380</td>
<td>$4,380</td>
<td>1.146</td>
<td>1st</td>
</tr>
</tbody>
</table>

Determine the optimal investment strategy if it is possible to defer the start of any of the projects to Year 1, at which time there will be no capital restriction.

#### Solution

If the start of any project, A, B or C, were delayed by one year, the 'NPV' would also be delayed by one year. So the NPVs previously calculated now relate to Year 1 values.

These can be restated in Year 0 terms, as follows:

<table>
<thead>
<tr>
<th>NPV in Year 1</th>
<th>NPV in Year 0 value</th>
<th>Loss in NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>(a) Project A</td>
<td>5,700 × $\frac{1}{1.10}$</td>
<td>5,182</td>
</tr>
<tr>
<td>(b) Project B</td>
<td>3,290 × $\frac{1}{1.10}$</td>
<td>2,991</td>
</tr>
<tr>
<td>(c) Project C</td>
<td>4,380 × $\frac{1}{1.10}$</td>
<td>3,982</td>
</tr>
</tbody>
</table>

An index of postponability would be calculated by considering the loss in NPV per $ of initial outlay deferred, as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Loss in NPV from one-year postponement</th>
<th>Outlay deferred from Year 0</th>
<th>Postponability index (loss/outlay)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$518</td>
<td>$50,000</td>
<td>0.0104</td>
</tr>
<tr>
<td>B</td>
<td>$299</td>
<td>$28,000</td>
<td>0.0107</td>
</tr>
<tr>
<td>C</td>
<td>$398</td>
<td>$30,000</td>
<td>0.0133</td>
</tr>
</tbody>
</table>

The loss in NPV by deferring investment would be greatest for project C, and least for project A. It is therefore more profitable to postpone A, rather than B or C.
The optimal investment plan is as follows:

**Investment in Year 0:**

<table>
<thead>
<tr>
<th>Project</th>
<th>Outlay</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>$30 000</td>
<td>$4 380</td>
</tr>
<tr>
<td>B</td>
<td>$28 000</td>
<td>$3 290</td>
</tr>
<tr>
<td>A (balance)</td>
<td>$2 000 (4% of 5 700)</td>
<td>$228</td>
</tr>
<tr>
<td></td>
<td>$60 000</td>
<td>$7 898</td>
</tr>
</tbody>
</table>

**Investment in Year 1 (balance):**

<table>
<thead>
<tr>
<th>Project</th>
<th>Outlay</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$48 000 (96% of 5 182)</td>
<td>$4 975</td>
</tr>
</tbody>
</table>

Total NPV (as at Year 0) of investments in Years 0 and 1 $12 873

### 7.5 Single period rationing with non-divisible projects

If the projects are **not divisible** then the method shown above may not result in the optimal solution.

The best way to deal with this situation is to use **trial and error** and test the NPV available from different combinations of projects. This can be a laborious process if there are a large number of projects available.

Another complication which arises is that there is likely to be a small amount of unused capital with each combination of projects. The combination of projects which remains at or under the limit of available capital without any of them being divided, and which maximises the total NPV, should be chosen.

#### Worked Example: Single period capital rationing with non-divisible projects

Short O’Funds has capital of $95 000 available for investment in the forthcoming period. The directors decide to consider projects P, Q and R only. They wish to invest only in whole projects, but surplus funds can be invested. Which combination of projects will produce the highest NPV at a cost of capital of 20%?

<table>
<thead>
<tr>
<th>Project</th>
<th>Investment required $ 000</th>
<th>Present value of inflows at 20% $ 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>40</td>
<td>56.5</td>
</tr>
<tr>
<td>Q</td>
<td>50</td>
<td>67.0</td>
</tr>
<tr>
<td>R</td>
<td>30</td>
<td>48.8</td>
</tr>
</tbody>
</table>

**Solution**

The investment combinations we need to consider are the various possible pairs of projects P, Q and R.

<table>
<thead>
<tr>
<th>Projects</th>
<th>Required investment $ 000</th>
<th>PV of inflows $ 000</th>
<th>NPV from projects $ 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>P and Q</td>
<td>90</td>
<td>123.5</td>
<td>33.5</td>
</tr>
<tr>
<td>P and R</td>
<td>70</td>
<td>105.3</td>
<td>35.3</td>
</tr>
<tr>
<td>Q and R</td>
<td>80</td>
<td>115.8</td>
<td>35.8</td>
</tr>
</tbody>
</table>

The highest NPV will be achieved by undertaking projects Q and R and investing the unused funds of $15 000 externally.
8 Allowing for inflation in investment appraisal

Section overview

- Inflation is a feature of all economies and it must be accommodated in financial planning. Inflation may be general, affecting prices of all kinds, or specific to particular prices.
- In DCF, project cash flows should be increased to allow for expected inflation, and these money cash flows should then be discounted at the money cost of capital.
- Alternatively, non-inflated (real) cash flows should be discounted at the real cost of capital.
- The two rates of return and the inflation rate are linked by the equation: 
  \[(1 + \text{money rate}) = (1 + \text{real rate}) \times (1 + \text{inflation rate})\]

So far we have not considered the effect of inflation on the appraisal of capital investment proposals. As the inflation rate increases, so will the minimum return required by an investor. For example, you might be happy with a return of 5% in an inflation-free world, but if the rate of inflation was running at 15% you would expect a considerably greater yield.

Worked Example: Allowing for inflation

A company is considering investing in a project with the following cash flows.

<table>
<thead>
<tr>
<th>Time</th>
<th>Actual cash flows at today's prices $</th>
<th>Actual cash flows, allowing for inflation at 10% per annum $</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18 000</td>
<td>(18 000)</td>
</tr>
<tr>
<td>1</td>
<td>9 000</td>
<td>9 900</td>
</tr>
<tr>
<td>2</td>
<td>8 000</td>
<td>9 680</td>
</tr>
<tr>
<td>3</td>
<td>7 000</td>
<td>9 317</td>
</tr>
</tbody>
</table>

The company requires a minimum return of 20% under the present and anticipated conditions. Inflation is currently running at 10% a year, and this rate of inflation is expected to continue indefinitely. Should the company go ahead with the project?

Solution

The company’s required rate of return is 20%. This is the return investors require in the expectation that inflation will be 10% per annum over the lifetime of the project. Suppose that the company invested $1 000 for one year on 1 January. On 31 December it would require a minimum return of $200. With the initial investment of $1 000, the total value of the investment by 31 December must therefore increase to $1 200. During the course of the year the purchasing value of the dollar would fall due to inflation. We can restate the amount received on 31 December in terms of the purchasing power of the dollar at 1 January as follows:

\[
\text{Amount received on 31 December in terms of the value of the dollar at 1 January} = \frac{1200}{(1.1)} = 1091
\]

In terms of the value of the dollar at 1 January, the company would make a profit of $91 which represents a rate of return of 9.1% in ‘today’s money’ terms. This is known as the real rate of return.

The required rate of 20% is a money rate of return (sometimes called a nominal rate of return). The money rate measures the return in terms of the dollar which is, of course, falling in value. The real rate measures the return in constant price level terms.

Note that current market rates of return are money rates of return. Investment yields on debt capital and equity capital are therefore money yields.
Definitions

Real rate of return is the return expressed in constant price level terms.

Money rate of return is the rate of return which includes a compensation for inflation.

The money rate is usually therefore higher than the real rate.

Formula to learn

The two rates of return and the inflation rate are linked by the equation:

\[(1 + \text{money rate}) = (1 + \text{real rate}) \times (1 + \text{inflation rate})\]

where all the rates are expressed as decimals.

Therefore in our example, having been given the money rate of return (20%) and the inflation rate (10%) we could calculate the real rate by rearranging the equation:

\[(1 + \text{real}) = (1 + \text{money rate})/(1 + \text{inflation rate})\]

\[(1 + \text{real}) = (1 + 0.20) / (1 + 0.10) = 1.091\]

Real rate of return = 9.1%

i.e. \((1.20) = (1.091) \times (1.10)\)

Question 5: Rates of return with inflation

A company is considering investing in a two year project. Its required rate of return in real terms is 10% per annum. The general level of inflation is expected to be 5% in Year 1 and 3% in Year 2. Calculate the money rate of return for each of the two years and also the appropriate discount factors for Time 1 and Time 2.

(The answer is at the end of the chapter)

8.1 Choosing an appropriate discount rate

So which rate should be used for DCF appraisals, the real rate of return or the money rate of return?

The rule is as follows:

(a) If the cash flows are expressed in terms of the actual number of dollars that will be received or paid on the various future dates (money or nominal cash flows), we use the money rate for discounting.

(b) If the cash flows are expressed in terms of the value of the dollar at time 0 (that is, in constant price level terms, real cash flows), we use the real rate.

Definitions

Money cash flows are the actual amounts to be received or paid at a future date.

Real cash flows are the cash flows expressed in terms of their current value.

8.1.1 Money flows and money rate of return

In our worked example we are given the cash flows expressed in terms of the actual number of dollars that will be received or paid at the relevant dates. These are money flows.
We should, therefore, discount them using the money rate of return.

<table>
<thead>
<tr>
<th>Time</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(18 000)</td>
<td>1.000</td>
<td>(18 000)</td>
</tr>
<tr>
<td>1</td>
<td>9 900</td>
<td>0.833</td>
<td>8 247</td>
</tr>
<tr>
<td>2</td>
<td>9 680</td>
<td>0.694</td>
<td>6 718</td>
</tr>
<tr>
<td>3</td>
<td>9 317</td>
<td>0.579</td>
<td>5 395</td>
</tr>
</tbody>
</table>

Time  Cash flow  Discount factor  PV

The project has a positive net present value of $2 360.

8.1.2 Real flows and real rate of return

Alternatively, we can use the cash flows at today's prices (real flows) and discount them using the real rate of 9.1%. The discount factors at 9.1% are:

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 9.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.917</td>
</tr>
<tr>
<td>2</td>
<td>0.840</td>
</tr>
<tr>
<td>3</td>
<td>0.770</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(18 000)</td>
<td>1.000</td>
<td>(18 000)</td>
</tr>
<tr>
<td>1</td>
<td>9 000</td>
<td>0.917</td>
<td>8 253</td>
</tr>
<tr>
<td>2</td>
<td>8 000</td>
<td>0.840</td>
<td>6 720</td>
</tr>
<tr>
<td>3</td>
<td>7 000</td>
<td>0.770</td>
<td>5 390</td>
</tr>
</tbody>
</table>

Allowing for some small rounding errors, the present value of the cash flows and the NPV is exactly the same as before. In other words, the NPV of a project will be exactly the same, no matter whether it is calculated:

(a) with actual cash flows and the money rate of return, or

(b) with non-inflated cash flows and the real rate of return.

However, this is only true if the same rate of inflation is applied to all cash flows and incorporated within the money rate of return – see below.

8.2 The advantages of using real values and a real rate of return

Although it is recommended that companies should discount money values at the money cost of capital, there are some advantages of using real values discounted at a real cost of capital.

(a) When all costs and benefits rise at the same rate of price inflation, real values are the same as current day values, so that no further adjustments need be made to cash flows before discounting. In contrast, when money values are discounted at the money cost of capital, the prices in future years must be calculated before discounting can begin.

(b) The government might possibly prefer to set a real return as a target for its investments, as being more suitable to their particular situation than a commercial money rate of return.

8.3 Costs and benefits which inflate at different rates

Not all costs and benefits will rise in line with the general level of inflation. In such cases, we can apply the money rate to inflated values to determine a project’s NPV, and then discount at the money cost of capital.
Question 6: Costs and benefits with inflation

Rice is considering a project which would cost $5,000 now. The annual benefits, for four years, would be a fixed income of $2,500 a year, plus other annual savings amounting to $500 in Year 1, rising by 5% each year (compound) because of inflation. Running costs will be $1,000 in the first year, but would increase at 10% each year (compound) because of inflating labour costs. The company’s required money rate of return is 16%. Is the project worthwhile?

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 16%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.862</td>
</tr>
<tr>
<td>2</td>
<td>0.743</td>
</tr>
<tr>
<td>3</td>
<td>0.641</td>
</tr>
<tr>
<td>4</td>
<td>0.552</td>
</tr>
</tbody>
</table>

(The answer is at the end of the chapter)

8.4 Expectations of inflation and the effects of inflation

When managers evaluate a particular project, they can only estimate what the rate of inflation is going to be. Their expectations will probably be wrong, at least to some extent, because it is extremely difficult to forecast the rate of inflation accurately. The only way in which uncertainty about inflation can be allowed for in project evaluation is by risk and uncertainty analysis.

We stated earlier that costs and benefits may rise at levels different from the general rate of inflation: inflation may be general, affecting prices of all kinds, or specific to particular prices. Generalised inflation has the following effects.

(a) Since non-current assets and inventories will increase in money value, the same quantities of assets must be financed by increasing amounts of capital.

(i) If the future rate of inflation can be predicted, management can work out how much extra finance the company will need, and take steps to obtain it (for example, by retaining more profits, or by borrowing).

(ii) If the future rate of inflation cannot be predicted with accuracy, management should guess at what it will be and plan to obtain extra finance accordingly. However, plans should also be made to obtain ‘contingency funds’ if the rate of inflation exceeds expectations. For example, a higher bank overdraft facility might be negotiated, or a provisional arrangement made with a bank for a loan.

(b) Inflation means higher costs and higher selling prices. The effect of higher prices on demand is not necessarily easy to predict. A company that raises its prices by 10% because the general rate of inflation is running at 10% might suffer a serious fall in demand.

8.5 Allowing for inflation in practice

In practice, it is very common to ignore inflation when carrying out capital project appraisal, and to use current market rates of interest (money rates) with non-inflated cash flows. There are probably two main reasons for this.

(a) Inflation rates are often difficult to predict, and so it is frequently assumed that inflation will not be significant, and can be ignored.

(b) It is a safety-first approach. Future cash flow estimates are often uncertain, and for most projects, longer-term annual cash flows of a project are cash inflows. By not allowing for inflation, the estimated cash inflows will be under-stated, and a project will have to justify itself financially without the benefit of inflating revenues.
Allowing for tax in investment appraisal

Section overview

- Taxation has an effect on the cash flows of a project and should be allowed for in DCF, both in terms of the cash flows and the discount rate.
- Two main aspects of taxation must be considered in relation to cash flows:
  (a) If a project earns profits, there will be extra tax to pay.
  (b) There will be capital allowances (tax allowable depreciation) to be claimed on the non-current asset. These reduce the tax payable.
- When taxation is allowed for in the cash flows for the DCF calculation, the cost of capital used should be the company’s after-tax cost of capital. This allows for the tax relief on the company’s debt finance.

So far, in looking at project appraisal, we have ignored taxation. However, payments of tax, or reductions of tax payments, are relevant cash flows and must be considered in DCF analysis. Two main aspects of taxation must be considered in relation to cash flows:

(a) If a project earns profits, there will be extra tax to pay.
(b) There will be capital allowances (tax allowable depreciation) to be claimed on the non-current asset. These reduce the tax payable.

Typical assumptions are as follows.

(a) Tax is payable in the same year as the year in which the taxable profits are made. Therefore, if a project increases taxable profits by $10 000 in Year 2, there will be a tax payment, assuming tax at 30%, of $3 000 in Year 2.

An alternative assumption is that tax is payable in the year after the one in which the profits arise. In this case, an increase in profits of $10 000 in Year 2 would give rise to higher taxation of $3 000 in Year 3, assuming tax at 30%.

(b) Net cash flows from a project should be considered as the taxable profits arising from the project (unless an indication is given to the contrary).

Worked Example: taxation on profits

A company is considering whether or not to purchase an item of machinery costing $40 000 in 20X5. It would have a life of four years, after which it would be sold for $5 000. The machinery would create annual cost savings of $14 000.

The rate of tax is 30% and tax is payable in the same year as the profits arise. The after-tax cost of capital is 8%. Assume that the cost of the machine is not allowable for tax and that there are no capital allowances.

Should the machinery be purchased?

Solution

The net cash flows and the NPV can be calculated as follows.

<table>
<thead>
<tr>
<th>Year</th>
<th>Equipment</th>
<th>Savings</th>
<th>Tax on savings</th>
<th>Net cash flow</th>
<th>Discount factor</th>
<th>Present value of cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(40 000)</td>
<td></td>
<td></td>
<td>(40 000)</td>
<td>1.00</td>
<td>(40 000)</td>
</tr>
<tr>
<td>1</td>
<td>14 000</td>
<td>(4 200)</td>
<td>9 800</td>
<td>9 075</td>
<td>0.926</td>
<td>9 075</td>
</tr>
<tr>
<td>2</td>
<td>14 000</td>
<td>(4 200)</td>
<td>9 800</td>
<td>8 399</td>
<td>0.857</td>
<td>8 399</td>
</tr>
<tr>
<td>3</td>
<td>14 000</td>
<td>(4 200)</td>
<td>9 800</td>
<td>7 781</td>
<td>0.794</td>
<td>7 781</td>
</tr>
<tr>
<td>4</td>
<td>5 000</td>
<td>14 000</td>
<td>(4 200)</td>
<td>14 800</td>
<td>0.735</td>
<td>10 878</td>
</tr>
</tbody>
</table>

The NPV is negative and so the purchase appears not to be worthwhile.
9.1 Taxation and the discount rate

The effect of taxation on capital budgeting is theoretically quite simple. Organisations must pay tax, and the effect of undertaking a project will be to increase or decrease tax payments each year. These incremental tax cash flows should be included in the cash flows of the project for discounting to arrive at the project’s NPV.

When taxation is ignored in the cash flows for DCF calculations, the discount rate will reflect the pre-tax rate of return required on capital investments.

When taxation is included in the cash flows, the cost of capital used should be the company’s after-tax cost of capital or post-tax required rate of return. This allows for the tax relief on the company’s debt finance.

Question 7: DCF and taxation

A company is considering the purchase of an item of equipment, which would earn profits before tax of $25 000 a year. Depreciation charges would be $20 000 a year for six years. Tax-allowable depreciation would be $30 000 a year for the first four years only. Tax is at 30%.

What would be the annual net cash inflows of the project:
(a) For the first four years?
(b) For the fifth and sixth years?
(c) What is the NPV of the project, if the after-tax cost of capital is 8%?

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor at 8%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.926</td>
</tr>
<tr>
<td>2</td>
<td>0.857</td>
</tr>
<tr>
<td>3</td>
<td>0.794</td>
</tr>
<tr>
<td>4</td>
<td>0.735</td>
</tr>
<tr>
<td>5</td>
<td>0.681</td>
</tr>
<tr>
<td>6</td>
<td>0.630</td>
</tr>
</tbody>
</table>

(The answer is at the end of the chapter)

9.2 Calculating capital allowances

When a business buys non-current assets, it may be entitled to claim a tax allowance for the decline in value or depreciation of the asset. This is known as a capital allowance.

For example, suppose that a company buys an item of equipment costing $100 000. It cannot usually claim the full $100 000 immediately against tax. Instead, it can claim capital allowances over the life of the asset.

Capital allowances are used to reduce taxable profits, and the consequent reduction in a tax payment should be treated as a cash saving arising from the acceptance of a project.

Under the prime cost method, the decline in value of the depreciating asset is generally calculated as a percentage of the initial cost of the asset and reflects a uniform decline in value over time.

Under the diminishing value method (also called the reducing balance method), the decline for each year is calculated on the balance of the asset’s cost that remains after the decline in value for previous years has been taken into account.

Worked Example: Capital allowances

A company acquires an asset for $10 000, with an effective life of 10 years.

If the company is required to use the prime cost method to calculate capital allowances, the annual deduction for capital allowances would be 10% of the asset’s cost:
Years 1-10: \(\frac{10000}{10} = \$1000\)

If the diminishing value method is used, capital allowances are available at 1.5 times the equivalent prime cost rate, and are calculated on a reducing balance basis. This equates to allowances of 15% p.a. for an asset with an effective life of 10 years:

- Year 1: \(10000 \times \frac{1.5}{10} = \$1500\)
- Year 2: \((10000 - 1500) \times \frac{1.5}{10} = \$1275\)
- Year 3: \((10000 - 1500 - 1275) \times \frac{1.5}{10} = \$1084\) etc

**Question 8: Capital allowances**

Capital allowances are available on an item of **plant and machinery** at the rate of 25% on a **reducing balance** basis.

If a company purchases plant costing \$80,000, calculate the available capital allowances for the first four years of the asset’s life.

(The answer is at the end of the chapter)

**9.2.1 Disposal of the asset**

When an asset is disposed of, there will be (a) a **balancing allowance** or (b) a **balancing charge**, depending on whether the sale value of the asset is (a) **lower** or (b) **higher** than the remaining tax adjusted asset value, after deducting cumulative capital allowances to date.

The balancing allowance or charge must be multiplied by the rate of tax to obtain the effect on cash flow.

**Worked Example: Impact of disposal**

A machine originally cost \$50,000 and capital allowances have been claimed at 10% on a prime cost basis for the past six years.

Assuming a tax rate of 30%, what is the tax effect of:

(a) Selling the machine for \$25,000 (salvage)

(b) Selling the machine for \$18,000 (salvage)?

**Solution**

The tax adjusted value after six years of capital allowances is \(50000 - (6 \times 10\% \times 50000) = \$20,000\)

(a) If the machine is sold for \$25,000 there will be a balancing charge of \$5,000 gain on salvage, which will result in additional tax payable of \$1,500.

(b) If the machine is sold for \$18,000 there will be a balancing allowance of \$2,000 loss on salvage, which will result in an additional tax saving of \$600.

**Question 9: Capital allowances on disposal**

A company is considering the purchase of a machine for \$150,000. It would be sold after four years for an estimated realisable value of \$50,000. By this time tax-allowable depreciation of \$120,000 would have been claimed. The rate of tax is 30%.

What are the tax implications of the sale of the machine at the end of four years?

(The answer is at the end of the chapter)
Assumptions about capital allowances can be simplified in a question. For example, you might be told that capital allowances can be claimed at the rate of 25% of cost on a straight line basis (that is, over four years), or a question might refer to 'tax allowable depreciation', so that the capital allowances equal the depreciation charge.

There are two possible assumptions about the time when capital allowances start to be claimed.

(a) It can be assumed that the first claim for capital allowances occurs at the start of the project (at Year 0) and so the first tax saving occurs in Year 0.

(b) Alternatively it can be assumed that the first claim for capital allowances occurs later in the first year, so the first tax saving also occurs in Year 1.

**Worked Example: Investment appraisal with taxation**

A company is considering whether or not to purchase an item of machinery.

The machine costs $40 000 in 20X5. It would have a life of four years, after which it would be sold for $5 000. The machinery would create annual cost savings of $14 000.

The machinery would attract capital allowances of 25% on the reducing balance basis which could be claimed against taxable profits of the current year, which is soon to end. A balancing allowance or charge would arise on disposal. The rate of income tax is 30%. Tax is payable in the same year as the profits arise. The after-tax cost of capital is 8%.

Should the machinery be purchased?

**Solution**

The first capital allowance is claimed against Year 0 profits.

Cost: $40 000

<table>
<thead>
<tr>
<th>Year</th>
<th>Allowance</th>
<th>Reducing balance (RB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0) 20X5 (25% of cost)</td>
<td>10 000</td>
<td>30 000 (40 000 – 10 000)</td>
</tr>
<tr>
<td>(1) 20X6 (25% of RB)</td>
<td>7 500</td>
<td>22 500 (30 000 – 7 500)</td>
</tr>
<tr>
<td>(2) 20X7 (25% of RB)</td>
<td>5 625</td>
<td>16 875 (22 500 – 5 625)</td>
</tr>
<tr>
<td>(3) 20X8 (25% of RB)</td>
<td>4 219</td>
<td>12 656 (16 875 – 4 219)</td>
</tr>
<tr>
<td>(4) 20X9 (25% of RB)</td>
<td>3 164</td>
<td>9 492 (12 656 – 3 164)</td>
</tr>
</tbody>
</table>

Sale proceeds, end of fourth year (salvage) 5 000

Less reducing balance, end of fourth year (9 492)

Balancing allowance (loss on salvage) (4 492)

Having calculated the allowances each year, the tax savings can be computed.

<table>
<thead>
<tr>
<th>Year</th>
<th>Allowance</th>
<th>Tax saved at 30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10 000</td>
<td>3 000</td>
</tr>
<tr>
<td>1</td>
<td>7 500</td>
<td>2 250</td>
</tr>
<tr>
<td>2</td>
<td>5 625</td>
<td>1 688</td>
</tr>
<tr>
<td>3</td>
<td>4 219</td>
<td>1 266</td>
</tr>
<tr>
<td>4</td>
<td>7 656 (3 164 + 4 492)</td>
<td>2 297</td>
</tr>
</tbody>
</table>

* Net cost $(40 000 – 5 000) = $35 000

These tax savings relate to capital allowances. We must also calculate the extra tax payments on annual savings of $14 000.
The net cash flows and the NPV are now calculated as follows.

<table>
<thead>
<tr>
<th>Year</th>
<th>Equipment $</th>
<th>Savings $</th>
<th>Tax on Capital savings $</th>
<th>Net cash $</th>
<th>Discount factor</th>
<th>Present value cash flow $</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(40 000)</td>
<td></td>
<td>3 000</td>
<td>(37 000)</td>
<td>8%</td>
<td>(37 000)</td>
</tr>
<tr>
<td>1</td>
<td>14 000</td>
<td>(4 200)</td>
<td>2 250</td>
<td>12 050</td>
<td>0.926</td>
<td>11 158</td>
</tr>
<tr>
<td>2</td>
<td>14 000</td>
<td>(4 200)</td>
<td>1 688</td>
<td>11 488</td>
<td>0.857</td>
<td>9 845</td>
</tr>
<tr>
<td>3</td>
<td>14 000</td>
<td>(4 200)</td>
<td>1 266</td>
<td>11 066</td>
<td>0.794</td>
<td>8 786</td>
</tr>
<tr>
<td>4</td>
<td>5 000</td>
<td>14 000</td>
<td>2 297</td>
<td>17 097</td>
<td>0.735</td>
<td>12 566</td>
</tr>
</tbody>
</table>

The NPV is positive and so the purchase appears to be worthwhile.

**Question 10: DCF with tax**

Quitongo is considering a major investment program which will involve the creation of a chain of retail outlets. The following schedule of expected cash flows has been prepared for analysis.

<table>
<thead>
<tr>
<th>Time</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 '000</td>
<td>3 250</td>
<td>750</td>
<td>1 000</td>
<td>1 750</td>
<td>2 500</td>
</tr>
<tr>
<td>1 '000</td>
<td>800</td>
<td>1 100</td>
<td>1 500</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>2 '000</td>
<td>170</td>
<td>250</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3 '000</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>4 '000</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Additional information:

(a) 40% of office overhead is an allocation of head office operating costs.

(b) The cost of land and buildings includes $120 000 which has already been spent on surveyors’ and other advisers’ fees.

(c) Quitongo expects to sell the chain at the end of year 4 for $4 500 000 after tax.

(d) Cost of capital is 7% after tax.

Quitongo is paying tax at 30% and is expected to do so for the foreseeable future. Tax is payable one year after profits are earned. Capital allowances are available on fittings and equipment (only) at 25% on a reducing balance basis. Resale proceeds of $200 000 for fittings and equipment have been included in the total figure of $4 500 000 given above.

Quitongo has an accounting year end of 31 December, and expenditure on the investment program will take place in January.

Quitongo expects the following working capital requirements during each of the four years of the investment program. (All figures in $’000s)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>300</td>
<td>375</td>
<td>400</td>
</tr>
</tbody>
</table>

Calculate the NPV of the project.

(The answer is at the end of the chapter)
Key chapter points

• With the NPV method of project appraisal, all expected cash inflows and all expected cash outflows from the project are discounted to a present value at the organisation’s cost of capital. Projects with a positive NPV are financially viable, but projects with a negative NPV are not.

• The discounted payback method is the time it takes to recover the initial project investment in discounted cash flow i.e. present value terms.

• The internal rate of return of the project (IRR) is the cost of capital at which the NPV of the project would be zero, and so is the discount rate of return that the project is expected to earn. A project is financially viable if its IRR exceeds the company’s target rate of return (its cost of capital).

• NPV tells us the absolute $ increase in shareholder wealth from a project, assuming a given cost of capital. IRR tells us the maximum amount that the company could afford to pay for the project finance, or the expected return of the project in percentage terms. NPV is the preferred method because it is consistent with the objective of maximising shareholder wealth and is the only approach for deciding between mutually exclusive projects. Despite the advantages of the NPV method over the IRR method, the IRR method is widely used in practice because it is easier to understand. Even so, the NPV method is superior.

• Sensitivity analysis assesses how responsive the project’s NPV is to changes in the variables used to calculate that NPV.

• Capital rationing refers to a situation in which a company has a limited amount of capital to invest in potential projects.

• Capital rationing may occur due to internal factors (soft capital rationing) or external factors (hard capital rationing).

• When capital rationing occurs in a single period, and projects are divisible, projects are ranked in terms of profitability index (PV of cashflows per $ initial outlay).

• If the projects are not divisible a decision has to be made by examining the absolute NPVs of all possible combinations of complete projects that can be undertaken within the constraints of the capital available.

• If projects can be postponed until Year 1, the optimal investment plan is determined by reference to the gain or loss of NPV from postponement.

• Inflation should be provided for in financial planning. In DCF, project cash flows should be increased to allow for expected inflation, and these should then be discounted at the money cost of capital. Alternatively, non-inflated cash flows should be discounted at the real cost of capital.

• The two rates of return and the inflation rate are linked by the equation:

\[
(1 + \text{money rate}) = (1 + \text{real rate}) \times (1 + \text{inflation rate})
\]

where all the rates are expressed as proportions.

• Taxation also has an effect on the cash flows of a project and should be allowed for in DCF.

• Two main aspects of taxation must be considered in relation to a project’s cash flows: (a) If a project earns profits, there will be extra tax to pay. (b) There will be capital allowances to be claimed on the asset. These reduce the tax payable.

• When taxation is allowed for in DCF, the cost of capital should be the company’s after-tax cost of capital. This allows for the tax relief on the company’s debt finance.

• When an asset is disposed of, there will be (a) a balancing loss on salvage allowance or (b) a balancing charge, depending on whether the sale value of the asset is (a) lower or (b) higher than the remaining balance of the asset value, after deducting cumulative capital allowances to date. The balancing allowance or charge must be multiplied by the rate of tax to obtain the effect on cash flow.
Quick revision questions

1 Project X, an eight-year project, would be expected to earn an NPV of +$800 000. Project Y, a four-year project, would be expected to earn an NPV of +$750 000. What investment strategy would you recommend?

2 A company whose cost of capital is 11 per cent is considering whether to undertake a project with the following cash flows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Net cash flow $000</th>
<th>Discount factor at 11%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(45.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>(15.0)</td>
<td>0.90</td>
</tr>
<tr>
<td>2</td>
<td>40.0</td>
<td>0.81</td>
</tr>
<tr>
<td>3</td>
<td>30.0</td>
<td>0.73</td>
</tr>
<tr>
<td>4</td>
<td>30.0</td>
<td>0.66</td>
</tr>
<tr>
<td>5</td>
<td>20.0</td>
<td>0.59</td>
</tr>
</tbody>
</table>

What is the discounted payback period for this project?
A 2.7 years  
B 3.2 years  
C 3.6 years  
D 3.8 years

3 The expected NPV of a project would be -$72 600 at a discount rate of 15% and +$197 300 at a discount rate of 12 per cent. Using these figures, the IRR to the nearest round number, can be estimated as:
A 12 per cent  
B 13 per cent  
C 14 per cent  
D 15 per cent

4 Sensitivity analysis allows for uncertainty in project appraisal by assessing the probability of changes in the decision variables. Is this statement true or false?
true □  
false □

5 Which of the following is not an example of soft capital rationing?
A Management does not want to issue more shares to raise capital, in order to avoid dilution of control.  
B The company will only use retained earnings to finance new investment.  
C The company is debt-averse.  
D The company's credit rating prevents it from borrowing further.
6 The profitability index may be used in investment decisions where capital rationing exists. In this context, when selecting investments for an optimal portfolio, the use of the profitability index is appropriate only where:

I projects are divisible.

II capital rationing occurs within a single investment period.

Which one of the following combinations (true/false) relating to the above statements is correct?

Statement

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>true</td>
</tr>
<tr>
<td>B</td>
<td>true</td>
</tr>
<tr>
<td>C</td>
<td>false</td>
</tr>
<tr>
<td>D</td>
<td>false</td>
</tr>
</tbody>
</table>

7 The money cost of capital is 11%. The expected annual rate of inflation is 5%. What is the real cost of capital?

- A 5.7%
- B 6%
- C 16%
- D 16.55%

8 Choose the correct words from those highlighted.

Tax-allowable depreciation is used to (1) **increase/reduce** taxable profits, and the consequent reduction in a tax payment should be treated as a (2) **cash saving/cash payment** arising from the acceptance of a project.

When the plant is eventually sold, the difference between the sales price and the tax adjusted value will be treated as a (3) **taxable profit/tax allowable loss** if the sales price exceeds the tax adjusted value, and as a (4) **taxable profit/tax allowable loss** if the tax adjusted value exceeds the sales price.
1 If the projects are not mutually exclusive, both should be undertaken. If they are mutually exclusive, project X should be undertaken because it has a higher NPV; however, if the company requires projects to pay back within a maximum time period, project Y might be preferred.

2 B

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV</th>
<th>Cumulative PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(45.0)</td>
<td>1.00</td>
<td>(45.0)</td>
<td>(45.0)</td>
</tr>
<tr>
<td>1</td>
<td>(15.0)</td>
<td>0.90</td>
<td>(13.5)</td>
<td>(58.5)</td>
</tr>
<tr>
<td>2</td>
<td>40.0</td>
<td>0.81</td>
<td>32.4</td>
<td>(26.1)</td>
</tr>
<tr>
<td>3</td>
<td>30.0</td>
<td>0.73</td>
<td>21.9</td>
<td>(4.2)</td>
</tr>
<tr>
<td>4</td>
<td>30.0</td>
<td>0.66</td>
<td>19.8</td>
<td>15.6</td>
</tr>
</tbody>
</table>

3 + \frac{4.2}{(4.2+15.6)} years = 3.2 years

3 C IRR = 12% + \frac{197 300}{(197 300+72 600)} \times (15 - 12)\%

= 12% + 2.2%

= 14% approx.

4 False. Sensitivity analysis does not assess probability.

5 D Soft capital rationing is a limit on capital investment imposed from within the company.

6 A Using the profitability index is in investment decisions where capital rationing exists is appropriate when profits are divisible and capital rationing occurs within a single investment period.

7 A \(1+r = \frac{(1+m)}{(1+i)}\)

1+r = \frac{1.11}{1.05} = 1.057. The real cost of capital is 5.7%.

8 (1) reduce
(2) cash saving
(3) taxable profit
(4) tax allowable loss
Answers to chapter questions

1  Savings are $75,000 \times (3 - 2.50) = $37,500 per annum.
   Additional costs are $7,500 per annum.
   Net cash savings are therefore $30,000 per annum. (Remember, depreciation is not a cash flow and
must be ignored as a 'cost'.)
   The first step in calculating an NPV is to establish the relevant costs year by year. All future cash
flows arising as a direct consequence of the decision should be taken into account. It is assumed that
the machine will be sold for $10,000 at the end of Year 4.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV of cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$90,000</td>
<td>1.000</td>
<td>$(90,000)</td>
</tr>
<tr>
<td>1</td>
<td>30,000</td>
<td>0.893</td>
<td>26,790</td>
</tr>
<tr>
<td>2</td>
<td>30,000</td>
<td>0.797</td>
<td>23,910</td>
</tr>
<tr>
<td>3</td>
<td>30,000</td>
<td>0.712</td>
<td>21,360</td>
</tr>
<tr>
<td>4</td>
<td>40,000</td>
<td>0.636</td>
<td>25,440</td>
</tr>
</tbody>
</table>

NPV = $7,500

The NPV is positive and so the project is expected to earn more than 12% per annum and is
therefore acceptable.

2  Try 14%  Try 16%

<table>
<thead>
<tr>
<th>Time</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV</th>
<th>Discount factor</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$(4,000)</td>
<td>1.000</td>
<td>$(4,000)</td>
<td>1.000</td>
<td>$(4,000)</td>
</tr>
<tr>
<td>1</td>
<td>1,200</td>
<td>0.877</td>
<td>1,052</td>
<td>0.862</td>
<td>1,034</td>
</tr>
<tr>
<td>2</td>
<td>1,410</td>
<td>0.769</td>
<td>1,084</td>
<td>0.743</td>
<td>1,048</td>
</tr>
<tr>
<td>3</td>
<td>1,875</td>
<td>0.675</td>
<td>1,266</td>
<td>0.641</td>
<td>1,202</td>
</tr>
<tr>
<td>4</td>
<td>1,150</td>
<td>0.592</td>
<td>681</td>
<td>0.552</td>
<td>635</td>
</tr>
</tbody>
</table>

NPV $83

The IRR must be less than 16% per cent, but higher than 14% per cent. The NPVs at these two costs of
capital will be used to estimate the IRR.

Using the interpolation formula:

$$\text{IRR} = 14\% + \frac{83 - 14\% \times (16\% - 14\%)}{83 + 81} = 15.01\%$$

The project should be accepted as the IRR is more or less exactly the minimum return demanded. It
is therefore just acceptable, ignoring risk and uncertainty in the cash flow estimates.

3  The PVs of the cash flows are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Discount factor 8%</th>
<th>PV of plant cost</th>
<th>PV of running costs</th>
<th>PV of savings</th>
<th>PV of net cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.000</td>
<td>$(7,000)</td>
<td>$</td>
<td></td>
<td>$(7,000)</td>
</tr>
<tr>
<td>1</td>
<td>0.926</td>
<td>(1,852)</td>
<td>5,556</td>
<td>3,704</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.857</td>
<td>(2,143)</td>
<td>5,999</td>
<td>3,856</td>
<td></td>
</tr>
</tbody>
</table>

(7,000) (3,995) 11,555 560
The project has a positive NPV and would appear to be worthwhile. Sensitivity of the project to changes in the levels of expected costs and savings is as follows:

(a) **Plant costs sensitivity** = \( \frac{560}{7000} \times 100 = 8\% \)

(b) **Running costs sensitivity** = \( \frac{560}{3995} \times 100 = 14\% \)

(c) **Savings sensitivity** = \( \frac{560}{11555} \times 100 = 4.8\% \)

4. The ratio of NPV at 10% to outlay in Year 0 (the year of capital rationing) is as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Outlay in year 0</th>
<th>PV</th>
<th>NPV</th>
<th>Ratio</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>50 000</td>
<td>55 700</td>
<td>5 700</td>
<td>1.114</td>
<td>3rd</td>
</tr>
<tr>
<td>B</td>
<td>28 000</td>
<td>31 290</td>
<td>3 290</td>
<td>1.118</td>
<td>2nd</td>
</tr>
<tr>
<td>C</td>
<td>30 000</td>
<td>34 380</td>
<td>4 380</td>
<td>1.146</td>
<td>1st</td>
</tr>
</tbody>
</table>

**Working**

**Present value A**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(20 000)</td>
<td>0.909</td>
<td>(18 180)</td>
</tr>
<tr>
<td>2</td>
<td>20 000</td>
<td>0.826</td>
<td>16 520</td>
</tr>
<tr>
<td>3</td>
<td>40 000</td>
<td>0.751</td>
<td>30 040</td>
</tr>
<tr>
<td>4</td>
<td>40 000</td>
<td>0.683</td>
<td>27 320</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>55 700</strong></td>
</tr>
</tbody>
</table>

**Present value B**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(50 000)</td>
<td>0.909</td>
<td>(45 450)</td>
</tr>
<tr>
<td>2</td>
<td>40 000</td>
<td>0.826</td>
<td>33 040</td>
</tr>
<tr>
<td>3</td>
<td>40 000</td>
<td>0.751</td>
<td>30 040</td>
</tr>
<tr>
<td>4</td>
<td>20 000</td>
<td>0.683</td>
<td>13 660</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>31 290</strong></td>
</tr>
</tbody>
</table>

**Present value C**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(30 000)</td>
<td>0.909</td>
<td>(27 270)</td>
</tr>
<tr>
<td>2</td>
<td>30 000</td>
<td>0.826</td>
<td>24 780</td>
</tr>
<tr>
<td>3</td>
<td>40 000</td>
<td>0.751</td>
<td>30 040</td>
</tr>
<tr>
<td>4</td>
<td>10 000</td>
<td>0.683</td>
<td>6 830</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>34 380</strong></td>
</tr>
</tbody>
</table>

The optimal investment policy is as follows:

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Project</th>
<th>Year 0 outlay</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>C</td>
<td>30 000</td>
<td>4 380</td>
</tr>
<tr>
<td>2nd</td>
<td>B</td>
<td>28 000</td>
<td>3 290</td>
</tr>
<tr>
<td>3rd</td>
<td>A (balance)</td>
<td>2 000 (4% of 5 700)</td>
<td>228</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NPV from total investment = 7 898</td>
</tr>
</tbody>
</table>
(1 + money rate) = (1 + real rate) x (1 + inflation rate)

Year 1: (1 + money) = (1 + 0.10) x (1 + 0.05)
(1 + m) = 1.155; m = 15.5%

Year 2: (1 + money) = (1 + 0.10) x (1 + 0.03)
(1 + m) = 1.133; m = 13.3%

Discount factors:
Time 1 = 1/1.155 = 0.866
Time 2 = 1/1.155 x 1/1.133 = 0.764

The cash flows at inflated values are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Fixed income</th>
<th>Other savings</th>
<th>Running costs</th>
<th>Net cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 500</td>
<td>500</td>
<td>(1 000)</td>
<td>2 000</td>
</tr>
<tr>
<td>2</td>
<td>2 500</td>
<td>525</td>
<td>(1 100)</td>
<td>1 925</td>
</tr>
<tr>
<td>3</td>
<td>2 500</td>
<td>551</td>
<td>(1 210)</td>
<td>1 841</td>
</tr>
<tr>
<td>4</td>
<td>2 500</td>
<td>579</td>
<td>(1 331)</td>
<td>1 748</td>
</tr>
</tbody>
</table>

The NPV of the project is as follows.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(5 000)</td>
<td>1.000</td>
<td>(5 000)</td>
</tr>
<tr>
<td>1</td>
<td>2 000</td>
<td>0.862</td>
<td>1 724</td>
</tr>
<tr>
<td>2</td>
<td>1 925</td>
<td>0.743</td>
<td>1 430</td>
</tr>
<tr>
<td>3</td>
<td>1 841</td>
<td>0.641</td>
<td>1 180</td>
</tr>
<tr>
<td>4</td>
<td>1 748</td>
<td>0.552</td>
<td>965</td>
</tr>
</tbody>
</table>

+ 299

The NPV is positive and the project would seem therefore to be worthwhile.

Working

<table>
<thead>
<tr>
<th>Years 1–4</th>
<th>Years 5–6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>$25 000</td>
<td>$25 000</td>
</tr>
<tr>
<td>Add back depreciation</td>
<td>Add back depreciation</td>
</tr>
<tr>
<td>$20 000</td>
<td>$20 000</td>
</tr>
<tr>
<td>$45 000</td>
<td>$45 000</td>
</tr>
<tr>
<td>Less tax-allowable depreciation</td>
<td>Less tax-allowable depreciation</td>
</tr>
<tr>
<td>$30 000</td>
<td>$30 000</td>
</tr>
<tr>
<td>Taxable cash flow</td>
<td>Taxable cash flow</td>
</tr>
<tr>
<td>$15 000</td>
<td>$24 000</td>
</tr>
<tr>
<td>Tax at 30%</td>
<td>Tax at 30%</td>
</tr>
<tr>
<td>$4 500</td>
<td>$13 500</td>
</tr>
</tbody>
</table>

(a) Years 1 – 4 Net cash inflow after tax $45 000 – $4 500 = $40 500
(b) Years 5 – 6 Net cash inflow after tax = $45 000 – $13 500 = $31 500
(c) The cost of the equipment is $120 000 (6 x annual depreciation or 4 x annual capital allowance).

<table>
<thead>
<tr>
<th>Year</th>
<th>Net cash flow</th>
<th>Discount factor</th>
<th>Present value of cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(120 000)</td>
<td>1.000</td>
<td>(120 000)</td>
</tr>
<tr>
<td>1</td>
<td>40 500</td>
<td>0.926</td>
<td>37 503</td>
</tr>
<tr>
<td>2</td>
<td>40 500</td>
<td>0.857</td>
<td>34 709</td>
</tr>
<tr>
<td>3</td>
<td>40 500</td>
<td>0.794</td>
<td>32 157</td>
</tr>
<tr>
<td>4</td>
<td>40 500</td>
<td>0.735</td>
<td>29 768</td>
</tr>
<tr>
<td>5</td>
<td>31 500</td>
<td>0.681</td>
<td>21 452</td>
</tr>
<tr>
<td>6</td>
<td>31 500</td>
<td>0.630</td>
<td>19 845</td>
</tr>
<tr>
<td></td>
<td>NPV</td>
<td></td>
<td>55 434</td>
</tr>
</tbody>
</table>
### Advanced Investment Appraisal

<table>
<thead>
<tr>
<th>Year</th>
<th>Capital Allowance</th>
<th>Reducing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(25% of cost)</td>
<td>$20,000</td>
</tr>
<tr>
<td>2</td>
<td>(25% of RB)</td>
<td>$15,000</td>
</tr>
<tr>
<td>3</td>
<td>(25% of RB)</td>
<td>$11,250</td>
</tr>
<tr>
<td>4</td>
<td>(25% of RB)</td>
<td>$8,438</td>
</tr>
</tbody>
</table>

9

There will be a balancing charge on the sale of the machine of 
\[\$(50,000 - (150,000 - 120,000)) = \$20,000.\]

This will give rise to a tax payment of 30% × $20,000 = $6,000.

10

\[
\begin{array}{lcccccc}
\text{	extdollar}'000 & \text{Time} & 0 & 1 & 2 & 3 & 4 & 5 \\
\text{Revenue} & 1,000 & 1,750 & 2,500 & 3,200 \\
\text{Direct costs} & (800) & (1,100) & (1,500) & (1,600) \\
\text{Marketing} & (170) & (250) & (200) & (200) \\
\text{Overheads (60\%)} & (60) & (60) & (60) & (60) \\
\text{Operating cash flow} & (30) & 340 & 740 & 1,340 \\
\text{Taxation @ 30\%} & 9 & (102) & (222) & (402) \\
\text{Fittings & equipment} & (750) & 200 \\
\text{Sale of business} & & 4,300 \\
\text{Land & buildings} & (3,130) \\
\text{Tax benefit of capital} & & & & & & \\
\text{allowances (W2)} & 56 & 42 & 32 & 35 \\
\text{Working capital} & (250) & (50) & (75) & (25) & 400 \\
\text{Net cash flow} & (4,130) & (80) & 330 & 655 & 6,050 & (367) \\
\text{7\% discount factors} & 1 & 0.935 & 0.873 & 0.816 & 0.763 & 0.713 \\
\text{Present value} & (4,130) & (75) & 288 & 534 & 4,616 & (262) \\
\end{array}
\]

\[
\text{NPV} = + \$971,000
\]

(W1) \textbf{Calculation of tax on profits:}

\[
\begin{array}{lcccc}
\text{Time} & 1 & 2 & 3 & 4 \\
\text{Operating profit} & (30) & 340 & 740 & 1,340 \\
\text{Tax} & 2 & 3 & 4 & 5 \\
\end{array}
\]

\[
\begin{array}{lcccc}
\text{Time} & 9 & (102) & (222) & (402) \\
\end{array}
\]
(W2) Calculation of tax benefit of capital allowances:

<table>
<thead>
<tr>
<th>Time</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDA ($000s)</td>
<td>188</td>
<td>141</td>
<td>105</td>
<td>116*</td>
</tr>
</tbody>
</table>

```
Time    | 2   | 3   | 4   | 5   |
Tax     | 56  | 42  | 32  | 35  |
```

* outlay – scrap proceeds – claims to date = 750 - 200 - 188 - 141 - 105 = 116

(W3) Calculation of working capital flows:

<table>
<thead>
<tr>
<th>Time</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>W.Cap</td>
<td>250</td>
<td>300</td>
<td>375</td>
<td>400</td>
<td>0*</td>
</tr>
<tr>
<td>$000s</td>
<td>(250)</td>
<td>(50)</td>
<td>(75)</td>
<td>(25)</td>
<td>400</td>
</tr>
</tbody>
</table>

* normal assumption that working capital released at end of project
Chapter 3
Capital markets

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital markets</strong></td>
<td>LO2</td>
</tr>
<tr>
<td>Specify the function and structure of the financial markets and the role of the</td>
<td>LO2.1</td>
</tr>
<tr>
<td>various market participants</td>
<td></td>
</tr>
<tr>
<td>Discuss the role of the government in regulating the capital markets and</td>
<td>LO2.2</td>
</tr>
<tr>
<td>establishing an appropriate regulatory framework</td>
<td></td>
</tr>
<tr>
<td>Describe typical guidelines related to the operation of securities markets</td>
<td>LO2.3</td>
</tr>
<tr>
<td>Recognise the impact of the external financial markets and the regulatory framework</td>
<td>LO2.4</td>
</tr>
<tr>
<td>on an entity’s financial strategy</td>
<td></td>
</tr>
<tr>
<td>Calculate and interpret the cost of various sources of finance</td>
<td>LO4.4</td>
</tr>
</tbody>
</table>

Topic list

1. Money markets and capital markets
2. Financial intermediaries
3. Regulation and the role of the government
4. Exchange rates
5. Rates of interest and rates of return
In this chapter we introduce the framework of markets and institutions through which the financing of a business takes place. Capital markets provide a source of funds and an exit route for investors.
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What is the difference between a money market and a capital market? (Section 1.2, 1.3)
2. Explain the characteristics of equity and debt securities. (Section 1.3)
3. What is the difference between a primary and secondary market? (Section 1.5)
4. What is a financial intermediary? (Section 2)
5. What is Over The Counter (OTC) trading? (Section 1.6.5)
6. Name any two roles that the government undertakes in relation to the financial markets. (Section 3.2)
7. The pattern of interest rates on financial assets is influenced by the ……… of the assets, the ……… of the lending, and the ……… of the loan. Fill in the blanks. (Section 5.1)
1 Money markets and capital markets

Section overview
- Money markets are markets for short-term capital.
- Capital markets are markets for long-term capital.
- The main capital market in Australia is the Australian Securities Exchange (ASX).
- A stock market acts as a primary market (i.e. where securities (debt and equities) are issued for the first time) and as a secondary market for the trading of existing securities (i.e. shares and bonds).

1.1 The role and structure of financial markets

The primary role of the financial market is to provide a medium of exchange where funds transfers can take place between individuals, firms and governments. Funds can flow directly between borrowers and lenders or through third parties known as financial intermediaries.

Financial market participants commonly distinguish between the 'capital market' and the 'money market'. The money market refers to borrowing and lending for periods of up to a year, whereas the capital market exists for the trading of longer term financial instruments.

Differences between loan terms

<table>
<thead>
<tr>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 5</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short term</td>
<td>Medium term</td>
<td>Long term</td>
<td></td>
</tr>
</tbody>
</table>

1.2 The money markets

Money markets are markets for:
- Trading short-term financial instruments.
- Short-term lending and borrowing.

The money markets are operated by the banks and other financial institutions. They facilitate short-term financing and provide liquidity for short-term assets. Although the money markets largely involve borrowing and lending by banks, some large companies, as well as the government, are involved in money market operations.

The inter-bank market is a market for very short term borrowing, often overnight, between banks.

The key financial instruments traded are:
(a) Cash deposits – money in the bank accounts of banks and other financial intermediaries, offering a range of different investment periods and rates of return.
(b) Negotiable instruments – a piece of paper representing ownership of debts and obligations. The ownership is passed on with the delivery of the piece of paper. Negotiable instruments traded in the money market include 90- and 180-day bills of exchange, promissory notes and certificates of deposit, which are written orders promising to pay a specified sum of money at a predetermined time to the order of a specified person or bearer.
(c) Treasury notes – a short-term debt instrument issued through the Reserve Bank of Australia (RBA), by the Australian government. Treasury notes are issued on a tender basis for periods of 5, 13 and 26 weeks, at a discount from face value. The notes are highly negotiable and are aimed at professional short-term money market investors rather than the ordinary individual.
(d) Commercial bills – IOUs issued by large companies which can be held to maturity or sold to third parties before maturity.
(e) Fixed interest short term bonds.
1.2.1 Official and unofficial money markets

**Definition**

The **official money market** is the market supported and sponsored by the Reserve Bank of Australia (RBA), which is responsible for the conduct of monetary policy, the issue of bank notes and the setting and management of Australia’s foreign exchange reserves.

Features of the official money market are:

- Authorised dealers trade in government securities.
- RBA provides lender of the last resort facilities to authorised dealers.
- Government implements monetary policy changes.

The **unofficial money market** is less formally organised and does not have official RBA support.

It comprises:

- the intercompany market — involving direct lending between companies.
- the commercial paper market — intermediary trading of commercial bills, promissory notes and negotiable certificates.

1.3 The capital markets

Capital markets are markets for trading in long-term finance, in the form of long-term financial instruments such as equities and corporate bonds. The stock market and bond market are capital markets.

Firms obtain long-term or medium-term capital in one of the following ways:

(a) They may raise share capital (equity). Most new issues of share capital are in the form of ordinary share capital. Firms that issue ordinary share capital are inviting investors to take an equity stake in the business, or to increase their existing equity stake.

(b) They may raise loan capital (debt). Long-term loan capital might be raised by issuing corporate securities in the form of loan notes, corporate bonds, debentures, unsecured and convertible bonds.

These may be issued domestically or in foreign capital markets.

**Definitions**

**Equity securities** consist primarily of ordinary shares which entitle the owner to a share of the company’s profits and give them voting rights.

**Debt securities** are typically fixed interest borrowings with a set repayment date, often secured on the assets of the company.

We will look at sources of long-term finance in more detail in Chapter 4.
1.4 Capital market participants

The various participants in the capital markets are summarised in the diagram below:

1.4.1 Institutional investors

Institutional investors are institutions which have large amounts of funds which they want to invest. They will invest in stocks and shares or any other assets which offer satisfactory returns and security or lend money to companies directly. The major institutional investors in Australia are superannuation funds and insurance companies and they are the biggest investors on the stock market.

1.5 Functions of the stock market

A stock market acts as a primary market for raising finance, and as a secondary market for the trading of existing securities.

Definitions

The primary market is the market where securities (debt and equity) are issued for the first time.

The secondary market is the market where securities which have been issued in the primary market are traded.

The stock markets serve two main purposes:

(a) As primary markets they enable organisations to raise new finance, by issuing new shares or new bonds. A company must have public company status to be allowed to raise finance from the public on a capital market.

(b) As secondary markets they enable existing investors to sell their investments, should they wish to do so. The marketability of securities is a very important feature of the capital markets, because investors are more willing to buy stocks and shares if they know that they could sell them easily, should they wish to.

These are the main functions of a stock market, but there are two other important ones.

(c) When a company comes to the stock market for the first time, and 'floats' its shares on the market, the owners of the company can realise some of the value of their shares in cash, because they will offer a proportion of their personally-held shares for sale to new investors.

(d) When one company wants to take over another, it is common to do so by issuing shares to finance the takeover. Takeovers by means of a share exchange are only feasible if the shares that are offered can be readily traded on a stock market, and so have an identifiable market value.
1.6 Australian capital markets

1.6.1 The stock market

Trading on financial markets is either exchange-based or off-exchange. The major exchange market in Australia is the Australian Securities Exchange (ASX) which brings together buyers and sellers of equity securities (shares) and futures instruments.

The Australian Stock Exchange (as it was known then) was formed in 1987 by the amalgamation of the stock exchanges of the six capital cities. In July 2006, the Australian Stock Exchange merged with the Sydney Futures Exchange (SFE), the major futures and commodities exchange, to form the current Australian Securities Exchange (ASX). As well as a market where the buying and selling of shares and debt securities takes place, the ASX is also the market for dealings in Australian government securities and the trading of derivatives. The ASX itself is a publicly listed company trading on the Exchange.

Trading is conducted by stockbrokers who bring together the buyers and sellers, and is done electronically using SEATS (Stock Exchange Automated Trading System).

Australia’s securities markets are supervised by the Australian Securities and Investments Commission (ASIC) through the Federal Government’s Corporations law. In addition, all companies listed on the Exchange must also comply with the ASX’s own business rules (see Section 3).

The size and importance of financial markets has increased significantly since the early 1980s. Australia’s share market is the eighth largest in the world, and the third largest in the Asia-Pacific region; while the Sydney Futures Exchange (SFE) is the largest futures exchange in the region.

All stock exchanges set eligibility criteria for companies wanting a listing. Key criteria generally include those relating to the size of the company and its shareholder base, which are aimed at ensuring an adequate market for trading in the company’s shares.

For example, the ASX requires companies to meet either a profits test (aggregated profit of at least $1 million from the same business in the last three years, and profit from continuing operations of at least $400 000 in the last 12 months) or an assets test (net tangible assets of at least $2 million – or market capitalisation of at least $10 million, with less than half of net tangible assets being held in cash).

The ASX also requires the company to have at least 500 shareholders each holding a parcel of shares worth at least $2 000. A lower threshold of 400 shareholders applies if at least 25 per cent of the shares are in public hands. In either case, the practical implication is that a company can’t raise capital solely from institutions, but requires substantial support from retail investors.

Other smaller exchanges have less strict requirements, and are more suitable for smaller organisations:

(a) The National Stock Exchange of Australia (NSX) specialises in small- and medium-sized company public listings, including community-based organisations, and high technology companies. The NSX only requires a market capitalisation of $500 000, and a minimum of 50 shareholders (among other criteria).

(b) The NSX also manages the Bendigo Stock Exchange (BSX) and the Wollongong Stock Exchange, which both focus on capital growth for regional business such as community banks or property trusts.

(c) Australia Pacific Exchange (APX) is an exempt stock market, which means that a business can have more flexibility on the structure of its shares.

1.6.2 The bond market

The Australian bond market has, until relatively recently, been dominated by the borrowing requirements of the Federal Government. Banks, life insurance companies and superannuation funds, who until the 1980s, were required to hold prescribed percentages of their assets in public sector securities, absorbed most of the debt issued by governments. Since the mid-1990s the bond market has grown in importance as a source of finance for the private sector.
1.6.3 The foreign currency markets

Foreign exchange is a major sector in the Australian financial markets. The Australian dollar is one of the most actively traded currencies in the world (after the US dollar, yen, euro and Swiss franc).

1.6.4 Derivatives markets

Derivatives markets allow market participants to fix today the price at which trades will be made in the future. Efficient derivatives markets allow financial market participants to manage risk. The Sydney Futures Exchange (SFE), which is now part of the ASX, provides derivatives in interest rates, equities, currencies and commodities. This is covered in more detail in Chapter 10.

1.6.5 Over-the-counter (OTC) markets

Over-the-counter (OTC) or off-exchange trading refers to financial instruments such as stocks, bonds, commodities or derivatives which are traded directly between two parties, as opposed to via an exchange. Major products traded on OTC markets in Australia include government debt securities, corporate debt securities, currency and derivative instruments.

1.6.6 Trading volumes


<table>
<thead>
<tr>
<th></th>
<th>Physical market ($AUD billions)</th>
<th>Derivatives market ($AUD billions)</th>
<th>Total ($AUD billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt market</td>
<td>13 430</td>
<td>64 636</td>
<td>78 066</td>
</tr>
<tr>
<td>Currency market</td>
<td>11 881</td>
<td>33 411</td>
<td>45 292</td>
</tr>
<tr>
<td>Equity market</td>
<td>1 339</td>
<td>3 198</td>
<td>4 537</td>
</tr>
<tr>
<td>Total</td>
<td>26 650</td>
<td>101 245</td>
<td>127 895</td>
</tr>
</tbody>
</table>

Traded as follows:

- OTC financial markets 78 173
- Exchange traded equities 2 020
- Exchange traded futures 47 702
- Total 127 895

2 Financial intermediaries

Section overview

- A financial intermediary links those with surplus funds (e.g. lenders) to those with funds deficits (e.g. potential borrowers) so providing aggregation and economies of scale, risk pooling and maturity transformation.

2.1 Financial intermediation

Definition

A **financial intermediary** is a party bringing together providers and users of finance either as broker or as principal.

A **financial intermediary** is an institution which links lenders with borrowers, by obtaining deposits from lenders and then re-lending them to borrowers.
Not all intermediation takes place between savers and investors. Some institutions act mainly as intermediaries between other institutions. Financial intermediaries may also lend abroad or borrow from abroad.

### 2.1.1 Examples of financial intermediaries

(a) Commercial banks are the major holders of public savings and the providers of loans to individuals and companies.

(b) Building societies and credit unions use savings from individuals (members) to provide mortgages and consumer credit.

(c) Institutional investors include pension funds, insurance companies and investment trusts.

(d) Finance houses raise funds through borrowing and debentures and provide short-term and long-term finance to firms and individuals e.g. major providers of lease finance.

(e) Merchant and investment banks mobilise and allocate funds of large denominations for major projects or investments.

### 2.2 The benefits of financial intermediation

Financial intermediaries perform the following functions:

(a) They provide obvious and convenient ways in which a lender can save money. Instead of having to find suitable borrowers for their money, lenders can deposit their money with a financial intermediary. All the lender has to do is decide for how long to lend the money, and what sort of return is required. They can then choose a financial intermediary that offers a financial instrument to suit their requirements.

(b) Financial intermediaries also provide a ready source of funds for borrowers. Even when money is in short supply, a borrower will usually find a financial intermediary prepared to lend some.

(c) They can aggregate or 'package' the amounts lent by savers and lend on to borrowers in different amounts.

(d) Risk for individual lenders is reduced by pooling. Since financial intermediaries lend to a large number of individuals and organisations, any losses suffered through default by borrowers or capital losses are effectively pooled and borne as costs by the intermediary. Such losses are shared among lenders in general.

(e) By pooling the funds of large numbers of people, some financial institutions are able to give investors access to diversified portfolios covering a varied range of different securities, such as unit trusts and investment trusts.

(f) Financial intermediaries, most importantly, provide maturity transformation; i.e. they bridge the gap between the wish of most lenders for liquidity and the desire of most borrowers for loans over longer periods.
3 Regulation and the role of the government

Section overview

- Well functioning financial markets require a regulatory system, administered by a capable regulatory authority.
- The aim of an efficient regulatory system is to protect investors while minimising interference in the market that might distort market price signals and investment decisions.
- The government plays a vital role in the functioning of the capital market as borrower and lender, financial intermediary (via the RBA), regulator of financial activities and source of ultimate liquidity.

3.1 Regulatory framework

Well functioning financial markets require a regulatory system, administered by a capable regulatory authority.

The aim of an efficient regulatory system is to protect investors from fraud and unfair practices, ensuring property rights are clearly defined and information is available and transparent, while minimising interference in the market that might distort market price signals and investment decisions.

Typical areas covered by guidelines might include:

- Market codes of conduct.
- Participant standards and accreditation.
- Licensing and authorisation of dealers.
- Misleading or deceptive conduct.
- False or misleading statements.
- Fraud and unfair practices.

Corporations law includes provisions relating to the trading of corporate and government debt.

3.2 The role of the government

The government plays a vital role in the functioning of the capital market as:

- Borrower and lender.
- Financial intermediary (via the RBA).
- Regulator of financial activities.
- Source of ultimate liquidity.

3.3 Regulation

Regulation is intended to protect the interests of investors and is primarily undertaken by both the:

- Australian Securities and Investments Commission (ASIC)
- Australian Prudential Regulation Authority (APRA)

3.3.1 Australian Securities and Investments Commission (ASIC)

ASIC is an independent Federal Government Statutory body which acts as Australia’s corporate, markets and financial services regulator.

ASIC enforces and administers Corporations law and Consumer Protection law for investments, life and general insurance, superannuation and banking (except lending) throughout Australia. Its purpose is to reduce fraud and unfair practices in financial markets and financial products so consumers use them confidently and companies and markets perform effectively.

Its roles include the following:

(a) As the corporate regulator, it is responsible for ensuring that company directors and officers carry out their duties honestly, diligently and in the best interests of their company.
(b) As the markets regulator, it assesses how effectively authorised financial markets are complying with their legal obligations to operate fair, orderly and transparent markets.

(c) As the financial services regulator, it licenses and monitors financial services businesses to ensure that they operate efficiently, honestly and fairly. These businesses typically deal in superannuation, managed funds, shares and company securities, derivatives, and insurance.

### 3.3.2 Australian Prudential Regulation Authority (APRA)

APRA is the prudential regulator of the Australian financial services industry, funded largely by the industries that it supervises.

It oversees banks, credit unions, building societies, insurance and life insurance companies, and most members of the superannuation industry through the ASX Market Rules, ACH Clearing Rules and ASIC Settlement Rules, which are collectively referred to as the ASX Business Rules.

### 3.3.3 Australian Securities Exchange (ASX)

The Australian Securities Exchange (ASX) is sometimes referred to as one of 'the regulators' of financial market activity in Australia, however it is not a regulatory body with powers conferred by the government, like ASIC or APRA.

The ASX is a regulated commercial organisation that under the terms of its licence is required to supervise and monitor specific aspects of the businesses of other organisations (for example, the governance of listed companies and the on-exchange or on-market trade execution by brokers). It monitors compliance with listing rules, clearing and settlement rules, and the standards of conduct of those participating in its markets.

### 3.3.4 Self regulation – Australian Financial Markets Association (AFMA)

The Australian Financial Markets Association is the industry association for Australia's wholesale banking and financial markets, representing participants such as Australian and foreign banks, securities companies, state government treasury corporations, fund managers and traders. Its role is to encourage high standards of professional conduct in wholesale financial markets and maintain effective self regulation of the over-the-counter financial markets.

### 4 Exchange rates

#### Section overview

- Factors influencing the exchange rate include the comparative rates of inflation in different countries (purchasing power parity), comparative interest rates in different countries (interest rate parity), the underlying balance of payments, speculation and government policy on managing or fixing exchange rates.

#### 4.1 Exchange rates

**Definitions**

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 or interest rate currently offered on a particular currency or security.

The spot rate is the rate of exchange in currency for immediate delivery.

The forward rate is an exchange rate set now for currencies to be exchanged at a future date.

Every traded currency in fact has many exchange rates. There is 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 there are really two exchange rates, a selling rate and a buying rate.
4.1.1 Factors affecting exchange rates

Factors influencing the exchange rate include the comparative rates of inflation in different countries (purchasing power parity), comparative interest rates in different countries (interest rate parity), the underlying balance of payments, speculation and government policy on managing or fixing exchange rates.

The exchange rate between two currencies – i.e. the buying and selling rates, both 'spot' and 'forward' – is determined primarily by supply and demand in the foreign exchange markets. Demand comes from individuals, firms and governments who want to buy a currency and supply comes from those who want to sell it.

Supply and demand for currencies are in turn influenced by:

- The rate of inflation, compared with the rate of inflation in other countries.
- Interest rates, compared with interest rates in other countries.
- The balance of payments.
- Sentiment of foreign exchange market participants regarding economic prospects.
- Speculation.
- Government policy on intervention to influence the exchange rate.

4.2 Foreign exchange demand

If an importer has to pay a foreign supplier in a foreign currency, he might ask his bank to sell him the required amount of the currency. For example, suppose that a bank's customer, a trading company, has imported goods for which it must now pay US $10 000.

(a) The company will ask the 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 (known as the ‘offer’, or ‘ask’ price) is, say US$0.9079 per AUD $1 for the currency, the bank will charge the company: $10 000/0.9079 = AUD $11 014.42

Similarly, if an exporter is paid, say, $10 000 by a foreign customer in the US, he may wish to exchange the US dollars to obtain Australian $. He will therefore ask his bank to buy the dollars from him. Since the exporter is selling currency to the bank, the bank is buying the currency.

If the bank quotes a buying rate (known as the bid price) of, say US$0.9129 per AUD $1, for the currency the bank will pay the exporter: $10 000/0.9129 = AUD $10 954.10

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.

If a bank were to buy a quantity of foreign currency from a customer, and then were to re-sell it to another customer, it would charge the second customer more (in Australian $) for the currency than it would pay the first customer. The difference would be profit. For example, the figures used for illustration in the previous paragraphs show a bank selling some US dollars for AUD $11 014.42 and buying the same quantity of US dollars for AUD $10 954.10, at selling and buying rates that might be in use at the same time. The bank would make a profit of AUD $60.32.

4.3 The foreign exchange (FX) markets

Banks buy currency from customers and sell currency to customers – typically, exporting and importing firms. Banks may buy currency from the government or sell currency to the government – this is how a government builds up its official reserves. Banks also buy and sell currency between themselves.

International trade involves foreign currency, for either the buyer, the seller, or both (for example, a Saudi Arabian firm might sell goods to a European buyer and invoice for the goods in US dollars). As a consequence, it is quite likely that exporters might want to sell foreign currency earnings to a bank in exchange for domestic currency, and that importers might want to buy foreign currency from a bank in order to pay a foreign supplier.

Since most foreign exchange rates are not fixed but are allowed to vary, rates are continually changing and each bank will offer new rates for new customer enquiries according to how its dealers judge the market situation.
5 Rates of interest and rates of return

Section overview

- Interest rates are effectively the 'prices' governing lending and borrowing.
- The pattern of interest rates on financial assets is influenced by the risk of the assets, the duration of the lending, and the size of the loan.
- There is a trade-off between risk and return. Investors in riskier assets expect to be compensated for the risk. In the case of ordinary shares, investors hope to achieve their return in the form of an increase in the share price (a capital gain) as well as from dividends.

Interest rates are effectively the 'prices' governing lending and borrowing. The borrower pays interest to the lender at a certain percentage of the capital sum, as the price for the use of the funds borrowed. As with other prices, supply and demand effects apply. For example, the higher the rates of interest that are charged, the lower will be the demand for funds from borrowers.

5.1 The pattern of interest rates

The pattern of interest rates refers to the variety of interest rates on different financial assets, and the margin between interest rates on lending and deposits that are set by banks. Note that the pattern of interest rates is a different thing from the general level of interest rates.

Why are there such a large number of interest rates? In other words, how is the pattern of interest rates to be explained?

The pattern of interest rates on financial assets is influenced by the risk of the assets, the duration of the lending, and the size of the loan.

(a) Risk

There is a trade-off between risk and return. Higher-risk borrowers must pay higher yields on their borrowing, to compensate lenders for the greater risk involved. Banks will assess the creditworthiness of the borrower, and set a rate of interest on its loan at a certain mark-up above its base rate.

(b) Need to make a profit on re-lending

Financial intermediaries make their profits from re-lending at a higher rate of interest than the cost of their borrowing. For example, the interest rate charged on bank loans exceeds the rate paid on deposits and the mortgage rate charged by building societies exceeds the interest rate paid on deposits.

(c) Duration of the lending

The term of the loan or asset will affect the rate of interest charged on it. In general, longer-dated assets will earn a higher yield than similar short-dated assets but this is not always the case. The differences are referred to as the term structure of interest rates.

(d) Size of the loan or deposit

The yield on assets might vary with the size of the loan or deposit. Administrative cost savings help to allow lower rates of interest to be charged by banks on larger loans and higher rates of interest to be paid on larger time deposits.

(e) Different types of financial asset

Different types of financial asset attract different rates of interest. This is partly because different types of asset attract different sorts of lender/investor. For example, bank deposits attract individuals and companies, whereas long-dated government securities are particularly attractive to various institutional investors.
5.2 The risk-return trade-off

There is a trade-off between risk and return. Investors in riskier assets expect to be compensated for the risk.

An investor has the choice between different forms of investment. The investor may earn interest by depositing funds with a financial intermediary who will lend on to, say, a company, or it may invest in corporate bonds. Alternatively, the investor may invest directly in a company by purchasing shares in it.

The current market price of a security is found by discounting the future expected earnings stream at a rate suitably adjusted for risk. This means that investments carrying a higher degree of risk will demand a higher rate of return. This rate of return or yield has two components:

- Annual income (dividend or interest)
- Expected capital gain

In general, the higher the risk of the security, the more important is the capital gain component of the expected yield.

Some of the main forms of investment are listed below in ascending order of risk.

(a) Government bonds

The risk of default is negligible. Hence this tends to form the base level for returns in the market. The only uncertainty concerns the movement of interest rates over time, and hence longer dated bonds will tend to carry a higher rate of interest.

Although the perceived risk of default on government stock is low, a country is a sovereign entity, and it is impossible or difficult for someone dealing with a government to enforce repayments of debt. The risk that a government will refuse to comply with the terms of a loan agreement during economically difficult or politically volatile times is known as sovereign risk. Sovereign risk has become an increasing concern as a result of the recent global financial crisis which has seen the Icelandic economy threatened by the collapse of all three of the country’s major banks and eurozone countries such as Greece, Portugal and Ireland facing big government deficits.

(b) Company bonds

Although there is some risk of default on company bonds, they are usually secured against corporate assets.

(c) Preference shares

These are generally riskier than bonds since they rank behind debt in the event of a liquidation, although they rank ahead of ordinary shares. The return takes the form of a fixed percentage dividend based on the par value of the share.

(d) Ordinary shares

Ordinary shares carry a high level of risk. Dividends are paid out of distributable profits after all other liabilities have been paid and can be subject to large fluctuations from year to year. However, there is the potential for significant capital appreciation in times of growth. In general, the level of risk will vary with the operational and financial gearing of the company and the nature of the markets in which it operates.

5.3 The reverse yield gap

Because debt involves lower risk than equity investment, we might expect yields on debt to be lower than yields on shares. More usually, however, the opposite applies and the yields on shares are lower than on low-risk debt; this situation is known as a reverse yield gap. A reverse yield gap can occur because shareholders may be willing to accept lower returns on their investment in the short term, in anticipation that they will make capital gains in the future.
5.4 Interest rates and shareholders' required rates of return

Given that equity shares and interest-earning investments stand as alternatives from the investor’s point of view, changes in the general level of interest rates can be expected to have an effect on the rates of return which shareholders will expect.

If the return expected by an investor from an equity investment (i.e. an investment in shares) is 11 per cent and the dividend paid on the shares is 15 cents, the market value of one share will be 15 cents/11% = $1.36.

Suppose that interest rates then fall. Because the option of putting the funds on deposit has become less attractive, the shareholders' required return will fall, to say, 9 per cent. Then the market value of one share will increase to 15 cents/9% = $1.67.

You can see from this that an increase in the shareholders' required rate of return (perhaps resulting from an increase in the general level of interest rates) will lead to a fall in the market value of the share.
Key chapter points

- Capital markets are markets for long-term capital.
- Money markets are markets for short-term capital.
- The main capital market in Australia is the Australian Securities Exchange.
- A stock market acts as a primary market for raising finance, and as a secondary market for the trading of existing securities (i.e. shares and bonds).
- Institutional investors will invest in stocks and shares or any other assets which offer satisfactory returns and security or lend money to companies directly. The major institutional investors in Australia are superannuation funds and insurance companies and they are the biggest investors on the stock market.
- Over-the-counter (OTC) or off-exchange trading refers to financial instruments such as stocks, bonds, commodities or derivatives which are traded directly between two parties, as opposed to via an exchange.
- A financial intermediary links those with surplus funds (e.g. lenders) to those with funds deficits (e.g. potential borrowers) so providing aggregation and economies of scale, risk pooling and maturity transformation.
- Well functioning financial markets require a regulatory system, administered by a capable regulatory authority. The aim of an efficient regulatory system is to protect investors while minimising interference in the market that might distort market price signals and investment decisions.
- The government plays a vital role in the functioning of the capital market as borrower and lender, financial intermediary (via the RBA), regulator of financial activities and source of ultimate liquidity.
- Factors influencing the exchange rate include the comparative rates of inflation in different countries (purchasing power parity), comparative interest rates in different countries (interest rate parity), the underlying balance of payments, speculation and government policy on managing or fixing exchange rates.
- Interest rates are effectively the ‘prices’ governing borrowing and lending.
- The pattern of interest rates on financial assets is influenced by the risk of the assets, the duration of the lending, and the size of the loan.
- There is a trade-off between risk and return. Investors in riskier assets expect to be compensated for the risk. In the case of ordinary shares, investors hope to achieve their return in the form of an increase in the share price (a capital gain) as well as from dividends.
1. The Australian Securities Exchange is a money market.
   - true
   - false

2. Which of the following types of investment carries the highest level of risk?
   A. company bonds
   B. preference shares
   C. government bonds
   D. ordinary shares

3. The ASX can reasonably be described as
   A. a primary market only.
   B. a secondary market only.
   C. neither a primary nor secondary market.
   D. both a primary and secondary market.

4. Which of the following is the best definition of the OTC market?
   A. an exchange for the trading of securities other than shares
   B. an unofficial market for derivatives
   C. an off-exchange market where financial instruments are traded directly between two parties
   D. a market where only transactions for cash are allowed

5. Which of the following is not an aim of regulating the financial markets?
   A. to allow investors to make a profit
   B. to ensure information is accurate and freely available
   C. to define property rights clearly
   D. to offer protection from fraud and misconduct
Answers to quick revision questions

1 False. The Australian Securities Exchange is a capital market, not a money market.

2 D Government bonds would be deemed least risky, followed by company bonds then preference shares. Ordinary shares carry the highest risk but offer the possibility of higher returns for the investor.

3 D The ASX is a primary market for the issuing of new securities to raise finance and a secondary market for the trading of existing securities.

4 C Over-the-counter (OTC) trading refers to financial instruments such as stocks, bonds, commodities or derivatives which are traded directly between two parties, as opposed to via an exchange.

5 A Regulation is intended to protect the interests of investors not to ensure that they are able to make a profit.
Chapter 4

Sources of finance

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital markets</strong></td>
<td>LO2</td>
</tr>
<tr>
<td>Identify the characteristics, terms and conditions of the alternative sources</td>
<td>LO2.5</td>
</tr>
<tr>
<td>of short, medium and long term finance available to a business, including both debt</td>
<td></td>
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<tr>
<td>and equity</td>
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<tr>
<td>Evaluate the suitability of different methods of finance in a given scenario</td>
<td>LO2.6</td>
</tr>
<tr>
<td><strong>Cost of funds</strong></td>
<td>LO4</td>
</tr>
<tr>
<td>Analyse the various sources of short term finance</td>
<td>LO4.2</td>
</tr>
<tr>
<td>Explain the cost of short and medium term finance</td>
<td>LO4.3</td>
</tr>
<tr>
<td>Calculate and interpret the cost of various sources of finance</td>
<td>LO4.4</td>
</tr>
<tr>
<td>Describe sources of international finance and their merits or otherwise</td>
<td>LO4.5</td>
</tr>
<tr>
<td>Explain the different sources of long term finance</td>
<td>LO4.6</td>
</tr>
<tr>
<td><strong>Valuation of corporate securities</strong></td>
<td>LO9</td>
</tr>
<tr>
<td>Calculate and interpret effective interest rates; and apply the concepts of</td>
<td>LO9.1</td>
</tr>
<tr>
<td>financial mathematics to valuing loans and debt and equity securities</td>
<td></td>
</tr>
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**Topic list**

1. Capital structure
2. Short term sources of finance
3. Debt finance
4. Equity finance
5. Venture capital
6. International money and capital markets
Introduction

Capital structure refers to the way in which an organisation is financed. Decisions include choosing a suitable balance between debt capital and equity capital (gearing level), and deciding on the balance between short-term and long-term finance. In this chapter we will look at the distinction between short-term and long-term sources of finance and the various types of finance available.
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What does capital structure refer to? (Section 1)
2. What is the general principle to be followed when choosing finance for an asset or investment? (Section 1.1)
3. Which finance will be more expensive, equity or debt, and why? (Section 1.4)
4. Name two advantages and two disadvantages of using bank overdrafts as a form of finance. (Section 2.3)
5. Why might a company use lease finance? (Section 2.5)
6. What is a deep discount bond? (Section 3.5)
7. What is a rights issue? (Section 4.7)
8. What is venture capital and for what might it be provided? (Section 5)
1 Capital structure

Section overview

• Capital structure refers to the way in which an organisation is financed.
• Decisions include choosing a suitable balance between debt capital and equity capital (gearing level), and deciding on the balance between short-term and long-term finance.
• As a general rule businesses should aim to match the length of finance with the maturity of the asset being financed, therefore non-current assets would be financed by long term capital and the majority of current assets by short-term capital.
• Short-term sources of finance include overdrafts, short-term loans, trade credit and lease finance. Long-term sources of finance include debt finance, leasing, venture capital and equity finance.
• The risk-return trade-off desired by potential investors will impact on the servicing cost of the finance. Shareholders bear the greatest risk and therefore will expect the highest return of long-term providers of finance. The cost of equity finance is therefore always higher than the cost of debt.

Capital structure refers to the way in which an organisation is financed, by a combination of long-term capital (equity capital, preference shares, bonds, bank loans, convertible loan stock and so on) and short-term liabilities, such as a bank overdraft and trade payables. It refers in particular to:

(a) The balance between equity and debt capital, and
(b) The balance between long-term and short-term finance.

The sources of new finance chosen by a company will affect its capital structure. Raising new debt capital, for example, will increase the proportion of debt in the capital structure, whereas retaining profits will increase the proportion of equity.

Equally, a financial policy of maintaining a particular capital structure (e.g. a target debt: equity ratio) will affect a company’s choices about where any new finance should come from.

Definition

The term ‘gearing’ (or ‘leverage’) is used to refer to the proportion of debt capital in a company’s capital structure.

1.1 Principles of capital structure

The assets of a business must be financed somehow, and when a business is growing, the additional assets must be financed by additional capital.

As a general rule, assets that yield profits over a long period of time should be financed by long-term funds. In this way, the returns made by the asset will be sufficient to pay either the interest cost of the loans raised to buy it, or dividends on its equity funding. If, on the other hand, a long-term asset is financed by short-term funds, the company cannot be certain that when the loan becomes repayable, it will have enough cash (from profits) to repay it.

It is usually prudent for a company not to finance all of its short-term assets with short-term liabilities, but instead to finance short-term assets partly with short-term funding and partly with long-term funding.
Share capital is regarded as long-term finance for a company. Other sources of finance may be either long-term or short-term. Companies might borrow either from banks, or from non-bank investors. Most company borrowing from investors other than banks is in the form of loan stock or bonds. Some finance sources, notably short-term trade credit, are obtained at little or no cost to the company.

### 1.2 Long-term capital requirements for replacement and growth

A distinction can be made between long-term capital that is needed to finance the replacement of worn-out assets, and capital that is needed to finance growth. If a company is not growing and only needs finance to maintain its current level of operations, including the replacement of non-current assets, its main sources of funding are likely to be internally-generated, provided that the rate of inflation is reasonably low. In contrast, when a company is seeking to grow, it will need extra finance.

### 1.3 Debt and financial risk

A high level of debt creates financial (or gearing) risk. **Financial risk** can be seen from different points of view.

(a) **The company** as a whole. If a company builds up debts that it cannot pay when they fall due, it will be forced into liquidation.

(b) **Creditors**. If a company cannot pay its debts, the company will go into liquidation owing creditors money that they are unlikely to recover in full.

(c) **Ordinary shareholders**. A company will not make any distributable profits unless it is able to earn enough profit before interest and tax to pay all its interest charges, and then tax. The lower the profits or the higher the interest-bearing debts, the less there will be, if there is anything at all, for shareholders. When a company has **preference shares** in its capital structure, ordinary shareholders will not get anything until the preference dividend has been paid.

### 1.4 Risk and the cost of finance

The providers of debt face lower risk (fixed interest capital, usually secured) but as a result they will receive lower rates of return.

Ordinary shareholders are the ultimate bearers of risk as they are at the bottom of the creditor hierarchy in a liquidation. This means there is a significant risk they will receive nothing after all of the other trade payables have been paid.

This greater risk means that shareholders expect the highest return of long-term providers of finance. The cost of equity finance is therefore always higher than the cost of debt.

In addition to the lower return required by the providers of the finance, debt becomes additionally cheaper as a result of any tax relief on the interest payments.

In structuring its finance, a company must have regard to the risk-return trade-off desired by potential investors and the impact this has on the servicing cost of the finance. Some finance will also involve greater transaction costs in order to obtain the finance in the first place (e.g. compare the costs of a public share issue with the arrangement fee for a loan).
2 Short term sources of finance

Section overview
- A range of short-term sources of finance are available to businesses including overdrafts, short-term loans, trade credit and lease finance.

Short-term finance is usually needed for businesses to run their day-to-day operations including payment of wages to employees, inventory ordering and supplies. Businesses with seasonal peaks and troughs and those engaged in international trade are likely to be heavy users of short-term finance. A range of short-term sources of finance are available to businesses including overdrafts, short-term loans, trade credit and lease finance.

2.1 Overdrafts

Where payments from a current account exceed income to the account for a temporary period, the bank finances the deficit by means of an overdraft. Overdrafts are the most important source of short-term finance available to businesses. They can be arranged relatively quickly, and offer a level of flexibility with regard to the amount borrowed at any time, while interest is only paid when the account is overdrawn.

<table>
<thead>
<tr>
<th>Overdrafts</th>
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<tbody>
<tr>
<td>Amount</td>
</tr>
<tr>
<td>Margin</td>
</tr>
<tr>
<td>Purpose</td>
</tr>
<tr>
<td>Repayment</td>
</tr>
<tr>
<td>Security</td>
</tr>
<tr>
<td>Benefits</td>
</tr>
</tbody>
</table>

By providing an overdraft facility to a customer, the bank is committing itself to provide an overdraft to the customer whenever the customer wants it, up to the agreed limit. The bank will earn interest on the lending, but only to the extent that the customer uses the facility and goes into overdraft. If the customer does not go into overdraft, the bank cannot charge interest.

The bank will generally charge a commitment fee when a customer is granted an overdraft facility or an increase in his overdraft facility. This is a fee for granting an overdraft facility and agreeing to provide the customer with funds if and whenever he needs them.

2.1.1 Overdrafts and the operating cycle

Many businesses require their bank to provide financial assistance for normal trading over the operating cycle.

For example, suppose that a business has the following working capital:

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Inventories and trade receivables</td>
<td>10 000</td>
</tr>
<tr>
<td>Bank overdraft</td>
<td>1 000</td>
</tr>
<tr>
<td>Trade payables</td>
<td>3 000</td>
</tr>
<tr>
<td>Working capital</td>
<td>4 000</td>
</tr>
<tr>
<td></td>
<td>6 000</td>
</tr>
</tbody>
</table>
It now buys inventory costing $2,500 for cash, using its overdraft. Working capital remains the same, $6,000, although the bank’s financial stake has risen from $1,000 to $3,500.

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventories and trade receivables</td>
<td>12,500</td>
</tr>
<tr>
<td>Bank overdraft</td>
<td>3,500</td>
</tr>
<tr>
<td>Trade payables</td>
<td>3,000</td>
</tr>
<tr>
<td><strong>Working capital</strong></td>
<td>6,500</td>
</tr>
</tbody>
</table>

A bank overdraft provides support for normal trading finance. In this example, finance for normal trading rises from $(10,000 - 3,000) = $7,000 to $(12,500 - 3,000) = $9,500 and the bank’s contribution rises from $1,000 out of $7,000 to $3,500 out of $9,500.

A feature of bank lending to support normal trading finance is that the amount of the overdraft required at any time will depend on the cash flows of the business—the timing of receipts and payments, seasonal variations in trade patterns and so on. The purpose of the overdraft is to bridge the gap between cash payments and cash receipts. This is examined further in Chapter 5.

### 2.1.2 Solid core overdrafts

When a business customer has an overdraft facility, and the account is always in overdraft, then it has a solid core (or hard core) overdraft. For example, suppose that the account of a company has the following record for the previous year:

<table>
<thead>
<tr>
<th>Quarter to</th>
<th>Average balance</th>
<th>Debit turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 March 20X5</td>
<td>40,000 debit</td>
<td>600,000</td>
</tr>
<tr>
<td>30 June 20X5</td>
<td>50,000 debit</td>
<td>500,000</td>
</tr>
<tr>
<td>30 September 20X5</td>
<td>75,000 debit</td>
<td>700,000</td>
</tr>
<tr>
<td>31 December 20X5</td>
<td>80,000 debit</td>
<td>550,000</td>
</tr>
</tbody>
</table>

These figures show that the account has been permanently in overdraft, and the hard core of the overdraft has been rising steeply over the course of the year.

If the hard core element of the overdraft appears to be becoming a long-term feature of the business, the bank might wish, after discussions with the customer, to convert the hard core of the overdraft into a loan, thus giving formal recognition to its more permanent nature. Otherwise, annual reductions in the hard core of an overdraft would typically be a requirement of the bank.

### 2.2 Short-term loans

**Definition**

A **term loan** is a loan for a fixed amount for a specified period.

A term loan is drawn in full at the beginning of the loan period and repaid at a specified time or in defined instalments. Term loans are offered with a variety of repayment schedules. Often, the interest and capital repayments are predetermined.

The main advantage of lending on a loan account for the bank is that it makes monitoring and control of the advance much easier. The bank can see immediately when the customer is falling behind with repayments, or struggling to make the payments. With overdraft lending, a customer’s difficulties might be obscured for some time by the variety of transactions on his current account.

(a) The customer knows what they will be expected to pay back at regular intervals and the bank can also predict its future income with more certainty (depending on whether the interest rate is fixed or floating).
(b) Once the loan is agreed, the term of the loan must be adhered to, provided that the customer does not fall behind with the repayments. It is not repayable on demand by the bank.

(c) Because the bank will be committing its funds to a customer for a number of years, it may wish to insist on building certain written safeguards into the loan agreement, to prevent the customer from becoming over-extended with excess borrowing during the course of the loan. A loan covenant is a condition that the borrower must comply with. If the borrower does not act in accordance with the covenants, the loan can be considered in default and the bank can demand payment.

2.3 Overdrafts and short-term loans compared

A customer might ask the bank for an overdraft facility when the bank would wish to suggest a loan instead; alternatively, a customer might ask for a loan when an overdraft would be more appropriate.

(a) In most cases, when a customer wants finance to help with ‘day to day’ trading and cash flow needs, an overdraft would be the appropriate method of financing. The customer should not be short of cash all the time, and should expect to be in credit in some days, but in need of an overdraft on others.

(b) When a customer wants to borrow from a bank for only a short period of time, even for the purchase of a major non-current asset such as an item of plant or machinery, an overdraft facility might be more suitable than a loan, because the customer will stop paying interest as soon as their account goes into credit.

2.3.1 Advantages of an overdraft over a loan

(a) The customer only pays interest when the account is overdrawn.

(b) The bank has the flexibility to review the customer’s overdraft facility periodically, and perhaps agree to additional facilities, or insist on a reduction in the facility.

(c) An overdraft can do the same job as a loan: a facility can simply be renewed every time it comes up for review.

Bear in mind, however, that overdrafts are normally repayable on demand.

2.3.2 Advantages of a loan for longer term lending

(a) Both the customer and the bank know exactly what the repayments of the loan will be and how much interest is payable, and when. This makes planning (budgeting) simpler.

(b) The customer does not have to worry about the bank deciding to reduce or withdraw an overdraft facility before they are in a position to repay what is owed. There is an element of ‘security’ or ‘peace of mind’ in being able to arrange a loan for an agreed term.

Loans normally carry a facility letter setting out the precise terms of the agreement.

However, a mix of overdrafts and loans might be suggested in some cases. Consider a case where a business asks for a loan, perhaps to purchase a shop with inventory. The banker might wish to suggest a loan to help with the purchase of the shop, but that inventory ought to be financed by an overdraft facility. The offer of part-loan part-overdraft is an option that might be well worth considering.

2.3.3 Calculation of repayments on a loan

We can use the annuity table to calculate the repayments on a loan.

For example, a $30 000 loan is taken out by a business at a rate of 12 per cent over five years. What will be the annual payment?

The annuity factor for 12 per cent over five years is 3.605. Therefore, $30 000 = 3.605 \times \text{annual payment}.

\[
\begin{align*}
\text{Annual payment} & = \frac{30 000}{3.605} \\
& = $8 321.78
\end{align*}
\]
2.3.4 The split between interest and capital repayment

A loan of $100 000 is to be repaid to the bank in equal annual year-end instalments made up of capital repayments and interest at 9 per cent per annum.

The annual payment = $100 000 \[ \frac{3.890}{9} = $25 707 \]

Each payment can then be split between the repayment of capital and interest.

<table>
<thead>
<tr>
<th>Year</th>
<th>Balance b/f</th>
<th>Interest @ 9%</th>
<th>Annual payment</th>
<th>Balance c/f</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100 000</td>
<td>9 000</td>
<td>(25 707)</td>
<td>83 293</td>
</tr>
<tr>
<td>2</td>
<td>83 293</td>
<td>7 496</td>
<td>(25 707)</td>
<td>65 082</td>
</tr>
<tr>
<td>3</td>
<td>65 082</td>
<td>5 857</td>
<td>(25 707)</td>
<td>45 232</td>
</tr>
<tr>
<td>4</td>
<td>45 232</td>
<td>4 071</td>
<td>(25 707)</td>
<td>23 596</td>
</tr>
<tr>
<td>5</td>
<td>23 596</td>
<td>2 111*</td>
<td>(25 707)</td>
<td></td>
</tr>
</tbody>
</table>

* Rounding difference

2.4 Trade credit

Trade credit is one of the main sources of short-term finance for a business. Current assets such as raw materials may be purchased on credit with payment terms normally varying from between 30 to 90 days. Trade credit therefore represents an interest free short-term loan. In a period of high inflation, purchasing via trade credit will be very helpful in keeping costs down. However, it is important to take into account the loss of discounts suppliers offer for early payment.

Unacceptable delays in payment will worsen a company’s credit rating and additional credit may become difficult to obtain.

2.5 Leasing

Rather than buying an asset outright, using either available cash resources or borrowed funds, a business may lease an asset. Leasing has become a popular source of finance.

Leasing can be defined as a contract between lessor and lessee for hire of a specific asset selected from a manufacturer or vendor of such assets by the lessee. The lessor retains ownership of the asset. The lessee has possession and use of the asset on payment of specified rentals over a period.

Many lessors are financial intermediaries such as banks and insurance companies. The range of assets leased is wide, including office equipment and computers, cars and commercial vehicles, aircraft, ships and buildings.

2.5.1 Sale and leaseback

A company which owns its own premises can obtain finance by selling the property to an insurance company or pension fund for immediate cash and renting it back, usually for at least 50 years with rent reviews every few years.

A company would raise more cash from a sale and leaseback arrangements than from a mortgage, but there are significant disadvantages:

(a) The company loses ownership of a valuable asset which is almost certain to appreciate over time.

(b) The future borrowing capacity of the firm will be reduced, as there will be less assets to provide security for a loan.

(c) The company is contractually committed to occupying the property for many years ahead which can be restricting.

(d) The real cost is likely to be high, particularly as there will be frequent rent reviews.
3 Debt finance

Section overview

- A company may use long-term or short-term debt capital as sources of finance. The cost of debt capital is interest.
- The choice of debt finance that a company can make depends upon:
  - The size of the business (a public issue of bonds is only available to a large company).
  - The duration of the loan.
  - Whether a fixed or floating interest rate is preferred (fixed rates are more expensive, but floating rates are riskier).
  - The security that can be offered.

Long-term finance is used for major investments and is usually more expensive and less flexible than short-term finance.

3.1 Reasons for seeking debt finance

Sometimes businesses may need long-term funds, but may not wish to issue equity capital. Perhaps the current shareholders will be unwilling to contribute additional capital; possibly the company does not wish to involve outside shareholders who will have more onerous requirements than current members.

Other reasons for choosing debt finance may include lesser cost and easier availability, particularly if the company has little or no existing debt finance. Debt finance provides tax relief on interest payments.

3.2 Sources of debt finance

If a company does wish to raise debt finance, it will need to consider what type of finance will be available. If it is seeking medium-term bank finance, it ought to be in the form of a loan, although an overdraft is a virtually permanent feature of many companies’ statements of financial position. Bank finance is a most important source of debt for small companies.

If a company is seeking to issue bonds, it must decide whether the bonds will be repaid (redeemed), whether there will be conversion rights into shares, and whether warrants will be attached.

3.3 Factors influencing choice of debt finance

The choice of debt finance that a company can make depends upon:

(a) Availability which is in part a function of the size of the business (a public issue of bonds is only available to a large company).
(b) The duration of the loan.
(c) Whether a fixed or floating interest rate is preferred (fixed rates are more expensive, but floating rates are riskier).
(d) The security that can be offered.

3.3.1 Availability

Only listed companies will be able to make a public issue of bonds on a stock exchange; smaller companies may only be able to obtain significant amounts of debt finance from their bank.

3.3.2 Duration

If loan finance is sought to buy a particular asset to generate revenues for the business, the length of the loan should match the length of time that the asset will be generating revenues.
3.3.3 Fixed or floating rate

**Expectations of interest rate movements** will determine whether a company chooses to borrow at a fixed or floating rate. Fixed rate finance may be more expensive, but the business runs the risk of adverse upward rate movements if it chooses floating rate finance.

3.3.4 Security and covenants

The choice of finance may be determined by the assets that the business is willing or able to offer as **security**, also on the restrictions in **covenants** that the lenders wish to impose.

3.4 Bonds

**Definition**

Bonds are long-term debt capital raised by a company for which interest is paid, usually half yearly and at a fixed rate. Holders of bonds are therefore long-term payables for the company.

The term **bonds** describes various forms of long-term debt a company may issue, such as **loan notes** or **debentures**, which may be:

- Redeemable
- Irredeemable

**Definition**

**Debentures** are a form of loan note, the written acknowledgement of a debt incurred by a company, normally containing provisions about the payment of interest and the eventual repayment of capital.

Bonds or loans come in various forms, including:

- Floating rate debentures
- Zero coupon bonds
- Convertible bonds

Bonds have a nominal value, which is the debt owed by the company, and interest is paid at a stated 'coupon' on this amount. For example, if a company issues 10% bonds, the coupon will be 10 per cent of the nominal value of the bonds, so that $100 of bonds will receive $10 interest each year. The rate quoted is the gross rate, before tax.

Unlike shares, debt is often issued at par, i.e. with $100 payable per $100 nominal value. Where the coupon rate is fixed at the time of issue, it will be set according to prevailing market conditions given the credit rating of the company issuing the debt. Subsequent changes in market (and company) conditions will cause the market value of the bond to fluctuate, although the coupon will stay at the fixed percentage of the nominal value.

The determination of the market value (MV) of bonds is covered in Chapter 6.

3.5 Deep discount bonds

**Definition**

**Deep discount bonds** are loan notes issued at a price which is at a large discount to the nominal value of the notes, and which will be redeemable at par (or above par) when they eventually mature.
For example a company might issue $1 000 000 of bonds in 20X1, at a price of $50 per $100 of bond, and redeemable at par in the year 20X9. For a company with specific cash flow requirements, the low servicing costs during the currency of the bond may be an attraction, coupled with a high cost of redemption at maturity.

Investors might be attracted by the large capital gain offered by the bonds, which is the difference between the issue price and the redemption value. However, deep discount bonds will carry a much lower rate of interest than other types of bond. The only tax advantage is that the gain gets taxed (as income) in one lump on maturity or sale, not as amounts of interest each year. The borrower can, however, deduct notional interest each year in computing profits.

3.6 Zero coupon bonds

Definition

Zero coupon bonds are bonds that are issued at a discount to their redemption value, but no interest is paid on them.

The investor gains from the difference between the issue price and the redemption value. There is an implied interest rate in the amount of discount at which the bonds are issued (or subsequently re-sold on the market).

(a) The advantage for borrowers is that zero coupon bonds can be used to raise cash immediately, and there is no cash repayment until redemption date. The cost of redemption is known at the time of issue. The borrower can plan to have funds available to redeem the bonds at maturity.

(b) The advantage for lenders is restricted, unless the rate of discount on the bonds offers a high yield. The only way of obtaining cash from the bonds before maturity is to sell them. Their market value will depend on the remaining term to maturity and current market interest rates.

The tax advantage of zero coupon bonds is the same as that for deep discount bonds (see 3.5 above).

3.7 Convertible bonds

Definition

Convertible bonds are bonds that give the holder the right to convert to other securities, normally ordinary shares, at a pre-determined price/rate and time.

Conversion terms often vary over time. For example, the conversion terms of convertible bonds might be that on 1 April 20X0, $2 of bonds can be converted into one ordinary share, whereas on 1 April 20X1, the conversion price will be $2.20 of bonds for one ordinary share. Once converted, convertible securities cannot be converted back into the original fixed return security.

3.7.1 The conversion value and the conversion premium

The current market value of ordinary shares into which a bond may be converted is known as the conversion value. The conversion value will be below the value of the bond at the date of issue, but will be expected to increase as the date for conversion approaches on the assumption that a company’s shares ought to increase in market value over time.

\[
\text{Conversion value} = \text{conversion ratio} \times \text{current market value per share}
\]

\[
\text{Conversion premium} = \text{current market value of debt} - \text{current conversion value}
\]
**Worked Example: Convertible debt**

The 10% convertible bonds of Starchwhite are quoted at $142 per $100 nominal. The earliest date for conversion is in four years’ time, at the rate of 30 ordinary shares per $100 nominal bond. The share price is currently $4.15. Annual interest on the bonds has just been paid.

**Required**

(a) Calculate the current conversion value.

(b) Calculate the conversion premium and comment on its meaning.

**Solution**

(a) Conversion ratio is $100 bond = 30 ordinary shares  
Conversion value = 30 × $4.15 = $124.50

(b) Conversion premium = $(142 – 124.50) = $17.50 or \( \frac{17.50}{124.50} \times 100\% = 14\% \)  
The share price would have to rise by 14% before the conversion rights became attractive.

---

**3.7.2 The issue price and the market price of convertible bonds**

A company will aim to issue bonds with the greatest possible conversion premium as this will mean that, for the amount of capital raised, it will, on conversion, have to issue the lowest number of new ordinary shares. The premium that will be accepted by potential investors will depend on the company’s growth potential and therefore on the prospects for a sizeable increase in the share price.

Convertible bonds issued at par normally have a lower coupon rate of interest than straight debt. This lower interest rate is the price the investor has to pay for the conversion rights. It is, of course, also one of the reasons why the issue of convertible bonds is attractive to a company, particularly one with tight cash flows around the time of issue, but which is expecting cash flow to be easier when the notes are due to be converted.

When convertible bonds are traded on a stock market, their minimum market price or floor value will be the price of straight bonds with the same coupon rate of interest. If the market value falls to this minimum, it follows that the market attaches no value to the conversion rights.

The actual market price of convertible bonds will depend on:

- the price of straight debt.
- the current conversion value.
- the length of time before conversion may take place.
- the market’s expectation as to future equity returns and the risk associated with these returns.

Most companies issuing convertible bonds expect them to be converted. They view the bonds as delayed equity. They are often used either because the company’s ordinary share price is considered to be particularly depressed at the time of issue or because the issue of equity shares would result in an immediate and significant drop in earnings per share. There is no certainty, however, that the security holders will exercise their option to convert; therefore the bonds may run their full term and need to be redeemed.

---

**3.8 Security**

Bonds will often be secured. Security may take the form of either a fixed charge or a floating charge.

<table>
<thead>
<tr>
<th>Fixed charge</th>
<th>Floating charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security relates to specific asset/group of assets (land and buildings).</td>
<td>Security in event of default is whatever assets of the class secured (inventory/trade receivables) company then owns.</td>
</tr>
<tr>
<td>Company can’t dispose of assets without providing substitute/consent of lender.</td>
<td>Company can dispose of assets until default takes place.</td>
</tr>
</tbody>
</table>

In event of default lenders appoint receiver rather than lay claim to asset.

Not all bonds are secured. Investors are likely to expect a higher yield with unsecured bonds to compensate them for the extra risk.
3.9 The redemption of bonds

Definition
Redemption is repayment of preference shares and bonds.

Bonds are usually redeemable. They are issued for a term of ten years or more, and perhaps 25 to 30 years. At the end of this period, they will 'mature' and become redeemable (at par or possibly at a value above par).

Most redeemable bonds have an earliest and a latest redemption date. For example, 12% Debenture Stock 20X7/X9 is redeemable, at any time between the earliest specified date (in 20X7) and the latest date (in 20X9). The issuing company can choose the date.

Some bonds do not have a redemption date, and are 'irredeemable' or 'undated'. Undated bonds might be redeemed by a company that wishes to pay off the debt, but there is no obligation on the company to do so.

3.9.1 How will a company finance the redemption of long-term debt?

There is no guarantee that a company will be able to raise a new loan to pay off a maturing debt. One item you should look for in a company’s statement of financial position is the redemption date of current loans, to establish how much new finance is likely to be needed by the company, and when.

Occasionally, perhaps because the secured assets have fallen in value and would not realise much in a forced sale, or perhaps out of a belief that the company can improve its position soon, unpaid debenture holders might be persuaded to surrender their debentures. In exchange they may get an equity interest in the company or convertible debentures, paying a lower rate of interest, but carrying the option to convert the debentures into shares at a specified time in the future.

3.10 Tax relief on loan interest

As far as companies are concerned, debt capital is a potentially attractive source of finance because interest charges reduce the profits chargeable to company tax.

(a) A new issue of bonds is likely to be preferable to a new issue of preference shares (Preference share are shares carrying a fixed rate of dividends).

(b) Companies might wish to avoid dilution of shareholdings and increase gearing (the ratio of fixed interest capital to equity capital) in order to improve their earnings per share by benefiting from tax relief on interest payments.

3.11 Debt v preference shares

Legally, preference shares are part of the share capital of a business. However preference shares usually carry no voting rights and no right to share in excess profits, so commercially, there is little difference between preference shares and unsecured debt (especially subordinated debt).

Both preference shares and debt:

- normally pay a fixed annual return (interest or dividends);
- may be irredeemable, redeemable at a pre-set value or convertible.

For a profitable going concern there is no commercial difference, and as a result it is normal to treat preference shares effectively as debt when considering gearing ratios.
The only true difference that arises is in respect of the risk to investors. In particular:

- If profitability is low a company can cut any preference dividend, but it cannot avoid interest on debt;
- If a company becomes insolvent, preference shareholders rank below all debt holders, even subordinated debt.

To compensate for this additional risk, preference shareholders are likely to receive a higher return than long-term debt holders.

Within our consideration of capital structure, however, it would be best to consider the true commercial substance and treat any preference shares as a form of debt.

## 4 Equity finance

### Section overview

**Equity finance** refers to the ordinary share capital of the company.

**Equity finance can come from three sources:**
- Retained earnings.
- Rights issue of shares to existing shareholders.
- New share issue.

### Definition

**Equity** finance refers to the ordinary share capital of a company.

## 4.1 Ordinary shares

Ordinary shares are issued to the owners of a company. Ordinary shares have a nominal or 'face' value, typically $1 or 50c.

You should understand that the market value of a quoted company's shares bears no relationship to their nominal value, except that when ordinary shares are issued for cash, the issue price must be equal to or (more usually) more than the nominal value of the shares.

Ordinary shareholders have rights as a result of their ownership of the shares:

(a) Shareholders can attend company general meetings.

(b) They can vote on important company matters such as the appointment of directors, using shares in a takeover bid, changes to authorised share capital or the appointment of auditors.

(c) They are entitled to receive a share of any agreed dividend.

(d) They will receive the annual report and accounts.

(e) They will receive a share of any assets remaining after liquidation.

(f) They can participate in any new issue of shares.

Ordinary shareholders are the ultimate bearers of risk as they are at the bottom of the creditor hierarchy in a liquidation. This means there is a significant risk they will receive nothing after all of the other trade payables have been paid.

This greatest risk means that shareholders expect the highest return of long-term providers of finance. The cost of equity finance is therefore always higher than the cost of debt.
4.1.1 Sources of equity finance

Equity finance can come from three sources:

- Retained earnings.
- Rights issue of shares to existing shareholders.
- New share issue.

The profits earned by a business can be paid out in the form of a dividend or reinvested. If they are reinvested, shareholders will expect them to generate sufficient returns to increase shareholder wealth. For most companies, retained earnings are the most important source of equity finance and would be used before considering a new/rights issue.

4.2 Advantages of a stock market listing

A company can obtain a stock market listing for its shares through a public offer or a placing.

4.3 Disadvantages of a stock market listing

The owners of a company seeking a stock market listing must take the following disadvantages into account:

(a) There will be significantly greater public regulation, accountability and scrutiny. The legal requirements the company faces will be greater, and the company will also be subject to the rules of the stock exchange, such as the ASX, on which its shares are listed.

(b) A wider circle of investors with more exacting requirements will hold shares.

(c) There will be additional costs involved in making share issues, including brokerage commissions and underwriting fees.

4.4 Methods of obtaining a listing

An unquoted company can obtain a listing on the stock market using one of the following:

- Initial public offer (IPO).
- Placing.
- Introduction.

All stock exchanges set eligibility criteria for companies on listing. Key criteria generally include those relating to the size of the company and its shareholder base, which are aimed at ensuring an adequate market for trading in the company’s shares. The ASX listing requirements were covered in Chapter 3.
4.4.1 Initial public offer

Definition

An initial public offer (IPO) is an invitation to apply for shares in a company based on information contained in a prospectus.

An initial public offer (IPO) is a means of selling the shares of a company to the public at large. When companies 'go public' for the first time, a large issue will probably take the form of an IPO. This is known as flotation. Subsequent issues are likely to be placings or rights issues, described later.

An IPO entails the acquisition by an issuing house of a large block of shares of a company, with a view to offering them for sale to the public and investing institutions.

An issuing house is usually a merchant bank (or sometimes a firm of stockbrokers). It may acquire the shares either as a direct allotment from the company or by purchase from existing members. In either case, the issuing house publishes an invitation to the public to apply for shares, either at a fixed price or on a tender basis. The issuing house accepts responsibility to the public, and gives to the issue the support of its own standing.

Note: It is illegal for Australian limited companies to offer shares to the general public without a prospectus.

4.4.2 A placing

A placing, also called a placement, is an arrangement whereby the shares are not all offered to the public, but instead, the sponsoring market maker arranges for most of the issue to be bought by a small number of investors, usually institutional investors such as pension funds and insurance companies. Share placements allow companies to raise funds quickly (often within 24 hours) and without incurring costs associated with rights issues.

In Australia, the Corporations Act 2001 allows companies to raise up to 15 per cent of their current capital base through share placements generally to institutional and sophisticated investors. They can do this without having to obtain shareholder approval or issuing a formal prospectus.

4.4.3 The choice between an IPO and a placing

Is a company likely to prefer an IPO of its shares, or a placing?

(a) Placings are much cheaper. Approaching institutional investors privately is a much cheaper way of obtaining finance, and thus placings are often used for smaller issues.

(b) Placings are likely to be quicker.

(c) Placings are likely to involve less disclosure of information.

(d) However, most of the shares will be placed with a relatively small number of (institutional) shareholders, which means that most of the shares are unlikely to be available for trading after the flotation, and that institutional shareholders will have control of the company.

(e) When a company first comes to the market in the UK, the maximum proportion of shares that can be placed is 75 per cent, to ensure some shares are available to a wider public. Under the ASX listing rules, companies are encouraged to make 25 per cent of shares available to public shareholders through the incentive of a lower number of shareholders needed to list (400 shareholders instead of 500).

4.4.4 A Stock Exchange introduction

By this method of obtaining a quotation, no shares are made available to the market, neither existing nor newly created shares; nevertheless, the stock market grants a quotation. This will only happen where shares in a large company are already widely held, so that a market can be seen to exist. A company might want an introduction to obtain greater marketability for the shares, a known share valuation for taxation purposes and easier access in the future to additional capital.
4.5 Costs of share issues on the stock market

Companies may incur the following costs when issuing shares:

- Underwriting costs (see below).
- Stock market listing fee (the initial charge) for the new securities.
- Fees of the issuing house, solicitors, auditors and public relations consultant.
- Charges for printing and distributing the prospectus.
- Advertising in national newspapers.

4.5.1 Underwriting

A company about to issue new securities in order to raise finance might decide to have the issue underwritten. Underwriters are financial institutions which agree (in exchange for a fixed fee, perhaps 2.25% of the finance to be raised) to buy at the issue price any securities which are not subscribed for by the investing public.

Underwriters remove the risk of a share issue's being under-subscribed, but at a cost to the company issuing the shares. It is not compulsory to have an issue underwritten. Ordinary offers for sale are most likely to be underwritten although rights issues may be as well.

4.6 Pricing shares for a stock market launch

**WHAT PRICE TO SET?**

- Price of similar quoted companies
- Current market conditions
- Desire for immediate premium
- Future trading prospects

Companies will be keen to avoid over-pricing an issue, which could result in the issue being under subscribed, leaving underwriters with the unwelcome task of having to buy up the unsold shares. On the other hand, if the issue price is too low then the issue will be oversubscribed and the company would have been able to raise the required capital by issuing fewer shares.

The share price of an issue is usually advertised as being based on a certain P/E ratio, the ratio of the price to the company's most recent earnings per share figure in its audited accounts. The issuer's P/E ratio can then be compared by investors with the P/E ratios of similar listed companies.

4.6.1 The price earnings ratio

**Definition**

\[
\text{Price earnings ratio} = \frac{\text{Market price of share}}{\text{EPS}} \quad \text{or} \quad \frac{\text{Total market value of equity}}{\text{Total earnings}}
\]

The price earnings (P/E) ratio reflects the market's appraisal of the share's future prospects. It is an important ratio because it relates two key considerations for investors, the market price of a share and its earnings capacity.
Worked Example: Price earnings ratio

A company has recently declared a dividend of 12c per share. The share price is $3.72 cum div and earnings for the most recent year were 30c per share. Calculate the P/E ratio.

Solution

\[
\text{P/E ratio} = \frac{\text{MV ex div}}{\text{EPS}} = \frac{3.60}{30c} = 12
\]

4.7 Rights issues

Definition

A **rights issue** is an offer to existing shareholders enabling them to buy more shares, usually at a price lower than the current market price.

A rights issue provides a way of raising new share capital by means of an offer to existing shareholders, inviting them to subscribe cash for new shares in proportion to their existing holdings.

Rights issues can be renounceable or non-renounceable. If shareholders choose not to take up renounceable rights on the new shares, they can sell them on to others. Non-renounceable rights must be taken up or forfeited.

For example, a rights issue on a one for four basis at 280c per share would mean that a company is inviting its existing shareholders to subscribe for one new share for every four shares they hold, at a price of 280c per new share. A rights issue may be made by any type of company. The analysis below, however, applies primarily to listed companies.

The major advantages of a rights issue are as follows:

(a) Rights issues are cheaper than IPOs to the general public. This is partly because a full prospectus is not normally required, partly because the administration is simpler and partly because the cost of underwriting will be less.

(b) Rights issues are more beneficial to existing shareholders than issues to the general public. New shares are issued at a discount to the current market price, to make them attractive to investors. A rights issue secures the discount on the market price for existing shareholders, who may either keep the shares or sell them if they wish.

(c) Relative voting rights are unaffected if shareholders all take up their rights.

(d) The finance raised may be used to reduce ‘gearing’ in book value terms by increasing share capital and/or to pay off long-term debt which will reduce gearing in market value terms. This is what gearing means: it describes the level of debt against the amount of equity and is usually expressed as a percentage.

4.8 Pricing of rights issues

The offer price in a rights issue will be lower than the current market price of existing shares. The size of the discount will vary, and will be larger for difficult issues. The offer price must however be at or above the nominal value of the shares, so as not to contravene company law.

A company making a rights issue must set a price which is low enough to secure the acceptance of shareholders, who are being asked to provide extra funds, but not too low, so as to avoid excessive dilution of the earnings per share.
Worked Example: Pricing a rights issue

Seagull can achieve a profit after tax of 20% on the capital employed. At present its capital structure is as follows.

| $ | 200 000 ordinary shares of $1 each | 200 000 |
| Retained earnings | 100 000 |
| **Total** | **300 000** |

The directors propose to raise an additional $126 000 from a rights issue. The current market price is $1.80.

Required

(a) Calculate the number of shares that must be issued if the rights price is: $1.60; $1.50; $1.40; $1.20.

(b) Calculate the dilution in earnings per share in each case.

Solution

The earnings at present are 20% of $300 000 = $60 000. This gives earnings per share of 30c. The earnings after the rights issue will be 20% of $426 000 = $85 200.

<table>
<thead>
<tr>
<th>Rights price</th>
<th>No of new shares</th>
<th>EPS ($85 200 ÷ total no of shares)</th>
<th>Dilution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.60</td>
<td>78 750</td>
<td>30.6</td>
<td>+ 0.6</td>
</tr>
<tr>
<td>$1.50</td>
<td>84 000</td>
<td>30.0</td>
<td>–</td>
</tr>
<tr>
<td>$1.40</td>
<td>90 000</td>
<td>29.4</td>
<td>– 0.6</td>
</tr>
<tr>
<td>$1.20</td>
<td>105 000</td>
<td>27.9</td>
<td>– 2.1</td>
</tr>
</tbody>
</table>

Note that at a high rights price the earnings per share are increased, not diluted. The breakeven point (zero dilution) occurs when the rights price is equal to the capital employed per share: $300 000 ÷ 200 000 = $1.50.

4.8.1 Theoretical ex-rights price

When a rights issue is announced, all existing shareholders have the right to subscribe for new shares, and so there are rights attached to the existing shares.

The shares are therefore described as being 'cum rights' (with rights attached) and are traded cum rights.

On the first day of dealings in the newly issued shares, the rights no longer exist and the old shares are now 'ex-rights' (without rights attached).

After the announcement of a rights issue, share prices normally fall. The extent and duration of the fall may depend on the number of shareholders and the size of their holdings. This temporary fall is due to uncertainty in the market about the consequences of the issue, with respect to future profits, earnings and dividends.

After the issue has actually been made, the market price per share will normally fall, because there are more shares in issue and the new shares were issued at a discount price.

In theory, the new market price will be the consequence of an adjustment to allow for the discount price of the new issue, and a theoretical ex-rights price can be calculated.

Worked Example: Theoretical ex-rights price

Fundraiser has 1 000 000 ordinary shares of $1 in issue, which have a market price on 1 September of $2.10 per share. The company decides to make a rights issue, and offers its shareholders the right to subscribe for one new share at $1.50 each for every four shares already held. After the announcement of the issue, the share price fell to $1.95, but by the time just prior to the issue being made, it had recovered to $2 per share. This market value just before the issue is known as the cum rights price. What is the theoretical ex-rights price?
**Solution**

Value of the portfolio for a shareholder with four shares before the rights issue: $8.00

| 4 shares @ $2.00 | 8.00 |
| 1 share @ $1.50  | 1.50 |
| **Total**        | **9.50** |

so the value per share after the rights issue (or TERP) is $9.50/5 = $1.90.

---

### 4.8.2 The value of rights

**Definition**

The *value of rights* is the theoretical gain a shareholder would make by exercising his rights.

(a) Using the above example, if the price offered in the rights issue is $1.50 per share, and the market price after the issue is expected to be $1.90, the value attaching to a right is $1.90 − $1.50 = $0.40. A shareholder would therefore be expected to gain 40 cents for each new share he buys.

If he does not have enough money to buy the share himself, he could sell the right to subscribe for a new share to another investor, and receive 40 cents from the sale. This other investor would then buy the new share for $1.50, so that his total outlay to acquire the share would be $0.40 + $1.50 = $1.90, the theoretical ex-rights price.

(b) The value of rights attaching to existing shares is calculated in the same way. If the value of rights on a new share is 40 cents, and there is a one for four rights issue, the value of the rights attaching to each existing share is $0.40 ÷ 4 = 10 cents.

---

### 4.8.3 The theoretical gain or loss to shareholders

The possible courses of action open to shareholders are:

(a) To 'take up' or 'exercise' the rights, that is, to buy the new shares at the rights price. Shareholders who do this will maintain their percentage holdings in the company by subscribing for the new shares.

(b) To 'renounce' the rights and sell them on the market. Shareholders who do this will have lower percentage holdings of the company’s equity after the issue than before the issue, and the total value of their shares will be less.

(c) To renounce part of the rights and take up the remainder. For example, a shareholder may sell enough of his rights to enable him to buy the remaining rights shares he is entitled to with the sale proceeds, and so keep the total market value of his shareholding in the company unchanged.

(d) To do nothing. Shareholders may be protected from the consequences of their inaction because rights not taken up are sold on a shareholder’s behalf by the company. The Stock Exchange rules state that if new securities are not taken up, they should be sold by the company to new subscribers for the benefit of the shareholders who were entitled to the rights.

---

**Question 1: Rights issue**

Gopher has issued 3,000,000 ordinary shares of $1 each, which are at present selling for $4 per share. The company plans to issue renounceable rights to purchase one new equity share at a price of $3.20 per share for every three shares held. A shareholder who owns 900 shares thinks that he will suffer a loss in his personal wealth because the new shares are being offered at a price lower than market value. On the assumption that the actual market value of shares will be equal to the theoretical ex-rights price, what would be the effect on the shareholder’s wealth if:

(a) he sells all the rights?

(b) he exercises half of the rights and sells the other half?

(c) he does nothing at all?

*(The answer is at the end of the chapter)*
4.8.4 The actual market price after a rights issue

The actual market price of a share after a rights issue may differ from the theoretical ex-rights price. This will occur when:

Expected yield from new funds raised ≠ Earnings yield from existing funds

The market will take a view of how profitably the new funds will be invested, and will value the shares accordingly. An example will illustrate this point.

**Worked Example: Actual market price post rights issue**

Musk currently has 4,000,000 ordinary shares in issue, valued at $2 each, and the company has annual earnings equal to 20 per cent of the market value of the shares. A 1-for-4 rights issue is proposed, at an issue price of $1.50. If the market continues to value the shares on a price/earnings ratio of 5, what would be the value per share if the new funds are expected to earn, as a percentage of the money raised:

(a) 15%?
(b) 20%?
(c) 25%?

How do these values in (a), (b) and (c) compare with the theoretical ex-rights price? Ignore issue costs.

**Solution**

The theoretical ex-rights price will be calculated first.

Four shares have a current value ($2) of 8.00
One new share will be issued for 1.50
Five shares would have a theoretical value of 9.50

Theoretical ex-rights price = \( \frac{1}{4 + \left(\frac{4 \times 2 + 1.50}{5}\right)} \)

= $1.90

The new funds will raise 1,000,000 × $1.50 = $1,500,000.

<table>
<thead>
<tr>
<th>Earnings as a % of money raised</th>
<th>Additional earnings</th>
<th>Current earnings</th>
<th>Total earnings after the issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>15%</td>
<td>225 000</td>
<td>1 600 000</td>
<td>1 825 000</td>
</tr>
<tr>
<td>20%</td>
<td>300 000</td>
<td>1 600 000</td>
<td>1 900 000</td>
</tr>
<tr>
<td>25%</td>
<td>375 000</td>
<td>1 600 000</td>
<td>1 975 000</td>
</tr>
</tbody>
</table>

If the market values shares on a P/E ratio of 5, the total market value of equity and the market price per share would be as follows:

<table>
<thead>
<tr>
<th>Total earnings</th>
<th>Market value</th>
<th>Price per share (5,000,000 shares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>1 825 000</td>
<td>9 125 000</td>
<td>1.825</td>
</tr>
<tr>
<td>1 900 000</td>
<td>9 500 000</td>
<td>1.900</td>
</tr>
<tr>
<td>1 975 000</td>
<td>9 875 000</td>
<td>1.975</td>
</tr>
</tbody>
</table>

(a) If the additional funds raised are expected to generate earnings at the same rate as existing funds, the actual market value will probably be the same as the theoretical ex-rights price.

(b) If the new funds are expected to generate earnings at a lower rate, the market value will fall below the theoretical ex-rights price. If this happens, shareholders will lose.

(c) If the new funds are expected to earn at a higher rate than current funds, the market value should rise above the theoretical ex-rights price. If this happens, shareholders will profit by taking up their rights.
The decision by individual shareholders as to whether they take up the offer will therefore depend on:

- The expected rate of return on the investment (and the risk associated with it).
- The return obtainable from other investments (allowing for the associated risk).

## 5 Venture capital

### Section overview

- Venture capital is provided to companies with high growth potential in return for a stake of equity. It is high risk financing as there is little guarantee this potential will be fulfilled.
- A venture capitalist will generally invest in business start-ups, business development, management buyouts or where an owner wants to realise some or all of his investment.

### Definition

**Venture capital** is risk capital, normally provided in return for an equity stake to companies with high growth potential.

### 5.1 Opportunities for venture capital

The types of business that a venture capitalist (VC) might invest in include the following:

(a) **Business start-ups.** When a business has been set up by someone who has already put time and money into getting it started, a VC may be willing to provide finance to enable it to get off the ground.

(b) **Business development.** A VC may be willing to provide development capital for a company which wants to invest in new products or new markets or to make a business acquisition, and so which needs a major capital injection.

(c) **Management buyouts.** A management buyout is the purchase of all or parts of a business from its owners by its managers.

(d) Helping a company where one of its owners wants to realise all or part of his investment. The VC may be prepared to buy some of the company’s equity.

### 5.2 Finding venture capital

Typically VCs invest in companies with high potential but with little guarantee that this potential can be fulfilled. Since the investment is high risk, the VC will expect high returns (averaging out at 25 to 40 per cent per annum). Investment is usually in the form of equity and much of the VC’s return will be in the form of a capital gain after three to five years, rather than by way of a steady annual dividend.

A key issue for a venture capitalist is the exit route i.e. the means by which they can liquidate their investment e.g. a trade sale or flotation.

When a company’s directors look for help from a venture capital institution, they must recognise that:

(a) The institution will want an equity stake in the company.

(b) It will need convincing that the company can be successful (management buyouts of companies which already have a record of successful trading have been increasingly favoured by venture capitalists in recent years).

(c) It may want to have a representative appointed to the company’s board, to look after its interests, or an independent director.
The directors of the company must then contact venture capital organisations, to try to find one or more which would be willing to offer finance. Typically, a venture capitalist will consider offering finance of $500,000 upwards. A venture capital organisation will only give funds to a company that it believes can succeed.

A survey has indicated that around 75 per cent of requests for venture capital are rejected on an initial screening, and only about 3 per cent of all requests survive both this screening and further investigation and result in actual investments.

The venture capital organisation will take account of various factors in deciding whether or not to invest.

**Factors in investment decisions**

| The nature of the company’s product | Viability of production and selling potential. |
| Expertise in production | Technical ability to produce efficiently. |
| Expertise in management | Commitment, skills and experience. |
| The market and competition | Threat from rival producers or future new entrants. |
| Future profits | Detailed business plan showing profit prospects that compensate for risks. |
| Board membership | To take account of VC’s interests and ensure VC has say in future strategy. |
| Risk borne by existing owners | Owners bear significant risk and invest significant part of their overall wealth. |

### 6 International money and capital markets

**Section overview**
- International money and capital markets are available for larger companies wishing to raise larger amounts of finance.

#### 6.1 International financial markets

Small- and medium-sized companies usually limit their sources of finance to the domestic market. Larger companies may seek funds in the international finance markets to finance global operations or domestic business operations. An Australian company might borrow money from a bank or from the investing public, in dollars. But it might also borrow in a foreign currency, especially if it trades abroad, or if it already has assets or liabilities abroad denominated in a foreign currency.

International money markets are known as euromarkets – a term used because initially these markets developed in Europe, but which are now used to refer to loans or bonds denominated in a currency other than the domestic borrower’s currency. It should be noted it is not related to the euro currency.

Larger companies are able to borrow funds on the **eurocurrency markets** (which are international money markets) and on the markets for **eurobonds** (international capital markets).

#### 6.2 Eurocurrency markets

The eurocurrency markets refers to money markets for borrowing and lending by banks in currencies other than that of the country in which the bank is based. Typically only available in major currencies for which active markets exist.

When a company borrows in a foreign currency, the loan is known as a **eurocurrency loan**.
**Definition**

**Eurocurrency** is currency which is held by individuals and institutions outside the country of issue of that currency.

For example, if an Australian company borrows US $50 000 from its bank, the loan will be a 'eurodollar' loan. Companies with foreign trade interests might choose to borrow from their bank in another currency.

### 6.3 Eurobond markets

Instead of borrowing from banks, in recent years, a strong international market has built up which allows very large companies to borrow from private investors by issuing securities.

**Definition**

A **eurobond** is an international bond that is denominated in a currency not native to the country where it is issued.

Eurobonds are long-term loans raised by international companies or other institutions and sold to investors in several countries at the same time. The term of a eurobond issue is typically ten to fifteen years and the issue is usually underwritten by a multinational syndicate of banks. Such bonds can be sold by one holder to another.

Eurobonds may be traded throughout the world e.g. Tokyo, Singapore (not on a specific national bond market) and are named after the currency they are denominated in. For example, Euroyen and Eurodollar bonds are denominated in Japanese yen and American dollars respectively.

Eurobonds may be the most suitable source of finance for a large organisation with an excellent credit rating, such as a large successful multinational company, which:

(a) requires a long-term loan to finance a big capital expansion programme. The loan may be for at least five and up to twenty years.

(b) requires borrowing which is not subject to the national exchange controls of any government.

In addition, domestic capital issues may be regulated by the government or central bank, with an orderly queue for issues. In contrast, eurobond issues can be made whenever market conditions seem favourable and can give a faster access to funds.

As well as eurobonds, there is also a less highly developed market in international equity share issues (‘euro-equity’). The issue is marketed through an international syndicate of banks. After the issue, the shares might be traded on the international equities market. The shares will also be listed on one or more stock exchanges (e.g. on the Australian Securities Exchange or the London Stock Exchange) and, in American Depository Receipts (ADR) form, on the New York Stock Exchange. Refer to Section 6.5 for more information.
6.4 Considerations when using euro-finance

A borrower who is contemplating borrowing money on the international market must consider the exchange risk of a long-term foreign currency loan. If the money is to be used to purchase assets which will earn revenue in a currency different to that of the bond issue, the borrower will run the risk of exchange losses.

If the money is to be used to purchase assets which will earn revenue in the same currency, the borrower can match these revenues with payments on the bond, and so remove or reduce the exchange risk.

An investor subscribing to a bond issue will be concerned about the following factors:

(a) **Security** – The borrower must be of high quality.

(b) **Marketability** – Investors will wish to have a ready market in which bonds can be bought and sold. If the borrower is of high quality the bonds or notes will be readily negotiable.

(c) **Anonymity** – Investors in eurobonds tend to be attracted to the anonymity of this type of issue, as the bonds are generally issued to bearer.

(d) The **return** on the investment – this is paid tax-free.

6.5 Other international alternatives

Another possibility for a company is to issue shares or bonds on a local market. In this case the foreign bond or share issues and trading are conducted under the supervision of local market authorities.

6.5.1 Foreign bonds

Foreign bonds are issued on a local market by a foreign borrower and are usually denominated in the local currency. In the US, non-US companies are able to issue bonds in a 'private placement' market. This is a stock market in which investors are restricted to investment institutions, and the wider general public cannot invest. Australian companies might, therefore, choose to issue bonds or shares in this market, to gain exposure to US investors and a more international investor base.

6.5.2 Foreign equity

Alternatively a company may apply for its shares to be traded on a foreign stock market.

For example, equity of large non-US companies might be traded on US stock markets in a special form known as **American Depositary Receipts**, or ADRs. An ADR is a security denominated in US dollars, that is backed by a number of shares in the non-US company. An Australian company wanting to raise capital in the US might therefore place a number of new shares in the custody of a bank, and a US bank will issue ADRs backed by these shares. The ADRs are registered in the US, and accepted to trading on a US stock market, such as the New York Stock Exchange or Nasdaq. When the Australian company pays dividends on the shares, it makes the dividend payment in Australian dollars, but ADR holders receive their dividends in US dollars from the US bank.

6.5.3 Regulation and compliance

When the bonds or shares (ADRs) of an Australian company are traded in the US, the company must comply with US market regulations. In the US, shares cannot be offered for sale to the general public unless they have been registered with the Securities and Exchange Commission (SEC). Australian companies not wanting to go through the costly and time-consuming procedures for obtaining registration can opt instead for the private placement market (for which registration is not required) but they must comply with the rules of that market.

When the bonds or shares of an Australian company are traded on the international capital market, it must comply with the market rules of ICMA, the International Capital Market Association, based in Zurich. ICMA was formed in 2005 by the merger of ISMA (the International Securities Market Association) and IPMA (the International Primary Market Association).
Key chapter points

- Capital structure refers to how a company is financed and involves choosing a suitable balance between debt capital and equity capital (gearing level), and deciding to what extent current assets can safely be financed by current liabilities.

- Gearing is a term that is used to refer to the balance between debt capital and equity capital.

- Factors influencing the choice of financing method, other than gearing, include the company’s profitability, the relative cost of different sources of finance, ease of access to different sources of finance, dilution of ownership with some forms of equity issue, maximum borrowing limits and other loan covenants, the security required for borrowing, conditions in the capital markets and the purpose for which the finance is required.

- As a general rule businesses should aim to match the length of finance with the maturity of the asset being financed, therefore non-current assets would be financed by long term capital and the majority of current assets by short-term capital.

- A range of short-term sources of finance are available to businesses including overdrafts, short-term loans, trade credit and lease finance. Long-term sources of finance are available to businesses including debt finance, leasing, venture capital and equity finance.

- The choice of debt finance that a company can make depends upon the availability of funds due to the size of the business, the duration of the loan, preference for a fixed or floating interest rate, the security that can be offered.

- The term bonds describes various forms of long-term debt a company may issue, such as loan notes or debentures, which may be redeemable or irredeemable.

- Convertible bonds are bonds that give the holder the right to convert to other securities, normally ordinary shares, at a pre-determined price/rate and time.

- Equity finance refers to the ordinary share capital of the company and can come from three sources: retained earnings, rights issue, or new share issue.

- A company can obtain a stock market listing for its shares through a public offer or a placing.

- A rights issue is an offer to existing shareholders enabling them to buy more shares, usually at a price lower than the current market price.

- Venture capital is risk capital, normally provided in return for an equity stake to companies with high growth potential.

- International money and capital markets are available for larger companies wishing to raise larger amounts of finance.

- The eurocurrency market is the money market for borrowing and lending by banks in currencies other than that of the country in which the bank is based. Typically, only available in major currencies for which active markets exist.

- Eurobonds are long-term loans raised by international companies or other institutions and sold to investors in several countries at the same time.
Quick revision questions

1. Debentures are more similar to equity than preference shares.
   - [ ] true
   - [ ] false

2. Which of the following sources of equity finance is a company most likely to use in practice?
   A. rights issue
   B. retained earnings
   C. venture capital
   D. new share issue

3. Which of the following is least likely to be a reason for seeking a stock market flotation?
   A. improving the existing owners' control over the business
   B. access to a wider pool of finance
   C. enhancement of the company's image
   D. transfer of capital to other uses

4. Which of the following is not true of a rights issue by a listed company?
   A. rights issues do not require a prospectus
   B. the rights issue price can be at a discount to market price
   C. if shareholders do not take up the rights, the rights lapse
   D. relative voting rights are unaffected if shareholders exercise their rights

5. Consider the following statements concerning share issues.
   I. An offer for sale involves a listed company making a direct invitation to the public to purchase shares in the company.
   II. A bonus issue involves the issue of new shares for cash to existing shareholders in proportion to their existing shareholdings.

   Are the statements above true or false?

   - [ ] A true true
   - [ ] B true false
   - [ ] C false true
   - [ ] D false false

6. Three important sources of long-term finance are loan capital, ordinary shares and preference shares.

   Which one of the following correctly ranks these sources of finance according to their relative cost to the business? (Where 1 represents the source of finance that is normally the most expensive and 3 represents the source that is normally the least expensive.)

   - [ ] A 1 2 3
   - [ ] B 2 3 1
   - [ ] C 3 1 2
   - [ ] D 2 1 3
The following comments, relating to methods of issuing shares by a public company, were recently made:

I. An offer for sale is an invitation to the public to buy shares that are not yet in issue.

II. A placing is an invitation to selected investors to buy either new shares or shares already in issue.

Which one of the following combinations (true/false) concerning the above statements is correct?

<table>
<thead>
<tr>
<th>Statement</th>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>true</td>
<td>true</td>
</tr>
<tr>
<td>B</td>
<td>true</td>
<td>false</td>
</tr>
<tr>
<td>C</td>
<td>false</td>
<td>true</td>
</tr>
<tr>
<td>D</td>
<td>false</td>
<td>false</td>
</tr>
</tbody>
</table>

What is the term for an arrangement whereby a listed company issues new shares which are bought by a small number of institutional investors, such as pension funds and insurance companies?

A. placing
B. offer for sale
C. offer for subscription
D. IPO
Answers to quick revision questions

1 False
Debentures pay a fixed return each year to investors, as do preference shares, while ordinary shares (equity) pay a variable return each year depending on the fortunes of the company. Also debentures and preference shares are both repaid on a liquidation before ordinary shares. Therefore debentures are more similar to preference shares than to equity.

2 B For most companies, retained earnings are the most important source of equity finance and would be used before considering a new/rights issue. Venture capital is high risk equity finance and is only provided to companies with significant growth potential.

3 A Flotation is likely to involve a significant loss of control to a wider circle of investors.

4 C Shareholders have the option of renouncing the rights and selling them on the market.

5 D An offer for sale involves a sponsoring intermediary such as an investment bank making a public invitation to purchase shares in the company. An offer for subscription is where the listed company makes a direct invitation itself.

A rights issue involves the issue of new shares for cash to existing shareholders in proportion to their existing shareholdings. A bonus issue is a free issue of shares to existing shareholders in proportion to their existing shareholdings.

6 C Loan finance is normally the cheapest external source since its cost (interest) attracts tax relief and has the lowest risks. Neither preference share nor ordinary share returns (dividends) attract tax relief. Preference shares are lower risk than ordinary shares due to their preferred right to dividends and capital and therefore have a lower cost.

7 C An offer for sale involves the sale of shares already in issue.

8 A An offer for sale and offer for subscription are issues of shares to the general public, and are larger issues than a placing. An IPO (initial public offering) is a term for an issue of shares to the general public when a company comes to the stock market for the first time.
1. Value of the portfolio for a shareholder with three shares before the rights issue:

\[
\begin{align*}
3 \text{ shares} @ \$4.00 & = 12.00 \\
1 \text{ share} @ \$3.20 & = 3.20 \\
4 & = 15.20
\end{align*}
\]

so the value per share after the rights issue (or TERP) is \( \frac{15.20}{4} = \$3.80 \).

\[
\begin{align*}
\text{Theoretical ex-rights price} & = 3.80 \\
\text{Price per new share} & = 3.20 \\
\text{Value of rights per new share} & = 0.60
\end{align*}
\]

The value of the rights attached to each existing share is \( \frac{0.60}{3} = \$0.20 \).

We will assume that a shareholder is able to sell his rights for \$0.20 per existing share held.

(a) If the shareholder sells all his rights:

\[
\begin{align*}
\text{Sale value of rights (900} \times 0.20) & = 180 \\
\text{Market value of his 900 shares, ex-rights} \times 3.80) & = 3420 \\
\text{Total wealth} & = 3600
\end{align*}
\]

Total value of 900 shares cum rights (\( \times 4 \)) \( $3600 \)

The shareholder would neither gain nor lose wealth. He would not be required to provide any additional funds to the company, but his shareholding as a proportion of the total equity of the company will be lower.

(b) If the shareholder exercises half of the rights (buys \( \frac{450}{3} = 150 \) shares at \$3.20) and sells the other half:

\[
\begin{align*}
\text{Sale value of rights (450} \times 0.20) & = 90 \\
\text{Market value of his 1050 shares, ex-rights} \times 3.80 & = 3990 \\
\text{Total value of 900 shares cum rights (} \times 4 \text{)} & = 3600 \\
\text{Additional investment (150} \times 3.20) & = 480
\end{align*}
\]

Total value of 900 shares cum rights \( (\times 4) \) \( 4080 \)

The shareholder would neither gain nor lose wealth, although he will have increased his investment in the company by \$480.

(c) If the shareholder does nothing, but all other shareholders either exercise their rights or sell them, he would lose wealth as follows:

\[
\begin{align*}
\text{Market value of 900 shares cum rights} \times 4 & = 3600 \\
\text{Market value of 900 shares ex-rights} \times 3.80 & = 3420 \\
\text{Loss in wealth} & = 180
\end{align*}
\]

It follows that the shareholder, to protect his existing investment, should either exercise his rights or sell them to another investor. If he does not exercise his rights, the new securities he was entitled to subscribe for might be sold for his benefit by the company, and this would protect him from losing wealth.
Chapter 5

Working capital and short term financial management

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost of funds</strong></td>
<td>LO4</td>
</tr>
<tr>
<td>Demonstrate the link between working capital management and corporate cash flow</td>
<td>LO4.8</td>
</tr>
<tr>
<td>Describe the operating cycle in working capital management to explain inventory</td>
<td>LO4.9</td>
</tr>
<tr>
<td>management, debtor management and cash management</td>
<td></td>
</tr>
<tr>
<td><strong>Short-term financial management</strong></td>
<td>LO8</td>
</tr>
<tr>
<td>Prepare short term finance plans and strategies</td>
<td>LO8.1</td>
</tr>
</tbody>
</table>

Topic list

1. The nature of working capital
2. Objectives of working capital management
3. The cash operating cycle
4. Working capital strategies and financing
Introduction

This chapter covers the crucial topic of working capital management and the link between working capital and liquidity. It explains the objectives and role of working capital management, the cash operating cycle and its implications for the management of cash, accounts receivable and payable and inventories. Strategies for financing working capital are also considered.
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. State the components of working capital. (Section 1)
2. What is meant by the trade-off between profitability and liquidity in respect of the working capital decision? (Section 2.1)
3. What is the cash operating cycle? (Section 3)
4. Name three ways that a company could ease a short-term cash shortage. (Section 3.4)
5. If a company adopts a moderate approach to working capital management, how is it likely to finance its investment in short term and long term assets? (Section 4.1)
1 The nature of working capital

Section overview

- The amount tied up in working capital is equal to the value of raw materials, work-in-progress, finished goods inventories and accounts receivable less accounts payable.
- The size of this net figure has a direct effect on the liquidity of an organisation so a business must have clear policies for the management of each component of working capital.

Definition

**Net working capital** of a business is its current assets less its current liabilities.

The amount tied up in working capital is equal to the value of raw materials, work-in-progress, finished goods inventories and accounts receivable less accounts payable. The size of this net figure has a direct effect on the liquidity of an organisation.

<table>
<thead>
<tr>
<th>Key current assets and liabilities</th>
<th>Current liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>Trade accounts payable</td>
</tr>
<tr>
<td>Inventory of raw materials</td>
<td>Taxation payable</td>
</tr>
<tr>
<td>Inventory of work in progress</td>
<td>Dividend payments due</td>
</tr>
<tr>
<td>Inventory of finished goods</td>
<td>Short-term loans</td>
</tr>
<tr>
<td>Amounts receivable from trade debtors</td>
<td>Long-term loans maturing within one year</td>
</tr>
<tr>
<td>Marketable securities</td>
<td>Lease rentals due within one year</td>
</tr>
</tbody>
</table>

1.1 Working capital characteristics of different businesses

Different businesses will have different working capital characteristics. There are three main aspects to these differences:

(a) **Holding inventory** (from their purchase from external suppliers, through the production and warehousing of finished goods, up to the time of sale).

(b) **Taking time to pay suppliers and other accounts payable**.

(c) **Allowing customers (accounts receivable) time to pay**.

Working capital management is a key factor in an organisation’s long-term success. A business must therefore have clear policies for the management of each component of working capital.

Here are some examples.

(a) Supermarkets and other retailers receive much of their sales in cash or by credit card or debit card. However, they typically buy from suppliers on credit. They may therefore have the advantage of significant cash holdings, which they may choose to invest.

(b) A company which supplies to other companies, such as a wholesaler, is likely to be selling and buying mainly on credit. Co-ordinating the flow of cash may be quite a problem. Such a company may make use of short-term borrowings (such as an overdraft) to manage its cash.

(c) Smaller companies with a limited trading record may face particularly severe problems. Lacking a long track record, such companies may find it difficult to obtain credit from suppliers. At the same time, customers will expect to receive the length of credit period that is normal for the particular business concerned. The firm may find itself squeezed in its management of cash.
When a company is growing, if it expands its operations too quickly, overtrading may occur. The expansion may be profitable but is likely to necessitate increased levels of inventory and accounts receivable. If a business expands faster than its existing levels of working capital can sustain, it will place a strain on cash flow and increase the risk of insolvency.

**Question 1: Overtrading**

Which of the following is the most likely to be a symptom of overtrading?

A. Static levels of inventory turnover  
B. Rapid increase in profits  
C. Increase in the level of the current ratio  
D. Rapid increase in sales

(The answer is at the end of the chapter)

## 2 Objectives of working capital management

### Section overview

- The two main objectives of working capital management are to ensure it has sufficient liquid resources to continue in business and to increase its profitability.

### 2.1 Profitability/Liquidity trade-off

Every business needs adequate liquid resources to maintain day-to-day cash flow. It needs enough to pay wages, salaries and accounts payable if it is to keep its workforce and guarantee supplies.

Maintaining adequate working capital is not just important in the short term. Adequate liquidity is needed to ensure the survival of the business in the long term. Even a profitable company may fail without adequate cash flow to meet its liabilities, for example, if the bank suspends its overdraft facilities, there will be a danger of insolvency unless the company is able to turn enough of its current assets into cash quickly.

On the other hand, an excessively conservative approach to working capital management resulting in high levels of cash holdings will harm profits because the opportunity to make a return on the assets tied up as cash will have been missed.

The two objectives of profitability and liquidity will often conflict as liquid assets give the lowest returns.

Current liabilities are often a cheap method of finance (trade accounts payable do not usually carry an interest cost). Companies may therefore consider that, in the interest of higher profits, it is worth accepting some risk of insolvency by increasing current liabilities, and taking the maximum credit possible from suppliers.

Therefore with most working capital decisions, there is a trade-off between profitability and liquidity.

### Case Study

These extracts from a press release, issued by Ernst & Young in July 2009, explain the importance of working capital management for Australian companies emerging from the global financial crisis.

**Australian businesses cautiously optimistic Monday, 27 July 2009**

‘Australia may prove to be the lucky country for businesses emerging from the global financial crisis, results from an Ernst & Young survey show.

The survey of 380 C-suite and board level executives from corporate Australia in June, compared to results of a similar global study, show Australian businesses have been more confident and more aggressive in responding to the crisis and the changing business landscape than global counterparts.
Ernst & Young’s Corporate Accounts Leader, Patrick Winter, says the results confirm that the impact on Australian businesses has not been as severe.

‘Access to capital is still difficult, particularly for small and mid-cap companies, however organisations have implemented initiatives to reduce costs and manage cash and working capital more effectively.

‘In the next 12 months, 78% of Australian businesses placed the greatest importance on improving the performance of current assets.

‘Many of our discussions with clients in recent months have focused on working capital and liquidity, as the pressure on management has intensified. Our respondents agree – only 15% say that cash is not an issue for their business.’

Key figures from the survey, “The lucky country looks forward – Opportunities in adversity for Australian business”, include:

- 71 per cent are reviewing cash management and cash flows.
- 31 per cent are obtaining access to short-term finance facilities/credit.
- 38 per cent are building working capital measures into performance objectives of management.
- 87 per cent have increased their focus on key customer accounts.
- 59 per cent have narrowed their supplier base to negotiate better prices or terms.

### 3 The cash operating cycle

#### Section overview

- The connection between investment in working capital and cash flow may be illustrated by means of the cash operating cycle.
- The cash operating cycle is the period of time which elapses between the point at which cash begins to be expended on the production of a product and the collection of cash from the customer who purchases it.
- Ideally, a business should aim to minimise the length of its cash operating cycle. This can be achieved by managing the various components of working capital.
- Cash shortages can be eased by postponing capital expenditure, selling assets, taking longer to pay accounts payable and pressing accounts receivable for earlier payment.
- Temporary surpluses of cash can be invested in a variety of financial instruments. Longer-term surpluses should be returned to shareholders if there is a lack of investment opportunities.

The connection between investment in working capital and cash flow may be illustrated by means of the cash operating cycle.

#### 3.1 Cash operating cycle

**Definition**

The cash operating cycle is the period of time which elapses between the point at which cash begins to be expended on the production of a product and the collection of cash from the customer who purchases it.

The cash operating cycle in a manufacturing business equals:

\[
\text{Cash operating cycle} = \left( \frac{\text{Average time that raw materials remain in inventory}}{\text{Less the period of credit taken from suppliers}} + \text{the time taken to produce (and store) the goods} \right) + \text{the time taken by customers to pay for the goods}
\]

If the turnover periods for inventories and accounts receivable lengthen, or the payment period to accounts payable shortens, then the operating cycle will lengthen and the investment in working capital will increase.
**Worked Example: Cash operating cycle**

Wines Co buys raw materials from suppliers that allow Wines Co 2.5 months’ credit. The raw materials remain in inventory for one month, and it takes Wines Co two months to produce the goods. The goods are sold within a couple of days of production being completed and customers take on average 1.5 months to pay.

**Required**

Calculate Wines’ cash operating cycle.

**Solution**

We can ignore the time that finished goods are in inventory as it is no more than a couple of days.

<table>
<thead>
<tr>
<th>Description</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>The average time that raw materials remain in inventory</td>
<td>1.0</td>
</tr>
<tr>
<td>Less the time taken to pay suppliers</td>
<td>(2.5)</td>
</tr>
<tr>
<td>The time taken to produce the goods</td>
<td>2.0</td>
</tr>
<tr>
<td>The time taken by customers to pay for the goods</td>
<td>1.5</td>
</tr>
</tbody>
</table>

The company’s cash operating cycle is two months. This can be illustrated diagrammatically as follows:

The cash operating cycle is the period between the suppliers being paid and the cash being received from the customers.

It represents the period of time the business is 'out-of-pocket' or will require funding for its investment in working capital e.g. in the form of an overdraft or short-term loan.

**Question 2: Cash flow**

How do cash flow problems arise?

(The answer is at the end of the chapter)

**3.2 Managing the length of the cycle**

Ideally, a business should aim to minimise the length of its cash operating cycle. This can be achieved by managing the various components of working capital.
3.2.1 Inventory

Inventory days can be reduced by minimising the holding of raw materials and finished goods and ensuring production processes are efficient so as to reduce work-in-progress.

Some manufacturing companies have sought to reduce their inventories of raw materials and components to as low a level as possible. Just-in-time procurement is a term which describes a policy of obtaining goods from suppliers at the latest possible time (i.e. just as they are needed) and so avoiding the need to carry any significant materials or components inventory. This is extended into a complete production philosophy where the finished goods are produced to customer order rather than being stockpiled in the warehouse.

3.2.2 Managing accounts receivable

Offering credit has a cost: the value of the interest charged on an overdraft to fund the period of credit, or the interest lost on the cash not received and deposited in the bank. It is also likely to lead to an increase in bad debts which do not arise if all sales are for cash. An increase in profit from extra sales arising as a result of offering credit could offset this cost. Insurance, particularly of overseas debts, can also help reduce the risk of bad debts.

A business must therefore consider whether the profit from making additional sales outweighs the cost of offering the credit necessary to entice the additional customers.

If offering credit generates extra sales, then those extra sales will have additional repercussions on:

(a) The amount of inventory maintained in the warehouse, to ensure that the extra demand must be satisfied.

(b) The amount of money the company owes to its accounts payable (as it will be increasing its supply of raw materials).

Early settlement discounts may be employed to shorten average credit periods, and to reduce the investment in accounts receivable and therefore interest costs. The benefit in interest cost saved should exceed the cost of the discounts allowed.

Some companies use factoring and invoice discounting to help short-term liquidity or to reduce administration costs. Businesses will often enter into arrangements with a factor or invoice discounter to improve cash flow and shorten the cash cycle.

Definitions

A factoring organisation takes over the management of the trade debts owed to its client (a business customer) on the client’s behalf. The factor company collects the debts and provides an immediate cash advance of a proportion of the money it is due to collect.

Invoice discounting is the purchase (by the provider of the discounting service) of a company’s trade debts, at a discount. Invoice discounting enables a company to raise finance based on their expected invoice receipts. The invoice discounter does not take over the administration of the client’s sales ledger so the client remains in control of debt collection.

Question 3: Managing accounts receivable

What factors should be considered by management in formulating a policy for credit control, and what is credit insurance?

(The answer is at the end of the chapter)
3.2.3 **Accounts payable**

The management of trade accounts payable involves:

- attempting to obtain satisfactory credit from suppliers.
- attempting to extend credit during periods of cash shortage.
- maintaining good relations with regular and important suppliers.

Taking credit from suppliers is a normal feature of business. Nearly every company has some trade accounts payable waiting for payment. It is particularly important to small and fast growing firms.

Trade credit is a source of short-term finance because it helps to keep working capital down. It is usually a cheap source of finance, since suppliers rarely charge interest. The costs of making maximum use of trade credit include the loss of suppliers’ goodwill, and the loss of any available cash discounts for the early payment of debts.

If a supplier offers a discount for the early payment of debts, a company must consider whether the benefits of accepting the discount (in terms of reduced purchase price) outweigh the finance cost of having to pay earlier.

3.3 **Working capital needs of different types of business**

Different industries have different optimum working capital profiles, reflecting their methods of doing business and what they are selling.

(a) Businesses with a lot of cash sales and few credit sales should have minimal accounts receivable.

(b) Businesses that exist solely to trade will only have finished goods in inventory, whereas manufacturers will have raw materials and work in progress as well. Also some finished goods, notably foodstuffs, have to be sold within a few days because of their perishable nature.

(c) Large companies may be able to use their strength as customers to obtain extended credit periods from their suppliers. By contrast, small companies, particularly those that have recently commenced trading, may be required to pay their suppliers immediately.

(d) Some businesses will be receiving most of their monies at certain times of the year, while incurring expenses throughout the year. Examples include travel agents who will have peaks reflecting demand for holidays during the summer and at Christmas.

**Worked Example: Working capital policies**

What differences would there be in working capital policies for a manufacturing company and a food retailer?

**Solution**

The manufacturing company will need to invest heavily in spare parts and may be owed large amounts of money by its customers. The food retailer will have a large inventory of goods for resale but will have low accounts receivable.

The manufacturing company will therefore need a carefully considered policy on the management of accounts receivable which will need to reflect the credit policies of its close competitors.

The food retailer will be more concerned with inventory management.

3.4 **Methods of easing cash shortages**

The steps that are usually taken by a company when a need for cash arises, and when it cannot obtain resources from any other source such as a loan or an increased overdraft, are as follows:

(a) **Postponing capital expenditure**

Some new non-current assets might be needed for the development and growth of the business, but some capital expenditure might be delayed without serious consequences. If a company’s policy is to replace company cars every two years, but the company is facing a cash shortage, it might decide to replace cars every three years.
(b) **Accelerating cash inflows which would otherwise be expected in a later period**

One approach would be to press accounts receivable for earlier payment. Often, this policy will result in a loss of goodwill and problems with customers. It might be possible to encourage accounts receivable to pay more quickly by offering discounts for earlier payment or using factoring/invoice discounting as described above.

(c) **Reversing past investment decisions by selling assets previously acquired**

Some assets are less crucial to a business than others. If cash flow problems are severe, the option of selling investments or property might have to be considered.

(d) **Negotiating a reduction in cash outflows, to postpone or reduce payments**

There are several ways in which this could be done:

(i) Longer credit might be taken from suppliers. Such an extension of credit would have to be negotiated carefully: there would be a risk of having further supplies refused.

(ii) Loan repayments could be rescheduled by agreement with a bank.

(iii) A deferral of the payment of company tax might be agreed with the taxation authorities. They will however charge interest on the outstanding amount of tax.

(iv) Dividend payments could be reduced. Dividend payments are discretionary cash outflows, although a company’s directors might be constrained by shareholders’ expectations, so that they feel obliged to pay dividends even when there is a cash shortage.

3.5 **Investing surplus cash**

Companies and other organisations sometimes have a surplus of cash and become ‘cash rich’. A cash surplus is likely to be temporary, but while it exists the company should invest or deposit the cash, as appropriate depending on its risk-return trade-off and its future liquidity requirements. The choice of investment will depend on how quickly the cash might be needed, and the risks of a fall in the capital value of the investment (e.g. investments in shares of other companies).

Three possible reasons for a cash surplus are:

(a) Profitability from trading operations.
(b) Low capital expenditure, perhaps because of an absence of profitable new investment opportunities.
(c) Receipts from selling parts of the business.

A company might keep surplus cash in liquid form to benefit from high interest rates that might be available from bank deposits, when returns on re-investment in the company appear to be lower. Another reason for holding on to cash is to have cash available should a strategic opportunity arise, perhaps for the takeover of another company for which a cash consideration might be needed.

If a company has no long-term plans to grow or to invest, any surplus cash should normally be returned to shareholders (see dividend policy in Chapter 8).

4 **Working capital strategies and financing**

- Organisations have to decide what are the most important risks relating to working capital, and therefore whether to adopt a conservative, aggressive or moderate approach.
- Working capital can be funded by a mixture of short and long-term funding.
- Businesses should be aware of the distinction between fluctuating and permanent assets. Fluctuating current assets together with permanent current assets both form part of the working capital of the business.
- A moderate approach to working capital management would involve matching the length of the finance with the life of the assets, so that long-term funds are used for non-current assets and short-term funds are used for current assets.
4.1 Approaches to working capital management

Organisations have to decide what are the most important risks relating to working capital, and therefore whether to adopt a **conservative**, **aggressive** or **moderate** approach.

4.1.1 A conservative approach

A conservative working capital management policy aims to reduce the risk of system breakdown by holding high levels of working capital.

Customers are allowed generous payment terms to stimulate demand, finished goods inventories are high to ensure availability for customers, and raw materials and work in progress are high to minimise the risk of running out of inventory and consequent downtime in the manufacturing process. Suppliers are paid promptly to ensure their goodwill, again to minimise the chance of stock-outs.

The cumulative effect on these policies can be that the firm carries a high burden of unproductive assets, resulting in a financing cost that can destroy profitability. A period of rapid expansion may also cause severe cash flow problems as working capital requirements outstrip available finance. Further problems may arise from inventory obsolescence and lack of flexibility to customer demands.

4.1.2 An aggressive approach

An aggressive working capital management policy aims to reduce this financing cost and increase profitability by cutting inventories, speeding up collections from customers, and delaying payments to suppliers.

The potential disadvantage of this policy is an increase in the chances of system breakdown through running out of inventory or loss of goodwill with customers and suppliers.

However, modern manufacturing techniques encourage inventory and work in progress reductions through just-in-time policies, flexible production facilities and improved quality management. Improved customer satisfaction through quality and effective response to customer demand can also mean that credit periods are shortened.

4.1.3 A moderate approach

A moderate working capital management policy is a middle way between the aggressive and conservative approaches.

4.2 Permanent and fluctuating current assets

In order to understand working capital financing decisions, assets can be divided into three different types:

(a) **Non-current (fixed) assets** are long-term assets from which an organisation expects to derive benefit over a number of periods. Buildings or machinery are examples.

(b) **Permanent current assets** are the amount required to meet long-term minimum needs and sustain normal trading activity, for example, inventory and the average level of accounts receivable.

(c) **Fluctuating current assets** are the current assets which vary according to normal business activity. This may be due to seasonal variations.

Fluctuating current assets together with permanent current assets form part of the working capital of the business, which may be financed by either long-term funding (including equity capital) or by current liabilities (short-term funding).

4.3 Working capital financing

The funding of the current and non-current assets of a business can be achieved by employing different combinations of long and short-term sources of funding.

Short-term sources of funding are usually cheaper and more flexible than long-term ones. However short-term sources are riskier for the borrower as interest rates are more volatile in the short term and they may not be renewed.
The diagram below illustrates three alternative types of policy A, B and C. The dotted lines A, B and C are the cut-off levels between short-term and long-term funding for each of the policies A, B and C respectively: assets above the relevant dotted line are financed by short-term funding while assets below the dotted line are financed by long-term funding.

(a) Policy A can be characterised as a conservative approach to financing working capital. All non-current assets and permanent current assets, as well as part of the fluctuating current assets, are financed by long-term funding. There is only a need to call upon short-term financing at times when fluctuations in current assets push total assets above the level of dotted line A. At times when fluctuating current assets are low and total assets fall below line A, there will be surplus cash which the company will be able to invest in marketable securities.

(b) Policy B is a more aggressive approach to financing working capital. Not only are fluctuating current assets all financed out of short-term sources, but so are some of the permanent current assets. This policy represents an increased risk of liquidity and cash flow problems, although potential returns will be increased if short-term financing can be obtained more cheaply than long-term finance.

(c) A balance between risk and return might be best achieved by the moderate approach of policy C, a policy of maturity matching where the length of the finance is matched to the life of the asset so that long-term funds finance permanent assets while short-term funds finance non-permanent assets.

4.4 Other factors

The overall approach to working capital management will be complicated by the following factors:

(a) **Industry norms**

These are of particular importance for the management of receivables. It will be difficult to offer a much shorter payment period than competitors.

(b) **Products**

The production process, and hence the amount of work in progress is obviously much greater for some products and in some industries. For example the production period for an aircraft manufacturer will be significantly longer than that of a company which produces children’s clothing.

(c) **Management issues**

How working capital is managed may have a significant impact upon the actual length of the working capital cycle whatever the overall strategy might be. Factors to consider include:

(i) The size of the organisation.

(ii) The degree of centralisation (which may allow a more aggressive approach to be adopted, depending though on how efficient the centralised departments actually are).
(iii) Management attitudes to risk.
(iv) Previous funding decisions.

Question 4: Issues for small business

What might be the consequences for its working capital management of the weak 'market power' of a small business?

(The answer is at the end of the chapter)
Key chapter points

- The amount tied up in working capital is equal to the value of raw materials, work-in-progress, finished goods inventories and accounts receivable less accounts payable. The size of this net figure has a direct effect on the liquidity of an organisation.

- The two main objectives of working capital management are to ensure the business has sufficient liquid resources to continue in business and to increase its profitability.

- The cash operating cycle is the period of time which elapses between the point at which cash begins to be expended on the production of a product and the collection of cash from a customer.

- The cash operating cycle in a manufacturing business equals:

  The average time that raw materials remain in inventory
  Less the period of credit taken from suppliers
  Plus the time taken to produce (and store) the goods
  Plus the time taken by customers to pay for the goods

- Ideally, a business should aim to minimise the length of its cash operating cycle. This can be achieved by managing the various components of working capital.

- Inventory days can be reduced by minimising the holding of raw materials and finished goods and ensuring production processes are efficient so as to reduce work-in-progress.

- In managing accounts receivable, early settlement discounts may be employed to shorten average credit periods. Some companies use factoring and invoice discounting to help short-term liquidity or to reduce administration costs. Insurance, particularly of overseas debts, can also help reduce the risk of bad debts.

- Effective management of trade accounts payable involves seeking satisfactory credit terms from suppliers, getting credit extended during periods of cash shortage, and maintaining good relations with suppliers.

- Cash shortages can be eased by postponing capital expenditure, selling assets, taking longer to pay accounts payable and pressing accounts receivable for earlier payment.

- Temporary surpluses of cash can be invested in a variety of financial instruments. Longer-term surpluses should be returned to shareholders if there is a lack of investment opportunities.

- Businesses can take an aggressive, moderate or conservative approach to working capital management. A company needs to be aware of the distinction between fluctuating and permanent assets.

- Working capital can be funded by a mixture of short and long-term funding. A moderate strategy is to match the length of the finance with the life of the asset, so short-term finance is used for current assets and long term finance for non-current assets.
Quick revision questions

1. What is the working capital requirement of a company with the following average figures over a year?

   Trade accounts receivable: $1,500
   Cash and bank balances: $500
   Trade accounts payable: $1,800
   Inventory: $3,750

2. The key trade-off at the heart of working capital management is between:
   A. current assets and current liabilities
   B. accounts receivable and payable
   C. liquidity and profitability
   D. business stability and solvency

3. The cash operating cycle is:
   A. The time
   Less B. The time
   Plus C. The time
   Plus D. The time

   Fill in the blanks.

4. The following information relates to a company:

   Debt collection period: 10 weeks
   Raw material inventory holding period: 2 weeks
   Supplier’s credit period: 7 weeks
   Production period: 3 weeks
   Finished goods inventory period: 5 weeks

   What is the cash operating cycle of the business?
   A. 8 weeks
   B. 10 weeks
   C. 13 weeks
   D. 27 weeks
Consider the following two statements concerning invoice discounting:

An invoice discounter will take on:

I  the administration of receivables of the client business
II responsibility for any bad debts relating to discounted invoices

Which one of the following combinations (true/false) relating to the above statements is correct?

<table>
<thead>
<tr>
<th>Statement</th>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>true</td>
<td>true</td>
</tr>
<tr>
<td>B</td>
<td>true</td>
<td>false</td>
</tr>
<tr>
<td>C</td>
<td>false</td>
<td>true</td>
</tr>
<tr>
<td>D</td>
<td>false</td>
<td>false</td>
</tr>
</tbody>
</table>

Which one of the following would be appropriate if a cash budget identified a short-term cash deficit?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>replace non-current assets</td>
</tr>
<tr>
<td>B</td>
<td>issue shares</td>
</tr>
<tr>
<td>C</td>
<td>implement better credit control procedures</td>
</tr>
<tr>
<td>D</td>
<td>pay suppliers early</td>
</tr>
</tbody>
</table>
1. Working capital requirement = current assets less current liabilities
   = 3750 + 1500 + 500 – 1800
   = $3 950

2. C Adequate liquidity is needed to ensure the survival of the business in the long term, since even a profitable company may fail without adequate cash flow to meet its liabilities. However, an excessively conservative approach to working capital management which results in high cash holdings will harm profits because the opportunity to make a return on the assets tied up as cash will have been missed. Thus most working capital decisions involve a trade-off between liquidity and profitability.

3. A The time raw materials remain in inventory
   B The time period of credit taken from suppliers
   C The time taken to produce (and store) goods
   D The time taken by customers to pay for goods

4. C 10 + 2 – 7 + 3 + 5 = 13 weeks

5. D Both statements are false. They would be true for debt factoring but not invoice discounting.

6. C A and D would create a bigger cash deficit. B would be more appropriate as a source of long-term finance. Implementing better credit control procedures should result in the earlier collection of receivables and reduced incidence of bad debts and would therefore be the most appropriate option to correct a short-term cash deficit.
Answers to chapter questions

1  D  Rapid increase in sales

2  (a)  Inadequate control of inventories, receivables and payables.
      (b)  Inadequate cash management.
      (c)  Making losses.
      (d)  Seasonal trading patterns and the build-up to a busy trading season.
      (e)  Growing the business and investing more in working capital and non-current assets.
      (f)  Large one-off expenditure items.

3  Administrative costs of debt collection, procedures for controlling credit to individual customers (e.g. assessing creditworthiness), procedures for debt collection, credit policy and its effect on total receivables and profits, early settlement discount policy.

Credit insurance is a form of insurance in which the insurance provider undertakes to reimburse the policy holder in the event of non-payment of a debt by a customer. When a factoring organisation provides credit insurance, it will insist on collecting the debt itself.

4  Suppliers unwilling to grant sufficient credit.
   Customers taking longer to pay than agreed.
   Banks unwilling to grant a sufficient overdraft facility, or to lend without a personal guarantee from the business owner.
Chapter 6

Cost of capital

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital budgeting: ROCE, payback, IRR, NPV</td>
<td>LO1</td>
</tr>
<tr>
<td>Calculate the weighted average cost of capital and apply it in capital budgeting</td>
<td>LO1.8</td>
</tr>
<tr>
<td>Cost of funds</td>
<td>LO4</td>
</tr>
<tr>
<td>Calculate and interpret the cost of various sources of finance</td>
<td>LO4.4</td>
</tr>
<tr>
<td>Calculate and interpret the cost of capital associated with leases; and debt and equity</td>
<td>LO4.7</td>
</tr>
<tr>
<td>Valuation of corporate securities</td>
<td>LO9</td>
</tr>
<tr>
<td>Calculate and interpret effective interest rates; and apply the concepts of financial mathematics to loans and debt and equity securities</td>
<td>LO9.1</td>
</tr>
<tr>
<td>Calculate and interpret share price in both perfect and imperfect markets</td>
<td>LO9.2</td>
</tr>
</tbody>
</table>

Topic list

1. What is the cost of capital?
2. The cost of equity capital
3. The cost of preference share capital
4. The cost of debt capital
5. The weighted average cost of capital (WACC)
6. The cost of leasing
7. The NPV of new projects and shareholder wealth
When a company uses the NPV method in relation to investment appraisal it needs to discount the expected cash flows of the project at its cost of capital. This chapter considers how the company can determine the cost of its various sources of equity and debt finance and whether the resulting weighted average cost of capital is an appropriate discount rate for investment appraisal purposes.

**Cost of capital**

- **Cost of each source of finance**
  - **Cost of equity** ($K_e$)
    - constant dividend
    - dividend growth
  - **Cost of preference shares** ($K_{pref}$)
  - **Cost of debt**
    - irredeemable
    - redeemable

Overall cost

- **WACC**
  - % cost $\times$ proportion of finance

When can WACC be used as a discount rate?
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What is an investor’s required return based on? (Section 1)
2. What does the dividend valuation model (DVM) state? (Section 2.2)
3. Name two methods of estimating dividend growth. (Section 2.4)
4. A company’s share price is $1.50. It has just paid a dividend of 20c. Dividends are expected to grow at 6 per cent per annum. Calculate the company’s cost of equity. (Section 2.3)
5. What is the difference between the required return of a debenture holder and the cost of that debenture to the company? (Section 4.3)
6. How would you calculate the cost of debt for a redeemable debenture? (Section 4.3.2)
7. What assumptions are made when Weighted Average Cost of Capital (WACC) is used as a discount rate? (Section 5.1)
8. What is the general formula for calculating the WACC? (Section 5.2)
1 What is the cost of capital?

Section overview

- The cost of capital is the rate of return that a business must pay to satisfy the providers of funds, and it reflects the riskiness of the funding transaction.
- The cost of capital can be measured by studying the returns required by investors, and then used to derive a discount rate for DCF analysis and investment appraisal.
- The investor’s required return from a particular company will reflect the risk free rate of return plus an additional premium for both business and financial risk. Therefore, the cost of capital applied to one company may differ radically from the cost of capital of another.

When a company evaluates an investment, and possibly decides how the investment should be financed if it goes ahead, it might carry out a DCF analysis and estimate the NPV of the project. Calculating an NPV involves discounting future cash flows at a cost of capital (see Chapter 2).

To do this, the company must first of all establish what its cost of capital is.

Definition

The cost of capital has two aspects to it:

(a) It is the cost of funds that a company raises and uses.
(b) It is also the return that investors expect to be paid for putting funds into the company. It is therefore the minimum return that a company should make on its own investments, to earn the cash flows out of which investors can be paid their return.

The cost of capital can therefore be measured by studying the returns required by investors, and then used to derive a discount rate for DCF analysis and investment appraisal.

1.1 The cost of capital as an opportunity cost of finance

The cost of capital, however it is measured, is an opportunity cost of finance, because it is the minimum return that investors require. If they do not get this return, they will transfer some or all of their investment somewhere else. Here are two examples:

(a) If a bank offers to lend money to a company, the interest rate it charges is the yield that the bank wants to receive from investing in the company, because it can get just as good a return from lending the money to someone else. In other words, the interest rate is the opportunity cost of lending for the bank.

(b) When shareholders invest in a company, the returns that they can expect must be sufficient to persuade them not to sell some or all of their shares and invest the money somewhere else. The yield on the shares is therefore the opportunity cost to the shareholders of not investing somewhere else.

1.2 The cost of capital and risk

The cost of capital has three elements. It consists of a premium over a risk-free rate to compensate the investor for the business risk and for the finance risk in the investment.

(a) The risk-free rate of return is the return which would be required from an investment if it were completely free from risk. Typically, a risk-free yield would be the yield on government securities.

(b) The premium for business risk is an increase in the required rate of return due to the existence of uncertainty about the future and about a firm’s business prospects. The actual returns from an investment may not be as high as they are expected to be. Business risk will be higher for some firms than for others, and some types of project undertaken by a firm may be more risky than other types of project that it undertakes.
1.3 The costs of different sources of finance

Where a company uses a mix of equity and debt capital, its overall cost of capital might be taken to be the weighted average of the cost of each type of capital. The weighted average cost of capital, and whether it is the appropriate cost of capital to use, is considered later. First of all, we must look at the cost of each separate source of capital: equity, preference shares and forms of debt capital.

2 The cost of equity capital

Section overview

- The 'fundamental theory of share values' states that the market price of a share is the present value of the expected future revenue cash flows from the share, discounted at the cost of equity capital.
- The dividend valuation model can be used to estimate a cost of equity, on the assumption that the market value of shares is directly related to the expected future dividends on the shares.
- Expected growth in dividends can be allowed for in calculating a cost of equity, using Gordon's growth model.
- Growth can be estimated either by extrapolating past dividend growth or by considering the company’s retention and reinvestment policy.

2.1 Sources of equity finance

New funds from equity shareholders are obtained either from new issues of shares or from cash deriving from retained earnings (see Chapter 4). Both of these sources of funds have a cost. Shareholders will not be prepared to provide funds for a new issue of shares unless the return on their investment is sufficiently attractive. Retained earnings also have a cost. This is an opportunity cost of the dividend forgone by shareholders. This is discussed further in Chapter 8.

Shareholders put a value on their shares. In the case of shares traded on a stock market, this value is represented by the market price of the shares. The market price shows how much investors are currently willing to pay for the shares, in return for the future benefits they expect to obtain. Shareholders may measure their income stream in terms of a dividend payout ratio, which is simply the proportion of total post-tax profits that is paid out in total as a dividend (for example, if profits are $100 000 and $25 000 in total is paid out in dividends the dividend payout ratio is 25 per cent).

2.2 The dividend valuation model

Definition

The 'fundamental theory of share values' states that the market price of a share is the present value of the expected future revenue cash flows from the share, discounted at the cost of equity capital.
The cost of equity, both for new issues and retained earnings, could be estimated by means of a dividend valuation model (DVM), on the assumption that the market value of shares is directly related to expected future dividends on the shares.

**Formula to learn**

If the future annual dividend per share \(D_1\) is expected to be constant in amount 'in perpetuity', the share price \(P_0\) can be calculated by the following formula:

\[ P_0 = \frac{D_1}{r} \]

where \(r\) is the shareholders' required return (cost of equity), expressed as a proportion (e.g. 12\% = 0.12).

The share price is 'ex dividend', which means that it excludes the value of any current dividend that has just been paid or is currently payable. The next annual dividend is receivable in one year's time.

The share price is the present value of a constant annual dividend forever, i.e. in perpetuity. The mathematical formula is quite simple because the PV of a constant annual cash flow \$C\) in perpetuity, discounted at a cost of capital \(r\), is \$C/r.

**Formula to learn**

Re-arranging this formula, we get a formula for the cost of equity.

\[ K_e = \frac{D_1}{P_0} \]

where:

- \(K_e\) is the shareholders' cost of capital
- \(D_1\) is the annual dividend per share, starting at year 1 and then continuing annually in perpetuity

**2.2.1 DVM assumptions**

The following assumptions are made in the dividend valuation model:

(a) The dividends from projects for which the funds are required will be of the same risk type or quality as dividends from existing operations.

(b) There would be no increase in the cost of capital, for any other reason besides (a) above, from a new issue of shares.

(c) All shareholders have perfect information about the company's future, there is no delay in obtaining this information and all shareholders interpret it in the same way.

(d) Taxation can be ignored.

(e) All shareholders have the same marginal cost of capital.

(f) There would be no issue expenses for new shares.

**Worked Example: Cost of equity, constant dividend**

Suppose that ABC is a company with no dividend growth prospects, which has just paid an annual dividend of 16c per share. The share price is 200c.

Applying the dividend valuation model, the cost of equity can be calculated as \(16/200 = 0.08\), i.e. 8 per cent.
2.3 The dividend growth model

Shareholders will normally expect dividends to increase year by year and not to remain as a constant amount every year. Expected growth in dividends can be allowed for in calculating a cost of equity, using Gordon’s growth model.

Given an expected constant annual growth in dividends, the share price formula would be:

\[ P_0 = \frac{D_0(1 + g)}{(r - g)} \]

where:
- \( D_0 \) is the current year’s annual dividend (i.e. the year 0 dividend) or dividend just paid.
- \( P_0 \) is the current ex-dividend share price.
- \( r \) is the shareholders’ required return, expressed as a proportion.
- \( g \) constant growth rate of dividends, is the annual growth rate in dividends, expressed as a proportion (e.g. 4 per cent = 0.04).

This formula assumes a constant growth rate in dividends, but it can be adapted for uneven growth. Re-arranging the formula, we get a formula for the ordinary shareholders’ cost of capital, \( K_e \):

\[ K_e = g \left( \frac{D_0}{P_0} + g \right) \]

This is equivalent to the following equation:

\[ K_e = \frac{D_1}{P_0} + g \]

where \( D_1 \) is the dividend in year 1, so that \( D_1 = D_0 (1 + g) \).

This dividend growth model is sometimes called Gordon’s growth model.

Question 1: Cost of equity capital

A share has a current market value of 96c, and the last dividend was 12c. If the expected annual growth rate of dividends is 4%, calculate the cost of equity capital.

(The answer is at the end of the chapter)

2.4 Estimating growth rates

The value of \( g \) may be estimated in two ways.
2.4.1 Extrapolation of growth in past dividends

Worked Example: Past dividend growth
A company’s dividend payments from 20X1 to 20X5 were as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>$ 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>20X1</td>
<td>2 200</td>
</tr>
<tr>
<td>20X2</td>
<td>2 578</td>
</tr>
<tr>
<td>20X3</td>
<td>3 108</td>
</tr>
<tr>
<td>20X4</td>
<td>3 560</td>
</tr>
<tr>
<td>20X5</td>
<td>4 236</td>
</tr>
</tbody>
</table>

Required
Estimate the dividend growth rate.

Solution
Dividend in 20X1 \times (1+g)^4 = \text{Dividend in 20X5}

\[
(1+g)^4 = \frac{\text{Dividend in 20X5}}{\text{Dividend in 20X1}}
\]

\[
(1+g)^4 = \frac{4 236}{2 200} = 1.925
\]

\[
1 + g = \sqrt[4]{1.925} = 1.18
\]

\[
g = 0.18 = 18\%
\]

2.4.2 Analysis of the future earnings rate and retention policy

Formula to learn
\[g = bR\]

where:
- \(g\) is the annual growth rate in dividends
- \(b\) is the yield on new investments, and
- \(R\) is the proportion of profits retained for reinvestment.

Worked Example: \(g = bR\)
An all equity financed company distributes 30% of its earnings each year and reinvests the balance to earn a constant return on projects of 15% pa.

Therefore, \(b = 0.15\) and \(R = 0.70\), so \(g = 0.15 \times 0.70 = 0.105\) i.e. 10.5%

Worked Example: Estimating dividend growth
The dividends and earnings of Hall Shores over the last five years have been as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividends</th>
<th>Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>20X1</td>
<td>150 000</td>
<td>400 000</td>
</tr>
<tr>
<td>20X2</td>
<td>192 000</td>
<td>510 000</td>
</tr>
<tr>
<td>20X3</td>
<td>206 000</td>
<td>550 000</td>
</tr>
<tr>
<td>20X4</td>
<td>245 000</td>
<td>650 000</td>
</tr>
<tr>
<td>20X5</td>
<td>262 350</td>
<td>700 000</td>
</tr>
</tbody>
</table>
The company is financed entirely by equity and there are 1,000,000 shares in issue, each with a market value of $3.35 ex div.

**Required**

(a) What is the cost of equity?

(b) What implications does dividend growth appear to have for earnings retentions?

**Solution**

The dividend growth model will be used. The dividend per share in the current year is $262,350/1,000,000 = $0.26235.

(a) **Growth in past dividends**

Dividends have risen from $150,000 in 20X1 to $262,350 in 20X5. The increase represents four years growth. (Check that you are aware that there are four years' growth, and not five years' growth, in the table.)

The average growth rate, $g$, may be calculated as follows:

\[
\begin{align*}
\text{Dividend in 20X1} & \times (1+g)^4 = \text{Dividend in 20X5} \\
(1+g)^4 & = \frac{\text{Dividend in 20X5}}{\text{Dividend in 20X1}} \\
& = \frac{262,350}{150,000} = 1.749 \\
1 + g & = \sqrt[4]{1.749} = 1.15 \\
g & = 0.15 = 15%
\end{align*}
\]

The growth rate over the last four years is assumed to be expected by shareholders into the indefinite future, so the cost of equity, $K_e$, is:

\[
K_e = \frac{g}{1 + g} = \frac{0.26235(1.15)}{3.35} + 0.15 = 0.24 = 24\%
\]

(b) **$g = bR$ (retained earnings model)**

Retained profits will earn a certain rate of return and so growth in dividends will come from the yield on the retained funds.

It might be assumed that $g = bR$ where $b$ is the yield on new investments and $R$ is the proportion of profits retained for reinvestment.

In our example, if dividends continue to grow at the same rate as previously the future annual growth rate would be 15 per cent.

If this is due to the retention and reinvestment policy, then $g = 0.15 = bR$.

If we assume that the rate of return on new investments averages 24% (which is the cost of equity and hence the return shareholders require from projects) and if the proportion of earnings retained is 62.5% (which it has been, approximately, in the period 20X1 – 20X5) then

\[
g = bR = 24\% \times 62.5\% = 15%.
\]

A change in the level of earnings retained or the return on reinvested earnings would result in a different future growth rate.

---

**Question 2: Cost of equity with dividend growth**

The current market price of Conrad Co’s shares is $3.50. It has just paid a dividend of 35c.

Conrad has consistently applied a dividend payout policy of 1/3 earnings. It makes an average return on investment of 15%. Estimate Conrad’s cost of equity.

*The answer is at the end of the chapter*
2.5 Weaknesses of the dividend growth model

(a) The model does not incorporate risk.
(b) Dividends do not grow smoothly in reality, so \( g \) is only an approximation.
(c) The model fails to take capital gains into account, however it is argued that a change of share ownership does not affect the present value of the dividend stream.
(d) No allowance is made for the effects of taxation although the model can be modified to incorporate tax.
(e) It assumes there are no issue costs for new shares.

2.6 Private companies and the cost of equity

The cost of capital cannot be calculated from market values for private companies in the way that has been described so far, because the shares in a private company do not have a quoted market price. Since private companies do not have a cost of equity that can be readily estimated, it follows that a big problem for private companies which want to use DCF for evaluating investment projects is how to select a cost of capital for a discount rate.

Suitable approaches might be: to estimate the cost of capital for similar public companies, but then add a further premium for additional business and financial risk; or to build up a cost of capital by adding estimated premiums for business risk and financial risk to the risk-free rate of return.

3 The cost of preference share capital

Section overview

- The cost of preference share capital is the return an enterprise must pay to the investors.
- For preference shares, this is the annual dividend as a percentage of the ex-div market value of the shares.

For preference shares the future cash flows are the dividend payments in perpetuity so that:

\[
P_0 = \frac{d}{(1 + k_{pref})} + \frac{d}{(1 + k_{pref})^2} + \frac{d}{(1 + k_{pref})^3} + \ldots
\]

where:
- \( P_0 \) is the current market price of preference share capital after payment of the current dividend.
- \( d \) is the dividend received.
- \( k_{pref} \) is the cost of preference share capital.

\[
\frac{d}{(1 + k_{pref})} + \frac{d}{(1 + k_{pref})^2} + \frac{d}{(1 + k_{pref})^3} + \ldots
\]

simplifies to \( \frac{d}{k_{pref}} \)

This can be rearranged to find the cost of preference share capital:

\[
k_{pref} = \frac{d}{P_0}
\]

Formula to learn

The cost of preference shares can be calculated as \( k_{pref} = \frac{d}{P_0} \)

Question 3: Cost of preference share capital

The current market price of Taylor Co’s 12 per cent $1 preference shares is $1.35. What is the cost of Taylor Co’s preference share capital?

(The answer is at the end of the chapter)
4 The cost of debt capital

Section overview

- The cost of debt is the return an enterprise must pay to its lenders. Debt is cheaper than equity or preference share capital because the interest payments attract tax relief. So actual the cost to the company is the after-tax cost.
- For irredeemable debt (or preference shares), this is the (post-tax) interest as a percentage of the ex int/div market value of the loan stock.
- For redeemable debt, the cost is given by the internal rate of return of the cash flows involved. The same technique is used to calculate either the pre-tax or the post-tax cost of redeemable debt. Only the interest payments attract tax relief.

4.1 Cost of irredeemable debt

Estimating the cost of fixed interest or fixed dividend capital is much easier than estimating the cost of ordinary share capital, because the amount received by the holder of the security in the form of interest or dividends is fixed by contract and will not fluctuate.

The cost of debt capital already issued is the rate of interest (the internal rate of return) which equates the current market price with the discounted future cash receipts from the security.

Ignoring taxation for the moment, in the case of irredeemable debt the future cash flows are the interest payments in perpetuity so that:

Formula to learn

\[ P_0 = \frac{1}{K_b} \]

where:

- \( P_0 \) is the current market price of debt capital after payment of the current interest.
- \( I \) is the annual interest.
- \( K_b \) is the required return of the providers of debt capital.

This formula can be re-arranged:

\[ K_b = \frac{1}{P_0} \]

4.2 Cost of redeemable debt or redeemable preference shares

If the debt is redeemable, then in the year of redemption the interest payment will be received by the investor/lender as well as the amount payable on redemption, so:

Formula to learn

\[ P_0 = \frac{1}{(1 + K_b)} + \frac{1}{(1 + K_b)^2} + \ldots + \frac{1 + P_n}{(1 + K_b)^n} \]

where \( P_n \) is the amount payable on redemption in year \( n \).

The above equation cannot be simplified so '\( K_b \)' will have to be calculated by trial and error, as an internal return of return (IRR) for the cash flows (using the method introduced in Chapter 2).
The best trial and error figure to start with in calculating the cost of redeemable debt is to take the cost of debt capital as if it were irredeemable and then add the annualised capital profit that will be made from the present time to the time of redemption.

**Worked Example: Cost of debt capital (no tax)**

Owen Allot has in issue 10% debentures of a nominal value of $100. The market price is $90 ex interest. Ignoring taxation, calculate the cost of this capital if the debenture is:

(a) irredeemable
(b) redeemable at par after 10 years.

**Solution**

(a) The cost of irredeemable debt capital is:

\[
\frac{1}{P_0} = \frac{$10}{$90} \times 100\% = 11.1\%
\]

(b) The cost of debt capital is 11.1 per cent if irredeemable. The capital profit that will be made from now to the date of redemption is $10 ($100 − $90). This profit will be made over a period of ten years which gives an annualised profit of $1 which is about 1 per cent of current market value. Therefore, the best trial and error figure to try first is 12 per cent.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV</th>
<th>Discount factor</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Market value</td>
<td>(90)</td>
<td>1.000</td>
<td>(90.00)</td>
<td>(90.00)</td>
</tr>
<tr>
<td>1-10</td>
<td>Interest</td>
<td>10</td>
<td>5.650</td>
<td>56.50</td>
<td>5.889</td>
</tr>
<tr>
<td>10</td>
<td>Capital repayment</td>
<td>100</td>
<td>0.322</td>
<td>32.20</td>
<td>0.352</td>
</tr>
</tbody>
</table>

The approximate cost of debt capital is therefore:

\[
11\% + \left(\frac{4.09}{(4.09 - 1.30)} \times 1\right) = 11.76\%
\]

The cost of debt capital estimated above represents the cost of continuing to use the finance rather than redeem the securities at their current market price. It would also represent the cost of raising additional fixed interest capital if we assume that the cost of the additional capital would be equal to the cost of that already issued. If a company has not already issued any fixed interest capital, it may estimate the cost of doing so by making a similar calculation for another company which is judged to be similar as regards risk.

### 4.3 Cost of debt capital and taxation

The interest on debt capital is an allowable deduction for purposes of taxation and so the cost of debt capital and the cost of share capital are not properly comparable costs. This tax relief on interest ought to be recognised in DCF computations. One way of doing this is to include tax savings due to interest payments in the cash flows of every project. A simpler method, and one that is normally used, is to allow for the tax relief in computing the cost of debt capital, to arrive at an ‘after-tax’ cost of debt.

**Note:** there is no tax relief on the payment of dividends in respect of equity or preference share capital, so tax does not affect these calculations.
4.3.1 Irredeemable debt capital

**Formula to learn**

The **after-tax cost of irredeemable debt capital** is: 

\[
K_d = \frac{1}{P_0} (1 - t)
\]

where:

- \(K_d\) is the after-tax cost of debt capital to the company.
- \(I\) is the annual interest payment.
- \(P_0\) is the current market price of the debt capital ex interest (that is, after payment of the current interest).
- \(t\) is the rate of tax.

Therefore, if a company pays $10 000 a year interest on irredeemable debenture stock with a nominal value of $100 000 and a market price of $80 000, and the rate of tax is 30 per cent, the cost of the debentures would be:

\[
\frac{10 000}{80 000} (1 - 0.30) = 0.0875 = 8.75\%
\]

The higher the rate of tax is, the greater the tax benefits in having debt finance will be compared with equity finance, since the actual cost of debt to the company would be lesser.

In the example above, if the rate of tax had been 40 per cent, the cost of debt would have been, after tax:

\[
\frac{10 000}{80 000} (1 - 0.40) = 0.075 = 7.5\%
\]

4.3.2 Redeemable debt capital

In the case of **redeemable debentures**, the capital repayment is not allowable for tax. To calculate the cost of the debt capital to include in the weighted average cost of capital, it is necessary to calculate an internal rate of return that takes account of tax relief on the interest.

**Worked Example: After-tax cost of redeemable debt capital**

(a) A company has outstanding $660 000 of 8 per cent debenture stock on which the interest is payable annually on 31 December. The stock is due for redemption at par on 1 January 20X6. The market price of the stock at 28 December 20X2 was 95.00 ex interest. Ignoring taxation, what do you estimate to be the current market rate of interest?

(b) If the effective rate of tax is 30 per cent what would be the cost to the company of the debenture stock in (a) above? Assume that tax relief on interest payments arises in the same year as the interest payment.

**Solution**

(a) The current market rate of interest (which is the same as the debenture holders’ required return) is found by calculating the pre-tax internal rate of return of the cash flows shown in the table below. A discount rate of 10 per cent is chosen for a trial-and-error start to the calculation.

<table>
<thead>
<tr>
<th>Item and date</th>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market value (ex int)</td>
<td>28.12.X2</td>
<td>0 (95)</td>
<td>1.000</td>
<td>(95.00)</td>
</tr>
<tr>
<td>Interest</td>
<td>31.12.X3</td>
<td>1</td>
<td>0.909</td>
<td>7.28</td>
</tr>
<tr>
<td>Interest</td>
<td>31.12.X4</td>
<td>2</td>
<td>0.826</td>
<td>6.61</td>
</tr>
<tr>
<td>Interest</td>
<td>31.12.X5</td>
<td>3</td>
<td>0.751</td>
<td>6.01</td>
</tr>
<tr>
<td>Redemption</td>
<td>1.1.X6</td>
<td>3</td>
<td>100</td>
<td>75.10</td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
By coincidence, the market rate of interest is 10% since the NPV of the cash flows above is zero.

(b) Again we must identify the current interest payable and use ex interest figures.

At a market value of 95.00

<table>
<thead>
<tr>
<th>Item</th>
<th>Year</th>
<th>Cash flow</th>
<th>Discount ex int</th>
<th>Discount factor at 5%</th>
<th>PV 5%</th>
<th>Discount factor at 8%</th>
<th>PV 8%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market value</td>
<td>0</td>
<td>(95.00)</td>
<td>1.000</td>
<td>(95.00)</td>
<td>1.000</td>
<td>(95.00)</td>
<td>1.000</td>
</tr>
<tr>
<td>Interest less tax saved</td>
<td>1</td>
<td>5.60</td>
<td>0.952</td>
<td>5.33</td>
<td>0.926</td>
<td>5.19</td>
<td></td>
</tr>
<tr>
<td>Interest less tax saved</td>
<td>2</td>
<td>5.60</td>
<td>0.907</td>
<td>5.08</td>
<td>0.857</td>
<td>4.80</td>
<td></td>
</tr>
<tr>
<td>Interest less tax saved</td>
<td>3</td>
<td>5.60</td>
<td>0.864</td>
<td>4.84</td>
<td>0.794</td>
<td>4.45</td>
<td></td>
</tr>
<tr>
<td>Redemption</td>
<td>3</td>
<td>100.00</td>
<td>0.864</td>
<td>86.40</td>
<td>0.794</td>
<td>79.40</td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td></td>
<td>6.65</td>
<td></td>
<td>(1.16)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The estimated cost of debt is:

\[
5\% + \left( \frac{6.65}{(6.65 + 1.16)} \times (8 - 5)\% \right)
\]

\[
= 7.6\% \text{ approx}
\]

Conclusion: As a result of the tax saving on the interest, it will only cost the company approx 7.6 per cent per annum in order to provide the debenture holders with an annual return of 10 per cent.

4.4 The cost of floating rate debt

If a firm has floating rate debt, then the after-tax cost of an equivalent fixed interest debt should be substituted. ‘Equivalent’ usually means fixed interest debt with a similar term to maturity in a firm of similar standing, although if the cost of capital is to be used for project appraisal purposes, there is an argument for using debt of the same duration as the project under consideration.

4.5 The cost of short-term funds

The cost of short-term funds such as bank loans and overdrafts is the current interest being charged on such funds. Remember that the company will save tax on the interest payment so the appropriate cost will be after-tax.

5 The weighted average cost of capital (WACC)

Section overview

- The weighted average cost of capital can be used to evaluate a company’s investment projects if:
  - The project is small relative to the company.
  - The existing capital structure will be maintained (same financial risk).
  - The project has the same business risk as the company.
  - New investments are financed by new sources of funds, and a marginal cost of capital approach is used.

5.1 Computing a discount rate

We have now looked at the costs of individual sources of capital for a company. But how does this help us to work out the cost of capital as a whole, or the discount rate to apply in DCF investment appraisals?

In many cases it will be difficult to associate a particular project with a particular form of finance. A company’s funds may be viewed as a pool of resources. Money is withdrawn from this pool of funds to invest in new projects and added to the pool as new finance is raised or profits are retained. Under these circumstances it might seem appropriate to use an average cost of capital as the discount rate.
The correct cost of capital to use in investment appraisal is the **marginal cost** of the funds raised (or earnings retained) to finance the investment. This is the additional cost to the company of obtaining the funds to invest in the project.

The weighted average cost of capital (WACC) might be considered the most reliable guide to the marginal cost of capital, but only on the assumption that the company continues to invest in the future:

(a) in projects of a standard level of business risk, and
(b) by raising funds in the same equity/debt proportions as its existing capital structure.

### 5.2 General formula for the WACC

The weighted average cost of capital is found by taking the cost of each individual source of finance and weighting it according to its importance in the finance mix.

**Formula to learn**

A general formula for the weighted average cost of capital is:

$$\text{WACC} = \left[ K_e \frac{E}{E + D} \right] + \left[ K_d \frac{D}{E + D} \right]$$

where:

- $K_e$ is the cost of equity.
- $K_d$ is the **post-tax** cost of debt for the company.
- $E$ is the total market value of equity in the firm.
- $D$ is the total market value of debt in the firm.

Where the company uses other forms of capital, e.g. preference shares, bank loans, the formula can be adjusted to incorporate these, each cost being weighted by the market value of that source of finance as a proportion of the total value of the firm.

### Worked Example: Weighted average cost of capital

Prudence is financed partly by equity and partly by debentures. The equity proportion is always kept at two thirds of the total. The cost of equity is 18 per cent and that of debt 12 per cent. A new project is under consideration which will cost $100 000 and will yield a return before interest of $37 500 a year for four years. Should the project be accepted? Ignore taxation.

**Solution**

Since the company will maintain its gearing ratio unchanged, it is reasonable to assume that its marginal cost of funds equals its WACC. The weighted average cost of capital is as follows:

<table>
<thead>
<tr>
<th>Proportion</th>
<th>Cost</th>
<th>Cost × proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>2/3</td>
<td>18%</td>
</tr>
<tr>
<td>Debt</td>
<td>1/3</td>
<td>12%</td>
</tr>
</tbody>
</table>

WACC = 16%

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor at 16%</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(100 000)</td>
<td>1.000</td>
<td>(100 000)</td>
</tr>
<tr>
<td>1</td>
<td>37 500</td>
<td>0.862</td>
<td>32 325</td>
</tr>
<tr>
<td>2</td>
<td>37 500</td>
<td>0.743</td>
<td>27 863</td>
</tr>
<tr>
<td>3</td>
<td>37 500</td>
<td>0.641</td>
<td>24 038</td>
</tr>
<tr>
<td>4</td>
<td>37 500</td>
<td>0.552</td>
<td>20 700</td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td></td>
<td>4 926</td>
</tr>
</tbody>
</table>
The NPV of the investment is $4,926. On the basis of the estimated figures it therefore appears financially justifiable. Before proceeding, it may be wise to assess the accuracy of the estimates and the sensitivity of the decision to changes in any of the estimated figures.

5.3 **Weighting**

In the last example, we simplified the problem of **weighting the different costs of capital** by giving the proportions of capital. Two methods of weighting could be used:

(a) Weights could be based on market values (by this method, the cost of retained earnings is implied in the market value of equity).

(b) Weights could be based on statement of financial position values ('book values').

Although book values are often easier to obtain, market values are more relevant to the organisation’s current. It is therefore appropriate to use market values. However, for unlisted companies estimates of market values are likely to be extremely subjective and consequently book values may be used.

When using market values it is not possible to split the equity value between share capital and reserves and only one cost of equity can be used. This removes the need to estimate a separate cost of retained earnings.

**Worked Example: WACC**

PLZ has equity share capital of 100 million shares with a current market price of 500c each, bonds with a current market value of $100 million and $150 million of bank loans. The company expects to maintain its current capital structure (the proportion of equity to bonds to bank loans) into the foreseeable future. The cost of equity is 12 per cent, the after tax cost of the bonds is 7 per cent and the after tax cost of the bank loans is 6 per cent.

What is the company’s weighted average cost of capital?

**Solution**

The WACC can be calculated as follows:

<table>
<thead>
<tr>
<th>Market value (MV)</th>
<th>Cost</th>
<th>$MV \times \text{Cost}</th>
<th>$m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>500</td>
<td>0.12</td>
<td>60</td>
</tr>
<tr>
<td>Bonds</td>
<td>100</td>
<td>0.07</td>
<td>7</td>
</tr>
<tr>
<td>Bank loans</td>
<td>150</td>
<td>0.06</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>750</strong></td>
<td><strong>76</strong></td>
<td><strong>76</strong></td>
</tr>
</tbody>
</table>

WACC = \frac{76}{750} = 0.101, i.e. 10.1%

**Question 4: WACC**

The management of Custer Ackers are trying to decide on a cost of capital to apply to the evaluation of investment projects. The company has an issued share capital of 500,000 ordinary $1 shares, with a current market value cum div of $1.17 per share. It has also issued $200,000 of 10 per cent debentures, which are redeemable at par in two years’ time and have a current market value of $105.30 per cent, cum int, and $100,000 of irredeemable 6 per cent $1 preference shares, currently priced at 40c per share. The preference dividend has just been paid, and the ordinary dividend and debenture interest are due to be paid in the near future.

Management consider the current capital structure of the company to be similar to their plans for its longer-term capital structure.

The ordinary share dividend will be $60,000 this year, and the directors have publicised their view that earnings and dividends will increase by 5 per cent a year into the indefinite future.
5.4 Arguments for using the WACC

The weighted average cost of capital can be used in investment appraisal if we make the following assumptions:

(a) The project is small relative to the overall size of the company.

(b) The weighted average cost of capital reflects the company’s long-term future capital structure, and capital costs. If this were not so, the current weighted average cost would become irrelevant because eventually it would not relate to any actual cost of capital.

(c) The project has the same degree of business risk as the company has now.

(d) New investments must be financed by new sources of funds: retained earnings, new share issues, new loans and so on.

(e) The cost of capital to be applied to project evaluation reflects the marginal cost of new capital (see the section that follows).

5.5 Arguments against using the WACC

The arguments against using the WACC as the cost of capital for investment appraisal (as follows) are based on criticisms of the assumptions that are used to justify use of the WACC.

(a) New investments undertaken by a company might have different business risk characteristics from the company’s existing operations. As a consequence, the return required by investors might go up (or down) if the investments are undertaken, because their business risk is perceived to be higher (or lower).

(b) The finance that is raised to fund a new investment might substantially change the capital structure and the perceived financial risk of investing in the company. Depending on whether the project is financed by equity or by debt capital, the perceived financial risk of the entire company might change. This must be taken into account when appraising investments.

(c) Many companies raise floating rate debt capital as well as fixed interest debt capital. With floating rate debt capital, the interest rate is variable, and is altered every three or six months or so in line with changes in current market interest rates. The cost of debt capital will therefore fluctuate as market conditions vary. As a result floating rate debt is difficult to incorporate accurately into a WACC computation. One possible estimate is to use the average long-term interest rate on corporate debt. Another is to substitute the current market rate of an ‘equivalent’ fixed interest debt capital, with similar risk and maturity characteristics, in place of the floating rate debt cost.

5.6 Marginal cost of capital approach

The marginal cost of capital approach involves calculating a marginal cut-off rate. This is the cost to the company of raising the additional capital to finance the project.

It can be argued that the current weighted average cost of capital should be used to evaluate projects where a company’s capital structure changes only very slowly over time. In such a situation, the marginal cost of new capital should be roughly equal to the weighted average cost of current capital. If this view is correct, then by undertaking investments that offer a return in excess of the WACC, a company will...
increase the market value of its ordinary shares in the long run. This is because the excess returns would provide surplus profits and dividends for the shareholders.

However, where gearing levels fluctuate significantly, or the finance for a new project carries a significantly different level of risks from that of the existing company, there is good reason to seek an alternative marginal cost of capital to establish the incremental financing costs of the new project.

6 The cost of leasing

Leasing is another form of debt finance. Like all forms of debt the cost of the lease can be calculated by finding the IRR of the leasing cash flows.

The decision whether to lease or buy an asset is a financing decision which interacts with the investment decision to buy the asset. The decision about how to finance the asset (whether to borrow money in order to buy it, or whether to lease it) is made once the decision to invest in the asset has been made.

We compare the cost of purchasing with the cash flows of leasing by discounting the financing cash flows at an after-tax cost of borrowing.

Worked Example: Cost of leasing

Brown Co has decided to invest in a new machine which has a five year life and no residual value. The machine can either be purchased now for $100,000, or it can be leased for five years with lease rental payments of $26,500 per annum payable at the end of each year. Calculate the interest rate implicit in the lease.

Solution

The interest rate of the lease is found by estimating the IRR of the cashflows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Purchase price saved</td>
<td>1.000</td>
<td>100.00</td>
</tr>
<tr>
<td>1-5</td>
<td>Lease rental</td>
<td>3.791</td>
<td>(100.461)</td>
</tr>
</tbody>
</table>

Since the NPV at the first guess of 10% is virtually zero, the IRR and therefore the interest rate of the lease must be approximately 10 per cent.

6.1 Lease or buy decisions

The decision whether to lease or buy an asset is a financing decision which interacts with the investment decision to buy the asset. The decision about how to finance the asset (whether to borrow money in order to buy it, or whether to lease it) is made once the decision to invest in the asset has been made.

Discounted cash flow techniques are used to evaluate the lease or buy decision so that the least-cost financing option can be chosen.

We assume that if the organisation decided to purchase the equipment, it would finance the purchase by borrowing funds (rather than out of retained funds). Therefore we compare the cost of purchasing with the cash flows of leasing by discounting the financing cash flows at an after-tax cost of borrowing.

The cash flows of purchasing do not include the interest repayments on the loan as these are dealt with via the cost of capital.
### Worked Example: Lease or buy decision

Brown Co has decided to invest in a new machine which has a ten-year life and no residual value. Brown can either borrow the money at a cost of capital of 9% in order to purchase the machine now for $50,000, or it can be leased for ten years with lease rental payments of $8,000 per annum payable at the end of each year. Ignore tax.

**Solution**

#### Present value of leasing costs

\[
PV = \text{Annuity factor at 9\% for 10 years} \times $8,000 \\
= 6.418 \times $8,000 \\
= $51,344
\]

If the machine was purchased now, it would cost $50,000. The purchase is therefore the least-cost financing option.

### Worked Example: Lease or buy decision, with taxation

Mallen and Mullins has decided to install a new milling machine. The machine costs $20,000 and it would have a useful life of five years with a trade-in value of $4,000 at the end of the fifth year. A decision has now to be taken on the method of financing the project.

(a) The company could purchase the machine for cash, using bank loan facilities on which the current rate of interest is 13 per cent before tax.

(b) The company could lease the machine under an agreement which would entail payment of $4,800 at the end of each year for the next five years.

The rate of tax is 30 per cent. If the machine is purchased, the company will be able to claim a tax depreciation allowance of 100 per cent in year 1. Tax is payable with a year’s delay.

**Solution**

Cash flows are discounted at the after-tax cost of borrowing, which is at $13\% \times 70\% = 9.1\%$, say 9%.

#### The present value (PV) of purchase costs

<table>
<thead>
<tr>
<th>Year</th>
<th>Item</th>
<th>Cash flow</th>
<th>Discount factor</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Equipment cost</td>
<td>$(20,000)</td>
<td>1.000</td>
<td>$(20,000)</td>
</tr>
<tr>
<td>5</td>
<td>Trade-in value</td>
<td>4,000</td>
<td>0.650</td>
<td>2,600</td>
</tr>
<tr>
<td>2</td>
<td>Tax savings, from allowances</td>
<td>6,000</td>
<td>0.842</td>
<td>5,052</td>
</tr>
<tr>
<td>6</td>
<td>Balancing charge</td>
<td>$(1,200)</td>
<td>0.596</td>
<td>$(715)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NPV of purchase $(13,063)$</td>
</tr>
</tbody>
</table>

The **PV** of leasing costs

It is assumed that the lease payments are fully tax-allowable.

<table>
<thead>
<tr>
<th>Year</th>
<th>Lease payment</th>
<th>Savings in tax (30%)</th>
<th>Discount factor</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>$(4,800) p.a.</td>
<td>3.890</td>
<td>9%</td>
<td>$(18,672)$</td>
</tr>
<tr>
<td>2-6</td>
<td>1,440 p.a.</td>
<td>3.569 (W)</td>
<td>5,139</td>
<td>(13,333)</td>
</tr>
</tbody>
</table>

NPV of leasing $(13,063)$
Working
6 year cumulative present value factor 9% 4.486
1 year present value factor 9% (0.917)

The cheapest option would be to purchase the machine.

Remember that the decisions made by companies are not solely made according to the results of calculations like these. Other factors (short-term cash flow advantages, flexibility, use of different costs of capital) may be significant.

Question 5: Lease or buy

The management of a company has decided to acquire Machine X which costs $63,000 and has an operational life of four years. The expected scrap value would be zero. Tax is payable at 30 per cent on operating cash flows one year in arrears. Tax allowable depreciation is available at 25 per cent a year on a reducing balance basis.

Suppose that the company has the opportunity either to purchase the machine or to lease it under a finance lease arrangement, at an annual rent of $20,000 for four years, payable at the end of each year. The company can borrow to finance the acquisition at 10 per cent. Should the company lease or buy the machine?

(The answer is at the end of the chapter)

7 The NPV of new projects and shareholder wealth

Section overview

- In theory, if a company undertakes a new capital investment and the net present value is positive when the cash flows are discounted at the company’s cost of capital, the wealth of shareholders will be increased by the amount of the NPV.

Using the dividend valuation model, it can be illustrated that the total wealth of a company’s shareholders will increase by the NPV of any project that is undertaken, provided that there is no change in the company’s WACC. This is an important concept, and helps to explain why the NPV method of project appraisal is the most appropriate to use, in cases where the financial objective of the organisation is to increase shareholder wealth.

We begin considering this argument for companies financed entirely by equity, so that the WACC and the cost of equity are the same.

Suppose that a company relying on equity as its only source of finance wishes to invest in a new project. The money will be raised by issuing new share capital to the existing shareholders. For simplicity, it will be assumed that the cash inflows generated by the new project will be used to increase dividends. The project will have to show a positive net present value (NPV) at the shareholders’ marginal cost of capital, because otherwise the shareholders would not agree to provide the new capital.

The gain to the shareholders after acceptance of the new project will be the difference between:

(a) The market value of the company before acceptance of the new project, and
(b) The market value of the company after acceptance of the new project, less the amount of funds raised from the shareholders to finance the project.
The market value of the shares will increase by the present value of the extra future dividends generated by the project. In formula terms, this is:

\[
\frac{A_1}{(1 + K_e)} + \frac{A_2}{(1 + K_e)^2} + \frac{A_3}{(1 + K_e)^3} + \ldots
\]

where: \( A_1, A_2, \ldots \) are the additional dividends at years 1, 2 and so on.

\( K_e \) is the shareholders’ marginal cost of capital.

Therefore, if the shareholders have financed the project, their net gain will equate to the PV (additional dividends) – cost of project.

This is the same as the NPV of the project. In other words, shareholder wealth will increase by the NPV of the project.

### 7.1 Investments financed by retained profits

A similar analysis applies if a project is financed by retained profits. To make the capital available for investment, current dividends would have to be reduced. However, even though in the short term dividends will be reduced, this will be more than compensated for in the long term by the fact that extra cash inflows generated by the investments will increase dividends in the future. (Indeed, it can be argued in theory that no dividends should be paid until all projects with positive net present values have been financed – this is considered further in Chapter 8.)

### 7.2 Conclusions for ungeared companies

If an all equity company undertakes a project, and it is financed in such a way that its cost of capital remains unchanged, the total wealth of the ordinary shareholders will increase by the amount of the NPV of the project.

### 7.3 Geared companies

Although the mathematics are more complex, a similar conclusion can be applied to companies with debt finance in their capital structure. Provided that the stock market is aware of the expected future cash flows from new investments, and shares management’s expectations of what these will be, share prices should rise to reflect the expected NPV of new investments. In other words, shareholder wealth will increase by the NPV of new investments.

### 7.4 Fundamental theory of share values

In Section 2.2 we considered the fundamental theory of share values, which states that the market price of shares reflects investors’ expectations of what the future returns from the shares will be. The share price represents the present value of all future returns, discounted at the investors’ yield requirements (the cost of equity).

In theory therefore, if a company undertakes a new capital investment and the net present value is positive when the cash flows are discounted at the company’s cost of capital, the wealth of shareholders will be increased by the amount of the NPV.

(a) The future cash flows from the project might be paid out to shareholders as dividends, so that future returns will be higher and the present value of future returns (i.e. the share price) will also be higher.

(b) If the future cash flows from a project are not paid out as dividends, but are re-invested in another project with a positive net present value, the re-investment will achieve earnings and dividend growth and will add to shareholder wealth by the amount of the new project’s NPV.

If this theory has validity, it is essential that investors:

(a) are aware of any new project undertaken by the company,

(b) are aware of the future returns from the project, and

(c) share the same expectations as management about what the future returns will be.
The timing of any increase in share price to reflect the expected gains from investment projects is considered in more detail in Chapter 8.

**Question 6: Impact of returns on share price**

Mansfield has just paid an annual dividend of 14c to its shareholders. The expected future growth rate in dividends is 5 per cent per annum, and the cost of equity capital is 10 per cent. The company has just announced that the expected future growth rate in dividends will be 3 per cent, instead of the 5 per cent previously forecast.

By how much would the share price be expected to fall, given no change in the cost of equity?

A 6c  
B 59c  
C 80c  
D 88c

(The answer is at the end of the chapter)
Key chapter points

- The cost of capital is the rate of return that a business must pay to satisfy the providers of funds, and it reflects the riskiness of the funding transaction.
- The fundamental theory of share values states that the market price of shares reflects investors' expectations of what the future returns from the shares will be.
- The dividend valuation model can be used to estimate a cost of equity, on the assumption that the share price represents the present value of all future dividends, discounted at the investors' yield requirements (the cost of equity).
- Expected growth in dividends can be allowed for in calculating a cost of equity, using Gordon's growth model. Growth can be estimated from past dividend growth or using the retained earnings model, $g = bR$.
- The cost of preference share capital is the return an enterprise must pay to the investors. For preference shares, this is the annual dividend as a percentage of the ex-div market value of the shares.
- The cost of debt is based on the return an enterprise must pay to its lenders. However, the company benefits from additional tax relief on interest payments, so the cost to the company is after-tax.
  - For irredeemable debt, this is the (post-tax) interest as a percentage of the ex-div market value of the loan stock (or preference shares).
  - For redeemable debt, the cost is given by the internal rate of return of the cash flows involved.
- The weighted average cost of capital is calculated by weighting the costs of the individual sources of finance according to their relative importance as sources of finance.
- The weighted average cost of capital can be used to evaluate a company's investment projects if:
  - the project is small relative to the company.
  - the existing capital structure will be maintained (same financial risk).
  - the project has the same business risk as the company.
  - new investments are financed by new sources of funds, and a marginal cost of capital approach is used.
- Leasing is another form of debt finance. Like all forms of debt the cost of the lease can be calculated by finding the IRR of the leasing cash flows.
- The decision whether to lease or buy an asset is a financing decision which interacts with the investment decision to buy the asset. The decision about how to finance the asset (whether to borrow money in order to buy it, or whether to lease it) is made once the decision to invest in the asset has been made.
- We compare the cost of purchasing with the cash flows of leasing by discounting the financing cash flows at an after-tax cost of borrowing.
- In theory, if a company undertakes a new capital investment and the net present value is positive when the cash flows are discounted at the company’s cost of capital, the wealth of shareholders will be increased by the amount of the NPV.
Quick revision questions

1. Fill in the blanks.
   Cost of capital = (1) ........................................ + (2) a premium for ........................................ risk +
   (3) a premium for ........................................ risk.

2. Hurstbourne Electronics has issued nominal share capital of $10 million, made up of $0.25 ordinary
   shares, and a market capitalisation of $20 million. The company expects post-tax profits for the
   forthcoming year to be $8 million and wishes to maintain a constant dividend payout ratio of 25 per
   cent. Dividends are expected to increase by 3 per cent per year for the foreseeable future.
   What is the expected rate of return from the ordinary shares?
   A 7%
   B 13%
   C 17%
   D 23%

3. Appleton has issued loan stock of $100 nominal value with annual interest of 10 per cent per year,
   based on the nominal value. The loan stock has two years remaining before it is redeemed at par.
   Interest is paid annually and the most recent interest payment has just been paid. Investors currently
   require a yield of 8 per cent per year on the loan stock.
   What is the market value of the loan stock per $100 nominal value, to the nearest dollar?
   A $95
   B $100
   C $104
   D $125

4. Stockton has 20 million $0.50 ordinary shares and irredeemable loan capital with a nominal value of
   $40 million in issue. The ordinary shares have a current market value of $2.40 per share and the loan
   capital is quoted at $80 per $100 nominal value. The cost of ordinary shares is estimated at 11 per
   cent and the cost of loan capital is calculated to be 8%. The rate of corporation tax is 25 per cent.
   What is the weighted average cost of capital for the company?
   A 7.0%
   B 9.0%
   C 9.5%
   D 9.8%

5. When calculating the weighted average cost of capital, which of the following is the preferred
   method of weighting?
   A book values of debt and equity
   B average levels of the market values of debt and equity (ignoring reserves) over five years
   C current market values of debt and equity (ignoring reserves)
   D current market values of debt and equity (plus reserves)
Cost of capital = a risk-free rate of return, a premium for business risk and a premium for financial risk.

\[ K_e = \frac{d_1}{E_{XD}} + g = \frac{8m \times 25\%}{20m} + 3\% = 13\% \]

Investors require 8% so use that as a discount rate to find MV:

| Year 1 interest (10 \times 0.926) | 9.26 |
| Year 2 interest (10 \times 0.857) | 8.57 |
| Redemption value (100 \times 0.857) | 85.70 |

Rounded to $104 per $100 nominal value.

\[
\begin{array}{|c|c|c|c|}
\hline
\text{MV} & \text{Weighting} & \% & \text{WACC} \\
\hline
\text{Equity} & 20m \times \$2.40 & 48 & 0.60 & 11 & 6.6 \\
\text{Debt} & 40m \times \$0.80 & 32 & 0.40 & 6 & (8\% \times 0.75) & 2.4 \\
\hline
\end{array}
\]

Current market values of debt and equity (ignoring reserves).
Answers to chapter questions

1. Cost of capital = \( \frac{12(1 + 0.04)}{96} + 0.04 = 0.13 + 0.04 = 0.17 = 17\% \)

2. Here \( b = 0.15 \) and \( R = 2/3 \) (0.67) so \( g = 0.15 \times 2/3 = 0.10 \) i.e. 10%

The cost of equity, \( K_e \), is:

\[
\frac{d(1 + g)}{P_0} + g = 0.35 (1.10)/3.50 + 0.10 = 0.21 = 21\%
\]

3. \( k_{pref} = \frac{d}{P_0} = 0.12/1.35 = 0.089 \) or 8.9%

4. **Equity.** Given a 5 per cent annual increase in dividend in perpetuity, the cost of equity capital may be estimated as:

\[
\frac{60000(1+0.05)}{585000 - 60000} + 0.05 = 0.17 = 17\%
\]

* Market value of equity ex div, not cum div. The current dividend must be subtracted from the cum div price.

**Preference shares.** The cost of capital is \( \frac{6c}{40c} \times 100\% = 15\% \)

**Debentures.** The cost of capital is the IRR of the following cash flows.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost</th>
<th>Interest</th>
<th>Tax relief</th>
<th>Net cash flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(95.30)*</td>
<td></td>
<td></td>
<td>(95.30)</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>(3.00)</td>
<td>7.00</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>100.00 **</td>
<td>10</td>
<td>(3.00)</td>
<td>107.00</td>
</tr>
</tbody>
</table>

* MV per $100 debenture is $105.30 cum int. MV ex int = $105.30 – 10 = 95.30

** Debentures are redeemed at par so each individual debenture is redeemed at its nominal value of $100

\[
\text{Try 10\%} \\
\text{Net cash flow} | \text{Discount factor} | \text{PV} | \text{Discount factor} | \text{PV} \\
\hline
(95.30)      | 1.000       | (95.30) | 1.000       | (95.30) |
7.00         | 0.909       | 6.36   | 0.926       | 6.48    |
107.00       | 0.826       | 88.38  | 0.857       | 91.70   |
\hline
(0.56)       |             |        |             | 2.88    |
\hline
\text{Try 8\%} \\
\text{Net cash flow} | \text{Discount factor} | \text{PV} | \text{Discount factor} | \text{PV} \\
\hline
(95.30)      | 1.000       | (95.30) | 1.000       | (95.30) |
7.00         | 0.909       | 6.36   | 0.926       | 6.48    |
107.00       | 0.826       | 88.38  | 0.857       | 91.70   |
\hline
(0.56)       |             |        |             | 2.88    |
\hline
The IRR is approx \( 8\% + \frac{2.88}{2.88 - 0.56} \times (10 - 8)\% = 9.67\% \)

**Weighted average cost of capital**

<table>
<thead>
<tr>
<th>Item</th>
<th>Market value</th>
<th>Cost of capital</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinary shares*</td>
<td>525 000</td>
<td>0.170</td>
<td>89 250</td>
</tr>
<tr>
<td>Preference shares</td>
<td>40 000</td>
<td>0.150</td>
<td>6 000</td>
</tr>
<tr>
<td>Debentures*</td>
<td>190 600</td>
<td>0.0967</td>
<td>18 431</td>
</tr>
<tr>
<td>755 600</td>
<td></td>
<td></td>
<td>113 681</td>
</tr>
</tbody>
</table>

* ex div \((500 000 \times 1.17) - 60 000\) and ex interest \((200 000 \times 95.30/100\)
WACC = \frac{113,681}{755,600} = 0.150 = 15.0\%

5  
**Tax allowable depreciation**

<table>
<thead>
<tr>
<th>Year</th>
<th>Item</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(25% of $63,000)</td>
<td>15,750</td>
</tr>
<tr>
<td>2</td>
<td>(75% of $15,750)</td>
<td>11,813</td>
</tr>
<tr>
<td>3</td>
<td>(75% of $11,813)</td>
<td>8,859</td>
</tr>
<tr>
<td>4</td>
<td>($63,000 – $36,422)</td>
<td>26,578</td>
</tr>
</tbody>
</table>

The financing decision will be appraised by discounting the relevant cash flows at the after-tax cost of borrowing, which is 10% \times 70\% = 7\%.

(a) **Purchase option**

<table>
<thead>
<tr>
<th>Year</th>
<th>Item</th>
<th>Cash flow</th>
<th>Discount factor 7%</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Cost of machine (63,000)</td>
<td>(63,000)</td>
<td>1.000</td>
<td>(63,000)</td>
</tr>
<tr>
<td></td>
<td>Tax saved from tax allowable depreciation</td>
<td>4,725</td>
<td>0.873</td>
<td>4,125</td>
</tr>
<tr>
<td>2</td>
<td>30% × $15,750</td>
<td>4,725</td>
<td>0.873</td>
<td>4,125</td>
</tr>
<tr>
<td>3</td>
<td>30% × $11,813</td>
<td>3,544</td>
<td>0.816</td>
<td>2,892</td>
</tr>
<tr>
<td>4</td>
<td>30% × $8,859</td>
<td>2,658</td>
<td>0.763</td>
<td>2,028</td>
</tr>
<tr>
<td>5</td>
<td>30% × $26,578</td>
<td>7,973</td>
<td>0.713</td>
<td>5,685</td>
</tr>
</tbody>
</table>

(48,270)

(b) **Leasing option**

It is assumed that the lease payments are tax-allowable in full.

<table>
<thead>
<tr>
<th>Years</th>
<th>Item</th>
<th>Cash flow</th>
<th>Discount factor 7%</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–4</td>
<td>Lease costs (20,000)</td>
<td>(20,000)</td>
<td>3.387</td>
<td>(67,740)</td>
</tr>
<tr>
<td>2–5</td>
<td>Tax savings on lease costs (× 30%)</td>
<td>6,000</td>
<td>3.165</td>
<td>18,990</td>
</tr>
</tbody>
</table>

(48,750)

The purchase option is cheaper, using a cost of capital based on the after-tax cost of borrowing. On the assumption that investors would regard borrowing and leasing as equally risky finance options, the purchase option is recommended.

6  
**Share price**

\[
P = \frac{D \cdot (1 + g)}{r - g}
\]

Previously \( P = \frac{14(1+0.05)}{0.10 - 0.05} = 294c \)

Now \( P = \frac{14(1+0.03)}{0.10 - 0.03} = 206c \)

Fall in share price = 294 – 206 = 88c
Chapter 7
Portfolio theory and CAPM

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Capital Asset Pricing Model</strong></td>
<td>LO3</td>
</tr>
<tr>
<td>Demonstrate the relationship between systematic risk and expected return of individual securities and portfolios using the CAPM and the security market line relationship</td>
<td>LO3.1</td>
</tr>
<tr>
<td><strong>Cost of funds</strong></td>
<td>LO4</td>
</tr>
<tr>
<td>Calculate and interpret the cost of capital associated with leases; and debt and equity</td>
<td>LO4.7</td>
</tr>
<tr>
<td><strong>Long term financing, investment appraisal and dividend policy</strong></td>
<td>LO6</td>
</tr>
<tr>
<td>Calculate and interpret measures of expected return and risk using the probability distribution approach</td>
<td>LO6.1</td>
</tr>
<tr>
<td><strong>Portfolio management</strong></td>
<td>LO7</td>
</tr>
<tr>
<td>Calculate and interpret rates of return on financial investments</td>
<td>LO7.1</td>
</tr>
<tr>
<td>Calculate and interpret measures of expected return and risk for two-security portfolios</td>
<td>LO7.2</td>
</tr>
<tr>
<td>Explain the impact of portfolio leveraging and short selling on the risk and expected return of two-security portfolios</td>
<td>LO7.3</td>
</tr>
<tr>
<td>Analyse and assess portfolio risk</td>
<td>LO7.4</td>
</tr>
</tbody>
</table>

**Topic list**

1. Portfolios and portfolio theory
2. Investors' preferences
3. The Capital Asset Pricing Model (CAPM)
Introduction

This chapter looks at measures of risk and return for asset portfolios. It discusses Portfolio theory and the Capital Asset Pricing Model (CAPM). Portfolio theory suggests that individual investments cannot be viewed simply in terms of their risk and return. It is the returns on investments that is important and the investor should be concerned with his or her overall position, not with the performance of individual investments.

The CAPM is based on the fact that many investors will be well diversified. A well-diversified investor is one that holds a balanced portfolio consisting of a range of different investments so as to reduce the risk associated with any one particular investment. Well-diversified investors are therefore only concerned with a comparison of the market risk of individual investments with the risks of all shares in the market.

CAPM can be used to establish a cost of equity, or discount rate, that takes risk into account.
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What does the correlation coefficient for two investments measure?  
(Section 1.3)

2. What value of correlation coefficient offers the maximum scope for diversification?  
(Section 1.3)

3. What is the efficient frontier?  
(Section 2.3)

4. What is the market portfolio?  
(Section 2.4)

5. Explain systematic and unsystematic risk.  
(Section 3.2)

6. What can CAPM be used for?  
(Section 3.1)

7. What does a beta factor measure?  
(Section 3.6)

8. A share has a beta factor of 1.2, the risk-free rate of return is 5 per cent and the average return from the stock market is 9 per cent.

   What is the CAPM required return for the share? What does this assume about investors?  
(Section 3.8)
1 Portfolios and portfolio theory

Section overview

- **Portfolio theory** suggests that individual investments cannot be viewed simply in terms of their risk and return. It is the return on investments that is important and the investor should be concerned with his or her overall position, not with the performance of individual investments.

- The **expected return** of a portfolio will be a weighted average of the expected returns of the investments in the portfolio, weighted by the proportion of total funds invested in each.

- The risk of a security, and the risk of a portfolio, can be measured as the **standard deviation of expected returns**, given estimated probabilities of actual returns.

- **Correlation** measures the degree to which the returns on investment vary with each other. Investments can be said to be positively correlated, negatively correlated or have no correlation.

- The combined risk of the portfolio will depend on how the two investments are correlated. Risk can be reduced by combining in a portfolio investments which have no significant correlation or are negatively correlated.

1.1 Individual and company portfolios

A **portfolio** is the collection of different investments that make up an investor's total holding. A portfolio might be the investments in stocks and shares of an **investor**, or the investments in capital projects of a **company**.

**Portfolio theory**, which originates from the work of Markowitz, is concerned with establishing guidelines for building up a portfolio of stocks and shares, or a portfolio of projects. The same theory applies to both stock market investors and to companies with capital projects to invest in.

<table>
<thead>
<tr>
<th>Factors in the choice of investment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>Maintenance of capital value.</td>
</tr>
<tr>
<td>Liquidity</td>
<td>If made with short-term funds, should be convertible into cash with short notice.</td>
</tr>
<tr>
<td>Return</td>
<td>Obtain highest return compatible with safety.</td>
</tr>
<tr>
<td>Spreading risks</td>
<td>Spread risks over several investments, so losses on some offset by gains on others.</td>
</tr>
<tr>
<td>Growth prospects</td>
<td>Investment in steadily growing businesses.</td>
</tr>
</tbody>
</table>

1.1.1 Investment returns

The theory examined in this chapter considers investments in the context of single period i.e. a sum of money invested now to generate a one-off cash sum a year from now. For example, an investor has $100 to invest in a security for one year and expects to realise $120 at the end of the investment period. This equates to a return of 20 per cent (120 - 100/100).

**Worked Example: Investment returns**

An investor purchased a share at the start of the period for $2.50. During the period the investor received a dividend of $0.20 and the share price at the end of the period had risen to $2.55. Calculate the return on the share.

**Solution**

The return on the share may be calculated as:

\[
R = \frac{\text{Capital gain (or loss) + dividend}}{\text{Price at start of period}} = \frac{P_t - P_0 + D_t}{P_0}
\]

\[
R = \frac{(0.05 + 0.20)}{2.50} = 10\%
\]
Alternatively:

% total return = Capital gain yield + dividend yield

Capital gain yield = \( \frac{P_1 - P_0}{P_0} = \frac{2.55 - 2.50}{2.50} = 2\% \)

Dividend yield = \( \frac{D_1}{P_0} = \frac{0.20}{2.50} = 8\% \)

Hence total return = 2% + 8% = 10%

### 1.2 Measuring the risk and return of an investment

The expected return \( \bar{X} \) of an investment is the weighted average of the various possible returns, multiplied by their expected probabilities.

The risk in an investment is that the actual return will not be the same as the expected return (the actual return could be lower or higher than the expected return).

The risk of a security can be measured as the standard deviation of expected returns, given estimated probabilities of actual returns.

**Worked Example: Risk and return of an investment**

Suppose that the return from an investment has the following probability distribution.

<table>
<thead>
<tr>
<th>Return</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>P</td>
</tr>
<tr>
<td>8</td>
<td>0.2</td>
</tr>
<tr>
<td>10</td>
<td>0.2</td>
</tr>
<tr>
<td>12</td>
<td>0.5</td>
</tr>
<tr>
<td>14</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Calculate the expected return and risk for the investment.

**Solution**

<table>
<thead>
<tr>
<th>Return</th>
<th>Probability</th>
<th>Expected value</th>
<th>( x - \bar{x} )</th>
<th>( p(x - \bar{x})^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>P</td>
<td>( pX )</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.2</td>
<td>1.6</td>
<td>-3</td>
<td>1.8</td>
</tr>
<tr>
<td>10</td>
<td>0.2</td>
<td>2.0</td>
<td>-1</td>
<td>0.2</td>
</tr>
<tr>
<td>12</td>
<td>0.5</td>
<td>6.0</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>14</td>
<td>0.1</td>
<td>1.4</td>
<td>3</td>
<td>0.9</td>
</tr>
</tbody>
</table>

The expected return \( \bar{X} \) is 11 per cent.

The standard deviation of the expected return is \( \sqrt{3.4} = 1.84 \) per cent.

Therefore, the expected return is 11 per cent with a standard deviation of 1.84 per cent.

The risk of an investment might be high or low, depending on the nature of the investment. **Low risk** investments usually give **low returns**. **High risk** investments might give **high returns**, but with more risk of not getting expected returns. So how does holding a **portfolio** of investments affect expected returns and investment risk?

### 1.3 Correlation of investments

Portfolio theory states that individual investments cannot be viewed simply in terms of their risk and return. The relationship between the return from one investment and the return from other investments is just as important.
Definition

**Correlation** is a statistical measure of how the returns from two securities move in relation to each other.

The relationship between investments can be one of three types:

1.3.1 **Positive correlation**
When there is positive correlation between investments, if one investment does well it is likely that the other will do well. Therefore, if you buy shares in one company making umbrellas and in another which sells raincoats you would expect both companies to do badly in dry weather.

1.3.2 **Negative correlation**
If one investment does well the other will do badly, and vice versa. Therefore, if you hold shares in one company making umbrellas and in another which sells ice cream, the weather will affect the companies differently.

1.3.3 **No correlation**
The performance of one investment will be independent of how the other performs. If you hold shares in a mining company and in a leisure company, it is likely that there would be no relationship between the profits and returns from each.

1.3.4 **Correlation coefficient**
The relationship between the returns from different investments is measured by the correlation coefficient. A figure close to +1 indicates high positive correlation, and a figure close to −1 indicates high negative correlation. A figure of 0 indicates no correlation.

1.3.5 **Correlation coefficient and risk**
When two investments are combined, the resulting risk of the portfolio depends on the correlation between them. The maximum potential for risk reduction occurs if the investments show perfect negative correlation (-1). However, overall risk can also be reduced by combining in a portfolio investments which have no significant correlation.

1.4 **Calculating correlation and covariance**
As well as being measured by correlation, the relationship between the returns on two investments can be measured by the covariance. The covariance is an absolute measure, whereas the correlation coefficient is a relative measure, varying as we have seen, between −1 and +1. A positive covariance indicates that the returns will move in the same direction.

The formulae for the covariance and correlation coefficient are as follows:

**Formula to learn**

\[
\text{Covariance} = \sum p(x - \bar{x})(y - \bar{y})
\]

where:  
\( p \) = probability of outcome  
\( x \) = return from security \( x \) at that outcome.  
\( \bar{x} \) = expected return from security \( x \).  
\( y \) = return from security \( y \) at that outcome.  
\( \bar{y} \) = expected return from security \( y \).

**Correlation coefficient**  
\[
\text{Correlation coefficient} = \frac{\text{Covariance}}{\sigma_x \sigma_y}
\]

where:  
\( \sigma_x \) = standard deviation of returns from security \( x \).  
\( \sigma_y \) = standard deviation of returns from security \( y \).
Worked Example: Positive correlation

Security A and security B have the following expected returns:

<table>
<thead>
<tr>
<th>Probability</th>
<th>Security A return</th>
<th>Security B return</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>0.8</td>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td>0.1</td>
<td>35%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Calculate the expected return and risk for each security individually and the covariance and correlation coefficient.

Solution

The expected return from each security is as follows:

\[
\begin{array}{c|c|c|c|c}
\text{Probability} & \text{Security A Expected Value (EV)} & \text{Security B Expected Value (EV)} \\
0.1 & 15 \times 0.1 = 1.5 & 10 \times 0.1 = 1 \\
0.8 & 25 \times 0.8 = 20 & 30 \times 0.8 = 24 \\
0.1 & 35 \times 0.1 = 3.5 & 50 \times 0.1 = 5 \\
\end{array}
\]

The expected return = 25.0

Expected return = 30

The variance of the expected return for each security is \( \sum p(x - \overline{x})^2 \)

\[
\begin{array}{c|c|c|c|c|c|c|c|c}
\text{Probability} & \text{Security A return} & \text{Security B return} & \text{Security A} & \text{Security B} & \text{Security A} & \text{Security B} & \text{Security A} & \text{Security B} \\
0.1 & 15 & 10 & 1.5 & 1 & 6.25 & 1 & 10 & 1 \\
0.8 & 25 & 30 & 20 & 24 & 400 & 24 & 0 & 0 \\
0.1 & 35 & 50 & 3.5 & 5 & 12.25 & 5 & 20 & 40 \\
\end{array}
\]

Variance = 220

Variance = 80

The standard deviation, \( \sigma \), is the square root of the variance.

Security A: \( \sqrt{220} = 4.472\% \)

Security B: \( \sqrt{80} = 8.944\% \)

Therefore, security B offers a higher expected return than security A, but at a greater risk.

We can see in this situation that the two investments are positively correlated since they both move in the same direction (when A does well, so does B). In fact, we can prove that there is perfect positive correlation between the securities:

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c}
\text{Probability} & \text{Security A return} & \text{Security B return} & \text{Security A} & \text{Security B} & \text{Security A} & \text{Security B} & \text{Security A} & \text{Security B} \\
0.1 & 15 & 10 & 1.5 & 1 & 6.25 & 1 & 10 & 1 \\
0.8 & 25 & 30 & 20 & 24 & 400 & 24 & 0 & 0 \\
0.1 & 35 & 50 & 3.5 & 5 & 12.25 & 5 & 20 & 40 \\
\end{array}
\]

Covariance = 40

Correlation coefficient = \( \frac{40}{4.472 \times 8.944} = +1 \)
**Worked Example: Negative correlation**

Alternatively, we could have had a situation where there was perfect negative correlation between the two investments, so that when A does badly and gives a return of 15 per cent, B does well and gives a return of 50 per cent.

<table>
<thead>
<tr>
<th>Probability</th>
<th>Security A return</th>
<th>Security B return</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td>0.1</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>0.8</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>0.1</td>
<td>35</td>
<td>10</td>
</tr>
</tbody>
</table>

\[
\text{Covariance} = (40)
\]

\[
\text{Correlation coefficient} = \frac{\text{Covariance}}{4.472 \times 8.944}
\]

\[
= -1
\]

**Worked Example: No correlation**

If there was no correlation between the returns, the probability distribution would be as follows:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>(0.1 x 0.1) 0.01</td>
</tr>
<tr>
<td>15</td>
<td>30</td>
<td>(0.1 x 0.8) 0.08</td>
</tr>
<tr>
<td>15</td>
<td>50</td>
<td>(0.1 x 0.1) 0.01</td>
</tr>
<tr>
<td>25</td>
<td>10</td>
<td>(0.8 x 0.1) 0.08</td>
</tr>
<tr>
<td>25</td>
<td>30</td>
<td>(0.8 x 0.8) 0.64</td>
</tr>
<tr>
<td>25</td>
<td>50</td>
<td>(0.8 x 0.1) 0.08</td>
</tr>
<tr>
<td>35</td>
<td>10</td>
<td>(0.1 x 0.1) 0.01</td>
</tr>
<tr>
<td>35</td>
<td>30</td>
<td>(0.1 x 0.8) 0.08</td>
</tr>
<tr>
<td>35</td>
<td>50</td>
<td>(0.1 x 0.1) 0.01</td>
</tr>
</tbody>
</table>

\[
1.00
\]

The covariance and correlation calculations would be as follows:

<table>
<thead>
<tr>
<th>Probability</th>
<th>Security A return</th>
<th>Security B return</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td>0.01</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>0.08</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>0.01</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>0.64</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>0.08</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>0.01</td>
<td>35</td>
<td>10</td>
</tr>
<tr>
<td>0.08</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>0.01</td>
<td>35</td>
<td>50</td>
</tr>
</tbody>
</table>

\[
\text{Covariance} = 0
\]

\[
\text{Correlation coefficient} = \frac{0}{4.472 \times 8.944}
\]

\[
= 0
\]
1.5 Combining two investments: expected return and risk of a portfolio

When an investor has a portfolio of securities, he will expect the portfolio to provide a certain return on his investment.

The **expected return** of a portfolio will be a weighted average of the expected returns of the investments in the portfolio, weighted by the proportion of total funds invested in each.

For example, if 70 per cent of the portfolio relates to a security which is expected to yield 10 per cent and 30 per cent to a security expected to yield 12 per cent, the portfolio’s expected return is \((70\% \times 10\%) + (30\% \times 12\%) = 10.6\) per cent.

**Formula to learn**

The expected return \(\bar{r}_p\) of a two-asset portfolio can therefore be stated by:

\[
\bar{r}_p = x \bar{r}_a + (1 - x) \bar{r}_b
\]

where:

- \(x\) is the proportion of investment A in the portfolio.
- \(\bar{r}_a, \bar{r}_b\) are the expected returns of investments A and B.

The risk of a security, and the risk of a portfolio, can be measured as the **standard deviation of expected returns**, given estimated probabilities of actual returns.

**Worked Example: Combined risk of a two asset portfolio**

Using the predicted returns for securities A and B in Section 1.4 above, let us now assume that an investor acquires a portfolio consisting of 50 per cent A and 50 per cent B.

The **expected return** from the portfolio will be \(0.5 \times 25\% + 0.5 \times 30\% = 27.5\) per cent.

This return is less than the expected return from security B alone, but more than that from security A.

The combined risk of the portfolio will depend on how the two investments are correlated.

Calculate the combined risk of a portfolio consisting of 50 per cent A and 50 per cent B if A and B have:

(i) perfect positive correlation.
(ii) perfect negative correlation.
(iii) no correlation.

**Solution**

(i) **Perfect positive correlation**

The standard deviation of the portfolio may be calculated as follows, given an expected return of 27.5% and **perfect positive correlation**.

<table>
<thead>
<tr>
<th>Probability</th>
<th>Return from 50%</th>
<th>Return from 50%</th>
<th>Combined portfolio return</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>(A)</td>
<td>(B)</td>
<td>(x)</td>
</tr>
<tr>
<td>0.1</td>
<td>7.5</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>0.8</td>
<td>12.5</td>
<td>15</td>
<td>27.5</td>
</tr>
<tr>
<td>0.1</td>
<td>17.5</td>
<td>25</td>
<td>42.5</td>
</tr>
</tbody>
</table>

Variance = \(\frac{45}{0}\)

The standard deviation is \(\sqrt{45} = 6.71\) per cent.
(ii) **Perfect negative correlation**

The standard deviation of the portfolio, given an expected return of 27.5 per cent and **perfect negative correlation**, is as follows:

<table>
<thead>
<tr>
<th>Probability</th>
<th>Return from 50%</th>
<th>Return from 50%</th>
<th>Combined portfolio return</th>
</tr>
</thead>
<tbody>
<tr>
<td>p A %</td>
<td>B %</td>
<td>x x−X</td>
<td>p(x − X)^2</td>
</tr>
<tr>
<td>0.1</td>
<td>7.5 25</td>
<td>32.5 5</td>
<td>2.5</td>
</tr>
<tr>
<td>0.8</td>
<td>12.5 15</td>
<td>27.5 0</td>
<td>0</td>
</tr>
<tr>
<td>0.1</td>
<td>17.5 5</td>
<td>22.5 (5)</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Variance = 5.0

The standard deviation is \( \sqrt{5} = 2.24\% \)

(iii) **No correlation**

The standard deviation of the portfolio, given an expected return of 27.5% and **no correlation**, is as follows:

<table>
<thead>
<tr>
<th>Probability</th>
<th>Return from 50%</th>
<th>Return from 50%</th>
<th>Combined portfolio return</th>
</tr>
</thead>
<tbody>
<tr>
<td>p A %</td>
<td>B %</td>
<td>x x−X</td>
<td>p(x − X)^2</td>
</tr>
<tr>
<td>0.01</td>
<td>7.5 5</td>
<td>12.5 (15)</td>
<td>2.25</td>
</tr>
<tr>
<td>0.08</td>
<td>7.5 15</td>
<td>22.5 (5)</td>
<td>2.00</td>
</tr>
<tr>
<td>0.01</td>
<td>7.5 25</td>
<td>32.5 5</td>
<td>0.25</td>
</tr>
<tr>
<td>0.08</td>
<td>12.5 5</td>
<td>17.5 (10)</td>
<td>8.00</td>
</tr>
<tr>
<td>0.64</td>
<td>12.5 15</td>
<td>27.5 0</td>
<td>0.00</td>
</tr>
<tr>
<td>0.08</td>
<td>12.5 25</td>
<td>37.5 10</td>
<td>8.00</td>
</tr>
<tr>
<td>0.01</td>
<td>17.5 5</td>
<td>22.5 (5)</td>
<td>0.25</td>
</tr>
<tr>
<td>0.08</td>
<td>17.5 15</td>
<td>32.5 5</td>
<td>2.00</td>
</tr>
<tr>
<td>0.01</td>
<td>17.5 25</td>
<td>42.5 15</td>
<td>2.25</td>
</tr>
</tbody>
</table>

Variance = 25.00

The standard deviation is \( \sqrt{25} = 5\% \)

### 1.5.1 Effect of correlation on combined risk

<table>
<thead>
<tr>
<th></th>
<th>% Return</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>A only</td>
<td>25</td>
<td>4.472</td>
</tr>
<tr>
<td>B only</td>
<td>30</td>
<td>8.944</td>
</tr>
<tr>
<td>50% A, 50% B, Cor=+1</td>
<td>27.5</td>
<td>6.71</td>
</tr>
<tr>
<td>50% A, 50% B, Cor=-1</td>
<td>27.5</td>
<td>2.24</td>
</tr>
<tr>
<td>50% A, 50% B, Cor=0</td>
<td>27.5</td>
<td>5.0</td>
</tr>
</tbody>
</table>

You should notice that for the same expected return of 27.5%, the standard deviation (the risk) is:

(a) **Highest** when there is **perfect positive correlation** between the returns of the individual securities in the portfolio; in this situation it is a weighted average of the standard deviations of the individual investments in the portfolio.

(b) **Lower** when there is **no correlation**.

(c) **Lowest** when there is **perfect negative correlation** – the risk is then less than for either individual security taken on its own.

If the investor starts with a single security B, then combines it with security A in equal proportions, note that for any correlation, the combined portfolio will be less risky than security B alone. To achieve this reduction in risk however, the combined return is lower than that of B alone.

If, however, the investor starts with a single security A, and combines it in equal proportions with B, the combined return is higher than that of A alone and if the investments are perfectly negatively correlated, this can be achieved with an overall risk that is lower than A alone. By creating a portfolio the investor has managed to increase return and reduce risk.
1.5.2 Alternative approach for calculating the standard deviation of a portfolio

The standard deviation of the returns from a portfolio of two investments can also be calculated using the following formula:

\[ \sigma_p = \sqrt{\sigma_a^2 \times x^2 + \sigma_b^2 \times (1 - x)^2 + 2x \times (1 - x) \rho_{ab} \sigma_a \sigma_b} \]

where:
- \( \sigma_p \) is the standard deviation of a portfolio of two investments, A and B.
- \( \sigma_a \) is the standard deviation of the returns from investment A.
- \( \sigma_b \) is the standard deviation of the returns from investment B.
- \( \sigma_a^2, \sigma_b^2 \) are the variances of returns from investments A and B (the squares of the standard deviations).
- \( x \) is the weighting or proportion of investment A in the portfolio.
- \( \rho_{ab} \) is the correlation coefficient of returns from investments A and B

\[ \rho_{ab} = \frac{\text{Covariance of investments A and B}}{\sigma_a \times \sigma_b} \]

**Worked Example: calculating the standard deviation of a portfolio**

We will use the previous example of the portfolio of 50% security A and 50% security B.

(a) When there is perfect positive correlation between the returns from A and B, \( \rho_{ab} = 1 \)

\[ \sigma_p^2 = (20 \times 0.5^2) + (80 \times 0.5^2) + (2 \times 0.5 \times 0.5 \times 1 \times \sqrt{20} \times \sqrt{80}) \]
\[ = 5 + 20 + (0.5 \times 4.472 \times 8.944) \]
\[ = 45 \]

The standard deviation of the portfolio is \( \sqrt{45} = 6.71\% \)

(b) When there is perfect negative correlation between returns from A and B, \( \rho_{ab} = -1 \)

\[ \sigma_p^2 = (20 \times 0.5^2) + (80 \times 0.5^2) + (2 \times 0.5 \times 0.5 \times -1 \times \sqrt{20} \times \sqrt{80}) \]
\[ = 5 + 20 - (0.5 \times 4.472 \times 8.944) \]
\[ = 5 \]

The standard deviation of the portfolio is \( \sqrt{5} = 2.24\% \)

(c) When there is no correlation between returns from A and B, \( \rho_{ab} = 0 \)

\[ \sigma_p^2 = (20 \times 0.5^2) + (80 \times 0.5^2) + (2 \times 0.5 \times 0.5 \times 0 \times \sqrt{20} \times \sqrt{80}) \]
\[ = 5 + 20 + 0 \]
\[ = 25 \]

The standard deviation of the portfolio is \( \sqrt{25} = 5\% \)

These are exactly the same figures for standard deviations that were calculated earlier.
2  Investors' preferences

Section overview

- Investors will choose a portfolio which gives them a satisfactory balance between the expected returns and the risk from the portfolio, based on their individual risk preferences.
- Traditional investment theory suggests that rational risk-averse investors wish to maximise return and minimise risk.
- The efficient frontier shows a collection of risky portfolios each one providing an optimal return for a given level of risk.
- The market portfolio is a hypothetical portfolio containing every security available to investors in a given market, in amounts proportional to their market values.
- When the market portfolio is combined with the risk-free asset, the range of possible portfolios lie along the capital market line (CML). All points along the CML have superior risk-return profiles to any portfolio on the efficient frontier.
- The interaction of investors' preferences, efficient portfolios and the returns from risk-free investments provides the basis for the Capital Asset Pricing Model.

2.1  Risk and return

Investors must choose a portfolio which gives them a satisfactory balance between the expected returns from the portfolio and the risk of that portfolio (that actual returns from the portfolio will be higher or lower than expected). Some portfolios will be more risky than others.

2.2  Investors' indifference curves

Traditional investment theory suggests that rational risk-averse investors wish to maximise return and minimise risk. Therefore, if two portfolios have the same element of risk, the investor will choose the one yielding the higher return. Similarly, if two portfolios offer the same return the investor will select the portfolio with the lesser risk. This is illustrated by Figure 1.

Figure 1 An investor's indifference curve

Portfolio A will be preferred to portfolio B because it offers a higher expected return for the same level of risk. Similarly, portfolio C will be preferred to portfolio B because it offers the same expected return for lower risk. (A and C are said to dominate portfolio B.) But whether an investor chooses portfolio A or portfolio C will depend on the individual's attitude to risk, whether he wishes to accept a greater risk for a greater expected return.

The curve $I_1$ is an investor's indifference curve. The investor will have no preference between any portfolios which give a mix of risk and expected return which lies on the curve, since he derives equal utility from each of them. Therefore, to the investor the portfolios A, C, D, E and F are all just as good as each other, and all of them are better than portfolio B.
An investor would prefer combinations of return and risk on indifferece curve A to those on curve B (Figure 2) because curve A offers higher returns for the same degree of risk (and less risk for the same expected returns). For example, for the same amount of risk x, the expected return on curve A is y₁, whereas on curve B it is only y₂.

![Figure 2 Indifference curves compared](image)

### 2.3 Efficient portfolios

If we drew a graph (Figure 3) to show the expected return and the risk of the many possible portfolios of investments, we could (according to portfolio theory) plot an egg-shaped cluster of dots on a scattergraph.

(a) In this graph, there are some portfolios which would not be as good as others, as they offer a lower level of return for the same amount of risk.

(b) However, there are other portfolios which are neither better nor worse than each other, either because they have a higher expected return but a higher risk, or a lower expected return but a lower risk. These portfolios lie along the so-called efficient frontier of portfolios which is shown as a dotted line in Figure 3. Portfolios on this efficient frontier are called 'efficient' portfolios.

(c) The efficient frontier is a curved line, not a straight line. This is because the additional return for accepting a greater level of risk will not be constant. The curve eventually levels off because a point will be reached where no more return can be offered to an investor for accepting more risk.

**Definition**

The efficient frontier shows a collection of optimal portfolios for a rational, risk averse investor: either the best return that can be expected for a given level of risk or the lowest level of risk needed to achieve a given expected rate of return.

![Figure 3 The efficient frontier of available investment portfolios](image)
We can now place an investor’s indifference curves on the same graph as the possible portfolios of investments (the **egg-shaped scatter graph**), as in Figure 4. An investor would prefer a portfolio of investments on indifference curve A to a portfolio on curve B, which in turn is preferable to a portfolio on curve C which in turn is preferable to curve D. No portfolio exists, however, which is on curve A or curve B.

**Figure 4 The optimum portfolio (ignoring risk-free securities)**

At a given risk-free rate, the optimum portfolio (or portfolios) to select is one where an indifference curve touches the efficient frontier of portfolios at a **tangent**. In Figure 4, this is the portfolio marked M, where indifference curve C touches the efficient frontier at a tangent. Any portfolio on an indifference curve to the right of curve C, such as one on curve D, would be worse than M, as it corresponds to a lower risk-free rate.

### 2.4 The market portfolio

We have said that rational, risk averse investors will only want to hold one portfolio of risky investments: portfolio M. Therefore, since all investors wish to hold Portfolio M, and all shares quoted on the Stock Exchange must be held by investors, it follows that all shares quoted on the Stock Exchange must be in portfolio M.

Therefore, portfolio M is the **market portfolio** and each investor’s portfolio will contain a proportion of it, with investments reflecting the risk and return characteristics of all shares in the market.

**Definition**

The **market portfolio** is a hypothetical portfolio containing every security available to investors in a given market, in amounts proportional to their market values.

In the real world, investors do not hold every quoted security in their portfolio, in practice a **well-diversified portfolio** will ‘mirror’ the whole market in terms of weightings given to particular sectors, high income and high capital growth securities, and so on. It has been shown that in practice, only 10 to 12 or so diverse shares are needed to reach this position.

### 2.5 Risk-free investments

All the portfolios created by combining investments in securities carry some degree of risk. But some investments are risk-free. It is extremely unlikely that the Commonwealth Government would default on any payment of interest and capital on its stocks. Therefore, government stocks can be taken to be risk-free investments.

If we introduce the possibility of holding a portfolio that includes a **risk-free investment** into the analysis we can see that the old efficient frontier is superseded by combinations of the risk-free investment with the market portfolio (Figure 5).
2.6 The capital market line

The straight line XZME is drawn at a tangent to the efficient frontier and cuts the y axis at the point of the risk-free investment’s return. It represents all possible combinations of the market portfolio and the risk-free asset.

All points along the line, known as the capital market line (CML), have superior risk-return profiles to any portfolio on the efficient frontier.

Portfolio M is the same as in Figure 4. It is the efficient portfolio consisting entirely of risky investments which will appeal to the investor most.

Portfolio Z is a mixture of the investments in portfolio M and risk-free investments.

Investors will prefer portfolio Z (a mixture of risky portfolio M and the risk-free investment) to portfolio P because a higher return is obtained for the same level of risk.

Portfolios that lie below the CML, such as P, are said to be inefficient. Any portfolio that lies on or above the line is efficient.

As with the curvilinear frontier, one portfolio on the capital market line is as attractive as another, since the return it offers exactly compensates for the risk involved. The exact portfolio selected will depend on the individual investor’s attitude to risk. To make this clearer consider the following example.

A more risk averse investor may wish to hold portfolio Z, which lies 2/3 of the way along the CML between risk-free investment X and portfolio M (that is, a holding comprising 2/3 portfolio M and 1/3 risk-free securities).

A less risk averse investor may wish to hold portfolio E, which entails putting all his funds in portfolio M and borrowing money at the risk-free rate to acquire more of portfolio M.

Note the impact of financial leverage or gearing: by borrowing at the risk-free rate the investor can move up the line and increase the available return on his portfolio.

Question 1: Efficient portfolios

The following data relate to four different portfolios of securities:

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Expected rate of return</th>
<th>Standard deviation of return on the portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>K</td>
<td>11</td>
<td>6.7</td>
</tr>
<tr>
<td>L</td>
<td>14</td>
<td>7.5</td>
</tr>
<tr>
<td>M</td>
<td>10</td>
<td>3.3</td>
</tr>
<tr>
<td>N</td>
<td>15</td>
<td>10.8</td>
</tr>
</tbody>
</table>

The expected rate of return on the market portfolio is 8.5% with a standard deviation of 3 per cent. The risk-free rate is 5 per cent. Identify which of these portfolios could be regarded as ‘efficient’.

(The answer is at the end of the chapter)
2.7 Impact of leverage and short selling on portfolio risk and return

In Section 2.6 we saw that an investor can move up or down the capital market line by lending or borrowing at the risk-free rate.

Therefore, portfolio E in Figure 5, represents a risk/return combination beyond that of the market portfolio, achieved by borrowing at the risk-free rate to invest more in risky securities.

The impact of financial leverage or gearing is that by borrowing at the risk-free rate the investor can increase the available return on his portfolio.

Investors can also increase the returns available on their portfolio by selling one asset short (effectively taking out a risky loan) and using the funds generated to invest more than their original capital, in an alternative asset which generates a higher return. This strategy is unlikely to be preferred by more risk averse investors since short selling involves the potential for large losses if the market rises instead of falls.

Note: short selling involves the investor selling an asset that he does not own at the time of sale, in order to generate cash, in the expectation that the market will fall and he can purchase the asset at a lower price in the future, in order to fulfil the transaction.

2.8 Does portfolio theory apply to companies?

Our discussion of portfolio theory has concentrated mainly on portfolios of stocks and shares. Just as an investor can reduce the risk of variable returns by diversifying into a portfolio of different securities, a company can reduce its own risk and stabilise its profitability if it invests in a portfolio of different projects or operations, assuming that any positive correlation between returns is weak.

3 The Capital Asset Pricing Model (CAPM)

Section overview

- The Capital Asset Pricing Model (CAPM) is a formula for predicting the required rate of return for an investment, based upon its level of systematic risk relative to that of the market as a whole. It can be used to calculate a discount rate or cost of equity that incorporates risk.
- The risk involved in holding securities (shares) divides into risk specific to the company (unsystematic) and risk due to variations in market activity (systematic).
- Unsystematic or business risk can be diversified away, while systematic or market risk cannot.
- CAPM is based on a comparison of the systematic risk of individual investments with the risks of all shares in the market.
- CAPM states that the required return of a well-diversified investor will be based on the risk-free rate, plus a premium for systematic risk. The size of this premium is the difference between the average stock market returns and the risk-free rate of return, multiplied by a beta factor: $\beta(r_m - r_f)$.
- The beta factor measures the systematic risk of a security relative to the risk of the market portfolio.
- Each company’s equity has its own beta factor. A higher beta indicates higher (non-diversifiable) systematic risk. When a company has a beta factor in excess of 1.0, its expected returns are higher than the average returns for the market as a whole. A beta factor of less than 1.0 indicates systematic risk lower than the market average, and so expected returns are also lower than the market average.

3.1 Overview of CAPM

Definition

Capital Asset Pricing Model (CAPM) is a formula for predicting the required rate of return for an investment, based upon its level of systematic risk relative to that of the market as a whole.
The capital asset pricing model can be used as a formula for calculating the cost of equity capital. It is an alternative to the dividend valuation model and dividend growth model.

The uses of the capital asset pricing model (CAPM) include:

(a) establishing the 'correct' equilibrium market value of a company's shares.
(b) establishing the cost of a company's equity (and the company's average cost of capital), taking account of both the business and financial risk characteristics of a company's investments.

It is useful to try to understand the logic underlying the CAPM. A starting point is the difference between systematic risk and unsystematic risk in investments.

### 3.2 Systematic risk and unsystematic risk

Whenever an investor invests in some shares, or a company invests in a new project, there will be some risk involved. The actual return on the investment might be better or worse than that hoped for. To some extent, risk is unavoidable, unless the investor settles for risk-free securities such as gilts.

Provided that the investor diversifies his investments in a suitably wide portfolio, ideally including investments that are negatively correlated, the investments which perform well and those which perform badly should tend to cancel each other out, and much risk can be diversified away. In the same way, a company which invests in a number of projects will find that some do well and some do badly, but taking the whole portfolio of investments, average returns should turn out much as expected.

Risks that can be diversified away, because they are specific to an individual project or investment, are referred to as unsystematic risk.

---

**Definition**

**Non-systematic** or **unsystematic risk** applies to a single investment or class of investments, and can be reduced or eliminated by diversification.

However, even if an investor holds a well-diversified portfolio, with no unsystematic risk, not all risk can be diversified away. All securities will be affected to some extent by the underlying risks of the market – changes in the economy, unexpected global events (e.g. September 11 2001), general elections etc – which will cause variations in the returns of the most diversified of portfolios.

This inherent risk, known as the **systematic risk** or **market risk**, cannot be diversified away because it affects all securities on the market, albeit some to a greater or lesser extent than others.

---

**Definition**

**Market** or **systematic risk** is risk that cannot be diversified away.
Systematic risk must be accepted by any investor, unless he invests entirely in risk-free investments. In return for accepting systematic risk, an investor will expect to earn a return which is higher than the return on a risk-free investment.

The amount of systematic risk in an investment varies between different types of investment, because they will be more or less sensitive to market factors:

(a) The systematic risk in the operating cash flows of a tourism company which will be highly sensitive to consumers' spending power might be greater than the systematic risk for a utility company. Although both would be affected by a recession, one might be affected more than the other.

(b) Some individual projects will be more risky than others and so the systematic risk involved in an investment to develop a new product would be greater than the systematic risk of investing in a replacement asset.

3.3 Systematic risk and unsystematic risk: implications for investments

The implications of systematic risk and unsystematic risk are as follows:

(a) If an investor wants to avoid risk altogether, he must invest entirely in risk-free securities.

(b) If an investor holds shares in just a few companies, there will be some unsystematic risk as well as systematic risk in his portfolio, because he will not have spread his risk enough to diversify away the unsystematic risk. To eliminate unsystematic risk, he must build up a well diversified portfolio of investments.

(c) If an investor holds a balanced portfolio of all the stocks and shares on the stock market, he will incur systematic risk which is exactly equal to the average systematic risk in the stock market as a whole.

(d) Shares in individual companies will have different systematic risk characteristics to this market average. Some shares will be less risky and some will be more risky than the stock market average. Similarly, some investments will be more risky and some will be less risky than a company's 'average' investments.

3.4 Propositions of CAPM

The capital asset pricing model is mainly concerned with how systematic risk is measured, and how systematic risk affects required returns and share prices.

It makes the following propositions:

(a) Investors in shares require a return in excess of the risk-free rate, to compensate them for systematic risk.
(b) Investors should not require a premium for unsystematic risk, because this can be diversified away by holding a wide portfolio of investments.

(c) Because systematic risk varies between companies, investors will require a higher return from shares in those companies where the systematic risk is bigger.

The same propositions can be applied to capital investments by companies:

(a) Companies will want a return on a project to exceed the risk-free rate, to compensate them for systematic risk.

(b) Unsystematic risk can be diversified away, and so a premium for unsystematic risk should not be required.

(c) Companies should want a bigger return on projects where systematic risk is greater.

### 3.5 Systematic risk and CAPM

#### 3.5.1 Market risk and returns

Market risk (systematic risk) is the average risk of the market as a whole. Taking all the shares on a stock market together, the total expected returns from the market will vary because of systematic risk. The market as a whole might do well or it might do badly.

#### 3.5.2 Risk and returns from an individual security

In the same way, an individual security may offer prospects of a return of $x\%$, but with some risk attached. The return ($x$ per cent) that investors will require from the individual security will be higher or lower than the market return, depending on whether the security’s systematic risk is greater or less than the market average.

**Worked Example: Risks**

The following information is available about the performance of an individual company’s shares and the stock market as a whole.

<table>
<thead>
<tr>
<th>Individual company</th>
<th>Stock market as a whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price at start of period</td>
<td>105.0</td>
</tr>
<tr>
<td>Price at end of period</td>
<td>110.0</td>
</tr>
<tr>
<td>Dividend during period</td>
<td>7.6</td>
</tr>
</tbody>
</table>

Calculate the return on the company’s shares and the return on the stock market as a whole.

**Solution**

The expected return on the company’s shares $R_i$ and the expected return on the ‘market portfolio’ of shares ($r_m$) may be calculated as:

\[
R_i = \frac{P_1 - P_0 + D}{P_0} = \frac{110 - 105 + 7.6}{105} = 12\%
\]

\[
r_m = \frac{490 - 480 + 39.2}{480} = 10.25\%
\]

Alternatively:

% total return = Capital gain yield + dividend yield

Capital gain yield = \[
\frac{P_1 - P_0}{P_0} = \frac{110 - 105}{105} = 4.8\%
\]

Dividend yield = \[
\frac{D}{P_0} = \frac{7.6}{105} = 7.2\%
\]

Hence total return = $4.8\% + 7.2\% = 12\%$
3.5.3 Comparing returns from an individual security with the average market return

A statistical analysis of 'historic' returns from a security and from the 'average' market may suggest that a linear relationship can be assumed to exist between them. A series of comparative figures could be prepared of the return from a company's shares and the average return of the market as a whole. The results could be drawn on a scattergraph and a 'line of best fit' drawn (using linear regression techniques) as shown below.

Figure 7 Returns from an individual security compared with average market return

This analysis would show the following:

(a) The return from the security and the return from the market as a whole will tend to rise or fall together. Note that returns can be negative. A share price fall represents a capital loss, which is a negative return.

(b) The return from the security may be higher or lower than the market return. This is because the systematic risk of the individual security differs from that of the market as a whole.

(c) What is of interest, is the angle or gradient of the line of best fit. Here it is less than 45 degrees, indicating that a given change in market return generally corresponds to a smaller change in share return. This indicates that the share's returns are less susceptible to market risk factors than market average, i.e. its systematic risk element is lower than market average.

(d) The scattergraph may not give a good line of best fit, unless a large number of data items are plotted, because actual returns are affected by unsystematic risk as well as by systematic risk.

The conclusion from this analysis is that individual securities will be either more or less risky than the market average in a fairly predictable way. A major assumption in CAPM is that there is a linear relationship between the return obtained from an individual security and the average return from all securities in the market.

The measure of this relationship between market returns and an individual security's returns, reflecting differences in systematic risk characteristics, can be developed into a beta factor for the individual security.

3.6 Beta factors

Systematic risk is measured using beta factors.

Definition

Beta factor is the measure of the systematic risk of a security relative to the risk of the market portfolio. The beta factor of the market as a whole is 1.0.

Suppose that returns on shares in XYZ tend to vary twice as much as much as returns from the market as a whole, so that if market returns went up 3%, say, returns on XYZ shares would be expected to go up by 6% and if market returns fell by 3%, returns on XYZ shares would be expected to fall by 6%. The beta factor of XYZ shares would be 2.0. Conversely, if the share price moved at half the market rate, the beta factor would be 0.5.
Therefore, if the average market return rises by, say, 2%, the return from a share with a beta factor of 0.8 should rise by 1.6% in response to the same conditions which have caused the market return to change. The actual return from the share might rise by, say, 2.5%, or even fall by, say, 1%, but the difference between the actual change and a change of 1.6% due to general market factors would be attributed to unsystematic risk factors unique to the company or its industry.

It is an essential principle of CAPM theory that unsystematic risk can be cancelled out by diversification. In a well-balanced portfolio, an investor’s gains and losses from the unsystematic risk of individual shares will tend to cancel each other out. In other words, if shares in X do worse than market returns and the beta factor of X’s shares would predict, shares in Y will do better than predicted, and the net effect will be self-cancelling elimination of the specific (unsystematic) risk from the portfolio, leaving the average portfolio return dependent only on changes in the average market return and the beta factors of shares in the portfolio.

3.7 The equity risk premium

The CAPM makes use of the principle that returns on shares in the market as a whole are expected to be higher than the returns on risk-free investments. The difference between market returns and risk-free returns is called an excess return or market risk premium.

**Definition**

Market risk premium or equity risk premium is the difference between the expected rate of return on a market portfolio and the risk-free rate of return over the same period.

For example, if the return on Commonwealth Government stocks is 9% and market returns are 13 per cent, the excess return on the market’s shares as a whole (the market risk premium) is 4 per cent.

Let:  
- \( r_f \) = the risk-free rate of return  
- \( r_m \) = the return on market portfolio M

The equity risk premium \( (r_m - r_f) \) represents the excess of market returns over those associated with investing in risk-free assets.

It is possible to calculate the appropriate risk premium for any given security by taking the market risk premium multiplied by the security’s beta factor.

Therefore, if an individual share’s price rises or falls at double the market rate, such that it would have a beta factor of 2.0, investors would require double the market risk premium: i.e. a premium of 8% (2.0 x 4%) over the risk free rate.

**Question 2: Risk premiums**

Shares in DEF have a beta of 1.5 when the risk-free return is 9 per cent and the expected market return is 13 per cent.

Calculate the expected return on DEF shares. What would happen to the expected return if market returns fell by 3 per cent?

(The answer is at the end of the chapter)

3.8 The CAPM formula

The CAPM may be used to calculate a cost for equity, to go into the calculation of WACC. A beta factor can also be applied to individual capital projects, so that high-risk projects should be expected to provide a higher return than lower risk projects.

**Formula to learn**

\[ E(r_i) = r_f + \beta_i (r_m - r_f) \]
where: \( E(r_i) \) is the required or expected return from a security.
\( r_f \) is the risk-free rate of return.
\( r_m \) is the return from the market as a whole.
\( \beta_i \) is the beta factor of the individual security.

In graphical form, this equation is known as the Security Market Line (SML).

### 3.9 Interpreting beta factors

If a security has a beta of 1, it means it has the same level of systematic risk as the market portfolio. Therefore, the required return from the security would equal \( r_m \).

If a security has a beta of >1, it means it has more systematic risk than the market portfolio. Therefore, the required return from the security would exceed \( r_m \).

If a security has a beta of <1, it means it has less systematic risk than the market portfolio. Therefore, the required return from the security would be lower than \( r_m \).

If a security has a beta of 0, it equates to a risk-free investment.

---

**Worked Example: CAPM (1)**

Shares in Louie and Dewie have a beta of 0.9. The expected returns to the market are 10% and the risk-free rate of return is 4%. What is the required return for shares in Louie and Dewie?

**Solution**

\[
E(r_i) = r_f + \beta_i(r_m - r_f)
\]

\[
= 4 + 0.9 \times (10 - 4)
\]

\[
= 9.4\%
\]

---

**Worked Example: CAPM (2)**

Investors have an expected rate of return of 8% from ordinary shares in Algol, which have a beta of 1.2. The expected returns to the market are 7%.

What will be the expected rate of return from ordinary shares in Rigel, which have a beta of 1.8?
Solution

Algol: \( E(r_i) = r_f + \beta_i(r_m - r_f) \)

\[
\begin{align*}
8 &= r_f + 1.2(7 - r_f) \\
8 &= r_f + 8.4 - 1.2 r_f \\
0.2 r_f &= 0.4 \\
r_f &= 2
\end{align*}
\]

Rigel: \( E(r_i) = 2 + (7 - 2) \times 1.8 = 11\% \)

Question 3: Expected returns from a share

The risk-free rate of return is 7 per cent. The average market return is 11 per cent.

(a) What will be the return expected from a share whose beta factor is 0.9?

(b) What would be the share’s expected value if it is expected to earn an annual dividend of 5.3c, with no capital growth?

(The answer is at the end of the chapter)

3.10 Problems with applying the CAPM in practice

Problems of CAPM include unrealistic assumptions and the required estimates being difficult to make.

(a) CAPM is a single period model, i.e. the results are only valid so long as the inputs (risk-free rate, market return, beta) remain constant.

(b) The need to determine the market premium \((r_m - r_f)\). Expected, rather than historical, returns should be used, although historical returns are often used in practice.

(c) 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.

(d) Errors in the statistical analysis used to calculate beta values. Betas may also change over time.

Question 4: Beta factors

(a) What does beta measure, and what do betas of 0.5, 1 and 1.5 mean?

(b) What factors determine the level of beta which a company may have?

(The answer is at the end of the chapter)

3.11 Dividend growth model and CAPM

In Chapter 6 we looked at the DVM as a method of calculating the cost of equity capital of a company. If a company’s shareholders are well-diversified, CAPM can be used to determine its cost of equity.

Worked Example: Use of CAPM to predict cost of equity and share prices

Company X and company Y both pay an annual cash return to shareholders of 34.5 cents per share and this is expected to continue in perpetuity. The risk-free rate of return is 8% and the current average market rate of return is 12%. Company X’s beta coefficient is 1.8 and company Y’s is 0.8. What is the expected
return from companies X and Y respectively, and what would be the predicted market value of each company’s shares?

Solution
(a) The expected return for X is $8\% + (12\% - 8\%) \times 1.8 = 15.2\%$
(b) The expected return for Y is $8\% + (12\% - 8\%) \times 0.8 = 11.2\%$

The dividend valuation model can now be used to derive expected share prices.
(c) The predicted value of a share in X is $\frac{34.5c}{0.152} = 227$ cents
(d) The predicted value of a share in Y is $\frac{34.5c}{0.112} = 308$ cents

The actual share prices of X and Y might be higher or lower than 227c and 308c. If so, CAPM analysis would conclude that the share is currently either overpriced or underpriced.

The two models will not necessarily give the same cost of equity and you may have to calculate the cost of equity using either, or both, models.

Question 5: CAPM and DVM
The following data relates to the ordinary shares of Stilton:

| Current market price, 31 December 20X1 | 250c |
| Dividend per share, 20X1 | 3c |
| Expected growth rate in dividends and earnings | 10% pa |
| Average market return | 8% |
| Risk-free rate of return | 5% |
| Beta factor of Stilton equity shares | 1.40 |

(a) What is the estimated cost of equity using the dividend growth model?
(b) What is the estimated cost of equity using the capital asset pricing model?

(The answer is at the end of the chapter)

3.12 CAPM and project appraisal
CAPM can be used instead of the dividend valuation model to establish an equity cost of capital to use in project appraisal.

The cost of equity is $K_{eq} = r_f + (E(r_m) - r_f) \times \beta_e$

where $\beta_e$ is the beta value for the company’s equity capital.

Worked Example: Use of CAPM to find a project discount rate
- A company is financed by a mixture of equity and debt capital, whose market values are in the ratio 3:1.
- The debt capital, which is considered risk-free, yields 10% before tax. The average stock market return on equity capital is 16 per cent.
- The beta value of the company’s equity capital is estimated as 0.95. The tax rate is 30 per cent.

What would be an appropriate cost of capital to be used for investment appraisal of new projects with the same systematic risk characteristics as the company’s current investment portfolio?
Solution
An appropriate cost of capital to use, assuming no change in the company’s financial gearing, is its WACC. The CAPM can be used to estimate the cost of the company’s equity.

\[ K_{eq} = 10% + (16 - 10) \times 0.95% = 15.7\% \]

The after tax cost of debt is 0.70 \times 10\% = 7.0\% per cent.

The WACC is therefore:

\[ \text{WACC} = K_e \frac{E}{E + D} + K_d \frac{D}{E + D} \]

\[ \left(\frac{1}{4} \times 15.7\%\right) + \left(\frac{1}{4} \times 7.0\%\right) = 13.5\% \]

The cost of capital to use in project appraisal is 13.5\% per cent.

---

3.12.1 How is the WACC different using CAPM?

You might be wondering how the weighted average cost of capital (WACC) is different when we use the CAPM compared to the method of calculating the WACC which was described earlier in this chapter. The only difference is the method used to calculate the cost of the firm’s equity: the dividend valuation model (DVM) or the CAPM.

Both assume that:
- Investors are rational and risk averse.
- Capital markets are perfect.
- Capital markets are efficient, hence prices are in equilibrium.

Using the different techniques for measuring the cost of equity should, in theory, produce the same results, however differences may arise as a result of the differing assumptions and limitations of the two models. The most important being that CAPM assumes investors are well-diversified and can freely invest or borrow at the risk-free rate.

3.12.2 The usefulness and limitations of CAPM for capital investment decisions

The CAPM produces a required return based on the expected returns on the stock market as a whole, expected project returns, the risk-free interest rate and the variability of project returns relative to the market returns.

Its main advantage when used for investment appraisal is that it produces a discount rate based on the systematic risk of the individual investment. It can be used to compare projects of all different risk classes and is therefore superior to a DCF approach that uses only one discount rate for all projects, regardless of their risk.

The model was developed with respect to securities. By applying it to an investment within the firm, the company is assuming that the shareholder wishes investments to be evaluated as if they were securities in the capital market and therefore assumes that all shareholders will hold diversified portfolios and will not look to the company to achieve diversification for them.
Key chapter points

- Portfolio theory takes account of the fact that there are many investments that are unlikely to change values in accordance with each other. The investor should be concerned with their overall position, rather than the performance of individual investments.

- Correlation (and the correlation coefficient) measures the degree to which the returns on investments vary with each other. A correlation coefficient close to +1 indicates high positive correlation, and a figure close to −1 indicates high negative correlation. A figure of 0 indicates no correlation. High negative correlation gives the maximum potential for diversifying risk.

- Both individuals and firms diversify their investments. Individuals have portfolios of shares and firms have portfolios of business operations and investments. Diversification is equally an important consideration for the financial manager in making investment decisions.

- Traditional investment theory suggests that rational risk-averse investors wish to maximise return and minimise risk and will choose a portfolio which gives them a satisfactory balance between the expected returns and the risk from the portfolio, based on their individual risk preferences.

- The efficient frontier shows a collection of risky portfolios each one providing an optimal return for a given level of risk.

- The market portfolio is a hypothetical portfolio containing every security available to investors in a given market, in amounts proportional to their market values.

- When the market portfolio is combined with the risk-free asset, the range of possible portfolios lie along the capital market line (CML). All points along the CML have superior risk-return profiles to any portfolio on the efficient frontier.

- The interaction of investors’ preferences, efficient portfolios and the returns from risk-free investments provides the basis for the Capital Asset Pricing Model (CAPM) and the calculation of beta factors.

- The risk involved in holding securities (shares) divides into risk specific to the company (unsystematic) and risk due to variations in market activity (systematic).

- Unsystematic or business risk can be diversified away, while systematic or market risk cannot.

- The CAPM is a formula for predicting the required rate of return for an investment, based upon its level of systematic risk relative to that of the market as a whole. It can be used to calculate a discount rate or cost of equity that incorporates risk.

- CAPM states that the required return of a well-diversified investor will be based on the risk-free rate, plus a premium for systematic risk. The size of this premium is the difference between the average stock market returns and the risk-free rate of return, multiplied by a beta factor: \( \beta_i (r_m - r_f) \).

- The beta factor measures the systematic risk of a security relative to the risk of the market portfolio.

- Each company’s equity has its own beta factor. A higher beta indicates higher (non-diversifiable) systematic risk. When a company has a beta factor in excess of 1.0, its expected returns are higher than the average returns for the market as a whole. A beta factor of less than 1.0 indicates systematic risk lower than the market average, and so expected returns are also lower than the market average.

- The CAPM can be used to calculate a cost for equity, to go into the calculation of WACC. A beta factor can also be applied to individual capital projects, so that high-risk projects should be expected to provide a higher return than lower-risk projects.

- Problems of CAPM include unrealistic assumptions and the required estimates being difficult to make.
(a) CAPM is a single period model, i.e. the results are only valid so long as the inputs (risk-free rate, market return, beta) remain constant.

(b) The need to determine the market premium \((r_m - r_f)\). Expected, rather than historical, returns should be used, although historical returns are often used in practice.

(c) 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.

(d) Errors in the statistical analysis used to calculate beta values. Betas may also change over time.
Quick revision questions

1. Match each of A, B, C and D to its equivalent: one of 1, 2, 3 or 4.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>the expected return of a portfolio</td>
<td>the risk of an investment</td>
<td>relationship between returns from different investments</td>
<td>extent to which return exceeds the risk-free rate of return</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. The predicted returns for two assets are as follows:

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>Asset A</th>
<th>Asset B</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.25</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>II</td>
<td>0.50</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>III</td>
<td>0.25</td>
<td>6%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Which asset would a risk averse investor choose?

A. asset A
B. asset B
C. indifferent between A and B
D. depends on the individual investor’s indifference curves

3. Diversification is most effective when security returns are:

A. high
B. negatively correlated
C. positively correlated
D. uncorrelated

4. Which of the following risks can be eliminated by diversification?

A. inherent risk
B. systematic risk
C. market risk
D. unsystematic risk

5. Unsystematic risk is measured by beta factors.

   [ ] true
   [ ] false
6. A portfolio consisting entirely of risk-free securities will have a beta factor of:
   A. −1
   B. 0
   C. +1
   D. none of the above

7. The following two statements concern the propositions which underpin the capital asset pricing model (CAPM).
   I. Investors in shares require a return in excess of the risk-free rate to compensate for systematic risk.
   II. Investors will require higher returns from shares in companies where the level of systematic risk is higher.

   Which one of the following combinations (true/false) is correct?
   
<table>
<thead>
<tr>
<th>Statement</th>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>true</td>
<td>true</td>
</tr>
<tr>
<td>B</td>
<td>true</td>
<td>false</td>
</tr>
<tr>
<td>C</td>
<td>false</td>
<td>true</td>
</tr>
<tr>
<td>D</td>
<td>false</td>
<td>false</td>
</tr>
</tbody>
</table>

8. Diamond pays an annual dividend of 30 cents per share to shareholders, which is expected to continue in perpetuity. The average rate of return for the market is 9% and the company has a beta coefficient of 1.5. The risk-free rate of return is 4%.

   What is the expected rate of return for the shareholders of the company and the predicted value of the shares in the company?

<table>
<thead>
<tr>
<th>Expected rate of return (%)</th>
<th>Predicted value (cents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 23.5</td>
<td>705</td>
</tr>
<tr>
<td>B 17.5</td>
<td>171</td>
</tr>
<tr>
<td>C 16.5</td>
<td>182</td>
</tr>
<tr>
<td>D 11.5</td>
<td>261</td>
</tr>
</tbody>
</table>
Answers to quick revision questions

1 A 3, B 4, C 1, D 2

2 C

<table>
<thead>
<tr>
<th>Return</th>
<th>Return</th>
<th>Expected value A</th>
<th>Expected value B</th>
<th>A and B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A %</td>
<td>B %</td>
<td>p</td>
<td>pA</td>
<td>pB</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>0.25</td>
<td>2.5</td>
<td>1.25</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>0.5</td>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>0.25</td>
<td>1.5</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.5</td>
</tr>
</tbody>
</table>

The expected return of both A and B is 7.5%. It can be seen by inspection that the variation of returns around the mean is the same and hence the risk (as measured by the variance) is the same.

3 B When two investments are combined, the resulting risk of the portfolio depends on the correlation between them. The maximum potential for risk reduction through diversification occurs if the investments show perfect negative correlation (-1).

4 D Unsystematic risk is risk that is specific to sectors, companies or projects. Systematic risk (also known as inherent risk or market risk) affects the whole market and therefore cannot be reduced by diversification.

5 False. Beta factors measure systematic risk.

6 B Beta factor is the measure of the systematic risk of a security relative to the risk of the market portfolio. A beta of 0 equates to a risk-free investment with returns that do not fluctuate despite fluctuations in the market.

7 A The capital asset pricing model assumes investors are already well-diversified and therefore unconcerned with unsystematic risk. It is concerned with how systematic risk affects required returns and share prices. It. Investors in shares require a return in excess of the risk-free rate, to compensate them for systematic risk. The higher the systematic risk, the higher the return required.

8 D Expected rate of return = 4% + 1.5 (9% – 4%) = 11.5%

Predicted share value = 30 cents/0.115 = 261 cents
To answer this question, we can start by drawing the CML (see below).

(a) When risk = 0, return = 5
(b) When risk = 3, return = 8.5

These points can be plotted on a graph and joined up, and the line can be extended to produce the CML. The individual portfolios K, L, M and N can be plotted on the same graph.

(a) Any portfolio which is on or above the CML is efficient.
(b) Any portfolio which is below the CML is inefficient.

(a) Portfolio M is very efficient.
(b) Portfolio L is also efficient.
(c) Portfolios K and N are inefficient.

If you prefer numbers to graphs, we can tackle the problem in a slightly different way, by calculating the equation of the CML.

Let the standard deviation of a portfolio be \( x \).
Let the return from a portfolio be \( y \).

The CML equation is \( y = r_f + bx \) where \( r_f \) is the risk-free rate of return. Here, this is 5.

To calculate \( b \), we can use the high-low method.

When \( x = 3 \), \( y = 8.5 \)
When \( x = 0 \), \( y = 5 \)

Therefore \( b = \frac{(8.5 - 5)}{(3 - 0)} = \frac{3.5}{3} = 1.16667 \)

The CML is \( y = 5 + 1.16667x \)
If the actual return exceeds the CML return for the given amount of risk, the portfolio is efficient. Here, L is efficient and M is even more efficient, but K and N are inefficient.

The expected return on DEF shares would exceed the risk-free return by \((13 - 9) \times 1.5\% = 6\%\) and the total expected return on DEF shares would be \((9 + 6)\% = 15\%\).

If the market returns fall by 3% to 10%, the expected return on DEF shares would fall by \(1.5 \times 3\% = 4.5\%\) to 10.5%, being \(9\% + (10 - 9) \times 1.5\% = 10.5\%\).

(a) \(7\% + 0.9 \times (11\% - 7\%) = 10.6\%

(b) \(\frac{5.3c}{10.6\%} = 50c\)

4 (a) **Beta measures** the systematic risk of a risky investment such as a share in a company. The total risk of the share can be sub-divided into two parts, known as **systematic (or market) risk** and **unsystematic (or unique) risk**. The systematic risk depends on the sensitivity of the return of the share to general economic and market factors such as periods of boom and recession. The capital asset pricing model shows how the return which investors expect from shares should depend only on systematic risk, not on unsystematic risk, which can be eliminated by holding a well-diversified portfolio.

Beta is calibrated such that the average risk of stock market investments has a **beta of 1**. Therefore, shares with betas of 0.5 or 1.5 would have half or 1½ times the average sensitivity to market variations respectively.

This is reflected by higher volatility of share prices for shares with a beta of 1.5 than for those with a beta of 0.5. For example, a 10% increase in general stock market prices would be expected to be reflected as a 5% increase for a share with a beta of 0.5 and a 15% increase for a share with a beta of 1.5, with a similar effect for price reductions.

(b) The beta of a company will be the **weighted average** of the beta of its shares and the beta of its debt. The beta of debt is very low, but not zero, because corporate debt bears default risk, which in turn is dependent on the volatility of the company’s cash flows.

Factors determining the beta of a company’s equity shares include:

(i) **Sensitivity** of the company’s cash flows to economic factors, as stated above. For example, sales of new cars are more sensitive than sales of basic foods and necessities.

(ii) The company’s **operating gearing**. A high level of fixed costs in the company’s cost structure will cause high variations in operating profit compared with variations in sales.

(iii) The company’s **financial gearing**. High borrowing and interest costs will cause high variations in equity earnings compared with variations in operating profit, increasing the equity beta as equity returns become more variable in relation to the market as a whole. This effect will be countered by the low beta of debt when computing the weighted average beta of the whole company.

5 (a) \[ k_o = \frac{d_o (1 + g)}{P_o} + g \]

\[ = \frac{3 (1.10)}{250} + 0.10 \]

\[ = 0.1132 \text{ or } 11.32\% \]

(b) \[ k_o = 5 + 1.40 (8 - 5) = 9.2\% \]
# Chapter 8

## Efficient market hypothesis and dividend policy

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficient Market Hypothesis</strong></td>
<td>LO5</td>
</tr>
<tr>
<td>Distinguish between the weak form test, the semi strong form test and the strong form test of the Efficient Market Hypothesis (EMH)</td>
<td>LO5.1</td>
</tr>
<tr>
<td>Explain the implications of market efficiency for both investors and companies</td>
<td>LO5.2</td>
</tr>
<tr>
<td>In the context of capital markets distinguish between operating efficiency, allocative efficiency and pricing efficiency</td>
<td>LO5.3</td>
</tr>
<tr>
<td><strong>Long term financing, investment appraisal and dividend policy</strong></td>
<td>LO6</td>
</tr>
<tr>
<td>Explain the factors which influence the dividend policy decision</td>
<td>LO6.2</td>
</tr>
<tr>
<td><strong>Valuation of corporate securities</strong></td>
<td>LO9</td>
</tr>
<tr>
<td>Calculate and interpret share price in both perfect and imperfect markets</td>
<td>LO9.2</td>
</tr>
</tbody>
</table>

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**Topic list**

1. The efficient market hypothesis
2. Implications for share values
3. Dividend policy
Introduction

This chapter deals with market efficiency, the determination of share prices and dividend policy.

As we shall explore, there are various theories which seek to provide a rationale for share price movement. The most important of these is the efficient market hypothesis, which provides an explanation of how markets take into account new information.

There is a clear link between financing decisions and the wealth of a company’s shareholders. Dividend policy plays a big part in a company’s relations with its equity shareholders, and a listed company must consider how the stock market will view its results and the impact of a change in dividend policy on its share price.
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What is the fundamental theory of share values? (Section 1.1)
2. Explain the difference between allocative, operational and information processing efficiency. (Section 1.3)
3. What is the efficient market hypothesis? (Section 1.6)
4. What are weak, semi-strong and strong form efficiency? (Section 1.6)
5. What is chartism? (Section 2.2)
6. What does dividend policy refer to? (Section 3.1)
7. Name two different theories of dividend policy. (Section 3.5)
8. What is the residual theory of dividends? (Section 3.5)
1 The efficient market hypothesis

Section overview
- The fundamental theory of share values states that the current market price of a share represents the present value of all future returns from that share, discounted at the shareholders’ cost of capital (required rate of investment return).
- The efficiency of a market refers to the extent to which share prices react to information about a company and its profitability. A market can be described as showing one of three forms of efficiency: weak form, semi-strong form and strong form.
  - Weak form efficiency implies that prices reflect all relevant information about past price movements and their implications.
  - Semi-strong form efficiency implies that prices reflect past price movements and publicly available knowledge.
  - Strong form efficiency implies that prices reflect past price movements, publicly available knowledge and inside knowledge.

1.1 The fundamental theory of share values

There is a theory of share prices, known as the fundamental theory of share values, which states:

The current market price of a share represents the present value of all future expected returns from the share, discounted at the shareholders’ cost of capital (required rate of investment return).

This theory of share values is the basis of the dividend valuation model and the dividend growth model, which were explained in the chapter on cost of capital.

If the fundamental theory of share values is correct, it has implications for changes in share prices and so changes in shareholder wealth. If a company undertakes a capital project with a positive NPV, and shareholders are aware of the future cash flows arising from the project, the total value of the company’s shares should rise immediately by the amount of the project’s NPV.

This is a theory of share values. It raises the question of whether it has validity in practice, and if so, to what extent.

1.2 Market efficiency

Definitions
An efficient market is one where the prices of securities bought and sold reflects all the relevant information available.

The efficiency of a market refers to the extent to which share prices react to information about a company and its profitability. Efficiency relates to how quickly and accurately prices adjust to new information.

Efficiency of a stock market, in the context of this chapter, relates to the extent to which:

(a) information about a company is available to investors, and

(b) shareholders use this information to re-assess the value of the shares, and buy shares that seem under-priced and sell shares that seem over-priced, so that the market price rises or falls to a new level.
1.3 Types of efficiency

Different types of efficiency can be distinguished in the context of the operation of financial markets.

(a) ** Allocative efficiency 
   If financial markets allow funds to be directed towards firms which make the most productive use of them, then there is allocative efficiency in these markets.

(b) ** Operational efficiency 
   Transaction costs are incurred by participants in financial markets, for example commissions on share transactions, margins between interest rates for lending and for borrowing, and loan arrangement fees. Financial markets have operational efficiency if transaction costs are kept as low as possible. Transaction costs are kept low where there is open competition between brokers and other market participants.

(c) ** Informational processing efficiency 
   The information processing efficiency of a stock market means the ability of a stock market to price stocks and shares fairly and quickly. An efficient market in this sense is one in which the market prices of all securities reflect all the available information.

1.4 Features of efficient markets

It has been argued that the world’s stock markets are efficient capital markets, that is, markets in which:

(a) The prices of securities bought and sold reflect all the relevant information which is available to the buyers and sellers: in other words, share prices change quickly to reflect all new information about future prospects.

(b) No individual dominates the market.

(c) Transaction costs of buying and selling are not so high as to discourage trading significantly.

(d) Investors are rational.

(e) There are low, or no, costs of acquiring information.

1.5 Impact of efficiency on share prices

If the stock market is efficient, share prices should vary in a rational way.

(a) If a company makes an investment with a positive net present value (NPV), shareholders will find out and the market price of its shares will rise in anticipation of future dividend increases.

(b) If a company makes a bad investment shareholders will find out and so the price of its shares will fall.

(c) If interest rates rise, shareholders will want a higher return from their investments, so market prices will fall.

1.6 The efficient market hypothesis

**Definition**

The efficient market hypothesis is the hypothesis that the stock market reacts immediately to all the information that is available. Therefore, a long term investor cannot obtain higher than average returns from a well diversified share portfolio.

A market can be described as showing one of three degrees or forms of information processing efficiency: weak form, semi-strong or strong.
1.6.1 Weak form efficiency

Under the weak form hypothesis of market efficiency, share prices reflect all available information about past changes in the share price.

Since new information arrives unexpectedly, changes in share prices should occur in a random fashion. If it is correct, then using technical analysis (see Section 2.2 below) to study past share price movements will not give anyone an advantage, because the information they use to predict share prices is already reflected in the share price.

Tests to prove that a stock market displays weak form efficiency are based on the fact that:

(a) share price changes are random and occur in response to historical information about the company when it is released and becomes available.

(b) there is no connection between past price movements and new share price changes, and trends in prices cannot be detected.

1.6.2 Semi-strong form efficiency

If a stock market displays semi-strong efficiency, current share prices reflect both:

(a) all relevant information about past price movements and their implications, and

(b) all knowledge which is available publicly.

This means that individuals cannot 'beat the market' by reading the newspapers or annual reports, since the information contained in these will be reflected in the share price.

Tests to prove semi-strong efficiency have concentrated on the speed and accuracy of stock market response to information and on the ability of the market to anticipate share price changes before new information is formally announced. For example, if two companies plan a merger, share prices of the two companies will inevitably change once the merger plans are formally announced. The market would show semi-strong efficiency, however, if it were able to anticipate such an announcement, so that share prices of the companies concerned would change in advance of the merger plans being confirmed.

Research in both the US and the UK has suggested that market prices anticipate mergers several months before they are formally announced, and the conclusion drawn is that the stock markets in these countries do exhibit semi-strong efficiency.

1.6.3 Strong form efficiency

If a stock market displays a strong form of efficiency, share prices reflect all information whether publicly available or not:

• from past price changes,

• from public knowledge or anticipation, or

• from specialists' or experts' insider knowledge (e.g. investment managers).

Investors in the market will be aware of all significant future changes affecting the company and its future profits and dividends.

A market with strong-form efficiency would be consistent with the fundamental theory of share values.

1.7 Implications of efficient market hypothesis for companies and their financial managers

If the markets are quite strongly efficient, the main consequence for financial managers will be that they simply need to concentrate on maximising the net present value of the company's investments in order to maximise the wealth of shareholders. Managers need not worry, for example, about the effect on share prices of financial results in the published accounts because investors will make allowances for low profits or dividends in the current year if higher profits or dividends are expected in the future.

If the market is strongly efficient, there is little point in financial managers attempting strategies that will attempt to mislead the markets.
(a) There is no point for example in trying to identify a correct date when shares should be issued, since share prices will always reflect the true worth of the company.

(b) The market will identify any attempts to window dress the accounts and put an optimistic spin on the figures.

(c) The market will decide what level of return it requires for the risk involved in making an investment in the company. It is pointless for the company to try to change the market’s view by issuing different types of capital instruments.

Similarly, if the company is looking to expand, the directors will be wasting their time if they seek as takeover targets companies whose shares are undervalued, since the market will fairly value all companies’ shares.

Only if the market is semi-strongly efficient, and the financial managers possess inside information that would significantly alter the price of the company’s shares if released to the market, could they perhaps gain an advantage. However, attempts to take account of this inside information may breach insider dealing laws.

The different characteristics of a semi-strong form and a strong form efficient market therefore affect the timing of share price movements, in cases where the relevant information becomes available to the market eventually. The difference between the two forms of market efficiency concerns when the share prices change, not by how much prices eventually change.

2 Implications for share values

Section overview

- The fundamental theory of share values states that share prices can be derived from an analysis of future dividends.
- Technical analysts or chartists work on the basis that past price patterns will be repeated.
- Random walk theory is based on the idea that share prices will alter when new information becomes available.
- If stock markets are efficient, in accordance with EMH, then an individual investor will not have an opportunity to consistently outperform the market by making abnormal gains, and techniques such as fundamental analysis are largely irrelevant.
- In practice, share prices may be affected by market imperfections, pricing anomalies and investor speculation.

2.1 The fundamental theory of share values

We discussed the fundamental theory of share values in Section 1. Remember that it is based on the theory that the realistic market price of a share can be derived from a valuation of estimated future dividends. The value of a share will be the discounted present value of all future expected dividends on the shares, discounted at the shareholders’ cost of capital.

If the fundamental theory of share values is correct, the price of any share will be predictable.

This is provided that all investors have:

- the same information about a company’s expected future profits
- the same information about a company’s expected and dividends
- a known cost of capital.
**Worked Example: Share valuation**

The management of Crocus are trying to decide on the dividend policy of the company. There are two options that are being considered:

(a) The company could pay a constant annual dividend of 8 cents per share.

(b) The company could pay a dividend of 6c per share this year, and use the retained earnings to achieve an annual growth of 3 per cent in dividends for each year after that.

The shareholders’ cost of capital is thought to be 10 per cent. Which dividend policy would maximise the wealth of shareholders, by maximising the share price?

**Solution**

(a) With a constant annual dividend

\[
\text{Share price} = \frac{8}{0.1} = 80c
\]

(b) With dividend growth

\[
\text{Share price} = \frac{6(1.03)}{(0.1 - 0.03)} = \frac{6.18}{0.07} = 88c
\]

The dividend of 6c per share with 3 per cent annual growth would be preferred.

---

### 2.2 Chartism or technical analysis

Chartists or 'technical analysts' attempt to predict share price movements by assuming that past price patterns will be repeated. Chartists do not attempt to predict every price change. They are primarily interested in trend reversals, for example when the price of a share has been rising for several months but suddenly starts to fall.

Moving averages help the chartist to examine overall trends. For example, he may calculate and plot moving averages of share prices for 20 days, 60 days and 240 days. The 20-day figures will give a reasonable representation of the actual movement in share prices after eliminating day to day fluctuations. The other two moving averages give a good idea of longer term trends.

One of the main problems with chartism is that it is often difficult to see a new trend until after it has happened. By the time the chartist has detected a signal, other chartists will have as well, and the resulting mass movement to buy or sell will push the price so as to eliminate any advantage.

With the use of sophisticated computer programs to simulate the work of a chartist, academic studies have found that the results obtained were no better or worse than those obtained from a simple 'buy and hold' strategy of a well diversified portfolio of shares.

This may be explained by research that has found that there are no regular patterns or cycles in share price movements over time – they follow a random walk.

### 2.3 Random walk theory

Random walk theory is consistent with the fundamental theory of share values. It accepts that a share should have an intrinsic price dependent on the fortunes of the company and the expectations of investors. One of its underlying assumptions is that all relevant information about a company is available to all potential investors who will act upon the information in a rational manner.

The key feature of random walk theory is that although share prices will have an intrinsic or fundamental value, this value will be altered as new information becomes available, and that the behaviour of investors is such that the actual share price will fluctuate from day to day around the intrinsic value.
2.4 Fundamental analysis

Fundamental analysis involves analysing all the publicly available information about a company, its industry and the economy in which it operates, in order to ascertain the intrinsic value of the share and assess whether its current share price is accurate. Profits can be made by trading shares that are perceived as under-valued.

2.5 Implications of EMH for investors

The efficient market hypothesis (EMH) implies that if new information is revealed about a company it will be incorporated into its share price rapidly and rationally, with respect to both the direction and size of the share price movement.

(a) In an efficient market, no investor will be presented with an opportunity for making a return on a share that exceeds the fair return for the risk associated with that share.

Stock markets are widely held to be at least semi-strong efficient. The absence of abnormal profit possibilities arises because current and past information is immediately reflected in current prices. It is only new information, which causes prices to change. Therefore, an individual investor would only be able to consistently outperform the market by gaining access to information before it became available to the majority of investors. For the vast majority of investors this implies that public information cannot be used to earn abnormal returns.

(b) The implication is that fundamental analysis is a waste of money and that so long as efficiency is maintained, the average investor should simply select a suitably diversified-portfolio, thereby avoiding costs of analysis and transaction.

In practice, timing differences in the availability of information and other market anomalies (see 2.6 and 2.7) may allow fundamental analysts to make superior profits by taking advantage of temporary pricing errors until the market recognises the pricing mistake and acts to correct it.

2.6 Availability and sources of information

In Section 1 of this chapter it was stated that an efficient market is one where the prices of securities bought and sold reflect all the relevant information available. Efficiency relates to how quickly and how accurately prices adjust to new information.

Information comes from financial statements, financial databases, the financial press and the Internet. Semi-strong efficiency depends on the quality and quantity of publicly available information.

Companies are encouraged by investor pressure, accounting bodies, government rulings and stock market regulation to provide as much information as is compatible with the necessity for some secrecy to prevent competitors gaining useful knowledge. The perception of a fair market is added to by the constraints and deterrents placed on insider dealers.

2.6.1 Dividend information

It has been argued that shareholders see dividend decisions as passing on new information about the company and its prospects. A dividend increase is usually seen by markets to be good news and a dividend decrease to be bad news, but it may be that the market will react to the difference between the actual dividend payments and the market’s expectations of the level of dividend. For example, the market may be expecting a cut in dividend but if the actual decrease is less than expected, the share price may rise. The relevance of dividend policy is considered further in Section 3.

2.7 Market imperfections and pricing anomalies

Various types of anomaly appear to support the views that irrationality often drives the stock market, including the following:

(a) Seasonal month-of-the-year effects, day-of-the-week effects and also hour-of-the-day effects seem to occur, so that share prices might tend to rise or fall at a particular time of the year, week or day.
(b) There may be a short-run overreaction to recent events. For example, the stock market crash in 1987 when the market went into a free fall, losing 20% in a few hours.

(c) Individual shares or shares in small companies may be neglected. Speculation by investors and market sentiment is a major factor in the behaviour of share prices. 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 over-react to past price changes.

**Question 1: Stock market returns**

'The return achieved on professionally managed equity portfolios is likely to be no better than that achieved by an individual investor holding a well-diversified portfolio.' What does this quotation imply about the efficiency of the stock market?

(The answer is at the end of the chapter)

### 3 Dividend policy

**Section overview**

- Retained earnings are the most important source of finance for companies.
- Dividend policy refers to the choice that financial managers make between retaining a proportion of earnings for reinvestment as opposed to distributing earnings in the form of dividends.
- The traditional view of dividend policy suggests that shareholders expectations of the future dividend pattern influence the share price.
- The residual theory of dividends says that if a company can identify projects with positive NPVs, it should invest in them. Only when these investment opportunities are exhausted should dividends be paid.
- MM’s dividend irrelevance theory holds that in a perfect capital market with no personal tax shareholder’s wealth is determined by the success of a company’s investments rather than the dividends it chooses to distribute.
- Companies generally smooth out dividend payments by adjusting only gradually to changes in earnings: large fluctuations might undermine investors’ confidence.
- The dividends a company pays may be treated as a signal to investors. A company needs to take account of different clienteles of shareholders in deciding what dividends to pay.
- Scrip dividends, stock splits and share repurchase may be used in certain circumstances as an alternative to dividends.

### 3.1 Retained earnings and dividend policy

In Chapter 4 we considered the use of retained earnings as an internal source of equity finance. For any company, the amount of earnings retained within the business has a direct impact on the amount of dividends. Profit re-invested as retained earnings is profit that could have been paid as a dividend.

A company must restrict its self-financing through retained earnings because shareholders should be paid a reasonable dividend, in line with realistic expectations, even if the directors would rather keep the funds for re-investing. At the same time, a company that is looking for extra funds will not be expected by investors (such as banks) to pay generous dividends, nor over-generous salaries to owner-directors. The interaction of investment, financing and dividend policy is the most important issue facing many businesses.

The dividend policy of a business affects the total shareholder return and therefore shareholder wealth.
3.2 Dividend payments

Shareholders normally have the power to vote to reduce the size of the dividend at the AGM, but not the power to increase the dividend. The directors of the company are therefore in a strong position, with regard to shareholders, when it comes to determining dividend policy. For practical purposes, shareholders will usually be obliged to accept the dividend policy that has been decided on by the directors, or otherwise to sell their shares.

3.3 Factors influencing dividend policy

We have seen in Section 3.1 that when deciding upon the dividends to pay out to shareholders, one of the main considerations of the directors will be the amount of earnings they wish to retain to meet financing needs.

As well as future financing requirements, the decision on how much of a company’s profits should be retained, and how much paid out to shareholders, will be influenced by:

(a) The need to remain profitable. (Dividends are paid out of profits, and an unprofitable company cannot for ever go on paying dividends out of retained profits made in the past.)

(b) Any legal restrictions on distributable profits.

(c) The government which may impose direct restrictions on the amount of dividends companies can pay.

(d) Any dividend restraints that might be imposed by loan agreements.

(e) The effect of inflation, and the need to retain some profit within the business just to maintain its operating capability unchanged.

(f) The company’s gearing level. (If the company wants extra finance, the sources of funds used should strike a balance between equity and debt finance.)

(g) The company’s liquidity position. (Dividends are a cash payment, and in addition to available profits, a company must have enough cash to pay the dividends it declares.)

(h) The need to repay debt in the near future.

(i) The ease with which the company could raise extra finance from sources other than retained earnings. (Small companies which find it hard to raise finance might have to rely more heavily on retained earnings than large companies.)

(j) The signalling effect of dividends to shareholders and the financial markets in general – see below.

3.4 Dividends as a signal to investors

The ultimate objective in any financial management decisions is to maximise shareholders’ wealth. This wealth is represented by the current market value of the company, which should largely be determined by the cash flows arising from the investment decisions taken by management.

Although the market would like to value shares on the basis of underlying cash flows on the company’s projects, such information is not readily available to investors. But the directors do have this information. The dividend declared can be interpreted as a signal from directors to shareholders about the strength of underlying project cash flows.

Investors usually expect a consistent dividend policy from the company, with stable dividends each year or, even better, steady dividend growth. A large rise or fall in dividends in any year can have a marked effect on the company’s share price. Stable dividends or steady dividend growth are usually needed for share price stability. A cut in dividends may be treated by investors as signalling that the future prospects of the company are weak. Therefore, the dividend which is paid acts, possibly without justification, as a signal of the future prospects of the company.

The signalling effect of a company’s dividend policy may also be used by management of a company which faces a possible takeover. The dividend level might be increased as a defence against the takeover: investors may take the increased dividend as a signal of improved future prospects, so driving the share price higher and making the company more expensive for a potential bidder to takeover.
3.5 Theories of dividend policy

Different theories exist as to whether the value of a company and hence its share price is affected by the level of dividends it pays.

A trade-off exists between retaining earnings for reinvestment on the one hand; or paying dividends and using alternative forms of finance for investments on the other.

3.5.1 Traditional view

The 'traditional' view of dividend policy focuses on the effects on share price. The price of a share depends upon the mix of dividends, given shareholders' required rate of return, and growth. If other factors are held constant, an increased dividend payout, as a result of growth in earnings, will lead to a higher share price. Therefore, shareholders' expectations of the future dividend pattern influence the share price.

3.5.2 Residual theory

This recognises that the issue is whether a company should pay out its earnings as dividends when it has profitable investment opportunities available.

The 'residual' theory of dividend policy can be summarised as follows:

(a) If a company can identify projects with positive NPVs, it should invest in them.
(b) Only when these investment opportunities are exhausted should dividends be paid.

3.5.3 Irrelevancy theory (Modigliani and Miller)

In contrast to the traditional view, Modigliani and Miller (MM) proposed that in a tax-free world with perfect information, no transaction costs and no personal tax, shareholders are indifferent between dividends and capital gains. A shareholder will be prepared to sacrifice dividends now in order to invest in projects that will allow it to pay higher dividends in the future. MM believed that the value of a company is determined solely by the 'earning power' of its assets and investments, rather than its dividend policy. It is the success of the projects undertaken by the firm that influence its share price, rather than the dividends it chooses to distribute from those projects.

3.5.4 The case in favour of the relevance of dividend policy (and against MM's views)

There are strong arguments against MM's view that dividend policy is irrelevant as a means of affecting shareholders' wealth.

(a) Differing rates of taxation on dividends and capital gains can create a preference for a high dividend or one for high earnings retention.
(b) Dividend retention should be preferred by companies in a period of capital rationing.
(c) Markets are not perfect. Because of transaction costs on the sale of shares, investors who want some cash from their investments will prefer to receive dividends rather than to sell some of their shares to get the cash they want.
(d) Due to imperfect markets and the possible difficulties of selling shares easily at a fair price, shareholders might need high dividends in order to fund their lifestyle or be able to invest in opportunities outside the company.
(e) Information available to shareholders is imperfect, and they are not aware of the future investment plans and expected profits of their company. Even if management were to provide them with profit forecasts, these forecasts would not necessarily be accurate or believable.
(f) Perhaps the strongest argument against the MM view is that shareholders will tend to prefer a current dividend to future capital gains (or deferred dividends) because the future is more uncertain.
Worked Example: Dividend policy

Ochre is a company that is still managed by the two individuals who set it up 12 years ago. In the current year the company was launched on the stock market. Previously, all of the shares had been owned by its two founders and certain employees. Now, 40% of the shares are in the hands of the investing public. The company’s profit growth and dividend policy are set out below. Will a continuation of the same dividend policy as in the past be suitable now that the company is quoted on the stock market?

<table>
<thead>
<tr>
<th>Year</th>
<th>Profits $000</th>
<th>Dividend $000</th>
<th>Shares in issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years ago</td>
<td>176</td>
<td>88</td>
<td>800 000</td>
</tr>
<tr>
<td>3 years ago</td>
<td>200</td>
<td>104</td>
<td>800 000</td>
</tr>
<tr>
<td>2 years ago</td>
<td>240</td>
<td>120</td>
<td>1 000 000</td>
</tr>
<tr>
<td>1 year ago</td>
<td>290</td>
<td>150</td>
<td>1 000 000</td>
</tr>
<tr>
<td>Current year</td>
<td>444</td>
<td>222 (proposed)</td>
<td>1 500 000</td>
</tr>
</tbody>
</table>

Solution

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividend per share cents</th>
<th>Dividend as % of profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years ago</td>
<td>11.0</td>
<td>50%</td>
</tr>
<tr>
<td>3 years ago</td>
<td>13.0</td>
<td>52%</td>
</tr>
<tr>
<td>2 years ago</td>
<td>12.0</td>
<td>50%</td>
</tr>
<tr>
<td>1 year ago</td>
<td>15.0</td>
<td>52%</td>
</tr>
<tr>
<td>Current year</td>
<td>14.8</td>
<td>50%</td>
</tr>
</tbody>
</table>

The company appears to have pursued a dividend policy of paying out half of after-tax profits in dividend. This policy is only suitable when a company achieves a stable earnings or steady growth. Investors do not like a fall in dividend from one year to the next, and the fall in dividend per share in the current year is likely to be unpopular, and to result in a fall in the share price.

The company would probably serve its shareholders better by paying a dividend of at least 15c per share, possibly more, in the current year, even though the dividend as a percentage of profit would then be higher.

3.6 Alternatives to dividends

3.6.1 Scrip dividends

Definition

A **scrip dividend** is a dividend paid by the issue of additional company shares, rather than by cash.

When the directors of a company would prefer to retain funds within the business but consider that they must pay at least a certain amount of dividend, they might offer equity shareholders the choice of a cash dividend or a scrip dividend. Each shareholder would decide separately which to take.

Recently enhanced scrip dividends have been offered by many companies. With enhanced scrip dividends, the value of the shares offered is much greater than the cash alternative, giving investors an incentive to choose the shares.

3.6.2 Stock split

A stock split occurs where, for example, each ordinary share of $1 is split into two shares of 50c each, therefore creating cheaper shares with greater marketability. There is possibly an added psychological advantage, in that investors may expect a company which splits its shares in this way to be planning for substantial earnings growth and dividend growth in the future.

As a consequence, the market price of shares may benefit. For example, if one existing share of $1 has a market value of $6, and is then split into two shares of 50c each, the market value of the new shares might
settle at, say, $3.10 instead of the expected $3, in anticipation of strong future growth in earnings and dividends.

The difference between a stock split and a scrip issue is that a scrip issue converts equity reserves into share capital, whereas a stock split leaves reserves unaffected.

### 3.6.3 Share repurchase

In many countries companies have the right to buy back shares from shareholders who are willing to sell them, subject to certain conditions.

For a smaller company with few shareholders, the reason for buying back the company’s own shares may be that there is no immediate willing purchaser at a time when a shareholder wishes to sell shares. For a public company, share repurchase could provide a way of withdrawing from the share market and ‘going private’.

Another reason for a share repurchase would be as a way or returning surplus cash to shareholders, instead of paying a dividend.

---

**Question 2: Dividend policy**

Karina is a listed company, which has historically had a low dividend payout ratio. It has built up a significant amount of cash reserves due to increased profitability and a lack of current investment opportunities. One of the directors has suggested using the surplus to pay a large dividend to shareholders. What factors should Karina consider before doing this?

*(The answer is at the end of the chapter)*
The fundamental theory of share values states that the current market price of a share represents the present value of all future expected returns from the share, discounted at the shareholders' cost of capital (required rate of investment return).

An efficient market is one where the prices of securities bought and sold reflects all the relevant information available.

The efficiency of a market refers to the extent to which share prices react to information about a company and its profitability. Efficiency relates to how quickly and accurately prices adjust to new information.

The efficient market hypothesis is the hypothesis that the stock market reacts immediately to all the information that is available. Therefore, a long term investor cannot obtain higher than average returns from a well diversified share portfolio.

The theory behind share price movements can be explained by the three forms of the efficient market hypothesis.

- Weak form efficiency implies that prices reflect all relevant information about past price movements and their implications.
- Semi-strong form efficiency implies that prices reflect past price movements and publicly available knowledge.
- Strong form efficiency implies that prices reflect past price movements, publicly available knowledge and inside knowledge.

If the markets are quite strongly efficient, the main consequence for financial managers will be that they simply need to concentrate on maximising the net present value of the company's investments in order to maximise the wealth of shareholders.

Fundamental analysis is based on the theory that share prices can be derived from an analysis of future dividends.

Technical analysts or chartists work on the basis that past price patterns will be repeated.

Random walk theory is based on the idea that share prices will alter when new information becomes available.

If stock markets are efficient, no investor will be presented with an opportunity for making a return on a share that exceeds the fair return for the risk associated with that share, unless they have information that is not available to the majority of investors.

In practice, share prices are also affected by availability and sources of information, market imperfections and pricing anomalies, and investor speculation.

Retained earnings are the most important single source of finance for companies, and financial managers should take account of the proportion of earnings that are retained as opposed to being paid as dividends.

There are various theories regarding the relevance of dividends to the share price and shareholder wealth: the traditional view, residual theory and MM irrelevance theory.

Companies generally smooth out dividend payments by adjusting only gradually to changes in earnings: large fluctuations might undermine investors' confidence.

The dividends a company pays may be treated as a signal to investors. A company needs to take account of different clienteles of shareholders in deciding what dividends to pay.

Companies may use scrip dividends, stock splits or share repurchase as an alternative means of returning wealth to shareholders.
Quick revision questions

1. Different types of efficiency can be identified in the operation of capital markets.
   To which particular type of efficiency do the terms 'weak form', 'semi-strong form' and 'strong form' apply?
   
   A  allocative efficiency
   B  operational efficiency
   C  information processing efficiency
   D  economic efficiency

2. Which one of the following statements is most consistent with the strong form of the efficient markets hypothesis?
   
   A  investors have access to all relevant information about a company and its plans
   B  investors can use insider dealing to make abnormal profits
   C  over the long term, the expected return from all shares will be the same
   D  past movements in share prices can be used to predict future movements in share prices

3. A study of the shares of companies listed on a particular stock market found that:
   - share prices were independent of past share price movements and followed a random path.
   - some investors used the published accounts of the companies to analyse performance and, by doing so, made abnormal gains over many years.

   Which of the following would be consistent with these findings?
   
   A  the stock market is inefficient
   B  the stock market is efficient in the weak form
   C  the stock market is efficient in the semi-strong form
   D  the stock market is efficient in the strong form

4. Studley, a listed public company, received a confidential letter on 1 June 20X0, confirming that it had won a major contract. The new contract is expected to increase profits significantly from 20X2 onwards. The news of the contract was not made publicly available until 5 June 20X0. What share price reaction would you expect on 5 June 20X0 under the semi-strong and strong forms of market efficiency?

<table>
<thead>
<tr>
<th>Share price reaction</th>
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<tbody>
<tr>
<td>Semi-strong form</td>
</tr>
<tr>
<td>A  increase</td>
</tr>
<tr>
<td>B  increase</td>
</tr>
<tr>
<td>C  no effect</td>
</tr>
<tr>
<td>D  no effect</td>
</tr>
</tbody>
</table>
The finance director of a listed company has recently announced that the company will not be paying a dividend this year due to the number of profitable investment opportunities that require financing. Which theory best describes the finance director’s approach to dividend policy?

A dividend irrelevance theory
B residual theory
C traditional theory
D fundamental theory
The information processing efficiency of a stock market refers to the ability of a stock market to price stocks and shares fairly and quickly. A market can be described as showing one of three forms of information processing efficiency: weak form, semi-strong form and strong form.

Allocative efficiency refers to financial markets allowing funds to be directed towards firms which make the most productive use of them; operational efficiency exists if transaction costs in financial markets are kept as low as possible. Economic efficiency refers to the optimum use of resources in order to maximise the production of goods and services.

If a stock market displays a strong form of efficiency, share prices reflect all information whether publicly available or not.

If investors are able to make gains from insider dealing it implies the market is only semi-strong form.

The efficient market hypothesis does not imply that in the long-run returns from shares will not differ, simply that if the stock market is efficient, share prices should vary in a rational way.

The use of past price movements to predict future share prices would imply the market is not efficient at any level.

Statement I implies the market must be at least weak form efficient. If gains can be made using fundamental analysis then this information must not yet be reflected in the share price, which implies that the market is not yet efficient at the semi-strong level.

Under the semi-strong form of market efficiency, the share price will increase when public information is available. Under the strong form of market efficiency, the share price will already reflect the information.

The finance director is choosing to fund positive NPV projects and as a result the amount of earnings available as a residual dividend, after financing requirements, is nil.
Answers to chapter questions

1. If an investor with a well-diversified portfolio can achieve the same return as a professional fund manager it implies that they both have access to the same information about companies. This statement accords with the view that fundamental analysis is a waste of time and is consistent with the stock market being at least semi-strong efficient.

2. The historically low payout ratio may mean shareholders have a tax preference for capital gains rather than dividends and could be adversely affected by a large dividend.

   Residual theory would suggest only paying a dividend if there are no positive investment opportunities available, so Karina needs to establish the size and amount of any future requirements.

   A sudden change in policy may be questioned by the market or may give rise to expectations of higher dividends in the long term. If in the long run the cash is not required for investment the company could consider repurchasing some of the shares.

   Retaining the cash may make the company vulnerable to takeover.
Chapter 9

Risk management

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk management and risk assessment</td>
<td>LO10</td>
</tr>
<tr>
<td>Define the term risk</td>
<td>LO10.1</td>
</tr>
<tr>
<td>Describe the different types of risk in international trade</td>
<td>LO10.2</td>
</tr>
<tr>
<td>Explain the different methods of risk assessment in international trade</td>
<td>LO10.3</td>
</tr>
<tr>
<td>Identify the key financial risks facing a business in a given scenario</td>
<td>LO10.4</td>
</tr>
<tr>
<td>Apply different methods of managing currency risks to given situations</td>
<td>LO10.5</td>
</tr>
<tr>
<td>Select methods of managing interest rate exposure appropriate to a given situation</td>
<td>LO10.6</td>
</tr>
</tbody>
</table>

Topic list

1. Risk and uncertainty
2. Risk management and attitudes to risk
3. Risk classification and concepts
4. Risks of international trade
5. Risk identification and assessment
6. Foreign currency risk
7. Managing foreign currency risk
8. Interest rate risk
9. Managing interest rate risk
Exposure to risk is an essential part of a company running its operations, and investors investing their money in a company's shares. Risk is increased for businesses engaged in international trade.

This chapter considers the nature of risk and uncertainty and the different methods of classifying risk. It also considers various approaches that can be adopted in order to reduce risk to acceptable levels.

If risk cannot be eliminated, it can at least be managed, so that the worst adverse effects are avoided. Risk management incorporates the identification of risks, assessment of their likelihood and impact, selection of appropriate responses, and monitoring and reporting.

International trade brings its own risks, including that of foreign currency and a number of methods are available for hedging that risk. Finally the chapter considers interest rate risk and some of the financial instruments which are now available for managing financial risks, including derivatives such as options.
Before you begin

If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What is the difference between risk and uncertainty? (Sections 1.1 and 1.2)
2. Explain the four possible strategies for managing risk. (Section 2.1)
3. What are the three main ‘attitudes to’ or ‘appetites for’ risk? (Section 2.2)
4. Explain two different ways of classifying risk. (Section 3.1)
5. What are the additional risks involved in international trade? (Section 4)
6. What does a quantitative risk assessment involve? (Section 5.2)
7. Explain the three types of foreign exchange risk. (Section 6)
8. Name three different ways of hedging currency risk. (Section 7)
9. Explain what interest rate risk is. (Section 8)
10. How does an interest rate cap, floor or collar protect against interest rate exposure? (Section 9.4)
1 Risk and uncertainty

Section overview

- **Risk** is the possible variation in an outcome from what is expected to happen.
- **Uncertainty** is the inability to predict the outcome of an activity due to a lack of information.
- The risks faced by a company can be looked at from the point of view of the company and its management, and also the investors in the company.

1.1 Risk

In the finance theory ideas we have studied to date, risk is defined as the variability of returns from an investment which may be assessed by such measures as the standard deviation or the beta.

However, for many risks, such as natural disasters that occur only occasionally but may have a massive impact, the traditional measures of the standard deviation or beta are inappropriate, and if we wish to assess risk and manage it on a business-wide basis we need to look at it differently.

For the purposes of risk management,

Definition

**Risk** is the possible variation in an outcome from what is expected to happen.

Risk arises because events cannot be predicted with certainty. It is common to consider risk as negative, e.g. safety risk management concentrates on the prevention or minimisation of harm, however finance theory considers risk more broadly.

Risk implies variability which may work in the favour of the business (an opportunity) or against it (a risk). Risks and opportunities arise because the future is not known with certainty.

Definitions

- **Risk** is the possibility that an event will occur and adversely affect the achievement of objectives. This is also known as **downside risk**.
- **Opportunity** is the possibility that an event will occur and positively affect the achievement of objectives. This is also known as **upside risk**.

Risk management is concerned with both the positive and negative aspects of risk.

1.2 Uncertainty

Risk and uncertainty are not the same. Risk considers the variability of possible outcomes. Uncertainty arises when information is insufficient to allow an outcome to be predicted.

Definition

**Uncertainty** is the inability to predict the outcome of an activity due to a lack of information.

Risk is capable of being evaluated and for the purposes of risk management is often defined as the combination of the probability of an event and its consequences.

**Risk = Probability × Financial consequences**
Uncertainty is non-quantifiable e.g. whether a customer will be retained for the next two years. Uncertainty of a measure or a particular outcome may be demonstrated by giving it a range of values or a best guess ± something. Uncertainty is central to the modelling of future events such as stock market forecasting.

1.3 Risks for companies
The risks faced by a company can be looked at from the point of view of:

(a) the company and its management, and also
(b) providers of capital to the company, both debt finance and equity finance.

1.3.1 The company
If the objective of a company is to maximise shareholder wealth then risks for a company are risks of losses, resulting (directly or indirectly) in negative cash flows. When losses become severe, there might be a risk of insolvency, leading to the liquidation of the company.

The activities of certain companies are inherently risky because they are potentially dangerous to public well-being: transport companies and pharmaceutical companies are obvious examples.

1.3.2 Risks for providers of capital (investors)
Investors also bear risks. Providers of debt capital to a company have to bear the risk that the company will default on its debt obligations, and fail to make an interest payment or might even become insolvent and unable to repay the loan principal. A lender or investor in company bonds will expect a higher yield than that offered on, say, Government gilts, to compensate for higher risk.

Shareholders are the ultimate bearers of risk. If a company becomes insolvent, they will lose all their investment. More important, if company profits fall, dividends and the share price are also likely to fall. Providers of debt capital are entitled to interest before any profits can be paid as dividend, so that the risk to income is much less for debt providers than for equity shareholders.

Risk for shareholders is two-way: there is the possibility of poor returns (no dividends or low dividends, and a fall in the share price), or profits and dividends might be higher than expected, and the share price might rise by more than anticipated. Risk is greater for shareholders when there is a greater possibility of wide variations in profits, dividends and share prices from year to year.

The range of potential variation in returns is known as the volatility of returns. Volatility varies between different companies.

2 Risk management and attitudes to risk

Section overview
- Risk management is the process of identifying and assessing (analysing and evaluating) risks and the development, implementation and monitoring of a strategy to respond to those risks.
- **Risk appetite** refers to the extent to which a company is prepared to take on risks in order to achieve its objectives. In broad terms we can distinguish **risk averse** attitudes, **risk neutral** attitudes and **risk seeking** attitudes.

2.1 Risk management
Risk management is the process of identifying and assessing (analysing and evaluating) risks and the development, implementation and monitoring of a strategy to respond to those risks.

Corporate governance standards encourage companies to adopt good practices in risk management. In addition, the success or failure of a business will in part be determined by how it manages risks and exploits opportunities to give it an advantage over its competitors.
The risk management strategy may involve:

- **risk avoidance** – e.g. not undertaking the relevant activity.
- **risk reduction** – taking steps to reduce the severity of the impact.
- **risk transfer** – passing the risk to a third party through hedging or insurance.
- **risk retention** – accepting the loss if and when it occurs.

**Effective risk management enables a business to:**

- reduce business threats to acceptable levels.
- make informed decisions about potential opportunities allowing stakeholders (investors, customers, employees) to have confidence in the business and its future prospects.

This raises the question of what is acceptable to the business, which depends on the management’s attitude towards risk.

### 2.2 Attitude to risk

#### Definition

**Risk appetite** refers to the extent to which a company is prepared to take on risks in order to achieve its objectives.

In broad terms we can distinguish **risk averse** attitudes, **risk neutral** attitudes and **risk seeking** attitudes.

#### Definitions

A **risk averse attitude** is that an investment should not be undertaken if there is an alternative investment offering either the same return but with a lower risk or a higher return for the same risk. However, an alternative investment might be undertaken if it has a higher risk, but offers a higher expected return.

A **risk neutral attitude** is that an investment should be chosen based on the expected (most likely) return, irrespective of the risk.

A **risk seeking attitude** is that an investment should be undertaken if it offers higher possible returns, even if the risk is higher.

For example, suppose a company is considering investing in four mutually exclusive projects, for which the following expected returns and risk (measured as the standard deviation of expected returns, as explained in Chapter 7) have been measured.

<table>
<thead>
<tr>
<th>Expected return</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project W</td>
<td>10%</td>
</tr>
<tr>
<td>Project X</td>
<td>12%</td>
</tr>
<tr>
<td>Project Y</td>
<td>14%</td>
</tr>
<tr>
<td>Project Z</td>
<td>12%</td>
</tr>
</tbody>
</table>

A **risk-averse company**:

(a) would not invest in project W, because project X offers a higher expected return for the same risk;
(b) would not invest in project Z, because project X offers the same return but for a lower risk;
(c) might choose either project X or project Y, because X offers a lower return but a lower risk, and Y offers a higher return but a higher risk.

A **risk neutral company** would invest in project Y because it has the highest expected return.

A **risk seeking company** would select either project Z or project Y, depending just how much risk it was seeking. Note that project Z would be preferable to X because although the expected (or average) return is the same, the fact that Z has a higher risk implies that there is a chance of a higher actual return than with X. This is because Z has the same average return as X but a wider spread of possible returns i.e. it has a higher downside risk but it also has a higher upside potential.
### 3 Risk classification and concepts

#### Section overview

- **Internal risks** are risks arising from factors internal to the company, factors over which the company can exercise control.
- **External risks** are risks arising from factors outside the business, that the company may be subject to but that it has no influence over.
- **Financial risk** is the risk arising as a result of how the business is financed.
- **Operating risk** is all the risks faced by a business that are not financial risks. It is the variability of returns due to how and where a business trades or operates, its exposure to markets, competitors, exchange rates and so on.

#### 3.1 Types of risk

**Identifying risks is the first stage in developing a business’s risk profile. Risk can be subcategorised in several ways. For example, it may be split into internal and external risk. Another way to sub-analyse risk is to split it between operating risk and financial risk.**

##### 3.1.1 Internal and external risk

**Internal risks** are risks arising from factors internal to the company, factors over which the company can exercise control. Internal risk can be sub-analysed into:

- process risk
- people risk
- systems risk

**External risks** are risks arising from factors outside of the control of the business, factors that the company may be subject to but that it has no influence over, e.g. natural disasters.

##### 3.1.2 Financial and operating risk

**Financial risk** is the risk arising as a result of how the business is financed.

**Operating risk** is all the risks faced by a business that are not financial risks.

#### 3.2 Financial risk

**Financial risk** is the risk arising as a result of how the business is financed – its level of gearing or leverage, its exposure to credit, interest rates and exchange rates. Financial risk tends to amplify the inherent operational risk at low levels of gearing, but at higher levels may directly contribute to the risk of business failure.

James Lam, (*Enterprise Risk Management* (2003)) divides **financial risk** into credit risk and market risk.

- **Credit risk** is ‘the economic loss suffered due to the default of a borrower or counterparty’ (e.g. a customer or supplier). In other words it is highly relevant to large financial institutions such as banks, and also is the main type of financial risk faced by small businesses, particularly the risk that their customers won’t pay them, or won’t pay them quickly enough. This is covered in Chapter 5 on working capital management.

- **Market risk** is ‘the exposure to potential loss that would result from changes in market prices or rates’. The relevant prices or rates might include share prices, commodity prices, interest rates and foreign exchange rates. This is examined in more detail in Chapter 10.
3.3 Operating risk

Operating risk is all the risks faced by a business that are not financial risks.

It is the variability of returns due to how and where a business trades or operates, its exposure to markets, competitors, exchange rates among numerous other factors.

This operating risk can itself be sub-analysed into:

(a) Strategic/business risk – risks associated with the long-term strategic objectives of the business, potential variability of business returns arising as a result of the company strategy and its strategic position with respect to competitors, customers, reputation, legal, regulatory change or political change. Strategic risk also encompasses knowledge management, i.e. the effective management and control of the knowledge resources including key personnel, intellectual property and production technology.

(b) Operational risk – variability arising from the effectiveness of how the business is managed and controlled on a day to day basis, the accuracy and effectiveness of its information/accounting systems, its reporting systems and its management and control structures. Operational risk also encompasses compliance with issues such as health and safety, consumer protection, data protection and so on.

(c) Hazard/events risk – the exposure a business may have to natural events and their impacts, the actions of employees, the consequences of accidents etc, be it on the business, its trading partners or customers.

3.4 Risk classifications

Pulling these ideas together we may view the risks faced by any business as falling into four quadrants of

- financial risk.
- strategic/business risk.
- operational risk.
- hazard/events risk.

Each of these can be sub-analysed between external and internal influences, as shown in the diagram below:
Question 1: Risk classification
Identify the risks faced by a business with which you are familiar.

(The answer is at the end of the chapter)
3.5 Interest rate risk

Interest rate risk is one element of financial risk. It is examined in more detail later in this chapter.

**Definition**

**Interest rate risk** is the risk of higher or lower profits or losses than expected, as a result of uncertainty about future movements in an interest rate, or the general level of interest rates.

When a company borrows or lends funds, it is exposed to the risk of changes in the market rate of interest. Changes in the interest rate will result in the company either paying or receiving more or less interest than it might otherwise have done.

Suppose for example, that a company borrows $10 million for one year at a fixed rate of interest of 7 per cent, when it could have obtained an overdraft facility for $10 million for a year at 7.5 per cent. If the interest rate were to fall, to the point where the company would have been paying overdraft interest of just, say, 6 per cent, it will be paying interest on its fixed rate loan at 1 per cent per annum more than it need have done. The annual cost of 1 per cent interest on $10 million is $100 000.

Financial assets that provide a fixed rate of interest to their holders change in value with changes in market interest rates. For example, suppose that a bond pays 6 per cent interest and is currently valued at par (100.00). The par value would indicate that investors currently expect to earn a yield of 6 per cent on bonds of this type. However, if market interest rates on similar bonds went up, say to 8 per cent, bond investors would expect to receive a yield of 8 per cent on their investment. A bond paying out only 6 per cent will no longer be worth 100.00, and the market price of the bond will fall (to $75, so that its yield – 6/75 – is 8 per cent).

Interest rate risk also applies indirectly to shares. Shareholders receive dividends, not interest. However, when interest rates in the market go up or down, there is often a tendency for the expected dividend yields on shares to go up or down in the same direction. When interest rates rise, there is consequently a tendency for share prices, as well as bond prices, to fall. Similarly, when interest rates fall, bond prices will rise, and there might also be a rise in share prices as well.

4 Risks of international trade

**Section overview**

- The benefits of international trade need to be considered in the context of the additional risk involved.
- International trade leads to enhanced trading risk, environmental risk and foreign currency risk.
- These risks can be managed through a variety of techniques including insurance, the careful selection of markets in which to operate, the use of appropriate business and management structures and hedging.

International trade involves the buying and selling of goods and services with countries around the world. As well as offering a wider sales market and hence increased sales and profit potential, international trade may offer access to cheaper resources.

The benefits of international trade need to be considered in the context of the additional risk involved:

(a) Both domestic and international traders will face trading risks, but the risks of international trade will be higher due to the increased distances and times involved.

(b) Environmental risk relates to the country in which the company operates and its political, economic, social and cultural environment.

(c) Legal restrictions may exist in some markets, limiting ownership of securities by foreign investors.
(d) Foreign exchange regulations may prohibit international investment or make it more expensive. Transacting in foreign currency increases the variability of income streams.
(e) Double taxation of income from foreign investment may deter investors.
(f) There are likely to be higher information and transaction costs associated with investing in foreign securities.

In summary, in addition to the normal risks faced by a business, international businesses face:

- enhanced trading risk.
- environmental risk.
- foreign currency risk.

4.1 Enhanced trading risks

The types of trading risk include:

(a) **physical risk**: The risk of goods being lost or stolen in transit, or the documents accompanying the goods going astray.

(b) **credit risk**: The possibility of payment default by the customer. The logistics involved in credit collection may enhance the risk of bad debts.

(c) **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.

(d) **liquidity risk**: The inability to finance the credit. Increased international trade is likely to give rise to the need for increased working capital.

Such risks may be reduced with the help of banks, insurance companies, credit reference agencies and government agencies. 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.

4.2 Environmental risk

4.2.1 Socio-cultural risk

Differences in culture internationally may affect:

(a) expectations of conduct and behaviour (e.g. the responsibility owed by a firm to the wider community and environment).

(b) methods of conducting business (e.g. conventions regarding negotiations, gifts, status, face-to-face contact).

(c) approach to managing staff (e.g. language differences, attitudes to authority, need for status and self-respect).

(d) products offered (religious prescriptions regarding food, appropriateness of brand names).

(e) methods of promotion (language of adverts, imagery used, restrictions concerning what is acceptable).

The risk is enhanced if the company lacks knowledge in these areas.

4.2.2 Political and legal risks

Political risk may involve the stability of its government and economy, the government’s policies and any changes made to them, its attitude to foreign investment and foreign trade, exchange control regulations.

For example:

(a) 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.
(b) Import tariffs could make imports more expensive and domestically produced goods therefore more competitive.

(c) Legal standards of safety or quality (non-tariff barriers) could be imposed on imported goods to prevent multinationals from selling goods which have been banned as dangerous in other countries.

(d) Exchange control regulations could be applied.

(e) 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, and energy supply.

(f) A government could nationalise foreign-owned companies and their assets (with or without compensation).

(g) Legislation requiring a minimum shareholding in companies by domestic residents. This would force a multinational to offer some of the equity in a subsidiary to investors in the country where the subsidiary operates.

Organisations may also face risks from lack of legislation (or lack of enforcement of legislation) designed to protect them.

4.2.3 Managing environmental risk

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

(a) Considering carefully which markets to enter after careful analysis of political stability, the possibility of government intervention and similar external influences.

(b) Considering carefully which markets to enter based on prior experience in similar markets, language and cultural understanding.

(c) Forming alliances with local business partners, perhaps via a joint venture or agency arrangement.

(d) Choosing an appropriate business structure

(e) Choosing an appropriate management structure e.g. if business is done globally, the need for rapid response to local opportunities and threats may be served by delegating a significant amount of authority to the local business unit (decentralisation).

(f) Hiring local employees who understand the culture and also demonstrating a commitment to supporting the local economy.

(g) Being alert for likely changes in policy through cultivation of relationships with legislators.

(h) Social and commercial good citizenship, complying with best practice and being responsive to ethical concerns.

(i) The design of internal control procedures to minimise the risks from legal action, for example human resource policies, health and safety policies.

Question 2: Managing risk due to international trade

A business is considering investing in a country where the national government is currently seeking inward investment by international businesses, having previously had a history of restricting foreign ownership and investment. Identify the risk management strategies available to deal with the political risk arising.

(The answer is at the end of the chapter)
5 Risk identification and assessment

Section overview

- Risk identification involves considering the internal and external events that may give rise to specific risks for a particular business.
- Risk assessment involves the evaluation or ranking of the identified risks in order to identify significant risks and implement suitable risk responses.
- Each risk can be assessed from the point of view of its potential impact (significance) and its probability of occurrence (likelihood).
- Quantitative risk assessment involves the determination of measured figures for probabilities and consequences, producing a specifically quantified measure of risk.
- The alternative is a qualitative (subjective) risk assessment perhaps using a relative high-medium-low style assessment.

5.1 Risk identification

In Section 2 we considered the types of risk that any business may face.

Suppose an organisation were considering launching a new product in China but knew absolutely nothing about doing business in China. It is highly likely that it will not be aware of many of the risks that could be encountered, because of factors such as different regulations, different ways of approaching customers, differences in disposable income and so on. The risks remain to be identified.

Risk identification can start by considering:

(a) **External events** such as political developments, economic changes, social considerations or technological advances (PEST factors).

(b) **Internal events** such as equipment problems, human error or difficulties with processes and systems.

Risk identification must be a continuous process as potential new risks may arise and existing risks may change.

5.1.1 Identification techniques

Identification techniques may make use of past data: for example, it may be possible to assess how likely it is that suppliers will deliver late on the basis of suppliers' historical delivery records.

A company may also try to take account of possible future data: for example, if a company starts offering a new service, it may consider how easy would it be for competitors to do likewise, and if they do what impact that would have on their own plans and projections.

5.2 Risk assessment

Risk assessment should be undertaken for all new strategies and proposed investment projects as well as for routine operations.

Risk assessment involves the evaluation or ranking of the identified risks in order to identify significant risks and implement suitable risk responses.

Risk assessment involves for each risk:

(a) **Analysis** – Considering the nature of the risk, and what implications it might have for the organisation.

(b) **Evaluation** – Making an initial judgment about the seriousness of the risk.
Remember that

\[ \text{Risk} = \text{probability} \times \text{financial consequences} \]

so each risk can be assessed from two aspects:

(a) Its potential **impact**, in other words how serious it would be.
(b) Its **probability of occurrence** (or likelihood).

### 5.2.1 Quantitative risk assessment

Quantitative risk assessment involves the determination of measured figures for probabilities and consequences producing a specifically quantified measure of risk.

In many cases the financial consequences are easy to measure, e.g. the value of lost inventories or the cost of rebuilding premises. More problematic, however, is the assessment of the probability of occurrence. Though insurance companies have detailed statistical information on the occurrence of many risk events, it is much more difficult to establish probabilities for the less likely events such as natural disasters.

Some types of risk lend themselves to a quantitative assessment process, such as many financial risks. For certain risks it may be very difficult to achieve, for example, the impact of an event on the reputation of a business is much harder to quantify, and from this perspective risk assessment is more subjective. The effort required and cost incurred in undertaking a full quantitative assessment is liable to be substantial, and may not be cost-effective.

### 5.2.2 Qualitative risk assessment

An alternative that may render risk prioritisation practical is qualitative risk estimation. This involves a subjective risk assessment perhaps using a relative high-medium-low style assessment.

The overall risk of an event can, by this system, be determined by reference to a **risk map** or **risk matrix**, with one axis for the impact or consequences of the risk and the other for the probability or frequency of occurrence. Such a diagram can help management to reach a view about:

(a) Which risks seem more serious than others (risks with a high impact and high probability would be considered a priority), and

(b) The nature of the risk management measures that might be appropriate for dealing with each risk.

Here is a simple example: the identification of risks and their placement is arbitrary, of course because this would be different for every organisation.

<table>
<thead>
<tr>
<th>IMPACT</th>
<th>PROBABILITY</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Low</td>
<td>Loss of suppliers</td>
<td>Loss of sales due to macroeconomic factor</td>
<td>Loss of senior or specialist staff</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Loss of key customers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMPACT</td>
<td>Low</td>
<td>Loss of suppliers</td>
<td>Loss of lower-level staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A qualitative assessment has the advantage of being much easier to undertake, though it is highly subjective. However, if it is consistently applied to all risks it does facilitate prioritisation.
5.3 Institute of Risk Management approach

In 'A structured approach to Enterprise Risk Management', the Institute of Risk Management (IRM) identifies the following, commonly used techniques for risk identification and assessment:

(a) Use of structured approaches to risk recognition – Strengths Weaknesses Opportunities Threats (SWOT) and Political Economic Social Technological Legal Environmental (PESTLE) analyses.

(b) Use of structured questionnaires and checklists to collect information to assist with the recognition of the significant risks.

(c) Workshops and brainstorming to share ideas and discuss the events that could impact on the organisation.

(d) Physical inspections of premises and activities and audits of compliance with established systems and procedures.

(e) Use of flowcharts to analyse processes and operations within the organisation to identify critical components that are key to success.

The IRM also suggests the following approach for benchmarking the significance of risks:

(a) For financial risks, a sum of money can be used as the benchmark test of significance.

(b) For risks that can cause disruption to operations, the length of disruption may be a suitable test.

(c) Reputational risks can be benchmarked in terms of the profile that the report of the event would receive, the likely impact of the event on share price, or the impact on the political and financial support received from key stakeholders.

6 Foreign currency risk

Section overview

- **Currency risk** occurs in three forms: **transaction exposure** (short-term), **economic exposure** (effect on present value of longer term cash flows) and **translation exposure** (book gains or losses).
- **Translation risk** 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.
- **Transaction risk** is the risk of adverse exchange rate movements occurring in the course of normal international trading transactions.
- **Economic risk** refers to the effect of exchange rate movements on the international competitiveness of a company and refers to the effect on the present value of longer term cash flows.

6.1 Translation risk

Definition

**Translation risk** 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 on the statement of financial position date.
6.2  Transaction risk

**Definition**

Transaction risk 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.

One consequence of taking and granting credit is that international traders will know in advance about the receipts and payments arising from their trade. They will know:

- what foreign currency they will receive or pay.
- when the receipt or payment will occur.
- how much of the currency will be received or paid.

The great danger to profit margins is in the movement in exchange rates. The risk faces (i) exporters who invoice in a foreign currency and (ii) importers who pay in a foreign currency.

**Worked Example: Transaction risk – changes in exchange rates**

Bulldog Pty Ltd, an Australian company, buys goods from Redland which cost 100 000 Reds (the local currency). The goods are re-sold in Australia for $32 000. At the time of the import purchase the exchange rate for Reds against the dollar is 3.5650 – 3.5800.

**Required**

(a) What is the expected profit on the re-sale?

(b) What would the actual profit be if the spot rate at the time when the currency is received has moved to:

   (i)  3.0800 – 3.0950
   (ii) 4.0650 – 4.0800?

*Ignore bank commission charges.*

**Solution**

(a) Bulldog must buy Reds to pay the supplier, and so the bank is selling Reds. The expected profit is as follows:

<table>
<thead>
<tr>
<th>Aus $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue from re-sale of goods</td>
</tr>
<tr>
<td>Less cost of 100 000 Reds in dollars (÷ 3.5650)</td>
</tr>
<tr>
<td>Expected profit</td>
</tr>
</tbody>
</table>

(b) (i) If the actual spot rate for Bulldog to buy and the bank to sell the Reds is 3.0800, the result is as follows:

<table>
<thead>
<tr>
<th>Aus $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue from re-sale</td>
</tr>
<tr>
<td>Less cost (100 000 ÷ 3.0800)</td>
</tr>
<tr>
<td>Loss</td>
</tr>
</tbody>
</table>

(ii) If the actual spot rate for Bulldog to buy and the bank to sell the Reds is 4.0650, the result is as follows:

<table>
<thead>
<tr>
<th>Aus $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue from re-sale</td>
</tr>
<tr>
<td>Less cost (100 000 ÷ 4.0650)</td>
</tr>
<tr>
<td>Profit</td>
</tr>
</tbody>
</table>
This variation in the final Australian dollar cost of the goods (and therefore, the profit) illustrates the concept of transaction risk.

Action to reduce or eliminate transaction exposure is known as hedging. Methods of hedging are discussed later.

6.3 Economic risk

Definition

Economic risk refers to the effect of exchange rate movements on the international competitiveness of a company and refers to the effect on the present value of longer term cash flows.

For example, an Australian company might use raw materials which are priced in Chinese RMB, but export its products mainly to US. A depreciation of the Australian dollar against the RMB or an appreciation of the Australian dollar against the US dollar will both 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.

7 Managing foreign currency risk

Section overview

• There are different ways of hedging transaction exposures. These include matching receipts and payments, leading and lagging, forward exchange contracts and money market hedges.
• Derivatives such as futures and options can also be used to hedge against foreign currency movements.
• Economic exposure arises from the risk that exchange rate movements might reduce the international competitiveness of a company in the long term. Hedging economic exposures could result in a relocation of operations (or some parts of them) to another country or currency zone.
• Translation exposures arising from restating the book value of investment in an overseas subsidiary might affect the share price of the parent company. An exposure can be reduced by borrowing in the domestic currency of the subsidiary.

A company can reduce or eliminate its transaction exposures in various ways.

Definition

Action to reduce or eliminate an exposure is known as hedging the risk or hedging the exposure.

Methods of hedging transaction exposures include:

(1) Buy or sell in domestic currency
(2) Matching receipts and payments
(3) Leading and lagging
(4) Matching assets and liabilities in a currency
(5) Forward exchange contracts
(6) Money market hedges
(7) Currency options
(8) Currency futures
7.1 Currency of invoice: buy or sell in domestic currency

One way of avoiding exchange risks is to buy or sell in the domestic currency. This could require:

(a) an exporter to invoice foreign customers in the exporter’s domestic currency, or for
(b) an importer to arrange with their foreign suppliers to be invoiced in their domestic currency.

However, although either the exporter or the importer can avoid exchange risk in this way, only one party in the transaction can deal in their domestic currency. The other must accept the exchange risk.

If an Australian exporter is able to invoice an overseas buyer in Australian dollars, the foreign exchange risk is transferred to the overseas buyer. Similarly, an Australian-based importer might persuade an overseas supplier to invoice in Australian dollars rather than in a foreign currency, and in this way the currency risk would be borne by the foreign supplier.

An alternative method of achieving the same result is to negotiate contracts expressed in the foreign currency but specifying a fixed rate of exchange as a condition of the contract.

The main disadvantage of this method of hedging risk is the possibility of losing business in foreign markets.

There are certain advantages in invoicing in a foreign currency which might persuade an exporter to take on the exchange risk.

(a) There is the possible marketing advantage by proposing to invoice in the buyer’s own currency, when there is competition for the sales contract.

(b) The exporter may also be able to offset payments to their own suppliers in a particular foreign currency against receipts in that currency.

(c) By arranging to sell goods to customers in a foreign currency, a UK exporter might be able to obtain a loan in that currency at a lower rate of interest than in the UK, and at the same time obtain cover against exchange risks by arranging to repay the loan out of the proceeds from the sales in that currency.

In some export markets, foreign currency (often the US dollar) is the normal trading currency, and so Australian exporters might have to quote prices in that currency for customers to consider buying from them.

7.2 Matching receipts and payments

A company that buys and sells in the same currency, or borrows and lends in the same currency, can reduce or eliminate its foreign exchange transaction exposure by matching receipts and payments.

Wherever possible, a company expecting to make payments and to 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.

For example, suppose that an Australian company expects to have to pay £100 000 to a UK supplier in one month’s time, and to receive a payment of £125 000 at about the same time. It can plan to use the money received to make the payment, which means that it has a net transaction exposure of only £25 000 of sterling income.

The process of matching currency receipts and payments, sometimes known as offsetting receipts and payments, is made simpler by having foreign currency accounts with a bank. Receipts of foreign currency can be credited to the account pending subsequent payments in the currency.

Offsetting receipts and payments should be used to manage the currency risk wherever possible. It is important to note that 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 surplus income or payment.
7.3 **Leading and lagging**

Companies may elect to use:

- **Lead payments** (payments in advance), or
- **Lagged payments** (delaying payments beyond their due date)

in order to take advantage of foreign exchange rate movements.

For example, suppose that an Australian company has to make a payment of US$150,000 in two months’ time, but at the current spot rate, US dollars are very cheap. The company might therefore decide to make the payment earlier, taking advantage of the current exchange rate to obtain the US dollars for a low price in Australian dollars. On the other hand, when a company has to make a payment in a foreign currency, the currency might seem over-priced at the current exchange rate. The company might decide to delay (lag) the payment in the hope that the exchange rate will change and the foreign currency will fall in value.

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 earlier than its due date, however early settlement discounts may be available from the supplier to offset.

7.4 **Matching assets and liabilities**

A company that expects to receive a substantial amount of income in a foreign currency at some time in the future will be concerned that this currency may weaken in value.

It can hedge the risk by borrowing in the foreign currency and using the eventual currency receipts to repay the loan.

For example, an Australian company with US dollar receivables can hedge its exposure to a fall in the value of the US dollar by taking out a US dollar overdraft. Similarly, suppose that an Australian company has a large investment in shares in a US company, on which it regularly receives dividends. The company can hedge its exposure to a fall in the value of the US dollar against the Australian dollar by taking out a US dollar loan and using the US dollar dividend income to make the interest payments on the loan.

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) by a **long-term loan in the foreign currency**.

7.5 **Forward exchange contracts**

**Definition**

A **forward exchange contract** is a binding agreement to buy or sell a quantity of one currency in exchange for another, at a future date, and at a rate of exchange that is fixed in the contract.

A widely-used method of hedging transaction risk is the **forward exchange contract**. A forward contract is a contract made now to buy or sell currency at a future date, at a rate of exchange that is fixed now. The trader 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) and therefore eliminates any risk of exchange rate movements up to the time that the transaction takes place.

A **forward exchange contract** is:

(a) an immediately firm and binding contract between a bank and its customer (or between two banks)

(b) for the purchase or sale of a specified quantity of a stated currency, in exchange for another stated currency

(c) at a rate of exchange fixed at the time the contract is made

(d) for performance (settlement of the contract) 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.
7.5.1 Implications of using forward contracts to hedge

A forward contract is a binding contract. Once made, both parties are legally obliged to perform their obligations, and settle the transaction at the agreed settlement date. This means that a forward exchange contract can be used to hedge currency risks by fixing the rate ‘now’ and preventing unforeseen losses from adverse changes in the exchange rate between ‘now’ and the future date when the currency transaction is required.

At the same time, it means that if the exchange rate moves the other way, in a favourable direction, it is also impossible to benefit from any profit arising from the unforeseen change in the exchange rate after the forward transaction has been made.

Even so, a manager might prefer to avoid an unforeseen loss by fixing the exchange rate now, even if this means having to forgo an unexpected profit in the event of a favourable movement in the spot rate. Risk management is not about maximising profit, it is about controlling the risk.

Worked Example: Forward exchange contract

An Australian importer knows on 1 April that he must pay a foreign seller 26 500 Hong Kong dollars in one month’s time, on 1 May. He can arrange a forward exchange contract with his bank on 1 April, whereby the bank undertakes to sell the importer 26 500 Hong Kong dollars on 1 May, at a fixed rate of 8.24.

The importer can be certain that whatever the spot rate on 1 May, he will have to pay on that date:

\[
\frac{26500}{8.24} = 3216
\]

If the spot rate on 1 May is lower than 8.24, the importer would have successfully protected himself against a weakening of the Australian dollar, and would have avoided paying more to obtain the HK dollars. If the spot rate is higher than 8.24, the Australian dollar’s value against the HK dollar would mean that the importer would pay more under the forward exchange contract than he would have had to pay if he had obtained the HK dollars at the spot rate on 1 May. He cannot avoid this extra cost however, because a forward contract is binding.

7.5.2 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.

(a) An importer might find that:
   (i) His 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
   (ii) The supplier sends fewer goods than expected, perhaps because of supply shortages, and so the importer has less to pay for
   (iii) The supplier is late with the delivery, and so the importer does not have to pay for the goods until later than expected

(b) An exporter might find the same types of situation, but in reverse, so that he does not receive any payment at all, or he receives more or less than originally expected, or he receives the expected amount, but only after some delay.

If a customer cannot satisfy a forward exchange contract, the bank will make the customer fulfil the contract.

(a) If the customer has arranged for the bank to buy currency but then cannot deliver the currency for the bank to buy, the bank will:
   (i) Sell currency to the customer at the spot rate (when the contract falls due for performance)
   (ii) Buy the currency back, under the terms of the forward exchange contract
(b) If the customer has contracted for the bank to sell him currency, the bank will:

(i) **Sell** the customer the **specified amount of currency** at the **forward exchange rate**

(ii) **Buy back** the **unwanted currency** at the **spot rate**

Therefore, 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.

**Question 3: Fixing exchange rates**

An Australian company wants to borrow $1 000 000 for one year. The cost of borrowing Australian dollars would be 6%. The company finance director has noticed, however, that he could borrow in Japanese yen at an interest rate of just 1%. The current spot rate for dollar/yen is $1 = 87 yen. The one year forward rate is $1 = 83 yen.

Would it profit the company to borrow in yen for one year, and fix the cost of paying interest and repayment of the loan principal in one year’s time by arranging a forward contract to fix the exchange rate at which it will buy the necessary yen in a year’s time?

(The answer is at the end of the chapter)

### 7.6 Money market hedge

A further method of hedging against currency risk is to use a money market hedge. This involves taking advantage of different interest rates in different countries.

**Money market hedging** involves borrowing in one currency, converting the money borrowed into another currency and putting the money on deposit until the time the transaction is completed, hoping to take advantage of favourable exchange rate movements.

An example is included below for illustration purposes but you will not be required to perform money market hedge calculations in the assessment.

**Worked Example: Money market hedge**

An Australian business is due to receive US$100 000 in 6 months’ time for goods sold to a US customer. The spot rate is 1.0970 - 1.0990.

Interest rates in Australia and the US are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Borrow</th>
<th>Lend</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Australia</td>
<td>6%</td>
<td>5%</td>
</tr>
</tbody>
</table>

The first step is for the company to borrow enough US dollars now to ensure that this borrowing plus interest for six months will equal US$100 000 in six months time. The annual borrowing rate for US dollars is 8% therefore we will use 4% for six months giving the amount that the business will borrow as:

$$\text{US}$100\ 000/1.04 = \text{US}$96\ 154$$

This borrowed amount of US dollars will then be converted into Australian dollars at the current spot rate:

$$\text{US}\$96\ 154/1.0990 = \text{AU}\$87\ 492$$

This amount will then be invested at the Australian interest rate for six months (5%/2 = 2.5%) and at the end of the six month period will be worth:

$$\text{AU}\$87\ 492 \times 1.025 = \text{AU}\$89\ 679$$

When the US$100,000 is received in six months’ time this will be used to pay off the US dollar loan of US$96 154 which with interest will then amount to US$100 000.

In this way the company will know in advance that the net Australian dollar receipt will be AU$89 679 rather than waiting for six months to see what the exchange rate is.
7.6.1 Choosing between a forward contract and a money market hedge

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 choice is generally made on the basis of which method is *cheaper*, with other factors being of limited significance.

7.7 Foreign currency derivatives

We look at derivatives in more detail in Chapter 10. Foreign currency derivatives such as currency futures and options can be used to hedge foreign currency risk.

7.7.1 Currency futures

**Definition**

*Currency futures* are standardised contracts for the sale or purchase at a set future date of a set quantity of currency.

A currency future is essentially a standardised, market-traded forward exchange contract. A *future* represents a commitment to an additional transaction in the future that limits the risk of existing commitments. Currency futures are not nearly as common as forward contracts, and their market is much smaller.

**Advantages of futures to hedge risks**

- Transaction costs should be *lower* than other hedging methods.
- Futures are *tradeable* and can be bought and sold on a secondary market so there is *pricing transparency*, unlike forward contracts where prices are set by individual financial institutions.
- 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.

**Disadvantages of futures**

- The *contracts* are in standard sizes and cannot be tailored to the user’s exact requirements.
- 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).
- Unlike options (see below), they do not allow a company to take advantage of favourable currency movements.

7.7.2 Currency options

*Currency options* protect against adverse exchange rate movements 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 (eg when tendering for overseas contracts).

**Definition**

A *currency option* is a right of an option holder to buy (call) or sell (put) foreign currency at a specific exchange rate at a future date.

The exercise price for the option may be the same as the current spot rate, or it may be more favourable or less favourable to the option holder than the current spot rate.
A key aspect of an option is it **conveys a right but not an obligation**. Thus the option holder has the choice between:

- Exercising the right to buy/sell currency at the agreed price on a specified future date
- Not exercising the right and letting the option lapse (if the exchange rate in the future is more favourable than the exercise price).

Compared to a futures contract, the option protects the holder from adverse movements in exchange rates while letting them take advantage of favourable movements.

Buying a currency option involves **paying a premium for this flexibility**, which is the most the buyer of the option can lose.

Companies can choose whether to buy:

(a) A tailor-made currency option from a bank, suited to the company's specific needs. These are **over-the-counter (OTC) or negotiated** options, or

(b) A standard option, in certain currencies only, from an options exchange. Such options are **traded** or **exchange-traded** options.

**The purpose of currency options**

The purpose of currency options is to reduce or eliminate exposure to adverse currency risks, and they are particularly useful for companies in the following situations:

(a) Where there is uncertainty about foreign currency receipts or payments, either in timing or amount. If the foreign exchange transaction does not occur, the option can be sold on the market (if it has any value) or exercised if this would make a profit.

(b) To support the tender for an overseas contract, priced in a foreign currency

(c) To allow the publication of price lists for its goods in a foreign currency

(d) To protect the import or export of price-sensitive goods.

In both situations (b) and (c), 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.

**Drawbacks of currency options**

- The cost depends on the expected volatility of the exchange rate.
- Options must be paid for as soon as they are bought.
- Tailor-made options lack negotiability.
- Traded options are not available in every currency.

### 7.8 Hedging economic exposure

**Economic exposure** arises from the risk that exchange rate movements might reduce the international competitiveness of a company. **Economic exposures** are long-term in effect and are of strategic importance to a company.

Hedging economic exposures could result in a relocation of operations (or parts of them) to another country or currency zone.

**Transaction exposure**, which has been the main subject of this discussion on hedging, can be seen as a short-term version of economic exposure.

**Worked Example: Economic exposure**

Suppose an Australian company invests in setting up a subsidiary in another country, but the currency of that country depreciates continuously over a five-year period. The cash flows remitted to Australia are worth less in dollars each year, causing a reduction in the value of the investment project.
Another example would be an Australian company which buys raw materials priced in Japanese Yen. It converts these materials into finished products which it exports mainly to the US, pricing the goods in US dollars. Over a period of several years, the Australian dollar depreciates against the Yen but strengthens against the US dollar. The Australian dollar value of the company’s income declines while the Australian dollar cost of its materials increases, resulting in a drop in the value of the company’s cash flows.

If there are fears that a company has large economic exposures, this perceived risk could reduce the company’s value and the share price. Protecting against economic exposure might therefore be necessary in order to protect the company’s share price.

A company need not engage in foreign activities to be subject to economic exposure. For example if a company trades only in Australia but the dollar strengthens appreciably against other currencies, it may find that it loses domestic sales to a foreign competitor who can now afford to charge cheaper Australian dollar prices.

Various actions can reduce economic exposure, including the following.

(a) **Matching assets and liabilities.** A foreign subsidiary can be financed, so far as possible, with a loan in the currency of the country in which the subsidiary operates. A depreciating currency results in reduced income but also reduced loan service costs. A multinational will try to match assets and liabilities in each currency so far as possible.

(b) **Diversifying the supplier and customer base.** A company might buy from a number of different sources, and pay in different currencies. It might also sell abroad into different currency zones. If the currency of one of the supplier countries strengthens, purchasing can be switched to a cheaper source.

(c) **Diversifying operations world-wide.** On the principle that companies that confine themselves to one country have the most severe economic exposures, international diversification is a method of reducing the risk.

(d) **Currency swaps.** An agreement between two parties to swap equivalent amounts of two different currencies for the period of the swap. This allows a company to restructure the currency base of its liabilities.

### 7.9 Hedging translation exposure

**Translation exposure** is the risk that a company with a foreign subsidiary will report losses when it prepares its consolidated financial accounts for the group, due to an adverse exchange rate movement. Translation losses can result from re-stating the book value of a foreign subsidiary’s assets at the exchange rate in force at the end of the accounting period.

Such losses will not have an impact on the firm’s cash flow unless the assets are sold.

However **translation exposures** might affect the share price of a parent company with foreign subsidiaries.

There are opposing arguments as to whether translation exposure is important. The arguments centre on whether the reporting of a translation gain or loss does actually 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.

Translation exposures can be hedged to an extent by group borrowing in the currency of the foreign subsidiary. If the assets of the subsidiary fall in value when translated into dollars, there would be a corresponding fall in the dollar value of the company’s debt liability. Similarly, any fall in the value of the subsidiary’s profits, when translated into dollars, would be offset to some extent by a fall in the dollar value of the interest and capital repayments.
8 Interest rate risk

Section overview

- When there is a rise or fall in the general level of interest rates, all market prices of fixed rate debt securities will change.
- Interest rate changes might also affect financing decisions and investment decisions by companies.
- Interest rate risk includes (a) the risk of paying more interest on debt than necessary, (b) the risk of losses on interest-earning investments and (c) the risk of being unable to meet debt payment obligations.
- Risk management issues include ensuring that the maturity mix of debt instruments is manageable and maintaining a suitable balance between fixed rate and floating rate borrowings.
- Interest rate risk can be managed using internal hedging in the form of asset and liability management, matching and smoothing or using external hedging instruments such as forward rate agreements and derivatives.

Interest rates are effectively the 'prices' governing lending and borrowing. The pattern of interest rates on financial assets is influenced by the risk of the assets, the duration of the lending, and the size of the loan. There is a trade-off between risk and return. Investors in riskier assets expect to be compensated for the risk. Rates of interest and rates of return was covered in more detail in Chapter 3.

Interest rate risk relates to the sensitivity of profit and cash flows to changes in interest rates. An organisation will need to analyse how profits and cash flows are likely to be affected by forecast changes in interest rates and decide whether to take action.

8.1 The impact of interest rate changes

8.1.1 Interest rate changes and capital gains or losses on bonds

When market interest rates on bonds (or other fixed interest financial instruments) go up or down, there will be a fall or rise in the market value of bonds. Bond prices fall when interest rates go up, and rise when interest rates fall.

For example, suppose the government issues long-term gilts at a coupon interest rate of, say, 7% and the market rate of interest is also 7%, the market value of the securities will be $100 per $100 face value of the stock (or '100 per cent'). This is because bonds have a par value whenever they offer a coupon rate of interest equal to the current market interest yield.

(a) Suppose that interest rates in the market subsequently rise to, say, 10% the re-sale value of the gilts will fall to about:

\[ $100 \times 7%/10% = $70.00 \text{ per } $100 \text{ face value of the stock} \]

An investor in the gilts will make a capital loss of $30 (plus selling costs) if he decides to sell the securities.

(b) If nominal interest rates subsequently fall to, say, 5%, the re-sale value of the gilts will rise to:

\[ $100 \times 7%/5% = $140 \text{ per } $100 \text{ face value} \]

An investor could then sell his asset for a capital gain of $40 (less selling costs).

8.1.2 Interest rate changes and financing decisions

Interest rates are important for financial decisions by companies.

(a) When interest rates are low, it might be financially prudent:

(i) To borrow more, preferably at a fixed rate of interest, and so increase the company's gearing.

(ii) To borrow for long periods rather than for short periods.
(iii) To pay back loans on which the rate of interest is high and to take out new loans at a lower interest rate.

(b) When interest rates are high and expected to remain at that level or even go higher:

(i) A company might decide to reduce the amount of its debt finance, and to substitute it with new equity finance, such as retained earnings.

(ii) A company which has a surplus of cash and liquid funds might switch some of its short-term investments out of equities and into interest-bearing securities.

(iii) A company might opt to raise new finance by borrowing at a variable interest rate (for example, by taking out a loan with a variable interest rate) rather than borrowing long-term funds at fixed rates of interest (by issuing bonds). The company would then benefit from any eventual fall in interest rates.

8.1.3 Interest rate changes and new capital investments

When interest rates go up, and so the cost of finance to a company goes up, the minimum return that a company will require on its own new capital investments will go up too. Some new capital projects might be in the pipeline, with purchase contracts already signed with suppliers, and so there will often be a time lag before higher interest rates result in fewer new investments.

A company’s management should give close consideration, when interest rates are high, to keeping investments in assets down to a minimum in order to reduce the company’s need to borrow.

8.2 Interest rate exposures

Interest rate risk includes

(a) the risk of paying more interest on debt than necessary,

(b) the risk of losses on interest-earning investments, and

(c) the risk of being unable to meet debt payment obligations.

Risk management issues include ensuring that the maturity mix of debt instruments is manageable and maintaining a suitable balance between fixed rate and floating rate borrowings.

An organisation has some exposure to interest rate risk if it:

(a) has any assets that earn interest, or

(b) has any liabilities on which interest is paid

Companies with massive amounts of financial assets and liabilities, eg commercial banks, face the greatest interest rate risks. Not surprisingly, they have developed extensive risk management systems to hedge and control these risks. Some institutions have more financial assets than liabilities: these include investment institutions and investment funds.

Many non-bank trading companies might have a few interest-bearing financial assets, but substantial borrowings. Borrowing creates an exposure to interest rate risk.

8.2.1 Floating vs. fixed interest rate debt

The most common form of interest rate risk faced by a company is the volatility of cash flows associated with a high proportion of floating interest rate debt. Floating interest rates, of course, change according to general market conditions.

Some of the interest rate risks to which a firm is exposed may cancel each other out, where there are both assets and liabilities on which there is exposure to interest rate changes. If interest rates rise, more interest will be payable on loans and other liabilities, but this will be compensated for by higher interest received on assets such as money market deposits.

A company with a high proportion of fixed interest rate debt has a commitment to fixed interest payments. If interest rates fall sharply, the company will suffer from a loss of competitive advantage compared with companies using floating rate borrowing whose interest costs and cost of capital will fall.
9 Managing interest rate risk

Interest rate risk can be managed using internal hedging in the form of asset and liability management, matching and smoothing or using external hedging instruments such as forward rate agreements and derivatives.

9.1 Matching and smoothing

Matching and smoothing are two methods of internal hedging used to manage interest rate risk.

Definition

Matching is where liabilities and assets with a common interest rate are matched.

For example subsidiary A of a company might be investing in the money markets at LIBOR and subsidiary B is borrowing through the same market at LIBOR. If LIBOR increases, subsidiary B's borrowing cost increases and subsidiary A's returns increase. The interest rates on the assets and liabilities are therefore matched.

This method is most widely used by financial institutions such as banks, who find it easier to match the sizes and characteristics of their assets and liabilities than commercial or industrial companies.

Definition

Smoothing is where a company keeps a balance between its fixed rate and floating rate borrowing.

A rise in interest rates will make a floating rate loan more expensive but this will be compensated for by the less expensive fixed rate loan. The company may however incur increased transaction and arrangement costs.

9.2 Forward rate agreements (FRAs)

Forward rate agreements hedge risk by fixing the interest rate on future borrowing.

A company can enter into an FRA with a bank that fixes the rate of interest for borrowing at a certain time in the future. If the actual interest rate proves to be higher than the rate agreed, the bank pays the company the difference. If the actual interest rate is lower than the rate agreed, the company pays the bank the difference. The FRA does not need to be with the same bank as the loan as the FRA is a hedging method independent of any loan agreement.

The interest rates which banks will be willing to set for FRAs will reflect their current expectations of interest rate movements. If it is expected that interest rates are going to rise during the term for which the FRA is being negotiated, the bank is likely to seek a higher fixed rate of interest than the variable rate of interest which is current at the time of negotiating the FRA.

An advantage of FRAs is that, for the period of the FRA at least, they protect the borrower from adverse market interest rate movements to levels above the rate negotiated for the FRA. With a normal variable rate loan (for example, linked to a bank's base rate or to LIBOR) the borrower is exposed to the risk of such adverse market movements. On the other hand, the borrower will not benefit from the effects of favourable market interest rate movements.
9.3 Futures contracts

Interest rate futures can be used to hedge against interest rate changes between the current date and the date at which the interest rate on the lending or borrowing is set. Borrowers sell futures to hedge against interest rate rises; lenders buy futures to hedge against interest rate falls.

Like other futures contracts, interest rate futures offer a way in which speculators can 'bet' on market movements just as they offer others who are more risk-averse a way of hedging risks.

(a) Borrowers will wish to hedge against an interest rate rise by selling futures now and buying futures on the day that the interest rate is fixed.

(b) Lenders will wish to hedge against the possibility of falling interest rates by buying futures now and selling futures on the date that the actual lending starts.

The basic principles behind such a decision are:

(a) The futures price is likely to vary with changes in interest rates, and this acts as a hedge against adverse interest rate movements.

(b) The outlay to buy futures is much less than for buying the financial instrument itself, and so a company can hedge large exposures of cash with a relatively small initial employment of cash.

Interest rate futures are similar in effect to FRAs, except that the terms, amounts and periods are standardised. As a result it is not always possible to achieve an exact match with the underlying interest rate exposure.

9.4 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.

Definition

An interest rate option grants the buyer of it 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.

Clearly, a buyer of an option to borrow will not wish to exercise it if the market interest rate is now below that specified in the option agreement. Conversely, an option to lend will not be worth exercising if market rates have risen above the rate specified in the option by the time the option has expired.

The cost of the option is the 'premium'. Interest rate options offer more flexibility than and are more expensive than FRAs.
9.4.1 Interest rate caps, collars and floors

Various cap and collar agreements are possible.

(a) An interest rate cap is an option which sets an interest rate ceiling.

(b) A floor is an option which sets a lower limit to interest rates.

(c) Using a ‘collar’ arrangement, the borrower can buy an interest rate cap and at the same time sell an interest rate floor. This limits the cost for the company as it receives a premium for the option it has sold.

The cost of a collar is lower than for buying an option alone. However, the borrowing company forgoes the benefit of movements in interest rates below the floor limit in exchange for this cost reduction and an investing company forgoes the benefit of movements in interest rates above the cap level.

9.5 Interest rate swaps

Definition

Interest rate swap is an agreement whereby the parties to the agreement exchange interest rate commitments.

Interest rate swaps are where two parties agree to exchange interest rate payments. In practice, however, the major players in the swaps market are banks and many other types of institution can become involved, for example national and local governments and international institutions.

In the simplest form of interest rate swap, party A agrees to pay the interest on party B’s loan, while party B reciprocates by paying the interest on A’s loan. If the swap is to make sense, the two parties must swap interest which has different characteristics. Assuming that the interest swapped is in the same currency, the most common motivation for the swap is to switch from paying floating rate interest to fixed interest or vice versa, raising less expensive loans and securing better deposit rates.

Obvious questions to ask are:

- Why do the companies bother swapping interest payments with each other?
- Why don’t they just terminate their original loan and take out a new one?

The answer is that transaction costs may be too high. Terminating an original loan early may involve a significant termination fee and taking out a new loan will involve issue costs. Arranging a swap can be significantly cheaper, even if a banker is used as an intermediary. Because the banker is simply acting as an agent on the swap arrangement and has to bear no default risk, the arrangement fee can be kept low.
Key chapter points

- Risk is the possible variation in an outcome from what is expected to happen. Uncertainty is the inability to predict the outcome of an activity due to a lack of information.
- The risks faced by a company can be looked at from the point of view of the company and its management, and also the investors in the company.
- Downside risk is the possibility that an event will occur and adversely affect the achievement of objectives. Opportunity or upside risk is the possibility that an event will occur and positively affect the achievement of objectives.
- Risk management is the process of identifying and assessing (analysing and evaluating) risks and the development, implementation and monitoring of a strategy to respond to those risks.
- Risk appetite refers to the extent to which a company is prepared to take on risks in order to achieve its objectives. A company can be risk averse, risk neutral or risk seeking.
- The risks faced by a business can be categorised in different ways into internal and external risk, or divided into financial risks and operational risks.
- Financial risk is the risk arising as a result of how the business is financed, and subdivides into credit risk (e.g. loss due to the default of a borrower) and market risk (e.g. interest rate risk). Operational risk is all the risks faced by a business that are not financial risks.
- Interest rate risk (which is part of market risk) is the risk of higher or lower profits or losses than expected, as a result of uncertainty about future movements in an interest rate, or the general level of interest rates.
- The Institute of Risk Management identifies four different risk classifications: financial, strategic / business, operational, hazard / event.
- Companies engaged in international trade face enhanced trading risk, environmental risks and foreign currency risk.
- Risks need to be identified and assessed. Risk identification considers internal and external events that might give rise to risk. Risk assessment involves the evaluation or ranking of the identified risks in order to identify significant risks and implement suitable risk responses.
- Risk assessment can be quantitative (probability x financial consequences) or qualitative (risk map or matrix).
- Foreign exchange risk consists of transaction, translation and economic risk.
- Basic methods of hedging foreign currency risk include matching receipts and payments, invoicing in own currency, and leading and lagging the times that cash is received and paid. Alternatives are to use a forward contract or money market hedge.
- A forward contract specifies in advance the rate at which a specified quantity of currency will be bought and sold.
- Money market hedging involves borrowing in one currency, converting the money borrowed into another currency and putting the money on deposit until the time the transaction is completed, hoping to take advantage of favourable exchange rate movements.
- Foreign currency derivatives such as futures contracts and options can also be used to hedge foreign currency risk.
- Currency futures are standardised contracts for the sale or purchase at a set future date of a set quantity of currency.
• Currency options protect against adverse exchange rate movements 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 (eg when tendering for overseas contracts).

• Economic exposures are long-term in effect and of strategic importance. Hedging economic exposures could result in a relocation of operations (or some of them) to another country or currency zone.

• Translation exposures might affect the share price of a parent company with foreign subsidiaries. An exposure can be reduced by borrowing in the domestic currency of the subsidiary.

• When there is a rise or fall in the general level of interest rates, all market prices of fixed rate debt securities will change. Interest rate changes might also affect financing decisions and investment decisions by companies.

• Interest rate risk includes (a) the risk of paying more interest on debt than necessary, (b) the risk of losses on interest-earning investments and (c) the risk of being unable to meet debt payment obligations.

• Risk management issues include ensuring that the maturity mix of debt instruments is manageable and maintaining a suitable balance between fixed rate and floating rate borrowings.

• Interest rate risk can be managed using internal hedging in the form of asset and liability management, matching and smoothing or using external hedging instruments such as forward rate agreements and derivatives.

• Forward rate agreements hedge risk by fixing the interest rate on future borrowing.

• Interest rate futures can be used to hedge against interest rate changes between the current date and the date at which the interest rate on the lending or borrowing is set. Borrowers sell futures to hedge against interest rate rises; lenders buy futures to hedge against interest rate falls.

• 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.

• Caps set a ceiling to the interest rate; a floor sets a lower limit. A collar is the simultaneous purchase of a cap and sale of a floor.

• Interest rate swaps are where two parties agree to exchange interest rate payments and act as a means of switching from paying one type of interest to another.
Quick revision questions

1 Which of the following is a downside risk for a business?
   A revenues may rise
   B the market may grow faster than expected
   C quality of the product may improve
   D cost of raw materials may increase

2 Which of the following is not a strategy for managing risk?
   A risk transfer
   B risk avoidance
   C risk escalation
   D risk retention

3 Which of the following investments would be most likely to be selected by a risk seeking investor?
   A highest risk, highest return
   B highest risk, lowest return
   C lowest risk, highest return
   D lowest risk, lowest return

4 Which of the following is not an example of operational risk?
   A event risk
   B gearing risk
   C people risk
   D process risk

5 Which of the following is not one of the commonly used techniques for risk identification and assessment, according to the Institute of Risk Management (IRM) ’A structured approach to Enterprise Risk Management’?
   A SWOT analysis
   B audits of compliance
   C structured questionnaires and checklists
   D operational planning

6 Transaction risk is the risk of adverse exchange rate movements occurring in the course of normal international trading transactions. Is this statement true or false?
   A true
   B false
7 Which of the following is not a type of currency risk?
A translation risk
B economic risk
C principal risk
D transaction risk

8 Which of the following hedging techniques would be most appropriate for hedging the purchase of a machine in a foreign currency, where there is a possibility that the supplier of the machine may not fulfil the contract?
A leading and lagging
B forward contract
C foreign currency option
D money market hedge

9 What will happen to the market price of Treasury bills when market interest rates fall?
A no change
B market price increases
C market price decreases
D direction of price movement depends on other market factors

10 Fill in the blanks
With a collar, the borrower buys (1) ......................... and at the same time sells (2) .........................

11 Which of the following is not an interest rate derivative used to hedge interest rate risk?
A interest rate option
B interest rate convertible bond
C interest rate swap
D interest rate futures contract
Answers to quick revision questions

1  D  Downside risk is the possibility that an event will occur and adversely affect the achievement of objectives.

2  C  Risk management strategies available to a business may involve:
- risk avoidance – e.g. not undertaking the relevant activity.
- risk reduction – taking steps to reduce the severity of the impact.
- risk transfer – passing the risk to a third party through hedging or insurance.
- risk retention – accepting the loss if and when it occurs.

3  A  A risk seeking attitude is that an investment should be undertaken if it offers higher possible returns, even if the risk is higher.

4  B  Operational risk is the variability arising from the effectiveness of how the business is managed and controlled on a day to day basis. Gearing risk is a type of financial risk.

5  D  Refer to section 5.3 for the full list of commonly used techniques, which do not include "operational planning".

6  A  Transaction risk 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.

7  C  Currency risk occurs in three forms: transaction exposure (short-term), economic exposure (effect on present value of longer term cash flows) and translation exposure (book gains or losses).

8  C  In the event that the contract is not fulfilled the option does not have to be exercised and is therefore the most flexible.

9  B  When market interest rates go down, there will be a rise in the market value of Treasury Bills to ensure that the Treasury Bills are giving a return commensurate with the market rate.

10  (1) An interest rate cap
    (2) An interest rate floor

11  B  Swaps, options and futures contracts are all methods of hedging interest rate risk. A convertible bond is a type of security which usually carries a lower interest rate because it offers the opportunity to convert to an equity stake in the company at a later date.
Answers to chapter questions

1. Here are some generic examples of the sort of risks you may have identified.

For many businesses the key strategic or business risk will be that customers do not purchase their product or service, e.g. due to increased competition or, as a result of an economic downturn. Other risks include increases in the costs of producing the product/service and running the business which erode profitability. Key financial risks will involve any threats to cash flow and solvency e.g. were the bank to limit or withdraw overdraft and loan facilities or profits to fall to the extent that interest payments are no longer able to be met. Hazard risks may arise as a result of the reliance of the business on key members of staff – should a critical person be involved in an accident there may be no obvious succession plan in place. Alternatively, the collapse of a key supplier might cause major disruption to the company’s supply chain. Operational risks may involve the failure to comply with appropriate health and safety or human resource legislation.

2. Risk avoidance – don’t invest.

Risk reduction – invite the government or domestic businesses to be part-owners of the business, invest small amounts gradually until the government’s long-term attitude becomes apparent.

Risk transfer – insure any assets.

Risk retention – accept the risk of losses if the government should revert to its previous policy.

3. If the company borrowed in Australian dollars, after one year, at an interest cost of 6%, the cost of paying interest and repaying the loan would be AUS $ 1,060,000.

If the company borrowed yen, it would need to borrow 87 million yen (and convert this into dollars at the spot rate of 87). Interest would be 87 million yen × 1% = 870,000 yen. The company would have to pay interest and principal of 87,870,000 yen in one year’s time. If this transaction is hedged with a forward contract at a rate of 83, the cost in dollars would be (87.87 million/83) = $1,058,674.

The cost would be about the same as borrowing in dollars. This is what would be expected, because forward rates reflect interest rate differentials between the two currencies.
Chapter 10

Hedging and derivatives

<table>
<thead>
<tr>
<th>Learning objectives</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital markets</strong></td>
<td>LO2</td>
</tr>
<tr>
<td>Describe the characteristics of derivatives and other hedging instruments</td>
<td>LO2.7</td>
</tr>
<tr>
<td>Identify the advantages and disadvantages of different hedging strategies</td>
<td>LO2.8</td>
</tr>
<tr>
<td>Identify different methods of hedging which are appropriate to meeting an organisation’s objectives</td>
<td>LO2.9</td>
</tr>
</tbody>
</table>

**Topic list**

1. Financial instruments and derivatives
2. Futures and forward contracts
3. Options and warrants
4. The uses of derivatives
In Chapter 9 we considered the various risks facing a business and introduced some of the techniques that can be applied to manage these risks. In this chapter we further examine the use of derivatives as a tool for transferring risk, and we consider the costs and benefits of some of the key products you will come across on the Australian Stock Exchange (ASX).
If you have studied these topics before, you may wonder whether you need to study this chapter in full. If this is the case, please attempt the questions below, which cover some of the key subjects in the area.

If you answer all these questions successfully, you probably have a reasonably detailed knowledge of the subject matter, but you should still skim through the chapter to ensure that you are familiar with everything covered.

There are references in brackets indicating where in the chapter you can find the information, and you will also find a commentary at the back of the Study Manual.

1. What is a financial instrument? (Section 1)
2. What is a derivative? (Section 1)
3. Explain what a futures contract is and give an example of how an index future might be used for hedging. (Sections 2.1/2.1.3)
4. What is the difference between a put and a call option? (Section 3.1)
5. Name two differences between options and warrants traded on the ASX. (Section 3.3)
1 Financial instruments and derivatives

Section overview

- Financial instruments are contracts that give rise to both a financial asset for one party to the contract and a financial liability or equity instrument by the other party to the contract.
- **Primary** financial instruments are those that have an associated, measurable value such as equity shares, corporate bonds, loans, cash deposits, and receivable balances.
- **Secondary financial instruments** often referred to as derivatives, are financial instruments whose value is derived from an underlying asset. Examples include forward contracts, futures, options and swaps.
- Derivatives are essentially tools for transferring risk, and offer the opportunity to diminish or increase exposure to uncertain events. A major use of derivatives is for hedging.

Definition

A **financial instrument** is a contract that gives rise to a financial asset for one party to the contract and a financial liability or equity instrument for the other party (the counterparty).

The term 'financial instrument' covers a range of entities and contracts, which can be split into two main types: primary and secondary.

**Primary financial instruments** include things such as shares, bonds, currencies and interest rates. These instruments are defined as primary by the fact that they have an associated, measurable value.

**Secondary financial instruments** often referred to as derivatives, are financial instruments whose value is derived from an underlying asset. Examples include futures, forward contracts, options and warrants.

Definition

Secondary financial instruments, or derivatives are financial instruments that derive their value from the price or actual value of an underlying asset or item.

In Chapter 9 we considered the various risks facing a business.

Some of the risk facing a business arises because of changes in the prices of currency, interest rates or commodities. Such changes increase the variability of profits and are borne by the investor in the sense that they will cause the share price to change.

Derivatives are essentially tools for transferring risk, and offer the opportunity to diminish or increase exposure to uncertain events. A major use of derivatives is for hedging (see Section 4). The purpose of hedging is to remove or reduce the risk of price changes in shares, commodities, interest rates and foreign currency.

**Question 1: Secondary financial instruments**

Have a look at the financial pages of a quality newspaper. Try listing as many secondary financial instruments as you can.

(The answer is at the end of the chapter)
2 Futures and forward contracts

<table>
<thead>
<tr>
<th>Section overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A <strong>future</strong> is a standardised contract, which may be traded or exchanged, to buy or sell a specific amount or value of an asset in the future at a set price, for delivery and payment on a set date.</td>
</tr>
<tr>
<td>• The ASX provides futures in interest rates, equities, currencies and commodities.</td>
</tr>
<tr>
<td>• A <strong>forward contract</strong>, like a future, is a binding promise to purchase or sell a set amount or value of an underlying asset at a set future time. Unlike a future, forwards are not traded; they are bespoke contracts between two parties.</td>
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</tbody>
</table>

2.1 Futures

**Definition**

A **future** is a standardised contract, which may be traded or exchanged, to buy or sell a specific amount or value of an asset in the future at a set price, for delivery and payment on a set date.

Futures were some of the first derivatives, the asset underlying the instrument normally being a commodity such as gold, coffee, oil or sugar. As the markets became more sophisticated, financial futures were developed and traded, with the underlying financial assets typically being bonds, shares and currencies.

2.1.1 ASX futures

The ASX provides futures in interest rates, equities, currencies and commodities. For example, wool and grain commodity futures available through ASX provide industry participants with a way to manage price risk in an often volatile market, where prices are affected by seasonal variation and also by unpredictable events e.g. droughts.

It should be emphasised that a future is a binding contract – a firm and binding promise by one party to buy and another party to sell a given, underlying asset at a set price at a set date. A future represents an additional transaction which runs alongside the company’s existing commitment, in order to reduce the risk associated with that commitment.

**Worked Example: Futures contract**

A company needs to purchase a consignment of coffee beans on 30 September. The current price of coffee on 1 July is $1 410 per tonne. The price on 30 September is uncertain. The company enters into a 3 month futures contract to buy coffee beans on 30 September at a futures price that is agreed today at $1 425 (this is based on the futures market estimate of the price in September).

On 30 September the company buys the coffee beans in the open market at the prevailing price, say $1 430. At the same time it closes out the futures contract (which would otherwise represent an obligation to buy further coffee beans) by selling the futures before the contract expiry date. The price of the futures contract on 30 September is the same as the September market price of $1 430. Therefore, the company makes a gain on the futures of $5 per tonne (selling price $1 430 – purchase price $1 425) which can be offset against the price it paid in the open market.

Therefore, the final price paid per tonne is $1 430 (market price) - $5 (gain on futures contract) i.e. $1 425. It can be seen that the futures contract has allowed the company to fix the price in advance at $1 425 per tonne.
2.1.2 Advantages and disadvantages

The objective of a futures contract is to remove the risk associated with price fluctuations by fixing the price. The benefit is that the downside risk of adverse price movements is eliminated. However, the disadvantage is that any upside risk of favourable price movements is removed.

The other disadvantage of futures contracts is that they are traded in standardised amounts and only whole contracts can be bought or sold. e.g. one coffee futures contract is 10 tonnes, so it is not always possible to cover the exact size of the transaction.

2.1.3 Index futures

Index futures can be used to protect against a fall in the value of a portfolio of shares. These are useful to investors with significant investments e.g. pension funds and are an alternative to managing the value of the portfolio by buying and selling the shares within it.

ASX offers four types of index future, three of which are based on the SPI 200 Index of the top 200 companies and the last of which is based on the SPI 50 Index of the top 50 companies.

When you buy an ASX Index Future, you agree to 'buy' the index's value underlying the futures contract on a specified date in the future. When you sell a future, you agree to 'sell' the index's value at that time. At maturity of the contract a cash settlement takes place. Whether a profit or loss is made on the contract at maturity depends on how the index has moved in the period since the futures contract was traded.

Note that the full value of the futures contract is not paid or received when the contract is established. Instead both buyer and seller pay an initial margin, which is a small percentage of the value of the contract. Over the life of the futures contract each then either pays or receives variation margins as the price of the futures contract varies with the movement of the underlying index.

Assume that the purpose of using index futures is to hedge against short term movements in the value of a share portfolio. Should the index fall, the gain on the index futures is available to offset the actual loss in value of the share portfolio. Conversely, should the index rise, any increase in value in the share portfolio is negated by the loss on the corresponding futures contract. Effectively the futures leave the investor in a no win/no loss position.

2.1.4 Futures exchanges

Futures can be highly volatile instruments and are traded on organised exchanges, which undertake to standardise the framework of trade in terms of quantities and delivery dates and, through associated 'clearing houses', to police the fulfilment of the contracts.

The clearing houses require participants or traders to 'trade on margin' or make a deposit, with the exchange, of a set percentage of all their outstanding contracts (typically between 5% and 15% of the contract value).

This is a way for the exchange to limit its own exposure to the risk of default and poor liquidity, although responsibility for fulfilment of the contract lies with the parties to it and not with the exchange. Unlike many derivatives, the market in futures is heavily regulated by government bodies.

2.2 Forward contracts

Definition

A forward contract, like a future, is a binding promise to purchase or sell a set amount or value of an underlying asset at a set future time. Unlike a future, forwards are not traded; they are bespoke contracts between two parties.
Forward contracts allow a company to set the price of a commodity well in advance. They are often used for gold, oil and agricultural products where market prices tend to be volatile. As well as commodities, they can also be based on currencies or interest rates, this latter being known as a Forward Rate Agreement or FRA. Forwards are popular with companies who wish to minimise risk and increase the certainty associated with their underlying costs.

For example, suppose an Australian company knows in January that it will be buying and paying for components at a cost of US $400 000 at the end of June. It could do nothing and buy US $ at the prevailing spot rate on the day of settlement, or, if it is unwilling to take the risk that the exchange rate may move against it, it could buy a forward contract at a set exchange rate. The rate may go either in the company’s favour or against it, but by taking the forward contract out, the company has managed its risk and avoided any surprises, good or bad.

Unlike futures, forward contracts are made between two parties and can be tailored to their exact requirements, however cancellation requires agreement of both parties.

3 Options and warrants

Section overview

• Options are the right but not the obligation to purchase (a call option) or sell (a put option) an underlying asset at a set price but at a future date.
• Options offer the opportunity to minimise the downside risk of adverse price movements, while providing the potential to share in any upside i.e. favourable price movements.
• Warrants are financial instruments issued by banks, governments and other institutions, which are traded on the ASX. Warrants may be issued over securities (such as shares), a basket of different securities, a share price index, debt, currencies, or commodities.
• A warrant works on the same principle as an option but because warrants are not a standardised product, there is much greater flexibility to tailor products to suit quite specific investor needs.

3.1 Options

Definitions

Options are the right but not the obligation to purchase (a call option) or sell (a put option) an underlying asset at a set price but at a future date.

A European option has to be exercised at a fixed date in the future.

An American option can be exercised at any point in time up to the expiry date of the option.

Options convey 'the right but not the obligation' to the holder and therefore provide more flexibility than a futures contract. The key difference is that the holder of the option has a choice and can:

(a) Exercise their right to buy or sell at a pre-determined price, or
(b) Let the option lapse.

Therefore, options have an advantage over futures because they offer the opportunity to minimise the downside risk of adverse price movements, while providing the potential to share in any upside i.e. favourable price movements.

In view of this flexibility, the seller or writer of the option receives a sum of money, the option premium, in consideration for granting the option purchaser the rights associated with the option.
**Worked Example: Options**

Say an investor knows that he will have a cash surplus available in three months' time which he wishes to use to buy shares in company Z. The current share price of company Z is $1.90 but he is concerned that the price may rise in the future. The investor could therefore purchase a call option, giving him the right to purchase shares in company Z for say $2.00 (the exercise price).

If the actual share price in three months rises to $2.20, the investor will use the option to purchase the shares at an option price of $2.00. The option is said to have an intrinsic value of $0.20 as this is the gain that could be made by immediately selling the shares.

If the share price falls to $1.80, the investor will let the option lapse and purchase shares on the open market at the market price of $1.80.

Options are a widely used tool in the management of financial risk and can be based on any underlying asset that can be reliably valued, for example, shares and commodities, and traded options are also available on the ASX SPI 200 index – these are referred to as ETOs or Exchange Traded Options.

Once again, these derivatives have evolved into some rather exotic beasts, e.g. futures options, which take a futures contract as the underlying asset, the value of which is of course itself derived from an underlying financial asset.

**3.2 Warrants**

Warrants are financial instruments issued by banks, governments and other institutions, which are traded on the ASX. Warrants may be issued over securities (such as shares), a basket of different securities, a share price index, debt, currencies, or commodities.

Some give holders the right to buy, or to sell the underlying instrument (e.g. a share) to the warrant issuer for a particular price according to the terms of issue.

Others entitle holders to receive a cash payment relating to the value of the underlying instrument at a particular time (e.g. index warrants).

Warrants may only be issued by a bank or other financial institution approved by the ASX as a warrant issuer.

**Definitions**

A **call warrant** gives the warrant holder the right to buy the underlying asset from the warrant issuer.

A **put warrant** gives the warrant holder the right to sell the underlying asset to the issuer.

The price of the warrant is determined by the price of the underlying asset, and market conditions at the time.

A warrant works on the same principle as an option.

**Worked Example: Warrants**

Suppose an investor holds an American 3 month call warrant over X Ltd’s shares, at an exercise price of $1.55. The current share price is $1.50. The investor has the right to purchase a share in X Ltd at any time in the next three months at $1.55. At the point of issue the warrant has no value. If the share price rises to $1.65 the warrant is clearly valuable as the holder can purchase a share at $1.55 and sell it immediately in the market for $1.65. This is known as the **intrinsic value**.
The range of financial instruments traded as warrants has evolved over time and covers a wide spectrum of risk profiles, investment objectives and likely returns. They are broadly split into trading style warrants and investment style warrants.

Trading-style warrants are frequently traded and relatively short-dated. Trading warrants can be used to manage risk on an investment portfolio but are predominantly used for short term speculative purposes. They have a higher risk/return profile compared to the investment-style warrants. Index warrants, currency warrants and equity warrants usually fall within this category.

Investment-style tend to be longer dated and are less frequently traded. They have a lower risk/return profile and often have a higher initial outlay compared to trading-style warrants. Endowments and structured investment products are investment-style products.

### 3.3 Comparing warrants and options

**Similarities:**
- Both are traded on ASX.
- Options and warrants are both based on an underlying asset e.g. shares.
- The buyer must pay a premium up-front.
- Can only be exercised at a pre-determined price.
- Can be exercised any time before a pre-determined date (American style) or at expiry (European style).

The major differences between options and warrants are as follows:
- The broader range of warrant products available.
- The longer potential lifetime of the products which range from three months to 15 years as compared to Index options (up to 18 months) and Equity options (up to five years).
- Because warrants are not a standardised product like exchange traded options, there is the flexibility to tailor products to suit quite specific investor needs.

### 4 The uses of derivatives

**Section overview**
- There are three main uses for derivatives: risk management (hedging), speculation, and arbitrage.

Over the last thirty years the growth in form and use of derivative instruments has been immense. The characteristics of the different types of derivatives are often very specific and make them suited to different purposes.

There are many users of derivatives, who can be classified in terms of the roles that they perform, e.g. company treasurers, traders, investment managers among others.

There are three main reasons for employing a derivative instrument:
- Risk management and hedging.
- Speculation.
- Arbitrage.

### 4.1 Risk management and hedging

**Definition**
A **hedge** is a transaction to reduce or eliminate an exposure of risk.
We considered risk management in Chapter 9. Hedging, sometimes called exposure management, is a form of risk management used by companies to offset a variety of market risks. In essence, the company is trying to reduce the volatility, or increase the predictability of its profits and/or cash flows. To achieve this a company can use derivatives to offset adverse changes in underlying assets.

For example, consider an Australian company planning on acquiring a large piece of machinery from a foreign manufacturer, priced at US $1 000 000. If the exchange rate rises they will incur significant extra costs. The company may choose to hedge in order to manage some of this risk and, depending on their appetite for risk, may choose to use a forward contract or futures.

The basic idea is that a company uses financial instruments to transfer the risk they are trying to manage, via the market, to those with a higher appetite for risk. In other words, a hedge is an insurance against some or all of the risk associated with a particular business activity. When using a hedge, the instruments chosen often have an inverse relationship to the movements of the hedged transaction.

For example, consider a fund that has invested in stocks, and the fund manager expects the market to go down in the near-term. If the market does indeed fall, the net asset value (NAV) of the fund will also decline. The fund manager can minimise the loss by 'hedging' his portfolio in anticipation of the fall. Since he holds stocks, he will invest in derivatives in such a way that the contracts benefit from the fall in index value. The fund manager may choose to hedge all or only some of the risk. This depends on his hedging objectives.

### 4.1.1 Hedging objectives

These vary widely between businesses and between transactions depending on the company’s risk appetite. The main problem when deciding upon a hedging policy is to strike a balance between uncertainty and the opportunity cost. Setting hedging policy is a strategic decision, the success or failure of which can have profound impacts on a company.

### 4.1.2 Does hedging matter?

Given the extensive use of hedging in general and derivatives in pursuit of exposure management in particular, it would seem that corporate treasurers, financial directors and shareholders generally think it does. Notwithstanding this, there are a number of authors who argue that it is largely irrelevant.

Provided the expected level of profit remains unchanged, the volatility is irrelevant as investors should take action to diversify their portfolio themselves and will thus be unwilling to pay a premium for the hedging activities of companies. The argument goes that investors will not be interested in individual fluctuations but in the performance of a diversified portfolio as a whole, which, if properly managed, will balance out the ups and downs of individual investments. These arguments would, therefore, seem to suggest that hedging would only be of interest to individual companies, and their managers, whose performance assessment may be based on short-term measures.

For hedging to be justified in financial terms, it has to have a positive effect on the value of the company; i.e. it must increase net cash flow or reduce the company’s cost of capital. Investors, irrespective of the actions of individual companies, can technically manage their main financial risks by using a diversified portfolio. This argument, however, ignores other, non-financial risks which may increase as a result of volatile earnings: reputational risk, increased incidence of liquidity shortages, higher contracting costs, and so on, which may in themselves lead to an increase in the cost of capital.

### 4.2 Speculation

Without risk there is no business. Speculators take a calculated risk on the movements in an underlying asset value and trade derivatives based on these, in the expectation of making a profit. Derivative prices are volatile and thus the returns or losses on speculation can be great. Speculators choose to use derivatives for a number of reasons:

- They generally mirror the performance of the underlying asset from which their value is derived.
- They are more efficient to trade in: e.g. transaction costs associated with trading a derivative may be significantly lower than those incurred in trading the underlying asset.
- Speculators can sell derivatives before they buy them, if they anticipate a fall in value, from which they can still make a profit. This is known as shorting the market.
- Derivatives markets are, generally speaking, more liquid than the markets associated with the underlying assets.
Speculators are often derided in the press; however, they do have a role to play in the development of efficient financial markets. Their activities can help to create liquidity in the markets, both for other speculators with different views, risk appetites or performance targets and also for other derivatives users.

4.3 Arbitrage

**Definition**

*Arbitrage* is the process of buying an instrument in one market and selling it either instantly or over a very short time horizon on another market, exploiting differences in the price to make a profit.

Theoretically, the price of an instrument should be identical whichever market it is traded in. In reality, however, even with the development of multi-national and global trading this is not always the case. Therefore arbitrage can be and is a major use of derivatives.
Key chapter points

- Financial instruments are contracts that give rise to both a financial asset for one party to the contract and a financial liability or equity instrument by the other party to the contract.

- **Primary** financial instruments are those that have an associated, measurable value such as equity shares, corporate bonds, loans, cash deposits, and receivable balances.

- Secondary financial instruments, or **derivatives** are financial instruments that derive their value from the price or actual value of an underlying asset or item. Examples include futures, forwards, swaps and options.

- Derivatives are essentially tools for transferring risk, and offer the opportunity to diminish or increase exposure to uncertain events. A major use of derivatives is for hedging.

- A **future** is a standardised contract, which may be traded or exchanged, to buy or sell a specific amount or value of an asset in the future at a set price, for delivery and payment on a set date. The ASX provides futures in interest rates, equities, currencies and commodities.

- A **forward contract**, like a future, is a binding promise to purchase or sell a set amount or value of an underlying asset at a set future time. Unlike a future, forwards are not traded; they are bespoke contracts between two parties.

- **Options** are the right but not the obligation to purchase (a call option) or sell (a put option) an underlying asset at a set price but at a future date.

- Options offer the opportunity to minimise the downside risk of adverse price movements, while providing the potential to share in any upside i.e. favourable price movements.

- Warrants are financial instruments issued by banks, governments and other institutions, which are traded on the ASX. Warrants may be issued over securities (such as shares), a basket of different securities, a share price index, debt, currencies, or commodities.

- Trading-style warrants are frequently traded and relatively short-dated. They are predominantly used for short term speculative purposes. Investment-style warrants tend to be longer dated and are less frequently traded. They have a lower risk/return profile and often have a higher initial outlay compared to trading-style warrants.

- A warrant works on the same principle as an option but there is a much broader range of warrant products available and because warrants are not a standardised product, there is much greater flexibility to tailor products to suit quite specific investor needs.

- There are three main **uses** for derivatives: risk management (hedging), speculation, and arbitrage.
Quick revision questions

1. Which of the following is not a primary financial instrument?
   A. receivables balance
   B. investment in shares
   C. US dollar futures contract
   D. bonds issued

2. Which of the following is not a possible use for a derivative?
   A. risk free investment
   B. hedging
   C. arbitrage
   D. speculation

3. XYZ Ltd, an Australian company, is due to sell a machine to a European customer. The customer has agreed to pay euro 500 000 in three months' time. Which one of the following could not be used by XYZ to hedge this transaction?
   A. a put option on 500 000 euros
   B. a forward contract to sell euros in three months
   C. a call option on 500 000 euros
   D. euro futures contracts

4. In relation to an option to purchase shares, what is an option premium?
   A. the gain made by the holder of the option
   B. the price that will be paid by the option holder for the shares, when the option is exercised
   C. a special type of share option that conveys additional dividend benefits
   D. the price paid for the option rights by the option holder

5. Which of the following is not a feature of a warrant?
   A. can be European or American style
   B. only available in standardised contract sizes
   C. can have put and call options
   D. can be trading or investment style
1. C Primary financial instruments are those that have an associated, measurable value such as equity shares, corporate bonds, loans, cash deposits, and receivable balances. A US dollars futures contract is a secondary financial instrument since it derives its value from the price of the underlying currency.

2. A Derivatives are essentially tools for transferring risk, and offer the opportunity to diminish or increase exposure to uncertain events. They cannot be used as a risk-free investment.

3. C XYZ Ltd will receive euros which it needs to sell to convert into Australian dollars. It therefore needs a put option, not a call option.

4. D Options offer the opportunity to minimise the downside risk of adverse price movements, while providing the potential to share in any upside i.e. favourable price movements. In view of this flexibility, the seller or writer of the option receives a sum of money, the **option premium**, in consideration for granting the option purchaser the rights associated with the option.

5. B Because warrants are not a standardised product like exchange traded options, there is the flexibility to tailor products to suit quite specific investor needs.
Answer to chapter question

1. A list of secondary financial instruments may include:
   - Swaps
   - Options
   - Collars and Floors
   - Caps and Ceilings
   - Forwards
   - Futures
   - Warrants
   - FRAs
   - Letters of Credit
   - Note issuance facilities
   - Commitments to purchase primary instruments
Revision questions
Chapter 1

1 Studley is investing in a new product line. Which of the following is it most likely to treat as capital expenditure?
   A the cost of the marketing campaign for the new product
   B repairs to an existing machine that will be used in production
   C an extension to the warehouse to store the additional components required
   D the wages of the production line staff

2 A project would involve spending on a non-current asset of $50 000 and working capital investment of $10 000. The non-current asset is expected to have a residual value of $20 000, at the end of the project’s three-year life. The average annual profit before depreciation would be $22 000. ROCE is measured as average annual profit as a percentage of the average investment.

   What would be the ROCE of this project?
   A 21.3%
   B 26.7%
   C 30%
   D 34.3%

3 A manager has appraised an investment based on its annual accounting profits. What adjustments would need to be made to these profits in order to convert them into relevant cash flows for investment appraisal purposes?

<table>
<thead>
<tr>
<th>Depreciation</th>
<th>Working capital</th>
</tr>
</thead>
</table>
   A add         | deduct at start of project and add at end |
   B deduct      | deduct at start of project and add at end |
   C add         | add at start of project and deduct at end |
   D deduct      | add at start of project and deduct at end |

4 Merton is currently considering a new investment project. Which one of the following items relating to the project should be included in the investment appraisal?

   A The payment of $30 000 for a market research report, which was commissioned last month and will be paid for next month.
   B The apportionment of fixed costs of $10 000 per year over the life of the project to represent a fair share of the total fixed costs of the factory.
   C An offer of $100 000 to acquire raw materials that were due to be sold but which will be used in the project if it goes ahead.
   D A depreciation charge of $10 000 per year over the life of the project for machinery that will be used in the project.

5 Which one of the following is not an advantage of the payback method of investment appraisal?

   A by focusing on projects with short payback periods investment risk is reduced
   B considers the time value of money
   C is useful as an initial screening tool
   D can be used to rank projects if liquidity is an issue for the company
6 A project is expected to have cash inflows of $60,000 at the end of its first year, $50,000 at the end of the second and $40,000 at the end of the third year. What is the present value of these cash flows, to the nearest $000 if the discount rate is 5 per cent?

A $150,000  
B $144,000  
C $137,000  
D $130,000

7 Jemima is taking out a 15-year mortgage for $150,000 at an interest rate of 5 per cent per annum. The monthly repayment, to the nearest $100 is:

A $600  
B $800  
C $1,200  
D $1,500
Chapter 2

1 Longparish is a listed company, committed to maximising the wealth of its shareholders.

Given this objective, which one of the following methods of investment appraisal is most appropriate for the company to use?

A payback period  
B discounted payback period  
C net present value  
D internal rate of return

2 Which of the following items would never be a relevant cash flow in a discounted cash flow calculation?

A increase in working capital investment during the project  
B directly attributable fixed costs  
C annual interest payments on the loan taken out to finance the project  
D disposal value of equipment to be used on the project

3 Hurstbourne Pty Ltd used the IRR and discounted payback methods of investment appraisal to evaluate an investment proposal that has an initial cash outlay followed by annual net cash inflows over its life. Following this evaluation, it was found that the cost of capital figure used was incorrect and that the actual cost of capital should be lower.

What will be the effect on the IRR and discounted payback period of correcting this error?

<table>
<thead>
<tr>
<th>Effect on</th>
<th>IRR figure</th>
<th>Discounted payback period</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>no change</td>
<td>no change</td>
</tr>
<tr>
<td>B</td>
<td>no change</td>
<td>decrease</td>
</tr>
<tr>
<td>C</td>
<td>increase</td>
<td>increase</td>
</tr>
<tr>
<td>D</td>
<td>decrease</td>
<td>decrease</td>
</tr>
</tbody>
</table>

4 Investment project A has a net present value of +$105 000 at a discount rate of 2 per cent and a net present value of +$45 000 at a discount rate of 8 per cent. Investment project B has an NPV of +$10 500 at a discount rate of 2 per cent and an NPV of −$45 000 at a discount rate of 8 per cent.

On the basis of these figures, and using the interpolation method, what is the best estimate of the IRR of each project?

A Project A 12.50 per cent  Project B 3.1 per cent  
B Project A 9.7 per cent  Project B 3.1 per cent  
C Project A 12.50 per cent  Project B 3.8 per cent  
D Project A 9.7 per cent  Project B 3.8 per cent
5. Odham is considering a capital investment project. The initial investment in equipment would be $87,000, and this would have no residual value at the end of the project's life. There would be a working capital investment of $40,000, which would have a present value of $25,000 when recovered at the end of the project. The net present value of the other cash outflows would be $100,000 and the present value of the other cash inflows would be $215,000.

What increase in the initial cost of the equipment, above the current estimate of $87,000, would make Odham indifferent between accepting and rejecting the project?

A 3 per cent  
B 10 per cent  
C 15 per cent  
D 32 per cent

6. Which of the following is not an example of hard capital rationing?

A Raising money through the stock market may not be possible if share prices are depressed.  
B There are restrictions on lending due to government control.  
C Lending institutions may consider the organisation to be too risky.  
D Management does not want to issue more shares to raise capital, in order to avoid dilution of control.

7. Micheldever has three possible investment opportunities, the details of which are as follows:

<table>
<thead>
<tr>
<th>Initial outlay</th>
<th>Total present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$000</td>
<td>$000</td>
</tr>
<tr>
<td>Project X</td>
<td>200 265</td>
</tr>
<tr>
<td>Project Y</td>
<td>250 310</td>
</tr>
<tr>
<td>Project Z</td>
<td>120 170</td>
</tr>
</tbody>
</table>

The company has a limited investment budget for the current year and will be unable to invest in all profitable opportunities.

Assuming that the company wishes to maximise the wealth of its shareholders, what should be the order of priority for the three projects?

Order of priority

<table>
<thead>
<tr>
<th>Order of priority</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

8. A company is appraising an investment that will save electricity costs. Electricity prices are expected to rise at a rate of 15% per annum in future, although the general inflation rate will be 10% per annum. The nominal cost of capital for the company is 20%. What is the appropriate discount rate to apply to the forecast actual nominal cash flows for electricity?

A 20.0%  
B 22.0%  
C 26.5%  
D 32.0%
Red Pty Ltd is considering the purchase of a machine for $2,190,000. It would be sold after four years for an estimated realisable value of $790,000. By this time tax-allowable depreciation of $1,450,000 would have been claimed. The rate of tax is 30%.

What is the cash flow arising as a result of tax implications on the sale of the machine at the end of four years?

A  Inflow of $15,000
B  Outflow of $50,000
C  Outflow of $459,000
D  Outflow of $15,000
Chapter 3

1. A stock market acts as both a primary and a secondary market for securities. Which of the following characterises the role of stock markets as secondary markets?
   A. They enable investors to sell their investments.
   B. Owners of a company coming to the market for the first time can realise the value of some of their investment in the flotation.
   C. They permit takeovers by means of share exchange.
   D. They enable companies to raise new capital.

2. Which of the following is not a financial intermediary?
   A. commercial bank
   B. insurance companies
   C. retail company
   D. superannuation fund

3. Which of the following is not a role undertaken by the government in respect of the functioning of the capital markets?
   A. regulator of financial activities
   B. auditor of pension funds
   C. borrower
   D. source of ultimate liquidity

4. Which body is responsible for the prudential regulation of deposit taking institutions in Australia?
   A. RBA
   B. APRA
   C. ASIC
   D. ACCC

5. Which of the following factors influence the exchange rate between two currencies?
   I. Interest rates
   II. Inflation rates
   III. Supply and demand
   A. I only
   B. III only
   C. I and II only
   D. I, II and III

6. The directors of Manley Ltd are considering raising long term finance by issuing shares in the company. They have been informed that the way to do this is to “access the market” but they are not sure which market is being referred to.
   The appropriate market for the new issue of equity by Manley Ltd is known as a:
   A. Money market
   B. Derivatives market
   C. Currency market
   D. Capital market
7 The directors of a company are discussing the financial market's regulatory system.

Director I: The primary purpose of regulation is to protect institutional investors as they are the biggest investors on the stock market.

Director II: Regulation is designed to protect lenders from capital losses or losses suffered through default by providing a mechanism for the pooling of losses which reduces their risk.

Director III: The aim of regulation is to help reduce fraud and unfair practices.

Which of the directors' comments are accurate?

A III only
B I and II only
C I and III only
D I, II and III

8 Kendone needs to construct a new factory and wants to set aside $150,000 for the costs involved. The exact start date of the project is not yet known as it is awaiting permission from local government but is likely to be within the next 12 months. Which of the following is the least appropriate place to invest the funds until they are required?

A Treasury notes
B Bank deposit
C Equities
D Commercial bills

9 Kiely Pty Ltd has in the past invested surplus funds in a variety of fixed interest Government bonds or placed them in a floating interest rate deposit account with the bank.

If general interest rates increase what effect will this have on the interest rate paid on government stocks and bank deposits?

<table>
<thead>
<tr>
<th>Government bonds</th>
<th>Bank deposit account</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Increase</td>
<td>No change</td>
</tr>
<tr>
<td>B Decrease</td>
<td>No change</td>
</tr>
<tr>
<td>C No change</td>
<td>Increase</td>
</tr>
<tr>
<td>D No change</td>
<td>Decrease</td>
</tr>
</tbody>
</table>

10 Kiely Pty Ltd has in the past invested surplus funds in a variety of fixed interest Government bonds or placed them in a floating interest rate deposit account with the bank.

If general interest rates increase what effect is this likely to have on the redemption value of the government stocks and bank deposits?

<table>
<thead>
<tr>
<th>Government bonds</th>
<th>Bank deposit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Increase</td>
<td>No change</td>
</tr>
<tr>
<td>B Decrease</td>
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</tr>
</tbody>
</table>
Chapter 4

1. A family company which is currently facing liquidity problems needs an injection of funds. Which of the following is most likely to be classified as a short-term source of finance?
   A. share capital
   B. trade credit
   C. bank loan
   D. mortgage on business property

2. Which one of the following statements concerning sources of finance is correct?
   A. Retained earnings represent a free source of finance to the business.
   B. Invoice discounting involves the administration of receivables by the invoice discounter.
   C. A bank overdraft is normally regarded as a long-term source of finance.
   D. A share repurchase will reduce distributable reserves.

3. A company issues convertible loan stock at $100 nominal value for $104. The loan stock can be converted in four years' time at a rate of 80 $1 ordinary shares for each $100 nominal value of loan stock. The current market value of the shares is $1.20.
   What is the conversion premium per share?
   A. $0.05
   B. $0.10
   C. $0.20
   D. $0.30

4. Mincham is a listed company. It intends to announce immediately a 1-for-4 rights issue at an issue price of $5.00. The current share price of the company is $8.00.
   What will be the theoretical value of the rights attached to each original share?
   A. $2.40
   B. $1.85
   C. $0.75
   D. $0.60

5. Consider the following statements concerning the issue of shares.
   I. A bonus issue raises finance through an offer of shares to existing shareholders.
   II. A placing of shares makes shares directly available to the general public.
   III. An offer for subscription is an invitation to the general public to subscribe for shares not yet in issue.
   IV. A rights issue raises finance through an offer of shares to existing shareholders.

   Which two of the above statements are correct?
   A. I and II
   B. I and III
   C. II and IV
   D. III and IV
6 Scowen Co has 2 million $0.50 ordinary shares in issue and the market capitalisation of the company is $28.0m. The company is about to make a 1-for-4 scrip issue, immediately followed by a 2-for-1 share split.

What will be the theoretical value of a share following the above transactions and the number of shares held by an investor that held 1 000 shares prior to these transactions?

<table>
<thead>
<tr>
<th>Share value following transactions</th>
<th>No of shares held following transactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A $14.00</td>
<td>2 500</td>
</tr>
<tr>
<td>B $5.60</td>
<td>2 500</td>
</tr>
<tr>
<td>C $8.75</td>
<td>625</td>
</tr>
<tr>
<td>D $1.87</td>
<td>7 500</td>
</tr>
</tbody>
</table>

7 Which of the following statements about venture capital is not valid?

A It can be used to fund start-ups.
B Venture capitalists would never sit on the board of the company.
C Venture capitalists may realise their shares on flotation of the company.
D Venture capitalists make most of their return in the form of capital gains.

8 Which of the following best describes a Eurobond?

A a loan, taken out with an Australian bank, denominated in euros
B a guarantee given by an Australian company to a European customer
C an international bond that is denominated in a currency not native to the country where it is issued
D a debenture issued on a financial market in a country belonging to the European Union

9 Bourne Ltd wants to make sure that it has access to standby funds but is unable to borrow at short notice. Which of the following is the most appropriate strategy to achieve its objective?

A Lengthen the maturity schedule of its financing
B Shorten the maturity schedule of its financing
C Lower the level of its investment in current assets
D Increase the level of its investment in non-current assets

10 The management team of your company are considering a management buyout and have been discussing the possibility of approaching venture capitalists for support.

Director I The venture capitalists won’t be interested unless we agree to take on a substantial part of the risk ourselves

Director II If we produce a business plan which demonstrates to the venture capitalists that the business is going to be successful we will definitely secure the funds

Director III We need to have thought about an exit route as the venture capitalists may want to realise their investment by selling shares on flotation of the business on the stock exchange.

Which of the directors’ statements are correct?

A I and II only
B I and III only
C II and III only
D I, II and III
11. Jander Ltd wishes to acquire a new machine to expand its production facilities with a view to achieving rapid growth and is considering the following methods to fund the purchase.

I. Leasing
II. Venture capital
III. Retained earnings
IV. Bank loan
V. Trade credit

Which of the above forms of finance would be appropriate?

A. I and IV only
B. I, III and IV only
C. I, IV and V only
D. I, II, III, and IV only
Chapter 5

1. Overton Pty Ltd is trying to decide on its optimal level of current assets. The company’s management face a trade-off between:
   A. profitability and risk
   B. equity and debt
   C. short-term and long-term borrowing
   D. liquidity and risk

2. Which one of the following equations describes the operating cash cycle?
   A. average inventory turnover period + average payables payment period - average receivables collection period
   B. average inventory turnover period + average receivables collection period - average payables payment period
   C. average cash balance + average receivables collection period - average payables payment period
   D. average cash balance - average receivables collection period + average payables payment period

3. Whitchurch (Engineering) Co buys raw materials from suppliers on four weeks’ credit and they are delivered immediately. When the raw materials are received, they are held in the warehouse for five weeks before being used in production. The production process takes one week and the completed goods are held for two weeks before finally being sold to credit customers. These customers are allowed a maximum credit period of six weeks but all of them pay after three weeks in order to obtain a discount for prompt settlement.

What is the operating cash cycle of the business?
   A. 7 weeks
   B. 10 weeks
   C. 11 weeks
   D. 12 weeks

4. Which of the following should a business do in order to improve its cash operating cycle?
   A. increase inventories of raw material
   B. decrease the credit period taken from trade suppliers
   C. extend the credit period for customers
   D. reduce the time taken to produce its product

5. A company’s cash budget highlights a short-term surplus in the future. Which of the following actions is least likely to be an appropriate use of the surplus?
   A. increase inventories and receivables to improve customer service
   B. invest in a short term deposit account
   C. buy back the company’s shares
   D. reduce payables by taking advantage of early settlement discounts from suppliers

6. If a company moves from a conservative working capital funding policy to an aggressive one it should expect:
   A. profitability to increase and liquidity to decrease
   B. risk to decrease and profitability to increase
   C. risk to decrease and profitability to decrease
   D. risk to increase and liquidity to increase
Chapter 6

1. Holmes has $1 ordinary shares in issue that have a current market value of $3. The dividend expected for next year is $0.40 and future dividends are expected to grow at the rate of 5 per cent per annum. The rate of income tax is 20 per cent and the Gordon Growth model is used to calculate the cost of ordinary shares.

What is the cost of ordinary shares to the business?

A  5.1%
B  15.7%
C  18.3%
D  19.0%

2. A company has loan notes in issue paying interest at the rate of 6% per year. Interest has just been paid on the loan notes, which are due for repayment in exactly one year’s time. The loan notes will be redeemed at $109 per $100 nominal value. A yield of 9% per year is required by investors from the loan notes.

What is the predicted current market value of the loan notes? (To the nearest $ and ignoring taxation)

A  $100
B  $102
C  $106
D  $108

3. Consider the following two statements concerning required rates of return:

I Required rates of return for preference shares are normally higher than required rates of return for ordinary shares.

II Convertible loan notes are normally issued at a lower rate of interest than non-convertible loan notes.

Which one of the following combinations (true/false) concerning the above statements is correct?

\[
\begin{array}{cc}
\text{Statement} & \\
I & II \\
A & \text{true} & \text{true} \\
B & \text{true} & \text{false} \\
C & \text{false} & \text{true} \\
D & \text{false} & \text{false} \\
\end{array}
\]

4. Henbury wishes to calculate its weighted average cost of capital for use in investment appraisal. The company is financed by 150 million $1 ordinary shares, which have a current market value of $2, and $100 million 12 per cent irredeemable debentures, which are currently quoted at $150 per $100 nominal value. The cost of ordinary share capital is 11 per cent and the rate of income tax is 25 per cent.

What is the weighted average cost of capital for Henbury? (To one decimal place)

A  9.0%
B  9.3%
C  10.3%
D  11.4%
5 It has been claimed that the weighted average cost of capital (WACC) should only be used to evaluate investment decisions, involving discounted cash flow calculations, where:
I the proposed project does not alter the business risk profile of the business.
II the WACC reflects the long-term capital structure of the business.
Which one of the following combinations (true/false) concerning the above statements is correct?

<table>
<thead>
<tr>
<th>Statement I</th>
<th>Statement II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A true</td>
<td>true</td>
</tr>
<tr>
<td>B true</td>
<td>false</td>
</tr>
<tr>
<td>C false</td>
<td>true</td>
</tr>
<tr>
<td>D false</td>
<td>false</td>
</tr>
</tbody>
</table>

6 A way to determine whether debt or lease financing would be preferable for a machine is to:
A compare the net present values of the cash flows under each alternative, using the weighted average cost of capital as the discount rate.
B compare the net present values of the cash flows under each alternative, using the after-tax cost of borrowing as the discount rate.
C compare the payback periods for each alternative.
D compare the interest paid under each alternative.
Chapter 7

1. A risk-averse investor has a choice between asset A (expected return 15%, standard deviation 20%) and asset B (expected return 20%, standard deviation 25%). Which asset would he prefer?
   A. asset A  
   B. asset B  
   C. indifferent between A and B  
   D. depends on the individual investor's indifference curves

2. Stock A has a variance of 0.25 and stock B has a variance of 0.18. The covariance between the two stocks is 0.05. What will be the variance of your complete portfolio if you invest 30% in stock A and 70% in stock B?
   A. 0.2010  
   B. 0.1317  
   C. 0.2150  
   D. 0.0550

3. Which of the following statements is correct about the market portfolio, M?
   A. It contains 10-12 shares.  
   B. It is a mixture of shares and government stocks.  
   C. It generates a return equal to the risk free rate.  
   D. It is the point at which the capital market line meets the efficient frontier of portfolios at a tangent.

4. An investor invests 40% of his wealth in a risky asset which has an expected return of 15% and a variance of 4% and 60% of his wealth in a risk-free security that pays 6%. What is the expected return and standard deviation of the portfolio?
   A. 8.0% and 1.2%, respectively  
   B. 9.6% and 0.8%, respectively  
   C. 9.6% and 1.0%, respectively  
   D. 11.4% and 1.2%, respectively

5. Consider the following statements:
   I. Investors can only expect to receive a return for incurring unsystematic risk.  
   II. Systematic risk can be eliminated by holding a well-diversified portfolio of shares.

   Statement
   I   II
   A. true   true
   B. true   false
   C. false   true
   D. false   false
6 A share that has a beta of 1.0 will have which one of the following properties?
A an expected return that is equal to the risk-free rate
B an expected return that is equal to the expected returns from the market
C an expected return that is above the expected returns from the market
D no non-diversifiable risk

7 Sapphire has a beta of 1.2 and pays a constant annual dividend to shareholders of 20 cents per share. The average market rate of return is 8% and the risk-free rate of return is 4%.
What is the predicted market value of a share in the company?
A $1.09
B $2.27
C $2.50
D $4.17

8 Shares in Ruby Co have an expected rate of return of 9% and a beta of 0.8. Shares in Topaz Co have a beta of 1.2. The expected market rate of return is 10%.
Using the Capital Asset Pricing Model (CAPM), what is the expected rate of return for shareholders in Topaz Co?
A 8.7%
B 11.0%
C 13.0%
D 13.5%
Chapter 8

1. What is meant by operational efficiency in the context of the efficient market?
   A. Financial markets allow funds to be directed towards firms which make the most productive use of them.
   B. Financial markets have transaction costs that are kept as low as possible.
   C. Financial markets have the ability to price stocks and shares fairly and quickly.
   D. Financial markets do not react to new information through share price changes.

2. Consider the following statements about a stock market that displays only weak-form efficiency.
   I. Share price changes are random.
   II. Share prices change in anticipation of new information being announced.

Which one of the following combinations is correct?

<table>
<thead>
<tr>
<th>Statement</th>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>true</td>
<td>true</td>
</tr>
<tr>
<td>B</td>
<td>true</td>
<td>false</td>
</tr>
<tr>
<td>C</td>
<td>false</td>
<td>true</td>
</tr>
<tr>
<td>D</td>
<td>false</td>
<td>false</td>
</tr>
</tbody>
</table>

3. On 29 September, Jones, a company listed on the stock exchange, made a confidential offer to buy all the shares in Taylor Co, at a price in excess of their current market value. At a private meeting, held the same day, the directors of Taylor Co agreed to accept the offer and made a public announcement of this decision two months later on 29 November.

What would you expect to see happen to Taylor Co’s share price on 29 November, under the semi-strong and strong forms of market efficiency?

<table>
<thead>
<tr>
<th>Share price reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-strong form</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>

4. An investor hopes to make abnormal gains on his stock market investments by analysing published annual reports, relevant newspaper and magazine articles and published share prices.

What is the highest form of market efficiency that the investor is assuming?

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>

A. strong form efficiency
B. semi-strong form efficiency
C. weak form efficiency
D. not efficient at any level
5 Which one of the following statements is correct?
A A stock market that is efficient in the semi-strong form cannot be efficient in the weak form.
B A stock market that is efficient has share price movements occurring on a random basis.
C A stock market that is efficient in the strong form is one in which investors cannot make any profit.
D A stock market that is efficient will have regular, recurring patterns of share price movements.

6 Which of the following arguments support the relevance of dividend policy?
I informational content of dividends
II investor’s preference for current income
III differing tax rates for dividends and capital gains
A I and II only
C I and III only
B II and III only
D I, II and III

7 Canberra has just made profits after tax of $4 million. Its cost of capital is 10% and it can re-invest retained profits to earn returns of 10% per annum. Which of the following dividend policies would maximise the total value of the company’s equity, assuming that the dividend growth model of share valuation is valid?

<table>
<thead>
<tr>
<th>Policy</th>
<th>Proportion of profits re-invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75%</td>
</tr>
<tr>
<td>2</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td>25%</td>
</tr>
</tbody>
</table>

A Shareholder value is unaffected by dividend policy.
B Policy 1 will maximise shareholder value.
C Policy 2 will maximise shareholder value.
D Policy 3 will maximise shareholder value.

8 The chief executive of a listed company wants to create a better impression of company performance among its investors. As a result he plans to publicly announce changes to the company’s accounting policies which will result in an increase in reported profits. What is the maximum level of market efficiency that would be consistent with the chief executive’s behaviour?
A Strong form efficiency
B Semi-strong form efficiency
C Weak form efficiency
D Inefficient market
Whitchurch Ltd is financed entirely by equity share capital, consisting of 4 million ordinary shares of $1 nominal value. Their market price is currently $4, prior to a 1 for 4 rights issue at $3 per share. The money raised from the rights issue will be invested immediately in a project that has an expected net present value of + $5 million.

What are the best estimates of the likely share price after the rights issue, if the market shows either weak form efficiency, or strong form efficiency with the expected NPV of the project known and believed by investors?

<table>
<thead>
<tr>
<th>Weak form</th>
<th>Strong form</th>
</tr>
</thead>
<tbody>
<tr>
<td>A $3.80</td>
<td>$4.00</td>
</tr>
<tr>
<td>B $3.80</td>
<td>$4.80</td>
</tr>
<tr>
<td>C $4.00</td>
<td>$4.00</td>
</tr>
<tr>
<td>D $4.00</td>
<td>$4.80</td>
</tr>
</tbody>
</table>

The following statements about dividends and dividend policy were made at a recent board meeting by three different directors:

Director I: According to the residual theory of dividend policy, once we have invested in or retained sufficient profits for future positive net present value opportunities, we should pay out the remaining profit as dividends.

Director II: That may cause our dividends to vary year on year. I thought companies generally try to smooth out dividend payments by adjusting gradually to changes in earnings, so as to avoid sending out confusing signals to investors.

Director III: We can avoid paying out cash by declaring a scrip dividend. Our existing shareholders will be given new shares in the business at no extra cost to themselves.

Which combination of the directors’ statements is true?

A I and II only
B I and III only
C II and III only
D I, II and III

Stranraer makes a bonus issue of shares during the year and it has been suggested that the effect of the issue will be that:

I The current ratio will be increased.
II The return on ordinary shareholders’ funds will be lowered.
III The net book value of assets per share will be lowered.
IV Earnings per share will be lowered.

Which of the above statements are correct?

A I and II only
B II and III only
C II and IV only
D III and IV only
Chapter 9

1. XYZ Bank’s staff appear to be unaware of the importance of risk. For XYZ Bank this is
   A. a financial risk
   B. a market risk
   C. an operating risk
   D. a credit risk

2. Consider the following two statements concerning investor attitudes towards risk:
   I. A risk-averse investor will only be prepared to invest in a project with the prospect of high
      returns if there are no risks involved.
   II. A risk-seeking investor will readily invest in a project with prospects of high returns, even if it
        means carrying substantially high risk.

   Which one of the following combinations relating to the above statements is correct?
   A. true true
   B. true false
   C. false true
   D. false false

3. A company is considering four projects which are mutually exclusive owing to a shortage of
   investment funds. For each project, it has estimated the internal rate of return, and calculated a
   measure of risk, based on probability analysis. The risk/return profile of each investment is as
   follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Return</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>II</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>III</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>IV</td>
<td>18</td>
<td>6</td>
</tr>
</tbody>
</table>

   If the company’s board of directors is risk-averse in its project selection, which of these projects
   would it select?
   A. project I
   B. project II
   C. project III
   D. project IV

4. To what does interest rate risk relate?
   A. The fact that the foreign currency exchange rate between two countries will reflect the
      difference in their interest rates.
   B. The difference between short term interest rates prevailing in two money markets at any
      given time.
   C. The fact that a company has chosen to borrow at a fixed rather than a variable rate.
   D. The sensitivity of profits and cash flow to fluctuations in the interest rate.
5 Which of the following is not an example of financial risk?
A market risk
B hazard risk
C credit risk
D interest risk

6 Koala Co has decided to create an export sales division but is aware that this will increase trading risk. It has screened all new customers carefully using an external credit reference organisation and has taken out bad debt insurance. The risk responses that Koala Co has applied are
A avoidance and reduction
B transfer and acceptance
C reduction and acceptance
D reduction and transfer

7 Blue Mountain Pty Ltd has for many years provided a service for customers wishing to develop photographs from 35mm colour film. This revenue stream has suffered a significant decline as a result of the development of digital cameras. In relation to the success of the digital camera, which risk has Blue Mountain suffered from?
A business risk
B hazard risk
C event risk
D market risk

8 Noble Co, an Australian business has recently purchased machinery from a Japanese supplier. The company has been invoiced in Australian dollars and the terms of sale include payment within sixty days. During this payment period, the dollar weakened against the Japanese yen.

If neither company hedges against foreign exchange risk, what would be the foreign exchange gain or loss arising for each of them from this transaction?

<table>
<thead>
<tr>
<th>Noble</th>
<th>Japanese supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>A No gain or loss</td>
<td>Gain</td>
</tr>
<tr>
<td>B Gain</td>
<td>No gain or loss</td>
</tr>
<tr>
<td>C No gain or loss</td>
<td>Loss</td>
</tr>
<tr>
<td>D Loss</td>
<td>No gain or loss</td>
</tr>
</tbody>
</table>
9 You have recently joined the treasury department of a business which uses the following hedging methods to protect itself against the particular types of foreign exchange risk against which they are matched.

<table>
<thead>
<tr>
<th>Hedging method</th>
<th>Used to protect against:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Forward exchange contracts</td>
<td>Transaction risk</td>
</tr>
<tr>
<td>II Matching receipts and payments</td>
<td>Economic risk</td>
</tr>
<tr>
<td>III Buying or selling in domestic currency</td>
<td>Translation risk</td>
</tr>
</tbody>
</table>

Which of the hedging methods are suitable for their intended purpose?
A I only
B III only
C I and III only
D II and III only

10 Overton Pty Ltd needs to borrow a significant sum of money in 3 months' time, to be repaid after 12 months. It is concerned that the interest rate will rise before the borrowing takes place. Which of the following is an effective hedge against the risk that interest rates will rise between now and taking out the loan?
A interest rate cap
B forward exchange contract
C forward rate agreement
D interest rate floor

11 An Australian company sources 50% of its raw materials domestically and the other 50% from China. Most of its output is sold to the US. It is strategically exposed to the risk of a rise in the value of the Chinese Renminbi and a fall in the value of the US dollar.

What is the name for this type of currency risk?
A Transaction
B Translation
C Financial
D Economic
Chapter 10

1 Which of the following is not a secondary financial instrument?
   A forward contract
   B investment style warrant
   C trading style warrant
   D investment in equity shares

2 What is the purpose of hedging?
   A to reduce costs only
   B to reduce or eliminate exposure to risk
   C to make a profit by accepting risk
   D to protect profits made from undertaking a risky position

3 Which one of the following is true?
   A The margin requirement is a purchase cost of a futures contract.
   B As the majority of futures contracts are closed out before delivery, a futures contract is not legally binding.
   C The quantity in a futures contract is agreed individually between the buyer and seller.
   D Delivery dates on futures contracts are specified by the futures exchange not the buyer and seller.

4 A pension fund wants to guard against a drop in value of its share portfolio, which comprises ASX SPI 200 shares. It is considering two possible hedging strategies:
   I sell ASX SPI 200 Index futures
   II buy ASX SPI 200 Index call options
Which of the following would represent an appropriate hedge?
   A I only
   B II only
   C I and II
   D neither of the above

5 Which of the following is the best description of arbitrage?
   A a transaction to reduce or eliminate an exposure of risk
   B the ASX process available to investors who need to resolve disputes
   C buying an instrument in one market and selling it almost instantly in another market, to make a profit from the difference in price
   D the effect of investors acting by chance or impulse rather than as a result of rational thought

6 Which of the following is a true comment on the use of derivatives by an organisation?
   A The availability of derivatives encourages financial managers to speculate on a variety of market factors such as interest rates
   B Use of derivatives allows a company to eliminate all exposure to risk
   C Derivatives are used by a company to transfer risk to those with a higher appetite for it
   D Derivatives are primarily used by companies wishing to profit from price differences between markets
7 The Treasury manager of a large coffee producer has entered into a futures contract to sell coffee in three months' time. Which of the following is likely to be the motive behind this?

A To protect profits by guaranteeing the price at which the current crop of coffee can be sold
B To enable the company to profit from any increase in the price of coffee in the next three months
C To guard against the risk of coffee prices falling between now and when the crop is harvested but to leave the company with the ability to benefit from any price increases
D To insure against the risk of having insufficient coffee to sell as a result of a poor harvest due to bad weather

8 Firefly has warrants in issue that can be used to subscribe for ordinary shares in the company on a one-for-one basis in six months' time at an exercise price of $4.50. The warrants are currently quoted at $1.20 and the current share price is $5.40.

What is the intrinsic value of the warrant?

A $0.30
B $0.90
C $1.20
D $1.50
Answers to revision questions
Chapter 1

1 C Capital expenditure is spending on the acquisition of non-current assets or an improvement in their earning capacity.
   Options A, B and D are likely to be treated as revenue expenditure – expenditure incurred for the purpose of the trade of the business or to maintain the existing earning capacity of non-current assets.

2 B Annual depreciation = ($50 000 – $20 000)/3 years = $10 000 per annum. Average annual profit is therefore $(22 000 – 10 000) = $12 000. The average non-current asset investment = ($50 000 + $20 000)/2 = $35 000. With the working capital investment of $10 000, average investment is therefore $45 000. ROCE = ($12 000/$45 000) × 100% = 26.7%

3 A Profit before depreciation can be treated as an approximation of the net cash inflows of the project. The initial investment in working capital is treated as an additional cash out flow at the start but is then released at the end of the project as a positive cash inflow.

4 C Option C is an opportunity cost of the project and must be brought into the calculations. Option A is a sunk cost as it is already committed. Option B is not an incremental cost of the project. Option D is a non-cash cost.

5 B The discounted payback method does this.

6 C (60 000 x 0.952 + 50 000 x 0.907 + 40 000 x 0.864)

7 C $1 200

If the annual interest rate is 5%, the effective interest rate per month can be calculated as follows:

Using \( i_e = (1 + r)^{1/n} - 1 \)

Where \( r = 0.05 \) and \( n = 12 \)

\( i_e = (1 + 0.05)^{1/12} - 1 \)

\( = 0.004 \)

\( = 0.4\% \)

Using the annuity formula

Here we need to derive a monthly cashflow, using an effective monthly discount rate of 0.4%

\[
150 000 = \frac{\text{Monthly repayment}}{0.004} \left( 1 - \frac{1}{1.004^{180}} \right)
\]

Annuity factor = 128

\( 150 000 = \text{monthly repayment} \times 128 \)

So, monthly repayment = 150 000 / 128 = $1 172
Chapter 2

1. C The NPV method is directly consistent with the objective of maximising shareholder wealth as it gives the $ increase in wealth arising from the project.

2. C The cost of capital is taken into consideration in the discount rate.

3. B The IRR is independent of the cost of capital. A lower cost of capital increases present values, reducing the discounted payback period.

4. A Project A
   \[\text{IRR} = 8\% + \left(\frac{45 000}{(105 000 - 45 000)}\times(8 - 2)\%\right) = 12.50\%\]
   Project B
   \[\text{IRR} = 2\% + \left(\frac{10 500}{(10 500 + 45 000)}\times(8 - 2)\%\right) = 3.1\%\]

5. C

<table>
<thead>
<tr>
<th>PV $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
</tr>
<tr>
<td>Working capital, year 0</td>
</tr>
<tr>
<td>Other outflows</td>
</tr>
<tr>
<td>Cash inflows</td>
</tr>
<tr>
<td>Working capital, end of project</td>
</tr>
<tr>
<td>Net present value</td>
</tr>
</tbody>
</table>

For the project to have an NPV of 0, the equipment would need to increase in cost above the estimate by $13 000/$87 000 = 15 per cent.

6. D Management-imposed restrictions are internal and therefore, soft capital rationing.

7. D Ranking the projects on PV per $ invested:
   X: 265/200 = 1.325
   Y: 310/250 = 1.240
   Z: 170/120 = 1.417
   Rankings 2, 3, 1 respectively.

8. A The nominal rate of 20% is applied to the nominal cash flows.

9. D There will be a balancing charge on the sale of the machine of $(790 000 – (2 190 000 – 1 450 000)) = $50 000. This will give rise to a tax payment of 30% × $50 000 = $15 000.
Chapter 3

1. A. The primary market is for companies bringing shares to the market or issuing new shares to raise fresh capital. The existence of a secondary market for their shares makes possible takeovers by listed companies; however, the primary function of a secondary market is for the trading of shares already in issue.

2. C. A financial intermediary is a party bringing together providers and users of finance either as broker or as principal.

3. B. In addition to Options A, C and D, the government also acts as a lender and a financial intermediary (via RBA).

4. B. APRA (Australian Prudential Regulation Authority) is the prudential regulator of the Australian financial services industry; RBA is the Reserve Bank of Australia; ASIC (Australian Securities and Investments Commission) acts as Australia’s corporate, markets and financial services regulator. ACCC (Australian Competition and Consumer Commission) ensures that individuals and businesses comply with the Commonwealth competition, fair trading and consumer protection laws.

5. D. Exchange rates are determined by supply and demand, which is influenced by both interest and inflation rates.

6. D. The primary capital market is where securities are issued for the first time.

7. A. Director I is incorrect as regulation is designed to protect all investors not just institutional ones. Director II is describing the role of financial intermediaries.

8. C. Equities are the most risky of the investments and would therefore be least appropriate for a short term cash surplus.

9. C. The coupon rate on government bonds is fixed, whereas the rate of interest on the bank deposit account will increase.

10. C. Government bonds are redeemed at par, so an increase in general interest rates will have no effect. The bank will return the amount invested, plus accumulated interest, when the account matures, so the amount returned will increase if interest rates increase.
Chapter 4

1  B  Trade credit is one of the main sources of short-term finance for a business. Options A and D are longer term sources of finance. A bank loan is a fixed amount drawn for a specified period; it can be short term but trade credit is more likely to be used to cover fluctuations in the cash flow requirements for normal trading operations.

2  D  Retained earnings is a source of equity finance, which has a higher cost than debt; Invoice discounting results in a business receiving an advance against receivables but does not include administration of the receivables ledger which is only available under debt factoring; a bank loan can be arranged for the short, medium or long term.

3  B  Market value of shares at conversion (80 shares × $1.20) = $96
Conversion premium ($104 – 96) = $8
Conversion premium per share ($8/80) = $0.10

4  D

\[
\begin{array}{ccc}
\text{Current shares} & 4 & \text{@$8.00} \\
\text{Rights issue} & 1 & \text{@$5.00} \\
\hline
\text{Total} & 5 & \text{@$37.00} \\
\end{array}
\]

$\text{Theoretical ex-rights price} = \frac{37.00}{5} = $7.40$

$\text{Value of rights} = \frac{(7.40 – 5.00)}{4} = $0.60$

5  D  A bonus issue does not raise any finance. A placing is an issue to selected investors but not to the public in general.

6  B  Scrip issue of 1 for 4 = 2m/4 = 500k shares.
Total shares in issue post scrip issue = 2m + 0.5m = 2.5m
Value per share following scrip issue
\[
\frac{28m}{2.5m} = $11.20
\]
Value per share following 2 for 1 stock split
\[
\frac{11.20}{2} = $5.60
\]
Shares held by individual \(\{(1000 + (0.25 \times 1000)) \times 2\} = 2500\)

7  B  Venture Capitalists often require a representative appointed to the company’s board, or an independent director, to safeguard their interests.

8  C  Eurobonds are long-term loans raised by international companies or other institutions and sold to investors in several countries at the same time. Eurobonds can be traded throughout the world rather than on a specific national bond market and are named after the currency they are denominated in e.g. Euroyen bonds are denominated in Japanese yen.

9  A  This will allow the company to put in place longer term borrowing arrangements which will provide a standby.

10 B  Even with a promising business plan the venture capitalists may still choose not to invest – only about 3% of the initial applications received are successful in obtaining funding.

11 B  The investment in a non-current asset should be financed with a long term source of finance. Venture Capital is a specific form of finance typically used in start-up or management buyout situations; Trade credit is short term.
Chapter 5

1 A B relates to the long-term capital structure of the business and C relates to a financing decision so neither are relevant. In deciding on the best level of working capital, all businesses face a trade-off between profitability and liquidity. Reduced liquidity incurs the risk of insolvency. Liquidity and risk are therefore on the same side of the trade-off, whereas profitability and risk are on opposite sides.

2 B The cash operating cycle is the period of time which elapses between the point at which cash begins to be expended on the production of a product (because it is paid out to the suppliers of material) and the collection of cash from the customer who purchases it.

3 A

<table>
<thead>
<tr>
<th>Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory holding period</td>
</tr>
<tr>
<td>Production period</td>
</tr>
<tr>
<td>Finished goods holding period</td>
</tr>
<tr>
<td>Receivables collection period</td>
</tr>
<tr>
<td>Payables payment period</td>
</tr>
<tr>
<td>Cash cycle</td>
</tr>
</tbody>
</table>

4 D To improve the cash operating cycle it needs to be shortened. The other options would all cause it to increase. Option A would increase the average inventory turnover period; Option B would reduce the average payables payment period and Option C would increase the average receivables collection period.

5 C This would be an appropriate use of a long-term surplus.

6 A An aggressive working capital strategy involves financing long-term requirements with short-term funds, which is likely to reduce liquidity but increase profitability since short-term debt is relatively cheap. Reduced liquidity leads to increased risk.
Chapter 6

1 C \[ K_e = \frac{0.40}{3.00} + 0.05 = 18.3\% \]

2 C Predicted current market value = present value of future cash flows = \((6 + 109) \times 1.09\) = $105.505, rounded to $106

3 C Preference shareholders normally receive a lower return because they take less risk than ordinary shareholders. Convertibles usually carry a lower interest rate because part of the return is received in the form of a gain on conversion.

4 B The cost of debentures will be post tax:

\[ K_d = \frac{\frac{1}{P_0}}{(1 - t)} = \frac{(12(1-0.25))}{150} = 6.0\% \]

The WACC will be:

<table>
<thead>
<tr>
<th>Market value</th>
<th>Proportion</th>
<th>Cost</th>
<th>Contribution to WACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>$m$</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>300</td>
<td>0.67</td>
<td>11.0</td>
</tr>
<tr>
<td>Debentures</td>
<td>150</td>
<td>0.33</td>
<td>6.0</td>
</tr>
</tbody>
</table>

5 A The WACC reflects the company’s existing mix of finance and the risk of its existing business activities. Thus if the existing WACC is used to appraise new investments, the assumption is that the mix of finance and the risk will remain unchanged, or that the project is so small that any changes would be insignificant. effect.

6 B The decision whether to lease or borrow money to buy the machine is a financing decision. Leasing is another form of debt finance and so the two forms of debt finance can be compared by discounting the relevant cash flows at an after-tax cost of borrowing.
Chapter 7

1. D A risk averse investor wants to be compensated in the form of higher returns for taking on additional risk. Here asset B has more risk than asset A but also generates a higher return. Whether the additional return is sufficient to compensate for the risk involved depends on the individual’s attitude to risk which is expressed by the investor’s indifference curve.

2. B

\[ \sigma_p = \sqrt{\sigma_a^2 x + \sigma_b^2 (1-x)^2 + 2x(1-x)p_{ab} \sigma_a \sigma_b} \]

\[ P_{ab} \] is the correlation coefficient of returns from investments A and B

\[ = \frac{\text{Covariance of investments A and B}}{\sigma_a \times \sigma_b} \]

\[ \sigma_p^2 = (0.25 \times 0.3^2) + (0.18 \times 0.7^2) + (2 \times 0.3 \times 0.7 \times 0.05) \]

\[ = 0.0225 + 0.0882 + 0.021 \]

\[ = 0.1317 \]

3. D The Capital Market Line which is drawn from the Risk-free rate at a tangent to the efficient frontier, cuts the efficient frontier at portfolio M, the market portfolio. This portfolio is a hypothetical portfolio of risky investments, containing every security available to investors in a given market, in amounts proportional to their market values. In practice a well-diversified portfolio of around 10-12 carefully selected different investments will ‘mirror’ the whole market in terms of the weightings given to particular sectors, high income and high capital growth securities, and so on.

4. B Expected return = 0.4 x 15% + 0.6 x 6% = 9.6 per cent

Combined risk of a two asset portfolio is given by

\[ \sigma_p = \sqrt{\sigma_a^2 x + \sigma_b^2 (1-x)^2 + 2x(1-x)p_{ab} \sigma_a \sigma_b} \]

Here the correlation coefficient between the risk free and risky asset is zero, and the risk-free asset has zero risk, so the combined risk is:

\[ \sigma_p^2 = (4 \times 0.4^2) \]

\[ = 0.64 \]

So, \( \sigma_p = 0.8 \)

Note that this is just the proportion invested in the risky asset times its std deviation i.e. \( \sigma_p \times x \)

5. D I Unsystematic risk is the risk that can be diversified and therefore no return is payable for this risk.

II Systematic risk, or market risk, cannot be diversified.

6. B If a security has a beta of 1, it means it has the same level of systematic risk as the market portfolio. Therefore, the required return from the security would equal \( r_m \).

7. B The expected return is 4% + (8% - 4%) \times 1.2 = 8.8 per cent

The predicted value of a share is \( \frac{20c}{0.088} = 227 \) cents
8 B  

**Step 1** – Calculate the risk-free rate using data for Ruby Co and the CAPM formula.

Cost of equity = risk-free rate + beta factor (expected market return less the risk-free rate).

Therefore, \(9.0 = \text{risk-free rate} + 0.8(10 - \text{risk-free rate})\)

\[9 = \text{risk-free rate} + 8 - 0.8 \text{ risk-free rate}\]

\[1 = 0.2 \text{ risk-free rate}\]

Risk-free rate = 5%

**Step 2** – Use the CAPM formula to calculate the cost of equity in Topaz Co.

Cost of equity in Topaz Co = 5 + 1.2 (10-5)

= 11.0%
Chapter 8

1. B Financial markets have operational efficiency if transaction costs are kept as low as possible.

2. B Under the weak form hypothesis of market efficiency, share prices reflect all available information about past changes in the share price. Since new information arrives unexpectedly, changes in share prices should occur in a random fashion. Therefore, statement I is true and statement II is false.

3. B Under the semi-strong form of market efficiency, the share price will increase when information is made publicly available. Under the strong form of market efficiency, the information will already have been reflected in the share price.

4. C Weak form efficiency implies that not all publicly available information is reflected in current prices and therefore may be used to make abnormal gains.

5. B Random walk theory is based on the idea that share prices will alter when new information becomes available. Since new information is unpredictable, share prices appear to follow a random walk. One of the underlying assumptions of random walk theory is that all relevant information about a company is available to all potential investors who will act upon the information in a rational manner i.e. that the stock market is efficient.

6. D MM's dividend irrelevance theory states that the value of a company is determined solely by the 'earning power' of its assets and investments, rather than its dividend policy. However statements I, II and III all support the view that dividend policy can have an impact: Information available to shareholders is imperfect, and they may not be aware of the future investment plans and expected profits of their company, thus some investors do use the dividend as an indicator of the company's success. Shareholders will tend to prefer a current dividend to future capital gains (or deferred dividends) because the future is more uncertain. Also differing rates of taxation on dividends and capital gains can create a preference for a high dividend or one for high earnings retention.

7. A This is consistent with the Modigliani-Miller theory of the irrelevance of dividend policy to shareholder value.

Equity value

Policy 1: Current year dividend $1 million. Dividend growth = 10% of the 75% of profits retained = 7.5% per annum.

\[
\text{Value} = \frac{1\text{ million}}{0.10-0.075} + \frac{(1\text{ million} \times 1.075)}{0.10-0.075} = 44\text{ million}
\]

Policy 2: Current year dividend $2 million. Dividend growth = 10% of the 50% of profits retained = 5% per annum.

\[
\text{Value} = \frac{2\text{ million}}{0.10-0.05} + \frac{(2\text{ million} \times 1.05)}{0.10-0.05} = 44\text{ million}
\]

Policy 3: Current year dividend $3 million. Dividend growth = 10% of the 25% of profits retained = 2.5% per annum.

\[
\text{Value} = \frac{3\text{ million}}{0.10-0.025} + \frac{(3\text{ million} \times 1.025)}{0.10-0.025} = 44\text{ million}
\]
8  B  As the information that is published is expected to change the market's perspective then the chief executive must believe that the semi-strong form of the market is in operation.

9  B  Weak form efficiency: the best estimate of the share price is the theoretical ex-rights price.

\[
\begin{array}{l}
\text{Current value of 4 shares (} \times \$4) \quad 16 \\
\text{Value of 1 new share} \quad 3 \\
\text{Theoretical value of 5 shares} \quad 19 \\
\end{array}
\]

Theoretical ex-rights price = $19.00/5 shares = $3.80 per share.

Strong form efficiency: if investors believe the estimated NPV of the project to be $5 million, the total value of equity will be as follows:

\[
\begin{array}{l}
\text{Total value of shares prior to rights issue (4 million} \times \$4) \quad 16 \\
\text{Funds raised in rights issue (1 million} \times \$3) \quad 3 \\
\text{NPV of project} \quad 5 \\
\text{Total equity value} \quad 24 \\
\end{array}
\]

Price per share = $24 million/5 million shares = $4.80.

10  D  All statements are correct.

11  D  A bonus issue does not involve a cash flow, being a capitalisation of reserves by issuing additional shares at no cost to the shareholders. Total net assets, shareholder's funds and earnings are unchanged; the number of shares has, however, increased.
Chapter 9

1 C Operating risk is all the risks faced by a business that are not financial risks. Credit and market risk are both types of financial risk.

2 C A risk-averse investor does not require an investment to be risk free. A risk averse attitude is that an investment should not be undertaken if there is an alternative investment offering either the same return but with a lower risk or a higher return for the same risk. However, an alternative investment might be undertaken if it has a higher risk, but offers a higher expected return.

3 A The risk-averse investor will aim to maximise return whilst minimising risk.

4 D Interest rate risk is the risk of higher or lower profits or losses than expected, as a result of uncertainty about future movements in an interest rate, or the general level of interest rates.

5 B Hazard risk is the exposure a business may have to natural events and their impacts, the actions of employees, the consequences of accidents etc, be it on the business, its trading partners or customers. Hazard risk is part of operating risk.

6 D The screening of customers is likely to reduce the risk of bad debts. Should bad debts arise, insurance will transfer the risk to a third party.

7 A The business has suffered due to technological development in the industry bringing innovation.

8 C As Noble is invoiced in dollars there is no exchange gain or loss
   As $ weakens against the Yen the supplier will make a loss

9 A Economic risk can be hedged by the matching of assets and liabilities. Translation risk may be hedged by group borrowings in the currency of the foreign subsidiary.

10 C Forward rate agreements hedge risk by fixing the interest rate on future borrowing. They protect the borrower from adverse market interest rate movements to levels above the rate negotiated for the FRA.

11 D Long term strategic exposure to risk is known as economic risk. Transaction risk arises on each individual purchase from China or sale to the US.
Chapter 10

1. D  Secondary financial instruments often referred to as derivatives, are financial instruments such as forward contracts, options and warrants, whose value is derived from an underlying asset. Primary instruments such as equity shares are defined as primary by the fact that they have an associated, measurable value.

2. B  Hedging, sometimes called exposure management, is a form of risk management used by companies to offset a variety of market risks.

3. D  A future is a legally binding contract, which may be traded or exchanged, to buy or sell a specific amount or value of an asset in the future at a set price, for delivery and payment on a set date. Futures are traded in standardised amounts. Both buyer and seller pay an initial margin, which is a small percentage of the value of the contract. Over the life of the futures contract each then either pays or receives variation margins as the price of the futures contract varies with the movement of the underlying index.

4. A  A call option on the index would only be of value if share prices increased in value.

5. C  Theoretically, the price of an instrument should be identical whichever market it is traded in. In reality, however, even with the development of multi-national and global trading this is not always the case. Arbitrage, which is a major use of derivatives, is the process of exploiting price differences between markets to make a profit.

6. C  An organisation wishing to reduce the volatility, or increase the predictability of its profits and/or cash flows can use derivatives to offset adverse changes in underlying assets. It does this by using financial instruments to transfer the risk it is trying to manage, via the market, to those with a higher appetite for risk.

7. A  Commodity futures provide an organisation with a way to manage price (not volume) risk in a volatile market. They limit the downside risk, but unlike an option do not provide the flexibility to benefit from any upside movement.

8. B  Intrinsic value = Share price – exercise price
   = 5.40 - 4.50 = $0.90
Before you Begin:
Answers and commentary
Chapter 1

1 **Capital expenditure** is expenditure which results in the acquisition of non-current assets or an improvement in their earning capacity. It is not charged as an expense in the income statement; the expenditure appears as a non-current asset in the statement of financial position.

**Revenue expenditure** is charged to the income statement and is expenditure which is incurred:

(a) For the purpose of the trade of the business – this includes expenditure classified as selling and distribution expenses, administration expenses and finance charges.
(b) To maintain the existing earning capacity of non-current assets.

2 **Capital budgeting** is the process of identifying, analysing and selecting investment projects whose returns are expected to extend beyond one year.

3 Any of: Return on capital employed (also known as accounting rate of return/return on investment), payback period, discounted payback, NPV, IRR.

4 The **return on capital employed (ROCE)** measures the profitability of an investment by expressing the expected accounting profits as a percentage of the book value of the investment. Once the expected return on capital employed for the project is calculated, it is compared with a pre-determined minimum target rate of return. The project is justified financially if its expected ROCE exceeds the minimum target.

5 When evaluating an investment, it is more appropriate to consider cash flows – money spent and received – rather than accounting profits which do not properly reflect investment returns. Accounting profits are based on the accruals concept of accounting, and do not represent the reality of a company as a portfolio of many different investments. Instead of reporting the cash outlay on an investment, an income statement reports a depreciation charge on capital equipment over the economic life of the asset. Depreciation is a notional accounting charge, and does not represent a cash flow. Therefore, cash flows and not accounting profits should be used for investment appraisal and decision-making. However one possible method of investment appraisal, return on capital employed (ROCE) is based on accounting profits. In contrast, payback and discounted cash flow techniques are based on relevant cash flows.

6 The relevant cash flows for appraisal of a project are the changes in future cash flows that would arise from acceptance of the project. Relevant costs and benefits to be taken into account are therefore future, incremental cash flows.

7 It is assumed that all variable costs are relevant costs.

<table>
<thead>
<tr>
<th>Net cash flow</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in sales</td>
<td>$10 000 x $20 = 200 000</td>
</tr>
<tr>
<td>Increase in variable costs</td>
<td>$10 000 x $8 = (80 000)</td>
</tr>
<tr>
<td>Increase in annual contribution</td>
<td>$120 000</td>
</tr>
<tr>
<td>Increase in fixed cost spending</td>
<td>(80 000)</td>
</tr>
<tr>
<td>Increase in annual cash profits</td>
<td>$40 000</td>
</tr>
</tbody>
</table>

8 The **payback period** is the length of time required before the total of the cash inflows received from a project is equal to the cash outflows, and is usually expressed in years. In other words, it is the length of time the investment takes to pay itself back.

9 The **time value of money** describes the concept that the earlier cash is received, the greater value it has to the recipient. Conversely, the later a cash payment is made, the less the cost to the payer. The concept of time value of money recognises that $1 today is worth more than $1 at a future time, because money can be reinvested to earn more money over time.

10 After 3 years, $30 000 x 0.751 = $22 530

11 $200 000 x 2.402 = $480 400
If the annual interest rate is 10 per cent, the effective interest rate per month can be calculated as follows:

Using \( i_e = (1 + r)^{\frac{1}{n}} - 1 \)

Where \( r = 0.1 \) and \( n = 12 \)

\[
\begin{align*}
i_e &= (1 + 0.1)^{\frac{1}{12}} - 1 \\
&= 0.00797 \\
&= 0.797\%
\end{align*}
\]

So an annual interest rate of 10% is the same as an effective monthly rate of just under 0.8 per cent.
Chapter 2

1. The net present value is the difference between the present value of total benefits and the present value of total costs. Projects with a positive NPV are financially viable, but projects with a negative NPV are not.

2. Discounted payback measures the time it takes for a project to recoup its initial investment, measured in discounted cash flow i.e. present value terms.

3. In this question, both NPVs are positive. Using the interpolation method, an IRR is calculated as follows. The NPV falls by $1,800 ($3,000 - $1,200) between 8 per cent and 10 per cent. The IRR is above 10%, and the NPV will be zero at:

\[
\text{IRR} = 8\% + \frac{3,000}{3,000 - 1,200} \times (10 - 8)\%
\]

\[
= 8\% + 3.3\%
\]

\[
= 11.3\% \text{ approx}
\]

4. NPV is better because it tells us the absolute $ increase in shareholder wealth from a project, assuming a given cost of capital. IRR is useful in that it tells us the maximum amount that the company could afford to pay for the project finance, or the expected return of the project in % terms. Both will give the correct decision for an individual project but NPV must be used to choose between projects.

5. Sensitivity analysis assesses how responsive the project’s NPV is to changes in the variables used to calculate that NPV. This helps identify the critical estimates in a project forecast.

6. Soft capital rationing is brought about by internal factors; hard capital rationing is brought about by external factors.

7. When capital rationing occurs in a single period, and projects are divisible, projects are ranked in terms of profitability index (PV of cashflows per $ initial outlay).

8. The real rate of return is the return expressed in constant price level terms and is the return that investors expect in the absence of inflation. The money rate of return is the rate of return which includes a compensation for inflation. The money rate is usually therefore higher than the real rate and can be determined using the following equation:

\[
(1 + \text{money rate}) = (1 + \text{real rate}) \times (1 + \text{inflation rate})
\]

where all the rates are expressed as decimals.

The current market rates of return are money rates of return i.e. investment yields on debt capital and equity capital are therefore money yields.

9. Payments of tax, or reductions of tax payments, are relevant cash flows and ought to be considered in DCF analysis. When taxation is ignored in the DCF calculations, the discount rate will reflect the pre-tax rate of return required on capital investments. When taxation is included in the cash flows, the cost of capital used should be the company’s after-tax cost of capital or post-tax required rate of return because this allows for the tax relief on the company’s debt finance.
1 Money markets are markets for short term capital:
   - Trading short-term financial instruments.
   - Short-term lending and borrowing.

   Capital markets are markets for trading in long-term finance, in the form of long-term financial instruments such as equities and corporate bonds.

2 **Equity securities** consist primarily of ordinary shares which entitle the owner to a share of the company’s profits and give them voting rights.

   **Debt securities** typically are fixed interest borrowings with a set repayment date, often secured on the assets of the company.

3 A stock market acts as a **primary market** for raising finance, and as a **secondary market** for the trading of existing securities.

   The **primary market** is the market where securities (debt and equity) are issued for the first time.

   The **secondary market** is the market where securities which have been issued in the primary market are traded.

4 **A financial intermediary** is a party bringing together providers and users of finance either as broker or as principal.

5 Over-the-counter (OTC) or off-exchange trading refers to financial instruments such as stocks, bonds, commodities or derivatives which are traded directly between two parties, as opposed to via an exchange. Major products traded on OTC markets in Australia include government debt securities, corporate debt securities, currency and derivative instruments.

6 The government plays a vital role in the functioning of the capital market as:
   - Borrower and lender
   - Financial intermediary (via the RBA)
   - Regulator of financial activities
   - Source of ultimate liquidity

7 Risk, duration, size
Chapter 4

1 Capital structure refers to the way in which an organisation is financed. Decisions include choosing a suitable balance between debt capital and equity capital (gearing level), and deciding on the balance between short-term and long-term finance.

2 As a general rule businesses should aim to match the length of finance with the maturity of the asset being financed, therefore non-current assets would be financed by long term capital and the majority of current assets by short-term capital.

3 The risk-return trade-off desired by potential investors will impact on the servicing cost of the finance. Shareholders bear the greatest risk and therefore will expect the highest return of long-term providers of finance. The cost of equity finance is therefore always higher than the cost of debt.

4 Advantages include: they can be arranged relatively quickly; they offer a level of flexibility with regard to the amount borrowed at any time; interest is only paid when the account is overdrawn. Disadvantages include the fact that they are technically repayable on demand and more expensive than other secured forms of short term finance.

5 Rather than buying an asset outright, using either available cash resources or borrowed funds, a business may lease an asset. Leasing has become a popular source of finance as it allows a business to spread the cost of having the asset over the time that it will generate returns.

6 Deep discount bonds are loan notes issued at a price which is at a large discount to the nominal value of the notes, and which will be redeemable at par (or above par) when they eventually mature.

7 A rights issue is an offer to existing shareholders enabling them to buy more shares, usually at a price lower than the current market price.

8 Venture capital is risk capital, normally provided in return for an equity stake to companies with high growth potential. Examples of situations suitable for VC include business start-ups and management buyouts.
Chapter 5

1. The amount tied up in working capital is equal to the value of raw materials, work-in-progress, finished goods inventories and accounts receivable less accounts payable. The size of this net figure has a direct effect on the liquidity of an organisation.

2. The two main objectives of working capital management are to ensure the company has sufficient liquid resources to continue in business and to increase its profitability. These two objectives will often conflict as liquid assets give the lowest returns. An excessively conservative approach to working capital management resulting in high levels of cash holdings will result in a liquid business but harm profits because the opportunity to make a return on the assets tied up as cash will have been missed.

3. The cash operating cycle is the period of time which elapses between the point at which cash begins to be expended on the production of a product and the collection of cash from a purchaser.

4. Any of the following:
   - Postponing capital expenditure.
   - Accelerating cash inflows which would otherwise be expected in a later period.
   - Reversing past investment decisions by selling assets previously acquired.
   - Negotiating a reduction in cash outflows, to postpone or reduce payments.

5. A moderate approach to working capital management achieves a balance between risk and return. This is likely to result in long-term funds being used to finance permanent assets while short-term funds finance non-permanent assets. This means that the maturity of the funds matches the maturity of the assets.
Chapter 6

1. The risk free rate of return plus a premium for business risk and financial risk.

2. The DVM states that the market price of a share is equal to the present value of the expected future dividends from the share, discounted at the cost of equity capital (or shareholders’ required return). This is derived from the fundamental theory of share values.

3. Past dividend growth or from the retention and reinvestment of earnings, \( g = bR \), where \( b = \) return on reinvested funds and \( R = \) proportion of earnings retained

4. \( K_E = \frac{0.20(1.06)}{1.50} + 0.06 = 20.13\% \)

5. The required return of the debentureholder is pre-tax whereas the cost to the company of the debt is post-tax, recognising that debt is a cheaper form of finance as a result of the tax relief arising on the interest payments.

6. To calculate the cost of the debt capital to include in the weighted average cost of capital, it is necessary to calculate an internal rate of return that takes account of tax relief on the interest.

7. The **weighted average cost of capital** can be used to evaluate a company’s investment projects if:
   - The project is small relative to the company
   - The existing capital structure will be maintained (same financial risk)
   - The project has the same business risk as the company
   - New investments are financed by new sources of funds, and a marginal cost of capital approach is used.

8. A general formula for the weighted average cost of capital is:

   \[
   WACC = \frac{K_E \cdot E}{E + D} + \frac{K_d \cdot D}{E + D}
   \]

   where:
   - \( K_E \) = cost of equity
   - \( K_d \) = cost of debt (post-tax)
   - \( E \) = market value of equity
   - \( D \) = market value of debt
Chapter 7

1. The **correlation coefficient** measures the degree to which the returns on investments vary with each other. Investments can be said to be positively correlated, negatively correlated or have no correlation.

   The combined risk of a portfolio will depend on how the two investments are correlated.

2. Risk can be reduced by combining in a portfolio investments which have no significant correlation. Investments that are perfectly negatively correlated (i.e. correlation coefficient = –1) offer the most scope to reduce risk through diversification.

3. The efficient frontier shows a collection of risky portfolios each one providing an optimal return for a given level of risk.

4. The market portfolio is a hypothetical portfolio containing every security available to investors in a given market, in amounts proportional to their market values.

5. The risk involved in holding securities (shares) divides into risk specific to the company (unsystematic) and risk due to variations in market activity (systematic). Unsystematic or business risk can be diversified away, while systematic or market risk cannot.

6. **Capital Asset Pricing Model (CAPM)** is a formula for predicting the required rate of return for an investment, based upon its level of systematic risk relative to that of the market as a whole.

   The capital asset pricing model can be used as a formula for calculating the cost of equity capital. It is an alternative to the dividend valuation model and dividend growth model.

   The uses of the capital asset pricing model (CAPM) include:
   (a) Establishing the 'correct' equilibrium market value of a company's shares.
   (b) Establishing the cost of a company's equity (and the company's average cost of capital), taking account of both the business and financial risk characteristics of a company's investments.

7. **Beta factor** is the measure of the systematic risk of a security relative to the risk of the market portfolio. The beta factor of the market as a whole is 1.0.

8. \[ r_i = r_f + \beta_i(r_m - r_f) = 5 + 1.2(9 - 5) = 9.8\% \]

   This assumes that the investors already hold a widely diversified portfolio of investments, so they have diversified away all unsystematic risk.
Chapter 8

1. The fundamental theory of share values states:

   The current market price of a share represents the present value of all future expected returns from the share, discounted at the shareholders' cost of capital (required rate of investment return).

2. Allocative efficiency

   If financial markets allow funds to be directed towards firms which make the most productive use of them, then there is allocative efficiency in these markets.

   Operational efficiency

   Financial markets have operational efficiency if transaction costs are kept as low as possible.

   Information processing efficiency

   The information processing efficiency of a stock market means the ability of a stock market to price stocks and shares fairly and quickly.

3. The efficient market hypothesis is the hypothesis that the stock market reacts immediately to all the information that is available. Therefore, a long term investor cannot obtain higher than average returns from a well diversified share portfolio.

4. Weak form efficiency implies that prices reflect all relevant information about past price movements and their implications.

   Semi-strong form efficiency implies that prices reflect past price movements and publicly available knowledge.

   Strong form efficiency implies that prices reflect past price movements, publicly available knowledge and inside knowledge.

5. Chartism or 'technical analysis' attempts to predict share price movements by assuming that past price patterns will be repeated.

6. Dividend policy refers to the choice that financial managers make between retaining a proportion of earnings for reinvestment as opposed to distributing earnings in the form of dividends.

7. Any of: traditional theory, residual theory or MM dividend irrelevance theory.

8. The residual theory of dividends says that if a company can identify projects with positive NPVs, it should invest in them. Only when these investment opportunities are exhausted should dividends be paid.
Chapter 9

1 Risk is the possible variation in an outcome from what is expected to happen.
   Uncertainty is the inability to predict the outcome of an activity due to a lack of information.

2 Risk management strategies include:
   - risk avoidance – e.g. not undertaking the relevant activity.
   - risk reduction – taking steps to reduce the severity of the impact.
   - risk transfer – passing the risk to a third party through hedging or insurance.
   - risk retention – accepting the loss if and when it occurs.

3 In broad terms we can distinguish risk averse attitudes, risk neutral attitudes and risk seeking attitudes.
   A risk averse attitude is that an investment should not be undertaken if there is an alternative investment offering either the same return but with a lower risk or a higher return for the same risk. However, an alternative investment might be undertaken if it has a higher risk, but offers a higher expected return.
   A risk neutral attitude is that an investment should be chosen based on the expected (most likely) return, irrespective of the risk.
   A risk seeking attitude is that an investment should be undertaken if it offers higher possible returns, even if the risk is higher.

4 Internal/external or financial/operating

5 Enhanced trading risk, environmental risk (political, legal, socio-cultural) and foreign currency risk.

6 Risk = probability × financial consequence
   Quantitative risk assessment involves the determination of measured figures for probabilities and consequences producing a specifically quantified measure of risk.

7 Translation risk 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.
   Transaction risk is the risk of adverse exchange rate movements occurring in the course of normal international trading transactions.
   Economic risk refers to the effect of exchange rate movements on the international competitiveness of a company and refers to the effect on the present value of longer term cash flows.

8 Any three of the following:
   Basic methods of hedging foreign currency risk include matching receipts and payments, invoicing in own currency, and leading and lagging the times that cash is received and paid. Alternatives are to use a forward contract or money market hedge. Foreign currency derivatives such as futures contracts and options can also be used to hedge foreign currency risk.

9 Interest rate risk includes (a) the risk of paying more interest on debt than necessary, (b) the risk of losses on interest-earning investments and (c) the risk of being unable to meet debt payment obligations.

10 Caps set a ceiling to the interest rate; a floor sets a lower limit. A collar is the simultaneous purchase of a cap and sale of a floor.
Chapter 10

1 Financial instruments are contracts that give rise to both a financial asset for one party to the contract and a financial liability or equity instrument by the other party to the contract. They can be divided into primary or secondary instruments.

2 Secondary financial instruments, often referred to as derivatives, are financial instruments whose value is derived from an underlying asset. Examples include forward contracts, futures, options and swaps.

3 A futures contract is a standardised contract, which may be traded or exchanged, to buy or sell a specific amount or value of an asset in the future at a set price, for delivery and payment on a set date. Index futures can be used to protect against a fall in the value of a portfolio of shares. These are useful to investors with significant investments e.g. pension funds and are an alternative to managing the value of the portfolio by buying and selling the shares within it.

4 Options are the right but not the obligation to purchase (a call option) or sell (a put option) an underlying asset at a set price but at a future date.

5 The major differences between options and warrants are:
   • the broader range of warrant products available
   • the longer potential lifetime of warrants which range from three months to 15 years as compared to index options (up to 18 months) and equity options (up to five years).
   • because warrants are not a standardised product like exchange traded options, there is the flexibility to tailor products to suit quite specific investor needs.
Glossary of terms
Accounting rate of return. See return on capital employed.

After-tax cost of capital. The cost of capital that allows for any tax relief on the company's debt finance.

Allocative efficiency. When financial markets allow funds to be directed towards firms which make the most productive use of them.

American Depository Receipts. (ADRs). Equity of large non-US companies might be traded on US stock markets as an ADR - a security denominated in US dollars, that is backed by a number of shares in the non-US company.

Annuity. A constant annual cash flow, for a number of years.

Arbitrage. The process of buying an instrument in one market and selling it either instantly or over a very short time horizon on another market, exploiting differences in the price to make a profit.

Beta factor. The measure of the systematic risk of a security relative to the risk of the market portfolio.

Bonds. Long-term debt capital raised by a company for which interest is paid, usually half yearly and at a fixed rate. Holders of bonds are therefore long-term payables for the company. The term is often used interchangeably with debentures.

Business risk. Risk that arises due to the existence of uncertainty about the future and about a firm's business prospects which increases the variability of its operating profits.

Capital allowance. A tax allowance for the decline in value or depreciation of a non-current asset.

Capital Asset Pricing Model (CAPM). A formula for predicting the required rate of return for an investment, based upon its level of systematic risk relative to that of the market as a whole.

Capital budgeting. The process of identifying, analysing and selecting investment projects whose returns are expected to extend beyond one year.

Capital expenditure. Expenditure which results in the acquisition of non-current assets or an improvement in their earning capacity.

Capital markets. Markets for trading in long-term finance, in the form of long-term financial instruments such as equities and corporate bonds.

Capital rationing. A situation in which a company has a limited amount of capital to invest in potential projects.

Capital market line (CML). The straight line which represents all possible combinations of the market portfolio and the risk-free asset.

Capital structure. The way in which an organisation is financed, by a combination of long-term capital (equity capital, preference shares, bonds, bank loans, convertible loan stock and so on) and short-term liabilities, such as a bank overdraft and trade payables.

Cash operating cycle. The period of time which elapses between the point at which cash begins to be expended on the production of a product and the collection of cash from the customer who purchases it.

Chartists (or technical analysts). Attempt to predict share price movements by assuming that past price patterns will be repeated.

Committed cost. A future cash outflow that will be incurred anyway, whatever decision is taken now about alternative opportunities.

Convertible bonds. Bonds that give the holder the right to convert to other securities, normally ordinary shares, at a pre-determined price/rate and time.

Correlation. Measures the degree to which the returns on investments vary with each other.

Cost of capital. The cost of funds that a company raises and uses, which is equivalent to the return that investors expect to be paid for putting funds into the company.

Cost of debt. The return an enterprise must pay to its lenders.

Cost of equity. The return an enterprise must pay to its ordinary shareholders.
Cost of preference share capital. The return an enterprise must pay to the investors in its preference shares.

Covariance. An absolute measure of the relationship between the returns on two investments.

Credit risk. The economic loss suffered due to the default of a borrower or counterpart (e.g. a customer or supplier).

Debentures. A form of loan note, the written acknowledgement of a debt incurred by a company, normally containing provisions about the payment of interest and the eventual repayment of capital. Debentures are usually secured: ie lenders have the right to seize assets if the loan is not repaid.

Debt securities. Typically fixed interest borrowings with a set repayment date, often secured on the assets of the company.

Deep discount bonds. Loan notes issued at a price which is at a large discount to the nominal value of the notes, and which will be redeemable at par (or above par) when they eventually mature.

Derivatives (or secondary financial instruments). Financial instruments that derive their value from the price or actual value of an underlying asset or item.

Discounted cash flow. A technique of evaluating capital investment projects, using discounting arithmetic to determine whether or not they will provide a satisfactory return.

Discounted payback method. How long it will take for a project to pay back the capital outlay on a discounted cash flow basis.

Dividend policy. The choice that financial managers make between retaining a proportion of earnings for reinvestment as opposed to distributing earnings in the form of dividends.

Dividend valuation model. The assumption that the share price represents the present value of all future dividends, discounted at the investors' required return (the cost of equity).

Divisible project. A project where it is possible to undertake a fraction of the investment, say, half, in order to earn half of the net present value (NPV) of the whole project.

Downside risk. The possibility that an event will occur and adversely affect the achievement of objectives.

Economic risk. (In the context of international trade) refers to the effect of exchange rate movements on the international competitiveness of a company and assesses the effect on the present value of longer term cash flows.

Efficient frontier. Shows a collection of optimal portfolios for a rational, risk averse investor: either the best return that can be expected for a given level of risk or the lowest level of risk needed to achieve a given expected rate of return.

Efficient market. One where the prices of securities bought and sold reflects all the relevant information available.

Efficient market hypothesis. The hypothesis that the stock market reacts immediately to all the information that is available. Therefore, a long term investor cannot obtain higher than average returns from a well diversified share portfolio.

Equity risk premium. (See market risk premium)

Equity securities. Consist primarily of ordinary shares which entitle the owner to a share of the company's profits and give them voting rights.

Exchange rate. The rate at which one country's currency can be traded in exchange for another country's currency.

External risks. Risks arising from factors outside the business, that the company may be subject to but that it has no influence over.

Eurobond. An international bond that is denominated in a currency not native to the country where it is issued (not necessarily in Euros).

Eurocurrency. Currency which is held by individuals and institutions outside the country of issue of that currency.
**Eurocurrency market.** Money market for borrowing and lending by banks in currencies other than that of the country in which the bank is based. Typically only available in major currencies for which active markets exist.

**Eurocurrency loan.** When a company borrows in a foreign currency.

**Factoring organisation.** Takes over the management of the trade debts owed to its client (a business customer) on the client’s behalf. The factor company collects the debts and provides an immediate cash advance of a proportion of the money it is due to collect.

**Financial instrument.** A contract that gives rise to a financial asset for one party to the contract and a financial liability or equity instrument for the other party (the counterparty).

**Financial intermediary.** A party bringing together providers and users of finance either as broker or as principal.

**Financial mathematics.** A collection of mathematical techniques that can be applied to finance and the financial markets.

**Financial risk.** The risk arising as a result of how the business is financed.

**Forward contract.** A binding promise to purchase or sell a set amount or value of an underlying asset at a set future time.

**Forward rate.** Is an exchange rate set now for currencies to be exchanged at a future date.

**Forward rate agreement.** A method of hedging interest rate risk by fixing the interest rate on future borrowing.

**Fundamental analysis.** Analysing all the publicly available information about a company, its industry and the economy in which it operates, in order to ascertain the intrinsic value of a share and assess whether its current share price is accurate.

**Fundamental theory of share values.** States that the market price of shares reflects investors’ expectations of what the future returns from the shares will be.

**Future.** A standardised contract, which may be traded or exchanged, to buy or sell a specific amount or value of an asset in the future at a set price, for delivery and payment on a set date.

**Gearing (or leverage).** The proportion of debt capital in a company’s capital structure.

**Hard capital rationing.** External limits are set on the amount of external financing an organisation can seek, perhaps because of scarcity of financing, high financing costs or other restrictions.

**Hazard/events risk.** The exposure a business may have to natural events and their impacts, the actions of employees and the consequences of accidents, be it on the business, its trading partners or customers.

**Hedge.** A transaction to reduce or eliminate an exposure of risk.

**Information processing efficiency.** The ability of a stock market to price stocks and shares fairly and quickly.

**Investor’s indifference curve.** Represents an investor’s preference for risk and return. An investor will have no preference between any portfolios which give a mix of risk and expected return which lies on the same curve, since he derives equal utility from each of them.

**Initial public offer (IPO).** An invitation to apply for shares in a company based on information contained in a prospectus.

**Institutional investors.** Institutions which have large amounts of funds which they want to invest.

**Interest rates.** Effectively the ‘prices’ governing lending and borrowing.

**Interest rate cap.** An interest rate option which sets an interest rate ceiling.

**Interest rate floor.** An interest rate option which sets a lower limit to interest rates.

**Interest rate collar.** An arrangement whereby a borrower can buy an interest rate cap and at the same time sell an interest rate floor.
**Interest rate parity.** The comparative interest rates in different countries are reflected in the forward exchange rate.

**Interest rate risk.** The risk of higher or lower profits or losses than expected, as a result of uncertainty about future movements in an interest rate, or the general level of interest rates.

**Interest rate swap.** An agreement whereby the parties to the agreement exchange interest rate commitments.

**Internal rate of return.** The discount rate at which a project has a zero NPV.

**Internal risks.** Risks arising from factors internal to the company, over which the company can exercise control.

**Investment.** Spending with a view to obtaining future benefits, long-term or short-term.

**Invoice discounting.** The purchase (by the provider of the discounting service) of a company’s trade debts, at a discount. Invoice discounting enables a company to raise finance based on their expected invoice receipts. The invoice discounter does not take over the administration of the client’s sales ledger so the client remains in control of debt collection.

**Leverage** (or **gearing**). The proportion of debt capital in a company’s capital structure.

**Long-term finance.** Used for major investments and usually more expensive and less flexible than short-term finance.

**Management buyout.** The purchase of all or parts of a business from its owners by its managers.

**Marginal cost of capital.** The additional cost to the company of obtaining specific funds to invest in a specific project.

**Market portfolio.** A hypothetical portfolio containing every security available to investors in a given market, in amounts proportional to their market values.

**Market risk** (or **systematic risk**). The exposure to potential loss that would result from changes in market prices or rates. Cannot be diversified away.

**Market risk premium (equity risk premium).** The difference between the expected rate of return on a market portfolio and the risk-free rate of return over the same period.

**Money markets.** Markets for trading short-term financial instruments and short-term lending and borrowing.

**Money cash flows.** The actual amounts to be received or paid at a future date.

**Money market hedge.** A method of hedging against currency risk which involves taking advantage of different interest rates in different countries.

**Money rate of return.** The rate of return which includes a compensation for inflation.

**Mutually exclusive projects.** Two or more projects from which only one can be chosen.

**Net present value.** The sum of the present value of the benefits (revenues or savings) from an investment, less the present value of expenditures.

**Nominal cash flows.** See **money cash flows**.

**Nominal rate of return.** See **money rate of return**.

**Non-systematic risk.** (See **unsystematic risk**)

**Official money market.** The market supported and sponsored by the Reserve Bank of Australia (RBA), which is responsible for the conduct of monetary policy, the issue of bank notes and the setting and management of Australia’s foreign exchange reserves.

**Operating risk.** All the risks faced by a business that are not financial risks.

**Operational risk.** Variability arising from the effectiveness of how the business is managed and controlled on a day to day basis, the accuracy and effectiveness of its information/accounting systems, its reporting systems and its management and control structures. Operational risk also encompasses compliance with issues such as health and safety, consumer protection, data protection and so on.
Operational efficiency. Financial markets have operational efficiency if transaction costs are kept as low as possible because there is open competition between brokers and other market participants.

Opportunity cost. The costs incurred or revenues lost from diverting existing resources from their next best use.

Options. The right but not the obligation to purchase (a call option) or sell (a put option) an underlying asset at a set price but at a future date.

Over-the-counter (OTC) (or off-exchange trading). Financial instruments such as stocks, bonds, commodities or derivatives which are traded directly between two parties, as opposed to via an exchange.

Payback period. The time required for the cash inflows from a project to recoup the cash outlays.

Perpetuity. A constant annual cash flow that continues indefinitely (a perpetual annuity).

Placing. An arrangement whereby the sponsoring market maker arranges for most of a share issue to be bought by a small number of investors, usually institutional investors such as pension funds and insurance companies.

Portfolio. The collection of different investments that make up an investor’s total holding.

Portfolio theory. States that individual investments cannot be viewed simply in terms of their risk and return. The relationship between the return from one investment and the return from other investments is just as important.

Post-tax cost of capital. See after tax cost of capital.

Preference shares. Shares which give the holder a fixed percentage dividend based on the par value of the share. Generally riskier than bonds since they rank behind debt in the event of a liquidation, although they rank ahead of ordinary shares.

Primary market. The market where securities (debt and equity) are issued for the first time.

Profitability index. The ratio of the present value of the project’s future cash flows (not including the capital investment) divided by the present value of the total capital investment.

Purchasing power parity. The idea that in absence of transaction costs, identical goods will have the same price in different markets.

Random walk theory. Based on the idea that share prices will alter when new information becomes available. Since new information is unpredictable share prices follow an unpredictable pattern or random walk.

Real cash flows. The cash flow expressed in terms of today’s value (i.e. uninflated).

Real rate of return. The return expressed in constant price level terms.

Redemption. The repayment of preference shares and/or bonds.

Regulatory system. The system which aims to protect investors while minimising interference in the market that might distort market price signals and investment decisions.

Relevant cash flows. Future incremental cash flows arising as a direct consequence of a decision being taken.

Residual value. The disposal value of equipment at the end of its life, or its disposal cost.

Return on capital employed. A measure of the expected accounting profits from an investment expressed as a percentage of the book value of that investment. Also called accounting rate of return (ARR) or return on investment (ROI).

Return on investment. See return on capital employed.

Revenue expenditure. Expenditure which is incurred for the purpose of the trade of the business or to maintain the existing earning capacity of non-current assets.

Reverse yield gap. Can occur because shareholders may be willing to accept lower returns on their investment in the short term, in anticipation that they will make capital gains in the future.

Rights issue. An offer to existing shareholders enabling them to buy more shares, usually at a price lower than the current market price.
**Risk.** The possible variation in an outcome from what is expected to happen.

**Risk appetite.** The extent to which a company is prepared to take on risks in order to achieve its objectives.

**Risk averse attitude.** An investment should not be undertaken if there is an alternative investment offering either the same return but with a lower risk or a higher return for the same risk.

**Risk neutral attitude.** An investment should be chosen based on the expected (most likely) return, irrespective of the risk.

**Risk seeking attitude.** An investment should be undertaken if it offers higher possible returns, even if the risk is higher.

**Risk-free rate of return.** The return which would be required from an investment if it were completely free from risk. Typically, a risk-free yield would be the yield on government securities.

**Sale and leaseback.** A company which owns its own premises can obtain finance by selling its property to an insurance company or pension fund for immediate cash and renting it back, usually for at least 50 years with rent reviews every few years.

**Scrip dividend.** A dividend paid by the issue of additional company shares, rather than by cash.

**Secondary market.** The market where securities which have been issued in the primary market are traded.

**Semi-strong efficient market.** A market where the current share prices reflect all relevant information about past price movements and their implications, and all knowledge which is available publicly.

**Sensitivity analysis.** Assesses how responsive a project's NPV is to changes in the variables used to calculate that NPV. This helps identify the critical estimates in the project forecast.

**Short-term finance.** Usually needed for businesses to run their day-to-day operations, includes overdrafts, short-term loans, trade credit and lease finance.

**Single period capital rationing.** Funds are rationed at one point in time and capital is freely available at all other times.

**Soft capital rationing.** The imposition of internal constraints on an organisation’s ability to raise finance, which are often imposed when managerial resources are limited.

**Sovereign risk.** The risk that a government will refuse to comply with the terms of a loan agreement during economically difficult or politically volatile times.

**Speculators.** Investors that take a calculated risk on the movements in an underlying asset value and trade derivatives based on these, in the expectation of making a profit.

**Spot rate.** The exchange or interest rate currently offered on a particular currency or security for immediate delivery.

**Standard deviation.** A measure of the risk of a security.

**Strategic risk.** Risks associated with the long-term strategic objectives of the business, potential variability of business returns arising as a result of the company strategy and its strategic position with respect to competitors, customers, reputation, legal, regulatory change or political change.

**Strong form efficient market.** A market where share prices reflect all information about a company, whether publicly available or not.

**Sunk cost.** A cost which has already been incurred and hence should not be taken account of in decision making.

**Systematic risk.** Risk that cannot be diversified away.

**Tax allowable depreciation.** See *capital allowances*.

**Technical analysts.** (See *chartists*)

**Term loan.** A loan for a fixed amount for a specified period.
**Time value of money.** Recognises that $1 today is worth more than $1 at a future time, because money can be reinvested to earn more money over time.

**Transaction risk.** The risk of adverse exchange rate movements occurring in the course of normal international trading transactions.

**Translation risk.** The risk that an organisation will make exchange losses when the accounting results of its foreign branches or subsidiaries are translated into the home currency.

**Uncertainty.** The inability to predict the outcome of an activity due to a lack of information.

**Underwriters.** Financial institutions which agree (in exchange for a fixed fee, perhaps 2.25% of the finance to be raised) to buy at the issue price any securities which are not subscribed for by the investing public.

**Unofficial money market.** Comprises the intercompany market (involving direct lending between companies) and the commercial paper market (intermediary trading of commercial bills, promissory notes and negotiable certificates). Less formally organised than the official money market and does not have official RBA support.

**Unsystematic risk.** Applies to a single investment or class of investments, and can be reduced or eliminated by diversification.

**Upside risk.** The possibility that an event will occur and positively affect the achievement of objectives.

**Value of rights.** The theoretical gain a shareholder would make by exercising his rights.

**Venture capital.** Provided to companies with high growth potential in return for a stake of equity. It is high risk financing as there is little guarantee this potential will be fulfilled.

**Warrants.** Financial instruments issued by banks, governments and other institutions, which are traded on the ASX. Warrants may be issued over securities (such as shares), a basket of different securities, a share price index, debt, currencies, or commodities.

**Weak form efficient market.** A market where share prices reflect all available information about past changes in the share price.

**Weighted average cost of capital.** Found by taking the cost of each individual source of finance and weighting it according to its importance in the finance mix.

**Working capital.** Current assets less current liabilities (the value of raw materials, work-in-progress, finished goods inventories and accounts receivable less accounts payable).

**Zero coupon bonds.** Bonds that are issued at a discount to their redemption value, but no interest is paid on them.
Formulae and discount tables
**Formulae**

**Investment appraisal (Chapters 1 and 2)**

**Future and Present values**

(a) The future value of a cash flow is given by:

\[ FV = PV (1 + r)^n \]

The present value of a cash flow is given by:

\[ PV = \frac{FV}{(1 + r)^n} \]

where:

- \( FV \) is the future value of the investment with interest.
- \( PV \) is the initial or 'present' value of the investment.
- \( r \) is the compound rate of return per time period, expressed as a proportion (so 10% = 0.10, 5% = 0.05 and so on).
- \( n \) is the number of time periods.

(b) The present value of an annuity is given by:

\[ PV = \frac{Annual \ cash \ flow}{r} \left( 1 - \frac{1}{(1 + r)^n} \right) \]

where \( r \) is the discount rate, expressed as a decimal.

(c) The present value of a perpetuity is given by:

\[ PV = \frac{Annual \ cash \ flow}{r} \]

where \( r \) is the discount rate, expressed as a decimal.

(d) Effective interest rates:

\[ r = (1 + i_e)^n - 1 \]

or alternatively,

\[ i_e = (1 + r)^{1/n} - 1 \]

where:

- \( r \) is the annual interest rate.
- \( i_e \) is the effective interest rate for the subperiod.
- \( n \) is the number of subperiods within a year.
(e) Internal rate of return is given by:

\[
IRR = A + \left[ \frac{N_A}{N_A - N_B} \times (B - A) \right] \%
\]

where:
- \(A\) is the lower rate of return.
- \(B\) is the higher rate of return.
- \(N_A\) is the NPV discounted at \(A\).
- \(N_B\) is the NPV discounted at \(B\).

(f) Sensitivity = \(\frac{\text{NPV}}{\text{Present value of project variable}}\) %

Cost of capital (Chapter 6)

(a) Market value of a share is given by:

\[
P_0 = \frac{D_0(1 + g)}{(r - g)}
\]

where:
- \(D_0\) is the current year’s annual dividend (i.e. the year 0 dividend).
- \(P_0\) is the current ex-dividend share price.
- \(r\) is the shareholders’ required return, expressed as a proportion.
- \(g\) is the annual growth rate in dividends, expressed as a proportion (e.g. 4 per cent = 0.04).

(b) Cost of equity is given by Gordon growth model:

\[
k_e = \frac{D_0(1 + g)}{P_0} + g
\]

where
- \(K_e\) is the cost of equity
- \(D_0\) is the current dividend per ordinary share
- \(g\) is the annual dividend growth rate
- \(P_0\) is the current ex-div price per ordinary share

(c) Dividend growth rate is given by

\[
g = bR
\]

where:
- \(b\) is the yield on new investments, and
- \(R\) is the proportion of profits retained for reinvestment.
(d) Cost of preference shares is given by
\[ K_{\text{pref}} = \frac{d}{P_0} \]

(e) Market value of debentures is given by:
\[ P_0 = \frac{1}{(1 + K_b)} + \frac{1}{(1 + K_b)^2} + \cdots + \frac{1 + P_n}{(1 + K_b)^n} \]
where \( P_0 \) is the current market price of debt capital after payment of the current interest.
I is the annual interest.
\( K_b \) is the required return of the providers of debt capital.
\( P_n \) is the amount payable on redemption in year \( n \).
This simplifies to
\[ P_0 = \frac{1}{K_b} \text{ for irredeemable debt} \]

(f) The after-tax cost of irredeemable debt capital is:
\[ K_d = \frac{1}{P_0} (1 - t) \]
where:
\( K_d \) is the after-tax cost of debt capital to the company.
I is the annual interest payment.
\( P_0 \) is the current market price of the debt capital ex interest (that is, after payment of the current interest).
\( t \) is the rate of tax.

(g) A general formula for the weighted average cost of capital is:
\[ \text{WACC} = K_e \frac{E}{E + D} + K_d \frac{D}{E + D} \]
where:
\( K_e \) is the cost of equity.
\( K_d \) is the post-tax cost of debt for the company.
\( E \) is the market value of equity in the firm.
\( D \) is the market value of debt in the firm.

**Portfolio theory and CAPM (Chapter 7)**

(a) The expected return \( \bar{r}_p \) of a two-asset portfolio is given by:
\[ \bar{r}_p = x \bar{r}_a + (1 - x) \bar{r}_b \]
where:
x is the proportion of investment A in the portfolio.
\( \bar{r}_a, \bar{r}_b \) are the expected returns of investments A and B.
(b) The standard deviation of the returns from a two-asset portfolio is given by:

\[ \sigma_p = \sqrt{\frac{\sigma_a^2 x^2}{\sigma_a^2} + \frac{\sigma_b^2 (1 - x)^2}{\sigma_b^2} + 2x (1 - x) \rho_{ab} \sigma_a \sigma_b} \]

where:
- \( \sigma_p \) is the standard deviation of a portfolio of two investments, A and B.
- \( \sigma_a \) is the standard deviation of the returns from investment A.
- \( \sigma_b \) is the standard deviation of the returns from investment B.
- \( \sigma_a^2, \sigma_b^2 \) are the variances of returns from investments A and B (the squares of the standard deviations).
- \( x \) is the weighting or proportion of investment A in the portfolio.
- \( \rho_{ab} \) is the correlation coefficient of returns from investments A and B.

(c) Correlation coefficient = \( \frac{\text{Covariance}}{\sigma_x \sigma_y} \)

where:
- \( \sigma_x \) = standard deviation of returns from security x.
- \( \sigma_y \) = standard deviation of returns from security y.

(d) Covariance = \( \sum p(x - \bar{x})(y - \bar{y}) \)

where:
- \( p \) = probability of outcome
- \( x \) = return from security x at that outcome.
- \( \bar{x} \) = expected return from security x.
- \( y \) = return from security y at that outcome.
- \( \bar{y} \) = expected return from security y.

(e) Capital asset pricing model

\[ E(r_i) = r_f + \beta_i(r_m - r_f) \]

where:
- \( E(r_i) \) is the required return from a security.
- \( r_f \) is the risk-free rate of return.
- \( r_m \) is the return from the market as a whole.
- \( \beta_i \) is the beta factor of the individual security.
Discount tables

**Present Value Table**

Present value of 1 i.e. \((1 + r)^{-n}\)

Where

\[ r = \text{discount rate} \]

\[ n = \text{number of periods until payment} \]

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### Annuity Table

Present value of an annuity of 1 i.e. \( \frac{1 - (1 + r)^{-n}}{r} \)

Where  
- \( r \) = discount rate
- \( n \) = number of periods

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Index
### A

Accounting rate of return (ARR), 9, 29  
Accounting rate of return method, 8  
Aggressive approach to financing working capital, 140  
Allocative efficiency, 211  
American Depository Receipts, 122  
**American option**, 269  
Annuity, 26  
Arbitrage, 273  
ARR and the comparison of mutually exclusive projects, 10

### B

Balanced portfolio, 193  
Basis risk, 253, 254, 255  
Benefits  
  - Intangible, 17  
**Beta factor**, 144, 195  
**Bonds**, 107  
Business risk, 164

### C

**Call warrant**, 270  
Cap, 254  
**Capital budgeting**, 5  
Capital allowances, 66  
**Capital asset pricing model (CAPM)**, 190, 191  
**Capital expenditure**, 4  
Capital investment decisions, 200  
**Capital rationing**, 55, 56, 70  
Capital structure, 98, 100  
Cash cycle, 134  
Cash flow, 134  
Cash flow forecasting, 7, 8  
**Cash operating cycle**, 134, 142  
Chartists, 214, 215  
Collar, 254  
**Committed cost**, 14  
Compounding, 22  
Conservative approach to financing working capital, 140  
Conversion premium, 108  
Conversion value, 108  
**Convertible bonds**, 108  
Corporate bonds, 83  
**Correlation between investments**, 180  
**Cost of capital**, 25, 150, 161  
Cost of debt capital, 157, 164  
Cost of floating rate debt, 160  
Cost of preference shares, 157  
Coupon, 107  
Creditors, 136  
**Currency futures**, 248  
Currency of invoice, 244  
**Currency options**, 248

### D

Day-of-the-week effects, 215  
**Debentures**, 107  
Deep discount bonds, 107  
**Derivatives**, 228, 266  
Discount factors, 24  
Discount rate, 161  
**Discounted cash flow**, 22  
**Discounted payback**, 43  
Discounting, 22, 23  
Dividend growth model, 153  
Dividend payout ratio, 151  
Dividend valuation model, 151, 198, 199

### E

Economic exposure, 241, 243, 249  
Economic risk, 243, 249  
**Efficient frontier**, 187  
**Efficient market**, 210  
**Efficient market hypothesis**, 211, 221  
Efficient portfolios, 187  
**Equity**, 111  
**Eurobond**, 121  
**Eurocurrency**, 121  
Euro-equity, 121  
**European option**, 269  
Exchange control regulations, 238  
**Exchange rate**, 89  
Exchange-traded options, 249  
Expected return of a portfolio, 178, 179, 183  
Exposure management, 272

### F

Factoring, 136  
Financial instruments, 266  
**Financial intermediary**, 86  
Financial risk, 101, 164  
Fixed charge, 109  
Floating charge, 109  
Floating rate debt, 160, 164  
Floor, 254  
Fluctuating current assets, 139  
Foreign currency derivatives, 248  
Foreign exchange (FX) markets, 90  
**Forward contracts**, 267, 268, 274  
**Forward exchange contracts**, 245  
Forward interest rate agreements (FRAs), 253, 269  
**Forward rate**, 89, 246
Fundamental theory of share values, 51, 151, 168, 169, 210, 221
Future, 267, 274

**G**

Gap analysis of interest rate risk, 252, 253, 254, 255
Gearing, 217
Go/no go decision, 7
Gordon’s growth model, 153

**H**

Hard capital rationing, 5, 56
Hedge, 271
Hedging, 243
Hour-of-the-day effects, 215

**I**

Impact, 240
Import quotas, 237
Incremental costs, 14
Indifference curve, 186
Inflation, 60
Information processing efficiency, 211
Initial public offer (IPO), 113
Institutional investors, 84, 94
Interest rate option, 254
Interest rate risk, 252
Interest rate swap, 255
Interest rates, 91, 251
Internal rate of return (IRR), 45
International capital markets, 120
International money markets, 120
Investing surplus cash, 138
Investment, 4
Investment appraisal, 6
Invoice discounting, 136
IRR formula, 48, 53
Irredeemable debt, 157
Issue price for a rights issue, 115

**J**

Just-in-time procurement, 136

**L**

Leading and lagging, 245
Lease or buy decisions, 165
Leasing, 105
Leverage, 100
Liquidity, 217
Listing, 111
Loan notes, 107
Marginal cost of capital, 164
Market efficiency, 210
Market imperfections and pricing anomalies, 215
Market portfolio, 188
Market risk, 191, 192
Market risk premium, 195
Markowitz, 176, 178
Matching and smoothing, 253
Matching assets and liabilities, 245, 247, 248, 249
Matching receipts and payments, 244
Maturity matching, 140
Mean-variance inefficiency, 187
Modigliani and Miller, 218
Money cash flows, 62
Money rate of return, 61
Month-of-the-year effects, 215
Mutually exclusive projects, 50

**N**

Nature of working capital, 132
Net present value (NPV), 40, 167
Net working capital, 132
Nominal rate of return, 61
Non-divisible projects, 60
Non-relevant costs, 14
Non-systematic risk, 192
Non-tariff barriers, 238

**O**

Operational efficiency, 211
Opportunity, 230
Options, 248, 269
Option premium, 269
Options, 269, 274
Ordinary shares, 111
Origination of proposals, 6
Over the counter (OTC) options, 249
Overdraft, 102

**P**

Payback (discounted), 43
Payback period, 18
Permanent current assets, 139
Placement, 113
Placing, 113
Political risks, 237, 238
Portfolio theory, 176, 178
Preference shares, 157
Present value, 24
Price earnings (P/E) ratio, 114
Primary financial instruments, 266
Primary market, 84
Private companies, 156
Probability, 240
Profitability index, 57
Project appraisal, 7
Put warrant, 270

Q
Qualitative issues in long-term decisions, 6, 7

R
Random walk theory, 214
Real cash flows, 62
Real rate of return, 61
Redemption, 110
Relevant cash flows, 12, 13
Relevant costs, 14
Repurchase of shares, 220
Residual theory of dividend policy, 218
Return on capital employed (ROCE), 8
Return on investment (ROI), 9, 29
Return on investment (ROI) method, 8
Revenue expenditure, 4
Reverse yield gap, 92
Rights issue, 115
Risk, 230
Risk averse, 232
Risk appetite, 232
Risk management, 271
Risk neutral, 232
Risk of a portfolio, 178, 183
Risk seeking, 232
Risk-free investments, 187
Risk-free rate of return, 150
Risk-free securities, 193

S
Sale and leaseback, 105, 106, 107
Savings, 16
Scrip dividend, 219
Secondary financial instruments, 266
Secondary market, 84
Semi-strong form efficiency, 212
Sensitivity analysis, 53
Share repurchase, 220
Shareholder wealth creation, 51
Shareholders, 217
Short-term loans, 103
Signalling, 217
Speculation, 272
Spot rate, 89, 246
Standard deviation of the portfolio,, 184
Stock Exchange, 85
Stock Exchange introduction, 113
Stock markets, 84
Stock split, 219, 220
Strong form efficiency, 212
Sunk cost, 15
Surplus cash, 138
Systematic risk, 191, 192

T
Tariffs, 237
Taxation, 64, 159
Term loan, 103
Time preference, 21
Time value of money, 21
Total shareholder return, 216
Trade credit, 105, 137
Trading cycle, 134
Transaction exposure, 241, 242, 249
Transaction risk, 242, 249
Translation exposure, 241, 250
Translation risk, 241, 250

U
Uncertainty, 230
Underwriters, 114
Unsystematic risk, 192

V
Valuation model, 167
Venture capital, 119, 123

W
Weak form efficiency, 212
Weighted average cost of capital (WACC), 161, 199
Working capital cycle, 134
Working capital financing, 139
Working capital investment, 4

Z
Zero coupon bonds, 108

Single period capital rationing, 57
Soft capital rationing, 5, 56