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THE INSTITUTE OF CHARTERED ACCOUNTANTS OF NIGERIA | Accuracy and Integrity

# FINANCIAL MANAGEMENT (FM)

## STUDY TEXT

THE INSTITUTE OF
CHARTERED ACCOUNTANTS
OF NIGERIA

ICAN

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FINANCIAL
MANAGEMENT (FM)

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# Foreword



**Foreword**

As the global economy continues to evolve, the importance of accounting professionals with strong technical skills, professional competence and ethical awareness cannot be overstated. The swift transformation in the business world, driven by globalisation, technological advancements and sustainability considerations, have significantly impacted the finance function and the skills required by professional accountants.

To remain relevant, the Institute's syllabus and training curriculum are designed to equip students with the knowledge and competencies required to succeed in the dynamic fields of accounting and finance. These are regularly reviewed and updated to reflect current trends and future needs of users of accounting and related services.

The Institute of Chartered Accountants of Nigeria (ICAN) is committed to ensuring that its syllabus and training curriculum remain current and relevant. To achieve this, ICAN undertakes a comprehensive review of these documents every three years, supplemented by annual updates to reflect emerging trends and developments in the national and global accountancy profession.

Following a rigorous process, the Syllabus Review, Professional Examinations, and Students' Affairs Committees have developed a new 3-level, 15-subject syllabus. As approved by the Council, the new syllabus will be implemented starting with the November 2025 examination diet.

The publication of the Study Texts has consistently accompanied syllabus reviews, yielding notable improvements in the performance of professional examination candidates. To further enhance student success rates, the Council has approved the development of new learning materials (Study Texts) for all the subjects. This sixth edition, incorporates significant updates, including IT and soft skills, thereby enhancing the contents, innovation, and quality. This edition has taken into consideration all requirements of the International Panel on Accountancy Education (IPAE).

The Institute engaged renowned writers and reviewers, comprising esteemed scholars and practitioners with extensive experience in their areas of specialisation, to develop high-quality learning materials. The 15 subjects include:

| Foundation Level | | |
|---|---|---|
| 1. | Business Environment | A1 |
| 2. | Financial Accounting | A2 |
| 3. | Management Accounting | A3 |
| 4. | Corporate and Business Law | A4 |

| Skills Level | | |
|---|---|---|
| 5. | Financial Reporting | B1 |
| 6. | Audit, Assurance and Forensics | B2 |
| 7. | Taxation | B3 |
| 8. | Performance Management | B4 |
| 9. | Financial Management | B5 |
| 10. | Public Sector Accounting and Finance | B6 |

| Professional Level | | |
|---|---|---|
| 11. | Strategic Business Reporting | C1 |
| 12. | Advanced Audit, Assurance and Forensics | C2 |
| 13. | Strategic Financial Management | C3 |
| 14. | Advanced Taxation | C4 |
| 15. | Case Study | C5 |

A rigorous quality control process was implemented, featuring a detailed and comprehensive review of the materials developed by the writers and reviewers by the Study Texts Review Technical Subcommittee.

These Study Texts will be valuable resources, not only for our candidates but also for students of other professional bodies, tertiary institutions, and finance and management practitioners, providing valuable resources for their studies and practices.

**Chibuzor Noel Anyanechi, (Chief) BSc, MBA, FCA**
**Chairman, Syllabus Review Committee**

# Acknowledgement

The Institute expresses its heartfelt appreciation to the following Syllabus Review Committee members, writers, reviewers, and editorial board members for their invaluable contributions, expertise, and scholarly dedication that enabled the successful production of these new Study Texts: They are:

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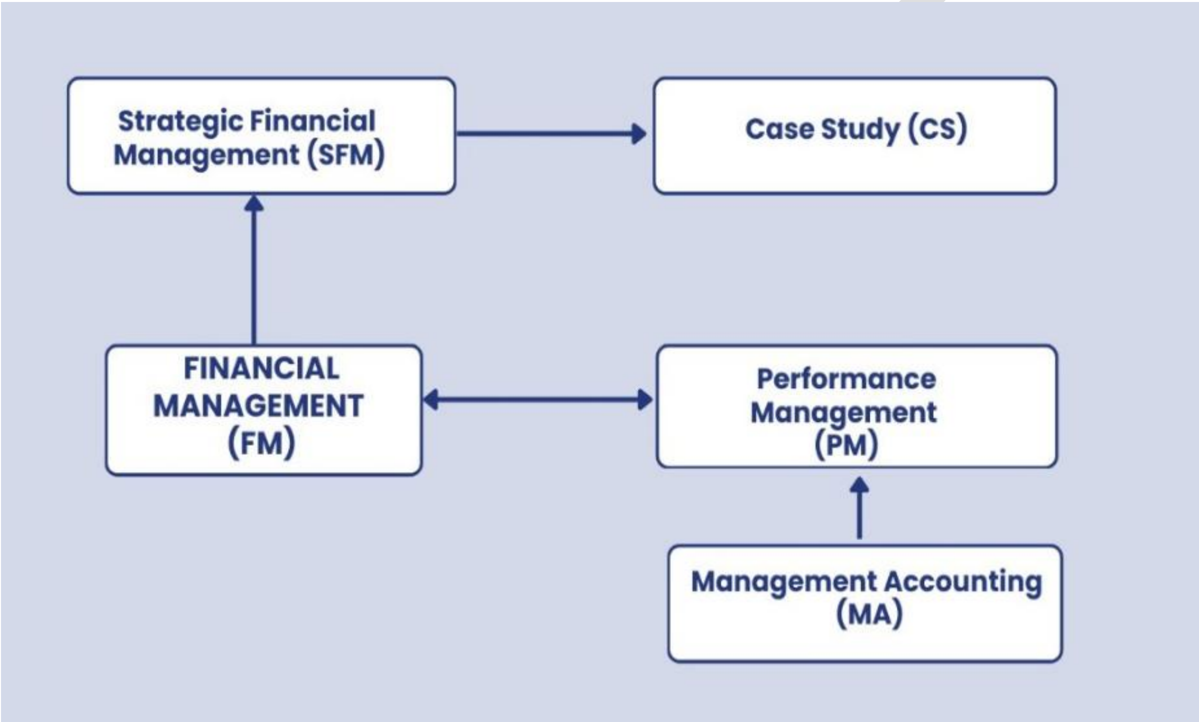
**Aim**

To enable candidates understand the role and purpose of the finance function, recommend relevant options for financing a business, manage working capital, make appropriate investment decisions, carry out business valuation, and recognise and manage financial risks.

**Linkage with other related subjects**

The diagram below depicts the relationship between this subject and other related subjects.




## Main competencies

On successful completion of this paper, candidates should be able to:

a) discuss the role and purpose of the financial management function;
b) understand and apply working capital management techniques;
c) carry out effective investment appraisal;
d) identify and evaluate alternative sources of business finance;
e) discuss and apply principles of business valuation; and
f) understand and apply risk management techniques in business.

## Specification grid

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

| | Content and competencies – Overview | |
|---|---|---|
| | **Grid** | **Weight %** |
| A | Financial management function and environment | 10 |
| B | Working Capital Management | 15 |
| C | Investment Appraisal | 25 |
| D | Business Finance | 20 |
| E | Business valuations | 15 |
| F | Risk management | 15 |
| | **TOTAL** | **100** |



## Detailed contents

### *A. FINANCIAL MANAGEMENT FUNCTION AND ENVIRONMENT 10%*

1. The nature and purpose of financial management

   (a) Explain the nature and purpose of financial management.
   (b) Explain the relationship between financial management, and each of financial accounting and management accounting.
   (c) Identify and describe various financial objectives, including:
      (i) stakeholders value creation;
      (ii) shareholder wealth maximisation;
      (iii) profit maximisation; and

(iii) earnings per share growth.

2. Corporate objectives and the influence of stakeholders

(a) Discuss the key stakeholders of an organisation and advise on their interests.
(b) Assess possible conflicts between stakeholder objectives.
(c) Evaluate management's role in managing stakeholder objectives, including the application of agency theory.
(d) Assess the various methods of achieving stakeholder objectives, including:
   (i) regulatory requirements – corporate governance codes and stock exchange listing regulations; and
   (ii) management reward schemes – share options and performance related pay.
(e) Advise on the various ways of evaluating corporate objectives, including:
   (i) ratio analysis; and
   (ii) total shareholders' return changes.

3. Financial management in not-for-profit organisations

(a) Evaluate the various objectives of a not-for-profit organisation.
(b) Discuss the ways of measuring achievement of objectives in a not-for-profit organisation.

4. The economic environment of business

(a) Evaluate major macroeconomic policy targets.
(b) Illustrate the role of fiscal, monetary, interest rate and exchange rate policies in achieving macro-economic policy targets.
(c) Assess the influence of government economic policies on decision making in business.

5. Financial markets and institutions

(a) Assess the role of money and capital markets both nationally and internationally.

(b) Evaluate the functions of stock market and the corporate bond market.
(c) Evaluate the impact of technology on the changing role of financial markets and institutions.
(d) Evaluate the role of money market in providing short term liquidity and short-term trade finance.
(e) Compare and contrast money market and capital market operations.
(f) Evaluate the role of banks and other financial institutions in the operation of the money markets.
(g) Evaluate the role of principal money market instruments, including:
  (i) interest bearing instruments;
  (ii) discount instruments; and
  (iii) derivative products.

## *B. WORKING CAPITAL MANAGEMENT 15%*

1. The nature, elements and importance of working capital

(a) Describe the nature of working capital and identify its elements.
(b) Identify the objectives of working capital management in terms of liquidity and profitability, and discuss the conflict between them.
(c) Discuss the central role of working capital management in financial management.

2. Management of inventories, accounts receivable, accounts payable and cash

(a) Explain and calculate the cash operating cycle.
(b) Explain and apply relevant accounting ratios, including:
  (i) Current ratio and quick ratio;
  (ii) Inventory turnover ratio, average collection period and average payable period; and
  (iii) Sales revenue/net working capital ratio.
(c) Discuss, apply and evaluate the use of relevant techniques in managing inventory, including the economic order quantity (EOQ) model and just-in-time (JIT) techniques.
(d) Discuss, apply and evaluate the use of relevant techniques in managing accounts receivables, including:

(i) assessing credit worthiness;
(ii) collecting amounts owing;
(iii) offering early settlement discounts; and
(iv) using factoring and invoice discounting.

(e) Discuss and apply the use of relevant techniques in managing accounts payable, including:

(i) using trade credit effectively; and
(ii) evaluating the benefits of early settlement and bulk purchase discounts.

(f) Explain the various reasons for holding cash, discuss and apply the use of relevant techniques in managing cash, including:

(i) preparing cash flow forecasts to determine future cash shortages or surpluses;
(ii) assessing the benefits of centralised treasury management and cash control;
(iii) cash management models, such as the Baumol model and the Miller-orr model; and
(iv) short-term investment.

3. Determining working capital needs

(a) Calculate the level of working capital investment in current assets and discuss the key factors determining this level, including:

(i) the length of the working capital cycle and terms of trade;
(ii) an organisation's policy on the level of investment in current assets; and
(iii) the industry in which the organisation operates.

(b) Evaluate and discuss the key factors in determining working capital funding strategies, including:

(i) the distinction between permanent and fluctuating current assets;
(ii) the relative cost and risk of short-term and long-term finance;
(iii) the matching principle; and
(iv) the relative costs and benefits of aggressive, conservative and matching funding policies.

## C. INVESTMENT APPRAISAL 25%

1. Investment appraisal methods

(a) Identify and calculate relevant cash flows for investment projects.

(b) Calculate and discuss the usefulness of each of the following investment appraisal methods:
   (i) Payback period;
   (ii) Accounting rate of return (ARR);
   (iii) Net present value (NPV); and
   (iv) Internal rate of return (IRR).

(c) Evaluate capital investment decisions, using capital budgeting techniques that incorporate strategic factors.

(d) Discuss the superiority of discounted cash flow (DCF) methods over non-DCF methods.

(e) Discuss the relative merits of NPV and IRR.

2. Inflation and taxation in DCF

(a) Apply and discuss the real-terms and nominal-terms approaches to investment appraisal.

(b) Calculate the taxation effects of relevant cash flows, including tax benefits of tax-allowable depreciation.

3. Risk and uncertainty in investment appraisal

(a) Describe and discuss the difference between risk and uncertainty in relation to investment appraisal.

(b) Discuss and apply the following techniques of dealing with risk and uncertainty in investment appraisal:

   (i) sensitivity analysis;

   (ii) expected value criterion, including, value of information;

   (iii) decision tree;

(iv) simulation; and

(v) risk-adjusted discount rates.

4. Specific investment decisions

(a) Evaluate leasing and borrowing-to-buy decisions, using Nigerian tax rules.

(b) Evaluate asset replacement decisions, using equivalent annual cost/value method and least cost method (LCM).

(c) Evaluate investment decisions under single-period capital rationing, including:

(i) the calculation of profitability indices for divisible investment projects;

(ii) the calculation of the NPV of combinations of non-divisible investment projects; and

(iii) a discussion of the reasons for capital rationing.

**D. BUSINESS FINANCE 20%**

1. Sources of finance

(a) Identify and discuss the range of short-term sources of finance available to businesses, including overdraft, bank loan, trade credit, etc.

(b) Identify and discuss the range of long-term sources of finance available to businesses, including equity, debt finance, finance lease and venture capital.

(c) Identify and discuss methods of raising equity finance, including rights issue, placing, public offer, introduction, etc.

(d) Discuss the major differences between islamic finance and the other forms of business finance.

(e) Identify and discuss methods of raising short-term and long-term islamic finance, including:

(i) the concept of riba (interest) and how returns are made by islamic financial securities.

(ii) islamic financial instruments available to businesses including:

- murabaha (trade credit);
- ijarah (lease finance);

- mudaraba (equity finance);
- sukuk (debt finance); and
- musharaka (venture capital).

(f) Identify and discuss internal sources of finance, including:

(i) retained earnings;

(ii) efficient management of working capital;

(iii) the relationship between dividend policy and the financing decision; and

(iv) the theoretical approaches to, and the practical influences on, the dividend decision (including legal constraints, liquidity, shareholder expectations and alternatives to cash dividends).

2. Cost of capital

(a) Evaluate the cost of equity, including:

(i) application of the dividend growth model (its assumptions, advantages and disadvantages);

(ii) explanation and discussion of systematic and unsystematic risk;

(iii) relationship between portfolio theory and the capital asset pricing model (CAPM); and

(iv) application of the CAPM (its assumptions, advantages and disadvantages).

(b) Evaluate the cost of debt:

(i) irredeemable debt;

(ii) redeemable debt;

(iii) convertible debt;

(iv) preference shares; and

(v) bank debt.

(c) Calculate the overall cost of capital, using weighted average cost of capital (WACC).

3. Sources of finance and their relative costs

(a) Discuss the relative risk-return relationship and the relative costs of equity and debt.

(b) Outline and discuss the problem of high gearing.

(c) Evaluate and discuss the impact of sources of finance on financial position, financial risk and shareholder wealth using appropriate measures, including:

(i) ratio analysis using statement of financial position gearing, operational and financial gearing, interest coverage ratio and other relevant ratios; and

(ii) cash flow forecasting.

(d) Discuss the effects of cost of capital on investments, including:

(i) the relationship between company value and cost of capital;

(ii) the circumstances under which WACC can be used in investment appraisal;

(iii) the advantages of the CAPM over WACC in determining a project-specific cost of capital; and

(iv) the application of the CAPM in calculating a project-specific discount rate.

4. Capital structure theories and practical considerations

(a) Explain the traditional view of capital structure and its assumptions.

(b) Discuss the views of Miller and Modigliani (M&M) on capital structure, both with and without corporate taxation, and their assumptions.

(c) Identify a range of capital market imperfections and describe their impact on the views of M&M on capital structure.

(d) Discuss the relevance of pecking order theory to the selection of sources of finance.

5. Finance for small and medium sized entities (SMEs)

(a) Explain the nature of financing problems for small businesses in terms of the funding gap, the maturity gap and inadequate security.

(b) Describe measures used to ease SMEs financing problems.

(c) Outline and evaluate the effects of financing sources for SMEs, including:

(i) business angel financing;

(ii) government assistance;

(iii) crowd funding; and

(iv) supply chain financing.

**E. BUSINESS VALUATIONS 15%**

1. Nature and purpose of the valuation of business and financial assets

(a) Outline and explain the rationale for businesses and financial assets valuation.

(b) Explain the information required in carrying out valuation of businesses and financial assets

2. Choice of assets valuation bases

(a) Discuss and apply asset valuation methods, including:

(i) historical cost method;

(ii) net realisable method; and

(iii) replacement cost method.

(b) Discuss and apply income-based valuation method, including:

(i) price/earnings ratio methods;

(ii) earnings yield methods; and

(iii) enterprise value/EBITDA multiple methods.

(c) Discuss and apply cash flow-based valuation methods, including:

(i) discounted cash flow method; and

(ii) dividend valuation method

3. The valuation of debt and other financial assets

(a) Explain and apply appropriate valuation methods to:

(i) irredeemable bond;

(ii) redeemable bond;

(iii) convertible bond;

(iv) irredeemable preference shares; and

(v) redeemable preference shares.

4. Efficient Market Hypothesis (EMH) and practical considerations in the valuation of shares

(a) Distinguish amongst and discuss weak form efficiency, semi-strong form efficiency and strong form efficiency.

(b) Discuss practical considerations in the valuation of shares and businesses, including:

(i) marketability and liquidity of shares;

(ii) availability and sources of information;

(iii) market imperfections and pricing anomalies; and

(iv) market capitalisation.

**F. RISK MANAGEMENT 15%**

1. The nature and types of risk and approaches to risk management

(a) Discuss different types of foreign currency risk, including transaction risk, translation risk and economic risk.

2. Causes of exchange rate differences and interest rate fluctuations

(a) Explain the causes of exchange rate fluctuations, including:

(i) balance of payments;

(ii) purchasing power parity theory;

(iii) interest rate parity theory; and

(iv) four-way equivalence.

(b) Carry out a forecast of exchange rates, using:

(i) purchasing power parity; and

(ii) interest rate parity.

(c) Discuss and apply covered interest arbitrage.

3. Hedging techniques for foreign currency risk

(a) Explain and apply method of foreign currency risk management, including traditional and basic methods.

(i) currency of invoice;

(ii) netting and matching;

(iii) leading and lagging;

(iv) forward exchange contracts; and

(v) money market hedging.

(b) Discuss and apply the main types of foreign currency derivatives used to hedge foreign currency risk and explain how they are used in hedging.

(Simple numerical questions will be required)

4. Hedging techniques for interest rate risk

(a) Explain and apply the following methods of hedging interest rate risk, including both traditional and basic methods:

(i) matching and smoothing;

(ii) asset and liability management; and

(iii) forward rate agreements.

(b) Outline and explain the main types of interest rate derivatives used to hedge interest rate risk and explain their uses.

(Simple numerical questions will be required).

C

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**Skills Level**
**Financial Management**

CHAPTER 1

# FINANCIAL MANAGEMENT FUNCTION

## Contents

# 1. The Nature and Purpose of Financial Management

## 1.0 Learning objective

This chapter introduces financial management, its nature, purpose and organisational financial objectives.

## 1.1 Learning outcomes

At successful completion of this chapter, readers should be able to:

a. explain the nature and purpose of financial management.
b. distinguish between financial management and financial and management accounting.
c. identify and describe various financial objectives including:
   i. stakeholders value creation;
   ii. shareholder wealth maximisation;
   iii. profit maximisation; and
   iv. earnings per share growth.

## 1.2 The nature of financial management

Financial management refers to that aspect of management which involves planning and controlling the financial affairs of an organisation, to ensure that the organisation achieves its objectives.

This involves decisions about:

a) how much finance does the business need for its daily operations and for longer-term investment projects;
b) where the finance should be obtained and whether it should be long term [equity or debt] or short term [trade suppliers and bank overdrafts];
c) how to manage short term cash surpluses and deficits;
d) how much to be paid as dividends; and
e) how to protect the organisation against financial risks.

## 1.3 Financial management, management accounting and financial accounting

Financial management should be distinguished from other financial roles.

Financial accounting is primarily concerned with preparing financial statements for shareholders and external users. It provides financial information about historical results of past plans and decisions. Its focus is external financial reporting.

Management accounting is concerned with providing information for daily control functions and decision making for internal users. It provides both financial and non-financial information to assist management with planning and controlling the resources of the organisation. Its focus is internal reporting.

Financial management is primarily focused on managing the organisation’s finance, that is raising finance and ensuring the finance is efficiently and effectively used. It focuses on raising finance, and the effective allocation of resources. It assists both internal and external users.

### 1.3.1. The relationship between financial accounting, management accounting and financial management

Though financial accounting, management accounting and financial management are different, there are some common principles adopted by them in providing information to the different users such as:

a. the ratio analysis of the report provided by financial accounting is used by financial management to advise investors on the viability of the organisation;
b. the budgeting process from management accounting assists the financial management function in strategic planning,
c. long-term investment appraisal is an aspect where both management accounting and financial management overlap; and
d. management accounting provides information on inventory control, receivables and other components of working capital, financial accounting has the day-to-day obligation for trade receivables while financial management is concerned with the efficient management of working capital. this implies that they all play a role in working capital management.

## 1.4 Financial objectives

Every organisation exists for a purpose. **Objectives** or targets explain **what** the organisation is trying to achieve, **strategy** is concerned with **how** the organisation can achieve it.

A corporate objective is the major purpose that an organisation is trying to achieve.

a. The main objective of a company might be to maximise the wealth of the company's owners, its equity shareholders.
b. The main objective of a state-owned organisation might be stated in terms of providing a certain standard of public service.
c. The main objective of a charity would be to fulfill its charitable purpose [for example provide maximum aid or support for a particular group of people]

The main corporate objective might therefore be expressed as a financial objective with appropriate targets that can be measured.

A financial objective is a specific, measurable, achievable, relevant, and time-bound (SMART) goal that an organisation seeks to accomplish through financial management.

When the main objective of an organisation is not a financial objective, there is always a financial constraint on its objective, such as providing the highest quality of public service with the available finance.

## 1.5 Strategic process

Plans or strategies are formulated for the achievement of the corporate objective. The process of formulating the strategy is as follows:

a. identify the corporate objective [usually a financial objective];
b. establish targets for the financial objective;
c. develop business strategies for achieving the financial objective/targets;
d. convert the strategies into action plans; and
e. monitor performance.

This implies that the identification of a primary objective is the starting point for the formulation of a strategy to achieve the objective.

## 1.6 Identifying the main financial objective

*Shareholder wealth maximisation is a fundamental principle of financial management.*

A financial objective can be expressed in several ways. Financial objectives include:

a. stakeholder value creation;
b. shareholder wealth maximisation;
c. profit maximisation; and
d. earnings per share growth.

### 1.6.1. Stakeholder value creation as a financial objective

This refers to the process of creating value for all stakeholders. Advocates of this objective believe that the competing claims of a wide range of stakeholders should be balanced by the organisation while considering its economic and social responsibilities.

This objective implies that the organisation should be able to identify all its stakeholders and their interests, create a strategy to balance their various interests especially where there may be conflicts of interest between and within groups of stakeholders.

This will be dealt with more when discussing the influence of stakeholders on corporate objectives.

#### Advantages of stakeholders value creation

a. It may lead to an improved reputation for the organisation based on positive stakeholder experiences.
b. It may create a stronger bond between the stakeholders which may result in increased loyalty to the organisation.
c. Unique stakeholder value propositions may give the organisation a competitive advantage in strategy differentiation.
d. It may lead to long term sustainable growth as it encourages investment in human capital, innovation and social responsibility.
e. It could improve risk management by encouraging proactive management of social and environmental impacts, and mitigating risks associated with stakeholder relationships.

#### Challenges of stakeholders' value creation

a. How do we manage the conflicting demands and expectations from different stakeholder groups.
b. It may be difficult in practice to identify relevant metrics and indicators to measure stakeholder value creation.
c. Unequal power distribution amongst the stakeholders would pose a significant challenge if this were taken as the primary objective.
d. How do we address the global issues that affect stakeholders value creation.
e. It may be an issue trying to manage the trade-offs between the financial and non-financial objectives of stakeholders.
f. It would be a daunting task integrating stakeholder value creation into the strategy, operations and culture of the organisation.

### 1.6.2. Shareholders' wealth maximisation as a financial objective

The main corporate objective can be stated as the maximisation of shareholders' wealth and this means maximising the market value of the company. Most companies are owned by shareholders, and it is logical that the primary objective is to maximise their wealth.

Shareholder wealth is increased by dividend payments and a higher share price. Corporate strategies are therefore desirable if they result in higher dividends, higher share prices or both.

**Advantages of shareholders' wealth maximisation**

a. It provides a clear objective for the organisation.
b. It encourages effective allocation of resources to increase returns.
c. It helps to ensure long-term viability of the organisation.
d. It helps to ensure that the organisation is responsive to market demands and changes.
e. It supports long-term growth and sustainability.

**Challenges of shareholders wealth maximisation**

a. What should be the period for setting targets for wealth maximisation?
b. How will wealth creation be measured?
c. How can targets be divided into targets for dividend payments and targets for share price growth?
d. Share prices are often affected by general stock market sentiments, and short-term increases or falls in share price might be caused by investor attitudes rather than any real success or falling of the company itself.

The objective of maximising shareholder wealth is generally accepted as a sound basis for financial planning, but it is not practical in terms of actual setting financial performance targets and measuring actual performance against the target. Other financial objectives such as profit maximisation and growth in earnings per share may be used instead, on the expectation that it will increase shareholders' wealth.

### 1.6.3. Profit maximisation as a financial objective

This is the goal of an organisation earning the highest possible profits. The organisation sets targets for profit growth over a strategic planning period. The organisation is focused on increasing revenue, reducing costs and ensuring efficient allocation of resources.

**Advantages of profit maximisation**

a. It provides a clear and simple objective for the organisation.
b. It encourages organisations to allocate resources efficiently to maximise profits.
c. It simplifies measurement of performance in the organisation, as profit maximisation is easy to understand and measure.
d. It encourages a culture of competitiveness through innovation and continuous improvement.
e. It increases returns to shareholders through dividend payments and capital appreciation.

**Challenges of profit maximisation**

a. Deciding the period over which the profit performance should be measured. There is a need to balance short term with long term issues, because it is possible to increase short term profits at the expense of long-term profits. For example, a company might avoid replacing ageing equipment to avoid higher depreciation or might avoid investing in new projects that will make initial losses regardless of how profitable they might be in the future.
b. Profits can be increased by raising and investing more capital. When share capital is increased, total profits might increase due to the bigger investment, but the profit per share may fall.
c. It may encourage short-term achievement or focus by the managers partly because their remuneration might depend on meeting annual performance targets or because the managers do not expect to remain in the same job for too long.

d. Accounting profit is different from cashflow, and so investors may be more interested in cashflow.
e. It could lead to window dressing and other sharp practices to manipulate the profit.

### 1.6.4. Earnings per share [EPS] growth as a financial objective

EPS is a popularly accepted measure of profit per share. A financial objective might be to increase the EPS each year and possibly to increase the EPS by a target amount each year for the next few years. It is calculated as profit after tax and preference dividends divided by the number of shares in issue.

**Advantages of EPS growth**

a. The growth in EPS target ensures that there will be more profits to pay the dividend per share.
b. It ensures that there will be more retained profits to reinvest with the intention of increasing earnings per share more in the future.
c. It would result in growth in shareholders' wealth over the long term.

**Challenges of EPS growth**

a. EPS can be increased through borrowing and debt capital through the tax relief on interest and not the performance of the company.
b. However, higher financial gearing (the ratio of debt capital to total capital) can expose shareholders to greater financial risk. Because of higher gearing, the share price might fall even when EPS increases.
c. It is a measure of profitability and is subject to the same challenges as profit maximisation above.

The main points to note about a company's financial objective are:

i. financial management is concerned with decisions on financing, investment and dividend issues.
ii. financial management though related is different from financial accounting and management accounting.it is generally accepted that the main financial
iii. objective of a company should be to maximise [increase] shareholders' wealth.
iv. there are practical challenges in selecting a suitable measurement for growth in shareholders' wealth. Financial targets such as profit maximisation and growth in EPS might be used, but no financial target on its own is ideal.

v. financial performance is therefore evaluated in a number of ways, by the increase in share price, growth in profit, growth in EPS and so on.

## 1.7 Stakeholders and their objectives

### 1.7.1. Corporate objectives and the influence of stakeholders

Stakeholders refer to everyone with a vested interest in the activities or performance of a company. Although the theoretical objective of a private sector company might be to maximise the wealth of its owners [shareholders], other individuals and groups have an interest in what a company does, and they might be able to influence its corporate objectives.

It is usual to group stakeholders into categories, with each category having its own interests and concerns. The main categories of stakeholders in a company are usually the following:

a. **Shareholders** – The shareholders themselves are a stakeholder group. Their interest is to obtain a suitable return from their investment and to maximise their wealth. Some shareholders are long-term investors with an interest in longer-term share price growth and dividends while other shareholders might be short-term investors, hoping for quick capital gain and/or high short-term profits and dividends.
b. **Directors and senior managers** – An organisation is led by its board of directors and senior executive management. Their interest in the organisation would be advancing their career, more income, good working conditions and personal wealth.
c. **Other employees** – The other employees in a company have a personal interest in what the company does. Their focus would be their salary or wages, job security or career prospects. However, unlike directors and senior executives, other employees might have less influence on what the company does, unless they have strong trade union representation or have some other source of power and influence such as specialist skills that the company needs and relies on.
d. **Lenders** – when a company borrows money, the lenders are stakeholders. Lenders might be banks or investors in the company's bonds. The main concern for lenders is to protect their investment. If the company is heavily in debt, credit risk might be a problem, and lenders might be concerned about the ability of the company to meet its interest and principal repayment

obligations. They might also want to ensure that the company does not continue to borrow even more money, so that the credit risk increases further.

e. **The government** – the government also has an interest in companies, especially large companies, for a variety of reasons, which include:
   i. The government regulates commercial and industrial activity, therefore, it has interest in companies as a regulator;
   ii. Companies are an important source of taxation income for the government, both tax on corporate profits and tax on employment income and sales taxes;
   iii. Companies are also employers, and one of the economic aims of the government might be to achieve full employment; and
   iv. Some companies are major suppliers to the government.
f. **Customers** – Customers have an interest in the action of companies whose goods or services they buy and might be able to influence what companies do.
g. **Suppliers** – major suppliers to a company might have some influence over its actions.
h. **Society as a whole** – A company might need to consider the concerns of society, about issues such as business ethics, human rights, the protection of the environment, the preservation of natural resources and avoiding pollution. Companies might need to consider how to protect their reputation in the mind of the public, since a poor reputation might lead to public pressure from new legislation, or a loss in customer support for the company's products or services.

Companies might therefore state their objectives in terms of seeking to increase the wealth of their shareholders, but subject to the need to satisfy other stakeholders too-rewarding employees well and being a good employer, acting ethically in business, and showing due concern for social and environmental issues.

The ability of stakeholders to influence what a company does depends to a large extent on:

a. The extent to which their interests can be accommodated and do not conflict with each other; and
b. The power of each group of stakeholders to determine or influence the company's objective and strategies.

### 1.7.2 Conflicts between different stakeholder objectives

Different stakeholders have differing interests in a company, and these might be incompatible and in conflict with each other. When stakeholders have conflicting interests,

a. either a compromise will be found so that the interests of each stakeholder group are satisfied partially but not in full.
b. Or the company will act in the interests of the most powerful stakeholder group, so that the interests of the other stakeholder groups are ignored.

In practice there might be a combination of these two possible outcomes. A company might make small concessions to some stakeholder groups but act mainly in the interests of its most powerful stakeholder group [groups].

Some examples of conflicting interests of stakeholder groups are as follows:

a. If a company needs to raise more long-term finance, its directors and shareholders might wish to do so by raising more debt capital, because debt capital is usually cheaper than equity finance. However existing lenders might believe that the company should not borrow any more without first increasing its equity capital – by issuing more shares or retaining more profits. The terms of loan agreements [the lending covenants] might therefore include a specification that the company must not allow its debt level [gearing level] to exceed a specified maximum amount.
b. The government might want to receive a tax on a company's profits, whereas the company will want to minimize its tax liabilities, through efficient tax avoidance schemes.
c. A company cannot maximize returns to its shareholders if it also seeks to maintain a contended work force possibly by paying them high wages and salaries.
d. A company cannot maximize short term profits if it spends money on environmental protection measures and safe waste disposal measures.

However, the most significant conflict of interest between stakeholders in a large company, especially in a public company where shares are traded on a stock market, is generally considered to be the conflicts of interest between:

a. The shareholders; and
b. The board of directors, especially the executive directors, and the other senior executive managers.

This perceived conflict of interest is fundamental to agency theory and the concepts of good corporate governance that have developed from agency theory.

## 1.8 Agency theory

Agency theory was developed by Jensen and Meckling [1976] who defined the agency relationship as a form of contract between a company's owners and its managers, where the owners appoint an agent [the managers] to manage the company on their behalf. As part of this arrangement, the owners must delegate decision making authority to the management.

The owners expect the agents to act in the best interests of the owners as stated in the contract between them. However, it is impossible to arrange the perfect contract, because decisions by the managers [agents] affect their own personal interests as well as the interests of the owners. Managers will give priority to their personal interests over those of the shareholders. When this happens, there is a weakness or failing on the governance of the company.

### 1.8.1. Agency conflicts

Agency Conflicts are differences in the interests of a company's owners and managers. They arise in several ways.

a. **Moral hazard** – A manager has an interest in receiving benefits from his or her position as a manager. These include all the benefits that come from status such as company car, lunches, attendance at sponsored events and so on. Jensen and Meckling suggested that a manager's incentive to obtain these benefits is higher when he has no shares, or only a few shares in the company. The biggest problem is in large companies.
b. **Effort level** – Managers may work less hard than they would if they were the owners of the company. The effect of this lack of effort could be lower profits and a lower share price. The problem will exist in a large company at middle levels of management and senior management level. The interests of middle managers and the interests of senior managers might well be different, especially if senior management are given pay incentives to achieve higher profits, but the middle managers are not.
c. **Earnings retention** – The remuneration of directors and senior managers is often related to the size of the company, rather than its profits. This gives managers an incentive to grow the company, and increase its sales turnover and assets, rather than increase the returns to the company's shareholders.

Management are more likely to want to re-invest profits in order to make the company bigger, rather than payout the profits as dividend.

d. **Risk aversion** – Executive directors and senior managers usually earn most of their income from the company they work for. They are therefore interested in the stability of the company because this will protect their job and their future income. This means that management might be risk-averse, and reluctant to invest in higher-risk projects. In contrast shareholders might want a company to take bigger risks, if the expected returns are sufficiently high.

e. **Time horizon** – shareholders are concerned about the long-term financial prospects of their company, because the value of their shares depend on expectations for the long term future. In contrast, managers might only be interested in the short term. This is partly because they might not receive annual bonuses based on short-term performance, and partly because they might not expect to be with the company for more than a few years. Managers might therefore have an incentive to increase accounting return on capital employed [or return on investment], whereas shareholders have a greater interest in long term share value.

### 1.8.2 Agency costs

Agency costs are the costs that the shareholders incur when professional managers run their company.

a. Agency costs do not exist when the owners and the managers are exactly the same individuals.
b. Agency costs start to arise as soon as some of the shareholders are not also directors of the company.
c. Agency costs are potentially very high in large companies, where there are many different shareholders and a large professional management.

There are three aspects to agency costs:

a. They include the **costs of monitoring** - A company establishes systems for monitoring the actions and performance of management, to try to ensure that management are acting in their best interests. An important example of monitoring is the requirement for the directors to present an annual report and audited accounts to the shareholders, setting out the financial performance and financial position of the company. Preparing accounts and having them audited has a cost.
b. Agency costs also include the costs to the shareholder that arise when the managers take decisions that are not in the best interests of the shareholders (but are in the interests of the managers themselves: **opportunity costs**). For example, agency costs arise when a

company's directors decide to acquire a new subsidiary and pay more for the acquisition than it is worth. The managers would gain personally from the enhanced status of managing a larger group of companies. The cost to the shareholders comes from the fall in share price that would result from paying too much for the acquisition.

c. The third aspect of agency costs is costs that might be incurred to provide incentives to managers to act in the best interests of the shareholders. These are sometimes called **bonding costs**. The main example of bonding costs are the costs of remuneration packages for senior executives. These costs are intended to reduce the size of the agency problem. Directors and other senior managers might be given incentives in the form of free shares in the company or share options. In addition, directors and senior managers might be paid cash bonuses if the company achieves certain specified financial targets

## 1.9 Achieving stakeholders' objectives [reducing the agency problem]

Jensen and Meckling argued that in order to reduce the agency problem, incentives should be provided to management to increase their willingness to take 'value-maximising decisions' – in other words, to take decisions that benefit the shareholders by maximising the value of their shares.

Several methods of reducing the agency problem have been suggested. These include:

a. Devising a remuneration package for executive directors and senior managers that gives them an incentive to act in the best interests of the shareholders.
b. Fama and Jensen (1983) argued that an effective board must consist largely of independent non-executive directors. Independent non- executive directors have no executive role in the company and are not full- time employees. They are able to act in the best interests of the shareholders.

c. Independent non-executive directors should also take the decisionswhere there is (or could be) a conflict of interest between executive directors and the best interests of the company. For example, non-executive directors should be responsible for the remuneration packages for executive directors and other senior managers.

   These ideas for reducing the agency problem are contained in codes of corporate governance.

### 1.9.1. Incentive schemes (management reward schemes)

This chapter has so far made the point that the main objective of a company should be a financial objective, but there are different ways of stating this objective and in measuring the extent to which the objective has been achieved.

There are different stakeholder groups with an interest in a company, and these are likely to have conflicting interests. The main conflict of interest is the agency problem and the different interests of shareholders and senior executive managers and directors.

This raises the question: Can the agency problem be reduced and can managers be persuaded to focus on returns to shareholders as the main objective of the company? Managers may be encouraged to work in the best interests of the company if there are remuneration incentive schemes (reward schemes) linked to profits, earnings, share price or total shareholder return.

Most, if not all, large stock market companies have remuneration schemes for their executive directors and other senior managers, and the purpose of such schemes is to make the personal interests of the directors and managers similar to those of the shareholders. By achieving financial performance that is in the interests of the shareholders, directors and managers will also obtain personal benefits for themselves.

### 1.9.2 Structure of a remuneration package for senior executives

The structure of a remuneration package for executive directors or senior managers can vary, but it is usual for a remuneration package to have at least three elements.

a. A basic salary (with pension entitlements) - Basic salaries need to be high enough to attract and retain individuals with the required skills and talent.
b. Annual performance incentives, where the reward is based on achieving or exceeding specified annual performance targets. The performance target might be stated as profit or earnings growth, EPS growth, achieving a profit target or achieving a target for TSR. Some managers might also have a non-financial performance target. Some managers might have several annual performance targets, and there is a reward for achieving each separate target. Annual rewards are usually in the form of a cash bonus.
c. Long-term performance incentives, which are linked in some way to share price growth or TSR over a longer period of time (in practice typically three years). Long-term incentives are usually provided in the form of share awards or share options in the company. The purpose of these awards is to

give the manager a personal incentive in trying to increase the value of the company's shares. As a holder of shares or share options, the manager will benefit financially from a rising share price.

### 1.9.3 Share awards

With a share award scheme, the company purchases a quantity of its own shares and awards these to its executive directors and other senior managers on condition that certain 'long-term' financial targets are achieved, typically over a three-year period.

### Share options

A company might award share options to its executives. A share option gives its holder the right to purchase new shares in the company on or after a specified date in the future, typically from three years after the options have been awarded. The right to buy new shares in the company is at a fixed price (an 'exercise price') that is specified when the share options are awarded. Typically, the exercise price is the market price of the shares at the time the options are awarded. The holder of a share option gains from any increase in the share price above the exercise price and so has a direct personal interest in a rising share price.

For example, a company might award share options to its chief executive officer. If the market price of the shares at the date of the award is, say, ₦7.00, the CEO might be given 500,000 share options at ₦7 per share, exercisable from three years after the date of the option award. If the share price three years later is, say, ₦10, the CEO will be able to buy 500,000 new shares at ₦7 and sell them immediately at ₦10, to make a personal financial gain of ₦1,500,000.

## 1.10 Regulatory requirements as an approach to achieving stakeholder objectives

### 1.10.1. Corporate governance

Corporate governance is a term that describes the way a company is managed on behalf of its owners by the board of directors. It is a more extensive approach to reducing the agency problem and trying to ensure that companies are governed in the best interests of shareholders.

### 1.10. 2. Elements of corporate governance

Remuneration and management reward schemes are one aspect of corporate governance but there are others. These includes:

a. the board of directors, responsibilities and composition of the board of directors;
b. the remuneration for directors;
c. internal control and risk management;
d. external auditors financial reporting and independence; and
e. communication between the company and its shareholders and the rights and responsibilities of shareholders.

### 1.10.3 Steps taken by corporate governance to reduce agency problems

a. Board responsibilities- The board of directors should in their responsibilities reserve certain decisions about major strategic investments to the board as a whole. The essence of this is to ensure that major decisions are taken by all directors and not just executive management.
b. Board composition - The positions of the chairman and the chief executive officer should not be held by the same individual; this is to avoid exerting excessive influence.
c. At least half the board, excluding the chairman, should be independent non-executive directors. This is to ensure that there are individuals in the board who do not have a conflict of interests and would work in the best interest of shareholders.
d. Board committees - It insists that there should be at least three committees of the board such as nominations committee to appoint directors, audit committee to liaise with external auditors and remunerations committee to negotiate the remuneration of individual directors.
e. External auditors – the audit committee is responsible for recommending the audit fee and reviewing the auditor's performance to reduce the influence of the executive directors on the external auditors.

### 1.10.4. Stock exchange listing practices

The stock exchange rules help ensure that public companies are managed in the best interests of shareholders and the agency problem reduced. They include:

a. Financial statements – Publicly listed companies in Nigeria are required to submit their financial statements regularly.
b. Quarterly and annual reports – companies must prepare and submit both quarterly and annual reports to update shareholders on their performance.

c. These reports must be submitted within the required timeframe or face penalties.

## 1.11 Evaluating the achievement of corporate financial objectives

When a financial objective is established, actual performance should be measured against the objective.

This requires the calculation of one or more suitable performance measurements.

Financial objectives are commonly measured using **ratio analysis**. Financial ratios can be used to make comparisons. These might be:

a. Comparisons over a number of years. By looking at the ratios of a company over a number of years, it might be possible to detect improvements or deterioration in the financial performance or financial position of the entity. Ratios can therefore be used to make comparisons over time, and to identify changes or trends
b. Comparisons with the similar ratios of other, similar companies for the same period.
c. Comparisons with 'industry average' ratios.

### 1.11.1. Return on capital employed (ROCE)

Profit-making companies should try to make a profit that is large enough in relation to the amount of money or capital invested in the business. The most important profitability ratio is return on capital employed or ROCE.

The formula for ROCE is:

$$\frac{Profit\ before\ interest\ and\ tax}{Share\ capital\ \&\ reserves\ plus\ long-term\ debt\ capital\ plus\ preference\ share\ capital} \times 100\%$$

The capital employed is the share capital and reserves, plus long-term debt capital such as bank loans, bonds and loan stock.

Where possible, use the average capital employed during the year. This is usually the average of the capital employed at the beginning of the year and end of the year.

**Example: Return on capital employed**

ABC company achieved the following results in year 20X5.

| | 1 January 20X5 | 31 December 20X5 |
|---|---|---|

| | ₦ | ₦ |
|---|---|---|
| Share capital of ₦1 | 1,000,000 | 1,000,000 |
| Share premium | 500,000 | 500,000 |
| Accumulated profits | 2,500,000 | 3,000,000 |
| Bank loans | 1,000,000 | 2,500,000 |
| | **5,000,000** | **7,000,000** |
| | | ₦ |
| Profit before taxation | | 1,050,000 |
| Taxation | | 375,000 |
| Profit after taxation | | **675,000** |

Interest charges on bank loans were ₦150,000. Sales during the year were ₦29,000,000 and dividend payment to shareholders were ₦225,000.

**Required:**

Calculate the return on capital employed for Year 20X5.

**Solution to the example on ROCE**

ROCE = PBIT/ average capital employed x 100 = 1,200,000 / 6,000,000 x 100% = 20%

**W1 Average capital employed**

| | ₦ |
|---|---|
| Capital employed at the beginning of the year | 5,000,000 |
| Capital employed at the end of the year | 7,000,000 |
| Average capital employed = [5,000,000 + 7,000,000] / 2 | 6,000,000 |

**W2 Profit before interest and taxation**

| | ₦ |
|---|---|
| Profit before tax | 1,050,000 |
| Interest | 150,000 |
| Profit before interest and taxation | 1,200,000 |

**NB:** The ROCE figure can be compared to the ROCE achieved by the company in previous years or the ROCE of similar companies, especially competitors.

The sales and dividend payment were not relevant in solving this question because we were given the profit and capital employed at the end of the year.

### 1.11.2 Return on equity

Return on equity (ROE) measures the return on investment that the shareholders of the company have made. This ratio normally uses the values of the shareholders' investment as shown in the statement of financial position rather than the market values of the shares.

$$ROE = \frac{\text{Profit after taxation and preference dividend}}{\text{Share capital and reserves}} \times 100\%$$

The average value of shareholder capital should be used if possible. This is the average of the shareholder capital at the beginning and the end of the year.

Profit after tax is used as the most suitable measure of return for the shareholders, since this is a measure of earnings (available for payment as dividends or for reinvestment in the business).

**Example: Return on equity**

ABC company achieved the following results in the year 20X5.

| | **1 January 20X5** | **31 December 20X5** |
|---|---|---|
| | **₦** | **₦** |
| Share capital of ₦1 | 1,000,000 | 1,000,000 |
| Share premium | 500,000 | 500,000 |
| Accumulated profits | 2,500,000 | 3,000,000 |
| Bank loans | 1,000,000 | 2,500,000 |
| | **5,000,000** | **7,000,000** |
| | | **₦** |
| Profit before taxation | | 1,050,000 |
| Taxation | | 375,000 |
| Profit after taxation | | **675,000** |

Interest charges on bank loans were ₦150,000. Sales during the year were ₦29,000,000 and dividend payment to shareholders were ₦225,000.

**Required**

Calculate the return on equity for Year 20X5.

**Solution to the example on ROE**

ROE = PAT/ average shareholders capital x 100 = 675,000 / 4,250,000 x 100% = 15.88%

**W1 Average capital employed**

| | ₦ |
|---|---|
| Shareholders capital at the beginning of the year | 4,000,000 |
| Shareholders capital at the end of the year | 4,500,000 |
| Average capital employed = [4,000,000 + 4,500,000] / 2 | 4,250,000 |

### 1.11.3. Earnings per share [EPS] and dividend per share [DPS]

The earnings per share (EPS) is a measure of the profit after taxation (and preference share dividend, if any) per equity share, during the course of a financial year. The EPS might be:

a. a historical EPS, as reported in the company's financial statements; or
b. a forward-looking EPS, which is the EPS that the company expects to achieve in the future, usually in the next financial year.

Dividend per share may be important for shareholders who are seeking income from shares rather than capital growth. The company may have a dividend policy which aims for steady growth of dividend per share.

Formula: Basic EPS

$$\frac{\text{Net profit/[loss] attributable to ordinary shareholders during a period}}{\text{Weighted average number of shares in issue during the period}}$$

**Example: Earnings per share and Dividend per share**

ABC company achieved the following results in the year 20X5.

| | **1 January 20X5** | **31 December 20X5** |
|---|---|---|
| | ₦ | ₦ |
| Share capital of ₦1 | 1,000,000 | 1,000,000 |
| Share premium | 500,000 | 500,000 |
| Accumulated profits | 2,500,000 | 3,000,000 |
| Bank loans | 1,000,000 | 2,500,000 |
| | **5,000,000** | **7,000,000** |
| | | ₦ |
| Profit before taxation | | 1,050,000 |
| Taxation | | 375,000 |
| Profit after taxation | | **675,000** |
| | | |

Interest charges on bank loans were ₦150,000. Sales during the year were ₦29,000,000 and dividend payment to shareholders were ₦225,000.

**Required**

Calculate the earnings per share and the dividend per share for Year 20X5.

**Solution to the example on EPS and DPS**

EPS = profit after tax / number of ordinary shares = 675,000 / 1,000,000 = 67.5k per share

DPS = Total dividend / number of ordinary shares = 225,000 / 1,000,000 = 22.5k per share

### 1.11.4. Changes in share price and dividend

Financial performance can also be measured by the return provided to shareholders over a period of time such as a financial year. The total return consists of dividend payments plus the increase in the share price during the period (or minus the fall in the share price).

This total return, often called the **total shareholder return (TSR)**, can be expressed as a percentage of the value of the shares at the beginning of the period.

**Example: Total shareholders return**

On 1 January 20X5, the share price of ABC limited was ₦15 per share. During the year, dividends of 75k per share were paid and on 31 December 20X5, the share price was ₦17.25 per share.

**Required:**

Calculate the total shareholders return [TSR]

**Solution to TSR**

TSR = [price at end – price at start] plus dividend / price at start

TSR = [17.25 – 15] + 0.75 / 15 = 20%

The share price has risen by ₦2.25 plus a dividend of ₦0.75 giving a total return of ₦3. This is 20% return [3/15]

**The total shareholder return [TSR] can also be broken down** into the capital gain yield and dividend yield.

**Capital gain yield** = [price at end – price at start] / price at start = 17.25 – 15 / 15 = 15%

**Dividend yield** = Dividend / price at start = 0.75 / 15 = 5%

TSR = capital gain yield + dividend yield = 15% + 5% = 20%

## 1.12 Financial Management in Not-for-profit organisations [NPOs]

Not-for-profit organisations are entities whose main objective is not financial. It is an entity that operates for the public benefit, rather than to generate profits for shareholders or owners. The primary objective of an NPO is to address social, economic, or environmental issues, rather than to maximise profits. Its major objective is not to make money but to benefit prescribed groups of people.

They include charity organisations, foundations, advocacy groups, community organisations and government departments and agencies.

Every not-for-profit organisation has a major objective. The main objective could be for the schools and universities t**o provide education** in an education system, or **provision of health care** in the health service or **providing special aid and support** for charities.

The likely objectives of NPOs could also be

| SN | Category | Focus |
|---|---|---|
| 1 | Social objectives | Improve the quality of life or address social issues like poverty. |
| 2 | Environmental objectives | Protect and preserve the natural environment, climate change etc |
| 3 | Research and development objectives | Conduct research and development in specific fields. |
| 4 | Educational objectives | Provide education and training to individuals or groups. |
| 5 | Health objectives | Improve access to health care services |

NPOs do not have a major financial objective but Not-for-profit organisations need to have financial objectives and financial management to help them achieve their main objectives. Some reasons why they need financial management include:

a. they need to survive;
b. they need to budget and plan their spending;
c. they need to compare actual expenditure against budget;
d. their spending should not exceed the amount of funds available;
e. they need to monitor how efficiently they are using the available resources;
f. they need to ensure that the available funds are well utilised; and
g. they need to measure how well they are performing in relation to key objectives.

### 1.12.1 Value for money [VFM]

Value for money is to not-for-profit organisations, what profit is to the financial management of companies. VFM refers to the optimal use of resources to achieve the best intended outcomes subject to the cost incurred. It simply means getting the best possible outcome for the lowest possible cost. It is of the view that not-for-profit organisations should optimise available spending.

Value for money has three elements sometimes known as the **drivers of the value for money or the "3 Es".**

a. Economy – refers to minimising cost while maintaining quality, it means obtaining the appropriate quantity and quality of resources at the lowest cost possible: maximizing the resources which an organisation has.
b. Efficiency – involves using resources the best way possible to get the most out of them. It is focused on maximizing outputs or outcomes while minimising inputs or resources.
c. Effectiveness – means achieving the desired outcomes or results. It is the relationship between the organisation's intended and actual results. For example, one of the indicators to measure tuition house performance is exam results. Effectiveness would be concerned with if the candidate passed the exam.

| Economy | Efficiency | Effectiveness |
|---|---|---|
| Are the appropriate quantity and quality of inputs bought at the lowest cost? | How well are inputs/ resources used converted into outputs? | How well do these outputs achieve objectives?<br><br>Achieving goals is the key issue. Does the outputs |

| | | |
|---|---|---|
| Cost of the inputs is the key issue. | Output per unit of input is the key issue. Ratio of output to input | achieved match the predetermined objectives. |

Value for money is seen as an appropriate framework for measuring performance in not-for-profit organisations, because it reflects both the cost of providing a service and the benefits achieved by providing it.

**Example: Value for money**

In Abuja, a city in Nigeria there are two major tuition houses: ABC and XYZ.

| | ABC | XYZ |
|---|---|---|
| Number of teachers | 10 | 10 |
| Salaries paid to teachers | ₦1,000,000 | ₦1,500,000 |
| Candidates Pass rate | 50% | 70% |
| Number of students | 500 | 400 |

All teachers in Abuja have the same qualifications and experience.

**Required**

Using your understanding of value for money, evaluate the performance of ABC and XYZ.

**Solution to the example on value for money**

a. Economy looks at cost, ABC spends less than XYZ and is more economical since the teachers are of same qualification and experience.
b. Efficiency looks at the relationship between input and output. They both use 10 teachers, but ABC has been able to attract more students and has a lower staff cost per student. ABC is more efficient.
c. Effectiveness looks at the intended goal, which in this case would be the pass rate of students. XYZ has a higher pass rate percentage and is assumed to be more effective.

## 1.13 Measuring the achievement of objectives in a not-for-profit organisation

### 1.13.1 Difficulties in measuring achievement in a not-for-profit organisation

This can be a very complicated task measuring the achievement of objectives for the following reasons:

a. there are different powerful stakeholder groups and not shareholders as in companies;

b. they usually have multiple objectives, and so it is difficult identifying the single major objective;
c. it may be difficult to define targets that are clearly linked to objectives which are measurable; and
d. limitation of funding could restrict achievable objectives.

### 1.13.2. Methods of measuring achievement in a not-for-profit organisation

a. Targets can be set for both financial and non-financial performance.
b. Benchmarking can be used where comparisons are made with other similar organisations and best practices.
c. Budgeting could be used for planning and monitoring expenditure

## 1.14 Chapter review

At the end of this chapter, ensure that you can:

a. explain the nature and purpose of financial management.
b. distinguish between financial management and financial and management accounting.
c. identify and describe various financial objectives including:
   i. stakeholders value creation;
   ii. shareholder wealth maximisation;
   iii. profit maximization; and
   iv. earnings per share growth.

**Skills Level**

**Financial Management**

CHAPTER 2

# THE ECONOMIC ENVIRONMENT OF BUSINESS

**Contents**

# 2 The Economic Environment of Business

## 2.0 Learning objectives

This chapter discusses macroeconomic environment, macroeconomic policies and instruments, money and capital markets.

## 2.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. explain how government has a profound influence on the economic environment through the exercise of fiscal and monetary policy;
b. explain further government influences;
c. explain the role of the capital markets;
d. describe the characteristics of government securities;
e. list the participants in financial markets and comment on their roles;
f. explain the role of the money markets; and
g. describe money market instruments.

## 2.2 Government economic policy and macroeconomic policy targets

Macroeconomics refers to economics at a national or international level, as distinct from microeconomics, which is the economics of individual firms and markets, and macroeconomic policy is formulated by the country's government. Macroeconomic policy, and changes in economic policy and economic conditions, can have important consequences for corporate objectives and management decisions.

In advanced economies, there are normally five main macroeconomic policy objectives:

a. to achieve sustained real growth in the national economy;
b. to achieve 'full employment';
c. price level stability;
d. to achieve balance of payments equilibrium; and
e. income redistribution

Success in achieving and maintaining 'full' employment depends to a large extent on success in achieving sustained real economic growth.

## 2.3 Economic growth and gross domestic product (GDP)

Economic growth is measured by the rate of growth in economic activity each year within a country.

GDP can be measured in any of three ways:

a. by the volume of output of goods and services, and other economic activity, each year: the output approach;

b. by the amount of income earned each year by individuals and organisations within the year (e.g. company profits and the wages and salaries of individuals): this is the income approach; and

c. by the amount of spending in the economy each year: this is the expenditure approach.

Total GDP should be the same in total using any of the three methods of measurement. However, the expenditure approach to measuring GDP is the most useful for the purpose of analysis. Using this approach the total value of GDP within a given period, typically one year, can be expressed in the following formula

**Formula: Gross domestic product (GDP)**

GDP = C + G + I + (X – M)

Where:

C = Total annual consumption spending each year (by companies as well as individuals): this is spending on goods and services other than capital investment.

G = Spending by the government (on consumption and investment by government).

I = Investment spending (other than investment spending by government).

X = The value of exports of goods and services M = The value of imports of goods and services.

(X – M) is the annual balance of trade for the country in international trade.

This formula shows that growth in GDP from one year to the next can be obtained through higher spending on consumption, higher government spending, more investment or an improvement in the balance of trade. However, growth is only achievable if an increase in C, G or It does not result in a matching fall in one of the other elements in the formula.

a. For example, the government might increase its annual spending by raising taxation. In raising taxation, it will reduce the spending power of individuals and companies, and as a consequence their might be a matching fall in consumption spending C or investment by companies.
b. Companies might want to increase investment spending, but to do so they will need to raise extra funds from somewhere. Funds for investment come from savings by individuals and organisations, and higher savings will result in less money for consumption.

### 2.3.1 GDP and inflation

The formula for GDP is a ‘money’ measurement that ignores inflation. There is a difference between:

a. Growth in GDP in money terms and
b. Growth in GDP in ‘real’ terms, which is growth after the effects of inflation have been removed.

For example, if GDP grows at an annual rate of 3% but the annual general rate of inflation is 2%, real growth in the economy is only 1%. If GDP grows at 3% but the rate of inflation is 5%, there will be ‘negative growth’ of about 2% in real terms (i.e. GDP will be about 2% less in real terms than in the previous year).

Government would be concerned about inflation for two reasons:

a. It will want to achieve real growth in national income each year, not simply growth in ‘money’ terms.
b. A high rate of inflation can have harmful effects on the economy and lead eventually to a fall in the rate of economic growth (and possibly economic recession).

There are several reasons why the government will try to prevent excessive inflation.

a. Inflation results in a transfer of wealth within the economy in ways that might be considered unfair. Individuals on fixed incomes, such as many people with fixed pensions, will find that the real value of their income falls each year. Other members of society, such as owners of property, might benefit from rising asset prices.
b. Inflation creates pressure for general cost increases. Employees will demand higher annual pay rises if the rate of inflation is rising. Higher employment costs might force employers to put up the prices of their goods

and services, and at the same time avoid as many extra costs as possible – by making some workers redundant, perhaps, or by deferring investment spending.

c. Experience has shown that a high rate of inflation, and high inflationary expectations, has the effect eventually of reducing real growth in the economy.

For the government, an economic policy objective to support the aims of growth in national income and full employment might therefore be to limit the rate of annual price inflation.

## 2.4 Economic policy

A government uses economic policy to try to influence economic conditions, with the objective of achieving sustained growth and full employment and restricting the rate of inflation. There are two main aspects of economic policy:

a. Fiscal policy; and
b. Monetary policy.

## 2.5 Fiscal policy and its effect on business

Fiscal policy relates to government spending, taxation and borrowing.

The central government spends enormous amounts of money every year, and higher government spending increases GDP. However, government spending has to be financed, and the money is obtained from:

a. taxation; and
b. borrowing.

When the government plans an increase in its spending programme, it will probably seek to finance the higher spending, in full or in part, through higher taxation. Taxation is raised from a variety of sources, but the main sources of tax income are likely to be:

a. The taxation of income of individuals
b. The taxation of profits of companies
c. Indirect taxation on expenditure, in the form of a sales tax or value added tax.

When the government spends more than it raises in taxes, it has to borrow the difference. In Nigeria, the main sources of borrowing for the government are:

a. To obtain long-term finance, to issue government bonds through the Debt Management Office known as Sovereign bonds. This source accounts for the bulk of Nigeria's public debt.
b. To obtain long-term finance, to borrow from multilateral sources (World Bank, African Development Bank etc.) and bilateral sources (China, etc.).
c. To obtain short-term funding, to issue short-term financial instruments known as Treasury bills. (Treasury bills are a form of short term borrowing because the borrowed money is repaid when the bills are 'redeemed', usually after 91 days).

**Fiscal policy and business**

Fiscal policy affects business in a variety of ways.

a. Companies might try to minimize their tax liabilities, possibly by transferring business operations to low-tax countries.
b. The investment decisions by companies could be affected by tax. For example, the government might offer some tax relief for new investments, and companies will expect to receive tax allowances for capital investment.
c. Spending decisions by customers could be affected by the rate of sales tax or value added tax. If the government increases the rate of value added tax, the volume of customer demand for the goods and services of companies will probably fall.
d. Other tax changes can affect the rate of growth in the economy. For example, an increase in rates of income tax on individuals will reduce their spending ability.

If the government borrows by issuing bonds, investors will be attracted by the risk-free nature of investing in the bonds. (These bonds are regarded as risk-free because the government is most unlikely to default on its debts, especially when the debt is denominated in the national currency. If it needs to it can print more money to pay off its debts.)

Government borrowing might affect borrowing by companies. If companies also want to borrow by issuing bonds, they will need to offer a higher rate of interest to investors than the interest rate on government bonds, to persuade them to put their money in risky corporate bonds rather than risk-free government bonds.

## 2.6 Monetary policy and inflation

Monetary policy relates to monetary issues in the economy, in particular:

a. The rate of inflation
b. Interest rates
c. The exchange rate for the domestic currency against foreign currencies.

As explained earlier, there is a link between economic growth and the rate of inflation. Excessive inflation is associated with an 'over-heating' economy, leading to a slow-down in economic growth and possibly economic recession.

A major target of the government's monetary policy is likely to be control over inflation. This is currently the main objective of monetary policy, for example, in the US, the eurozone countries and the UK. In these countries, interest rate policy is the main instrument of economic policy for controlling the rate of inflation. In Nigeria also, the Central Bank of Nigeria (CBN) uses the Monetary Policy Rate (the interest rate it charges when it lends to banks) as a major instrument of controlling inflation.

The link between interest rates and the rate of inflation can be summarised as follows.

In order to reduce the rate of inflation in the long term it is essential to reduce general expectations about what the future rate of inflation will be. Inflation will increase when inflationary expectations are high.

To reduce inflationary expectations, the authorities must be seen to take action to reduce inflationary pressures whenever these become evident. In the UK, USA and eurozone, the 'authorities' are the central bank.

The central bank can take action by raising the rate of interest at which it lends money to other banks. This rate of interest is sometimes called the 'central bank base rate'.

There is a 'transmission effect' in the economy, whereby the effect of the increase in the base rate works its way through to the rest of the economy. If banks have to pay more to borrow from the central bank, they will put up their interests rates to borrowers. In time higher costs of borrowing might reduce the demand by companies and individuals to borrow, and this in turn might reduce consumption spending.

a. If spending in the economy is rising too quickly, and there is a risk of inflation, interest rates should therefore be raised. Higher interest rates will eventually discourage borrowing and the growth in credit, and so restrict the growth in spending.

b. If on the other hand the economy could grow more quickly without the threat of inflation, interest rates might be lowered, to stimulate spending and investment.

For companies, the implications of interest rate policy are perhaps fairly clear. If the central bank alters its rate of interest on lending to banks, this is likely to affect the rate at which companies can borrow from banks, and changes in the cost of borrowing might affect investment decisions.

## 2.7 Monetary policy and the exchange rate

Monetary policy can also affect the value of a country's currency. In general terms:

a. higher interest rates are likely to attract more investors into buying investments in the currency; and

b. lower interest is likely to persuade investors to sell their investments in the currency.

Changes in interest rates, by affecting supply and demand for the currency, can therefore alter its exchange rate value.

It would be possible for the government or central bank to make the exchange rate a key economic policy target, possibly with the aim of stabilising the value of the currency and encouraging international trade. However if the authorities use interest rates to manage the value of the country's currency in the foreign exchange markets, interest rate policy cannot be used at the same time as a policy weapon for controlling inflation.

In the case of Nigeria, where a significant proportion of foreign exchange receipts come from oil, the exchange rate is largely a function of the price of oil in the international oil market. A rise in oil price and oil income leads to naira appreciation while a fall in oil receipts will bring about a depreciation of the naira in the long run (in the short run, to defend the value of the naira, the CBN usually intervenes using available foreign reserves).

## 2.8 Monetary policy and business

Businesses might be affected by the monetary policies of the government in a variety of ways.

a. In the long term, businesses benefit from government control over the rate of inflation and restricted rises in prices, because real economic growth is likely to be greater.

b. Changes in interest rates affect the cost of borrowing, and so profits. Higher interest rates on long-term finance might deter companies from making some new investments, which will result in a reduction in their capital spending.

c. Changes in interest rates might affect spending by customers. For example, higher interest rates might reduce consumer spending and so make it more difficult for companies to sell their goods and services.

d. Changes in the exchange rate affect companies that sell goods to other countries or buy from suppliers in other countries.

   i. If there is a fall in the value of the currency, the products of exporting companies become cheaper to foreign buyers and export demand should increase. However, the cost of imported goods, priced in other currencies, will rise. This could lead to an inflationary spiral as higher costs lead to higher prices and higher wage demands.

   ii. If there is an increase in the value of the currency, the products of exporting companies become more expensive to foreign buyers and export demand is likely to fall. The cost of imported goods, priced in other currencies, will fall. This will reduce the costs for companies of purchases from abroad but could also increase the market competition from imported goods.

In your examination, you might be required to consider the implications for a company of a change in economic conditions, or a change in economic policy by the government, by considering how a company might be affected by the change and respond to it.

## 2.9 Financial markets

A financial market is a place where buyers and sellers come together to trade in financial assets such as bonds, stocks, derivatives, currencies and commodities. The financial markets bring together organisations and individuals wishing to obtain finance and organisations and individuals wishing to invest. The main objective of financial markets is to increase capital, transfer risk, fix prices for global trade and provide liquidity.

In addition to the bank lending markets, the financial markets can be classified as capital markets or money markets.

The **capital markets** can be classified into:

a. equity markets; and
b. bond markets.

## 2.10 The role of money and capital markets

### 2.10.1 Capital markets

Capital markets are financial markets for primary issues and secondary market trading in long-term investments: equities and bonds. The capital markets are both national (domestic) and international.

Many countries have at least one stock market. Although some bonds might be traded on stock markets, the main purpose of stock markets is to trade in shares of companies.

There is a primary market and a secondary market for shares.

a. The primary market is used by companies to sell shares to investors for the first time, for example by issuing new shares to raise cash. The primary capital markets are therefore a source of new long-term capital for companies, governments and other organisations.
b. The secondary market is used by investors to sell shares that they own, or to buy shares that are already in issue.

A successful primary market relies on a large and liquid secondary market, because when investors buy shares in the primary market, they want to know that they can sell their investment at any time at a fair market price.

### 2.10.1. Functions of a stock market

The stock market is a marketplace for buying and selling shares in companies that apply to have their shares traded on the exchange and whose application is accepted. It acts as both a primary market and a secondary market for shares.

In Nigeria, companies must obtain a listing for their shares and also apply to have their shares traded on the stock exchange. The major stock exchanges trade shares of domestic companies (companies registered in the same country) but also the shares of some international companies.

The international stock markets therefore consist mainly of national stock exchanges that also trade shares of some foreign companies. However, the New

York Stock Exchange owns Euronext which in turn owns the national stock exchanges of France, Belgium and the Netherlands.

The main functions of a stock exchange are to:

a. Provide a system in which shares can be traded in a regulated manner.
b. Enforce rules of business conduct on market participants, to ensure fair dealing.
c. Ensure that there is an efficient system for providing new financial information about companies to investors in the market.
d. Provide a system for recording information about the prices at which shares are bought and sold, and providing share price information to participants in the market.

### 2.10.2 The bond markets

There are also domestic bond markets. Bonds are debt instruments issued by governments, government agencies, international organisations and companies. Most bonds are issued for a fixed period of time (maturity) after which they are redeemed by the issuer, usually at their face value. During the time they are in issue, the issuer pays interest to the bondholders, usually once, twice or quarterly in each year at a fixed rate of interest.

Investors can trade the bonds in a secondary bond market and so invest or disinvest at any time of their choosing.

In the US, the largest bond market is for US government bonds (Treasuries), but there is also a large and active market for corporate bonds, which are bonds issued by companies. In the UK, there is a large bond market for UK government bonds (gilts) but only a very small domestic market for corporate bonds.

As in the UK, the bond market in Nigeria is dominated by government bonds mainly federal government and some state bonds (Lagos, Edo, Delta, Imo, Rivers, Ogun have issued bonds at one time or the other). The size of corporate bonds is very small as only a few companies (mainly banks, Zenith, GTBank) have issued corporate bonds.

There are international bond markets. (At one time, these bond markets were called the 'eurobond markets'.) The international bond markets are used by large companies, governments and international organisations to issue bonds, usually in a major currency (US dollars or euros). The markets are organised by international investment banks. These banks advise issuers and organise the selling of the bonds to investors. Nigeria issued its first Eurobond in January 2011 ($500million) and another $1billion Eurobond in 2013.

International bonds are also traded in a secondary market, although much of the trading is arranged by telephone and e-mail. There is also an electronic trading platform for trading bonds electronically.

The bond markets are not accessible to small companies. The international bond markets are used by governments and very large companies to issue bonds denominated mainly in either US dollars or euros (although bonds in other currencies such a Japanese yen, Swiss francs or British pounds might occasionally be issued). Smaller non-US companies are able to borrow in the US corporate bond market, by issuing bonds denominated in dollars. However, foreign companies need to be fairly large and well-established to persuade US investors to buy their bonds.

**Characteristics of quoted government securities**

The characteristics of government securities quoted on the Nigerian Stock Exchange are discussed under the following headings:

**Issuing prices**

These are usually in units of ₦1,000 and at so much percent. The ₦1,000 represents the nominal or par value of the security.

**Interest**

Each government security usually has a rate of interest attached to it at the time of issuance. This is referred to as the nominal rate of interest (also called coupon rate).

This coupon rate may be fixed or variable. If it is fixed, it means the issuer guarantees a fixed amount of interest every year payable usually, twice a year.

If it is variable, it means the interest rate will be linked to movement in a particular market index such as the CBN monetary policy rate (MPR) but with a floor rate and a ceiling rate.

**Yield**

This is the market rate of interest and the driving force for the market price (real value) of all quoted fixed - interest government securities.

The higher the yield or market interest rate the lower the value of a quoted fixed interest bond and vice versa.

For example, if investors feel that a fair rate of interest for investing now in long-term government securities is 20%, a previously issued State Revenue Bond with a fixed coupon of 10% and par value of ₦1000, will now be worth ₦500. Thus, a prospective investor in this particular bond will now pay ₦500 per unit.

**Return**

Return comprises both types of interest actually received during the period the security is held plus capital appreciation.

It is mathematically expressed as:

**Formula: Annual return on a government security**

$$R = \frac{I + (P1 - P0)}{P0} \times 100$$

**Where:** I = interest receipts**:**

P1 = value of bond at the end of the year

P0 = value of bond at the start of the year

When applied to bonds, the annual return can be broken down into interest yield and capital gain yield.

Capital gain yield = P1 – P0 / P0

Interest yield = I / Po

Capital gain yield plus interest yield equals Annual return.

**Redemption**

Repayment of the nominal amount borrowed by the government will be made at a specified future date (say 2025) or within a specified future period (2025-2030).

Where government bonds are undated, these bonds will probably never be repaid as the government has no obligation to repay by a specific date and repayment will depend on sharply falling interest rates when new issues could be made at a lower coupon on the same nominal value.

Repayment of a state bond is usually based on the issue of an Irrevocable Standing Payment Order (ISPO) which serves as a first charge upon (and is payable out of) the state's statutory allocation.

### Advantages and disadvantages of investing in government bonds

### Advantages

a. Security of capital: Capital is usually secured as it is backed by the Federal or State government as the case may be. Also, as a bond approaches its repayment date, the market value will not fluctuate so much from its par value.
b. Security of income: Income is also secured as a default in paying interest is not expected from the government; and
c. Liquidity: Being a quoted security, there is a market where disposal can take place if there is a need for cash.

### Disadvantages

a. Risk: Being a quoted security, the bond has a price that could fluctuate.
b. Inflation: Both income streams and capital values may be eroded by inflation.

### 2.10.2 Money markets

Money markets are for trading in financial instruments with shorter maturity, usually one year.

The money markets are wholesale markets for dealing in short-term lending and borrowing and for trading short-dated financial instruments.

a. 'Wholesale' markets are markets for large-value transactions.
b. Short-dated financial instruments are financial instruments that have one year or less to maturity when they are issued. They include Treasury bills, bills of exchange, commercial paper and certificates of deposit (CDs). The repo market, which is one of the money markets, also deals in short-dated bonds (bonds with a short time remaining to maturity) as well as other money market securities.

The main money markets are:

a. The inter-bank market; and
b. The repo market.

### Interbank market

The interbank market refers to lending and borrowing between banks usually in large scale and short-term. These transactions are done at a floating rate of interest linked to the benchmark interest rate in the money market. In the UK, the benchmark interest rate is called the London inter-bank offered rate [LIBOR] and it differs for different maturities.

**The Repo Market**

This is a market for the sale and re-purchase of short-term financial instruments, especially treasury bills and government bonds. A repo transaction is the simultaneous contract to sell a number of financial instruments and to buy them back again at a later date, at a higher price. The difference between the sale and the repurchase price is assumed to be the interest on a cash loan secured by the financial instruments.

There are international money markets for all the main currencies. For example, London is a major money market centre which operates large money markets in US dollars, euros, yen, Swiss francs and Canadian dollars as well as sterling.

Examples of instruments traded in the Nigerian money market include, treasury bills, Central Bank of Nigeria (CBN) certificates, commercial bank deposits, certificate of deposit (negotiable and non-negotiable), bankers' acceptances (BAs) and Commercial Papers (CPs).

## 2.11. The impact of technology on the changing role of financial markets and institutions

Technology is revolutionizing the financial sector, transforming the operations of financial markets and institutions.

For years, technology has been a major driver for growth in several industries including the financial services industry. Developments in the application of internet and artificial intelligence have introduced innovation into financial markets and institutions such as online banking, cryptocurrency, blockchain, QR codes, artificial intelligence and others.

The use of new technological advancements to improve and automate financial services, making them more accessible, efficient and cost-effective is known as financial technology [Fintech]. Fintech has helped create several emerging technologies that have helped shape the future of financial services globally.

The impact of technology on the changing role of financial services can be seen in

a. Payments – there are faster, secure and convenient payment platforms because of the introduction of technology such as mobile wallets and other digital solutions.

b. Investing – technology has reduced human intervention to the barest minimum and reduced the cost of investing making it more accessible and affordable to invest.
c. Lending – the invent of technology has created several online lending platforms thereby improving access to credit.
d. Banking – technology has transformed virtually all banking transactions from online account opening, fund transfers to payments of bill, thereby improving customers experience with the financial markets and institutions.
e. Regulations – technology has created new questions to the regulators on ensuring safety, security and reliability of financial market operations.

Financial markets and industries have been significantly transformed with some of the following benefits

a. Cost efficiency – reduction of entry barriers for new entries into the financial services industry and some services available at little or no cost.
b. Collaboration – technology helps make it easy for cooperation and contributions from the global community of developers.
c. Rapid innovation – better global collaboration leads to faster innovation which results in more advanced technologies.
d. Security – it makes the operations of the financial market and institutions more transparent and reliable, as it allows for frequent audits and updates. Technology has also posed the challenge of cyber-security which has compelled financial institutions to continuously update security measures.
e. Better customer experience – automation in the financial markets helps simplify processes resulting in faster responses, more accurate responses and higher customer satisfaction.

## 2.12. The role of the money market

The main purpose of the money markets is to provide:

a. Short-term liquidity to entities needing money; and
b. Short-term investment opportunities for entities with surplus liquidity.

Banks are the most active participants in the money markets, but some large companies also have direct access to the markets. Smaller companies and individuals might be offered an opportunity by their bank to borrow or lend at money market interest rates, and their access to the money markets is made through the bank. This means that companies are able to borrow or deposit money short-term in the money markets through their bank. When they participate through their bank, they can borrow or lend much smaller amounts of money than the normal size of money market transaction.

Money markets also provide ready access to short-term borrowing and lending opportunities in foreign currency. This is important for companies involved in international trade that need short-term finance for transactions involving a foreign currency.

## 2.13. Money market and capital market operations

The largest money market is the inter-bank market for loans and deposits. There are also markets for dealing in other money market 'instruments or securities. These include:

a. Treasury bills
b. Bills of exchange (including bankers' acceptances or BAs)
c. Certificates of deposit (CDs)
d. Commercial paper (CP).

A money market is a financial market for liquid, short term securities with a maturity tenure of less than a year. Money markets mobilizes funds from different sectors of the economy and make it easy for business and governments to obtain short term funding.

A capital market is a financial market for long-term investments with a maturity tenure of more than a year such as stocks, bonds, derivatives and others.

Both money and capital markets play crucial roles in the operations in the economy, but they are different in several ways as shown in the table below:

| Basis | Money Market | Capital Market |
|---|---|---|
| Tenure | Less than a year | More than a year |
| Instruments | Treasury bills, commercial papers | Stocks, bonds, mutual funds |
| Participants | Banks. Corporation, government | Commercial banks, Insurance companies, stockbrokers, underwriters & investors. |
| Risk and return | Low risk and low returns | Higher risk and higher returns |
| Liquidity | Highly liquid | Less liquid |
| Market | Over the counter | Exchange |
| Purpose | Short-term trade credit requirements | Long-term trade credit requirements |

| | | |
|---|---|---|
| Nature of market | informal | Formal |

## 2..14. The role of banks and other financial institutions in money market operations

Banks and other financial institutions [BOFI] play a crucial role in money market operations and their major functions include:

a. liquidity provision – bofi provides short term loans to investors and create deposits thereby ensuring liquidity;
b. risk management – banks help assess the credit worthiness of borrowers, thereby reducing the risk associated with money market operations;
c. investment opportunities – banks help provide alternative investing alternatives for investors; and
d. facilitating transactions – banks assist in payment processing and settlement functions which help ease money market operations.

Banks and other financial institutions play a significant role in the money market by providing liquidity, providing investment opportunities, risk management and issuing money market instruments.

## 2.15. Role of principal money market instruments

### 2.15.1. Coupon-bearing and discount instruments

There are two broad categories of money market instruments, coupon-bearing and discount instruments.

a. **Coupon-bearing instruments** are instruments or securities on which interest is payable at a stated interest rate (or 'coupon') on a fixed amount of principal. When the instrument or security reaches its maturity date, its holder receives the initial principal plus interest in settlement. Examples of coupon-bearing instruments are certificates of deposit.
b. **Discount instruments** are instruments or securities where the borrower undertakes to pay a fixed amount of principal at maturity, and the instrument is issued at a discount to its 'face value'. The difference between the discounted issue price and the eventual redemption price (face value) represents interest on the borrowing. Examples of discount instruments are Treasury bills, bills of exchange and commercial paper

### 2.15.2 Treasury bills

Treasury bills are short-dated securities issued by a government, when money is needed to meet a short-term financing requirement. Treasury bills are normally issued for 91 days (three months).

They are discount instruments. The government might issue 91-day Treasury bills with a face value of ₦100 million at a price of, say, 98.75. It would raise

₦98.75 million from the issue and at the end of the 91 days it would pay ₦100 million to the holders of the bills. Interest for the three-month period would be

₦1.25 million on the ₦98.75 million raised, which is an interest rate of about 5% (annual).

There is an active market in Treasury bills. Buyers of Treasury bills can re-sell them before they mature to other investors or banks. Treasury bills should be risk-free, because they are promises to pay by the government. A company with a short-term cash surplus might therefore decide to invest in Treasury bills, which can be re-sold at any time or held until the bills eventually mature.

### 2.15.2 Bills of exchange

a. A bill of exchange is a form of promise to pay a stated amount of money at a date in the future (usually in several months' time). A bill has a drawer and a drawee.
b. The bill is issued by the borrower and is 'drawn on' the drawee. When the bill is drawn, it is a form of 'You Owe Me'. With the bill the drawer is stating that the drawee owes a specified amount of money.
c. The bill is then 'accepted' by the drawee, who signs the bill to indicate acceptance. An accepted bill becomes an undertaking by the drawee to pay the specified amount of money at the specified date.

A bill of exchange that is drawn on and accepted by a bank is called a bank bill.

There is an active market in bank bills, especially bills that have been accepted by banks with high credit ratings. This means that the drawer of a bill is able to obtain short-term finance by selling the accepted bill in the money markets.

Bank bills might be used as a source of short-term finance by companies in two ways.

a. As a method of financing foreign trade transactions. Trade finance is described in a later section.

b. As a method of raising short-term finance by means of bankers' acceptances (BAs), as an alternative to bank borrowing or issuing commercial paper.

### 2.15.3 Bankers' acceptances (BAs)

A company that intends to borrow amounts of money for a short-term over a period of time in the future might arrange a BA programme with a bank. Under the terms of the agreement, the bank undertakes to accept bills of exchange that are drawn on it by the company, up to a maximum amount. When the company needs short-term funding, it draws a bill on the bank. The bank accepts it and then sells it in the money market on behalf of the company at a discount.

The company therefore receives the money 'now'. The company must also pay the bank the face value of the bill when it reaches maturity, to enable the bank to settle the bill. The bill is therefore a form of short-term finance, and the interest cost is the difference between the discounted value of the bill when it is sold and the face value of the bill that must be paid in settlement.

An advantage of BAs for a company is that if the programme is arranged with a top-quality bank, the discount rate (interest rate) on the accepted bills might be fairly low – lower than on other forms of money market borrowing.

**Example: Bankers' acceptances**

A company has arranged a bankers' acceptances programme with its bank. Under the terms of the arrangement, which lasts for one year, the company is able to draw bills on the bank up to a total value in issue at any time of ₦25 million.

The company might draw a bill on the bank for ₦1,000,000 with a settlement date in three months' time. The bank accepts the bill and sells it for the company in the bills market. The company might receive, say, ₦985,222, so that the discount on the bill is ₦14,778.

The discount means that the rate of interest for the three months is about: (₦14,778/₦985,222) × 12/3 = 6.0%

After three months when the bill reaches maturity, the bank pays the bill and the company pays ₦1,000,000 to the bank

**Certificates of deposit (CDs)**

A certificate of deposit is a certificate issued by a bank stating that the bank is holding a specified quantity of money as a term deposit, on which interest is being earned at a specified rate. The deposit cannot be removed from the bank until the end of the stated term, but it can be sold in a money market for CDs.

For example, an investor might place a deposit of ₦20 million with a bank for a fixed term of six months, and receive interest at 5.5% on the deposit. It might be agreed that the bank should issue a certificate of deposit that the depositor holds. However, if the depositor needs access to money before the end of the six months, it can sell the CD on to another investor or a bank and receive immediate cash.

**Commercial paper (CP)**

Large creditworthy companies have several ways of raising short-term finance and might select the least-cost financing method. This might be borrowing at money market rates from a bank, arranging a BA programme or issuing commercial paper. The cheapest rate of financing might vary according to conditions in each of the money markets.

Commercial paper (CP) is an unsecured promissory note. A promissory note is a promise by the issuer of the note to pay a specific amount of money on a specified date. When a company issues CP it promises to pay the face value of the paper at a specified date in the future.

Non-financial companies issue CP through a bank, as part of a commercial paper programme. The bank issues the CP on behalf of the company and sells it to investors. All CP is negotiable, which means that it can be sold in the money market. In practice, however, investors buying CP normally hold it to maturity when they are paid the face value of the paper they have bought.

The company issuing the CP therefore receives immediate cash (at a discount to the face value of the paper) and makes a payment when the paper reaches maturity.

Only companies with a good credit rating are able to issue CP, and commercial paper is normally given a credit rating by one or more of the major credit rating agencies (Moody's, Standard & Poor's and Fitch). The interest rate payable on CP varies with the term to maturity of the paper when it is issued, the credit rating for the paper and conditions in the market at the time of the issue.

**Example: Commercial paper**

A large company has arranged a commercial paper programme with a bank. The programme will last for two years. During that time the company may issue CP up to a total value of ₦300 million in issue at any time.

Initially, the company might issue ₦50 million of CP with a maturity date in three months' time. The bank sells the paper to a number of investors, who buy the paper at a discount and will receive payment of the full face value after three months.

Investors buying the CP are able to re-sell it if they wish to do so at any time before maturity, through a bank that deals in the CP market.

The company can issue more CP at any time, up to the specified limit.

**Example: Commercial paper**

A company has arranged a commercial paper programme with a bank. It issued ₦40 million worth of commercial paper with maturity of three months. The interest rate is 6.2%.

Required

Calculate the amount of money the company will receive from the CP issue.

**Answer**

The annual interest rate is 6.2%, so for three months the interest rate is approximately 6.2% × 3/12 = 1.55%.

Amount received from the issue × 1.0155 = ₦40 million.

Amount received from the issue = ₦40 million/1.0155 = ₦39,389,463. Interest payable will be ₦40 million - ₦39,389,463 = ₦610,537

**Fundamental Differences between Commercial Paper and Bankers' Acceptance**

| Category | Commercial paper | Bankers' Acceptance |
|---|---|---|
| Security | It is an unsecured, short term debt instrument | It is a short-term debt instrument guaranteed by the bank. |
| Purpose | It is usually issued by large creditworthy companies to finance short term needs | It is usually used to finance international trade transactions providing assurance of payment. |
| Maturity | Usually ranges from a few days to 270 days | Usually ranges from 30 to 180 days |

The major difference is that the commercial paper relies on the issuer's credit worthiness, while a banker's acceptance is backed by a bank's guarantee, making it a more secure instrument.

## Derivatives

The following useful definition of a derivative is found in IFRS (IAS 32: Financial Instruments: Presentation).

A derivative is a financial instrument with all three of the following characteristics:

a. its value changes in response to a specified underlying (interest rate, commodity price, exchange rate etc.);
b. it requires no or little initial investment; and
c. it is settled at a future date.

## Categories of derivatives

Some derivatives are bespoke contracts stuck between two parties. These are described as over the counter (OTC) and are not traded. Examples of such derivatives include forward contracts and SWAPs (though there is trading in SWAPs as well).

Other derivatives are standardised with respect to amounts, settlement dates and other features. This allows these to be traded. Examples of traded derivatives include futures and options (though other OTC options are also very important).

## Use of derivatives

The small initial outlay that is a characteristic of derivatives provides a party to a derivative contact with exposure to price change on large volumes of currency or commodity. For example, a dealer could enter into a crude oil derivative that might allow the dealer access to price movement on 1,000 barrels for far less outlay than actually buying the same 1,000 barrels outright.

Many derivatives are traded on exchanges and so are easily available for buying and selling. Entities can buy or sell derivatives in order to set up speculative positions, so that a profit will be made from dealing in derivatives provided that the market price of the 'underlying item' moves favorably.

Speculating in derivatives may expose entities to huge risks, if expectations do not come true and the price of the underlying item moves the 'wrong way'.

Occasionally, losses on derivatives positions can result in financial collapse of the company.

Derivatives can be used to obtain protection against exposure to the risk of an unfavourable movement in the market price of an item, such as the price of a commodity, an interest rate or a foreign exchange rate. This is covered in detail in later chapters of this text.

**Test questions on financial management function & environments**

**Illustration 1**

Arise co is a private company in the manufacturing industry. The manufacturing industry in Nigeria, has had an average annual growth in share price of 20%, annual earnings growth of 16% and annual growth in dividend of 15% for the past five years.

General inflation in the economy has averaged 10% per year.

The number of shares in issue has remained unchanged over the last five years. Price/earnings ratios are calculated using share prices at the end of the year.

Draft Financial statement extracts for Arise Co.

| Year | 2029 | 2025 |
|---|---|---|
| Dividend per share | 25 kobo | 13 kobo |
| Price/earnings ratio | 20.0 | 18.0 |
| Earnings per share | 120 kobo | 70 kobo |

The Board chairman on seeing the above results presented by the Director of finance, commended the team for an above average performance in alignment with the company's objective of maximizing shareholder wealth. He said the company has shown good growth in earnings, dividends and share price, with the intention of better performance in the future.

**Required**

a. Identify the financial and other objectives Arise co should pursue in order to satisfy three key stakeholders in a company [excluding shareholders & directors].
b. Critically evaluate the chairman's statement calculating the growth rate in dividend per share, earnings per share and share price.

**Illustration 2**

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

i. cash flow generation;
ii. profitability as measured by profits after tax and return on investment;
iii. risk adjusted return to shareholders; and
iv. performance improvement in a number of areas such as concern for the environment, employees' remuneration and quality of working conditions and customer satisfaction.

**Requirement:**

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

a. discuss the argument that maximisation of shareholder wealth should be the only true objective of a firm, and
b. discuss the advantages and disadvantages of the MD's suggestions about alternative goals.

**Illustration 3**

Many decisions in financial management are taken in a framework of conflicting stakeholder viewpoints. Identify the stakeholders and some of the financial management issues involved in the following situations:

a. a private company converting into a public company

b. a highly geared company attempting to restructure its capital

c. a large conglomerate 'spinning off its numerous divisions by selling them, or setting them up as separate companies; and

d. Japanese car-makers, such as Nissan and Honda, building new car plants in other countries.

**Solution to test questions on financial management function & environment**

**Solution to Illustration 1**

Three other key stakeholders include:

a. Local community that would be interested in the financial success of the company, as this can generate jobs and wealth. They will also be concerned with minimised pollution risk.
b. Customers that would be interested in the cost and quality of the products.
c. The government will be interested in tax receipts and compliance with regulations.
d. The bank is interested in the ability to pay back promptly.

**B Part of the question**

The first step is to calculate the actual DPS, EPS and share price which would be compared with the industry ratios.

a. Annual growth rate in DPS = 5-1√[25/13] – 1 = 17.76%
b. Annual growth rate in EPS = 5-1√[120/70] – 1 = 14.43%
c. Annual growth rate in Share price = 5-1√[24.00/12.60] – 1 = 17.48%
d. Share price = PE ratio x EPS

Year 2025 = 18 x 70 kobo = N12.60

Year 2029 = 20 x 120 kobo = N24.00

Comparison

| | Actual | Target | Comment |
|---|---|---|---|
| DPS | 17.76% | 15% | Actual is higher, good performance |
| EPS | 14.43% | 16% | Actual is lower |
| Share price | 17.48% | 20% | Actual is lower |
| | | | |

It is difficult to justify the chairman's statement of a great performance as the computations above reflect that the EPS and share price are below the industry average. This is also a cause of concern to shareholders, as the increase in earnings may not be able to sustain the increase in dividends.

**Solution to Illustration 2**

(a)

To: The Managing Director

From: The Finance Director

## ARGUMENT ON SHAREHOLDERS‟ WEALTH MAXIMISATION OBJECTIVE OF A COMPANY

The memorandum is meant to educate you on the debate on shareholders‟ wealth maximisation objective as the only true objective of a company.

What is shareholders‟ wealth maximisation? Shareholders‟ wealth maximisation objective concept means maximising the return to ordinary shareholders as measured by the sum of dividends and capital appreciation. It means maximising the net present value of a course of action to shareholders, that is, the difference between the present value of its benefits and the present value of its costs. A financial action that has a positive net present value (NPV) creates wealth for shareholders. It also seeks to maximise the value of a firm or its share price. Though, the share price is determined by a general consensus among market operators, regarding the value of companies and mirrors its expectation concerning the current and anticipated future profits of the firms, it reflects the time value of money to them and the risk attached to those profits.

Shareholders‟ wealth maximisation may have some practical difficulties in selecting a suitable measurement for growth in shareholders‟ wealth, financial targets such as profit maximisation and growth in earnings per share might be used but no financial target on its own is ideal.

Financial performance may be assessed in a variety of ways by the actual or expected increase in the share price, growth in profits, growth in earnings per share and so on. Companies may also adopt profit maximisation (accounting profit), profitability maximisation (return on capital employed (ROCE), return on equity(ROE), return on investment (ROI), growth, long-term stability and so on as their objective, but all these objectives ignore risk and time value of money which are taking care of in the shareholders‟ wealth maximisation objective. In practice, however, companies might have other stated objectives, but these can usually be justified in terms of the pursuit of wealth maximisation. Therefore, the shareholders wealth maximisation objective is an appropriate and operationally feasible criterion to choose among the alternative objectives.

However, shareholders‟ wealth maximisation objective should not be adopted in isolation without considering other objectives such as, profit maximisation and earnings growth, in the expectation that if these objectives are achieved shareholders‟ wealth maximisation will be increased by an optimal amount.

It is therefore recommended that companies should assume and follow this objective in their financial decision making, but they should balance it with those of other stakeholders in the firm. It is theoretically logical and operationally feasible normative goal for guiding financial decision-making. It is also all embracing, that is, it takes care, in the long run, all other company objectives including maximisation of profits, sales revenue, market share, level of employee turnover, satisfaction of management staff and so on.

Signed

Finance Director

(b) i) **Cash flow generation**

Cash flow generation is one of the main sources of liquidity; it is a short-term objective which should be pursued only in a period of economic meltdown. During this period, it is the „survival instinct‟ that is critical. Shareholders are not likely to put their funds in a company whose management lacks the required aggressiveness for long-term profitability and growth. However, if the aim of the firm‟s management is to maximise the net present value of the cash flows generated in the medium to long term, then this objective will effectively be the same as maximising shareholders‟ wealth.

ii) **Profitability as measured by profit after tax and return on investment**

This is a better objective than profit maximisation (accounting profit) as it takes into account both profits and the assets utilised in generating such profits.

Measures of profitability include return on capital employed (ROCE) or return on investment (ROI) or return on equity (ROE) and earnings per share (EPS) and so on. This objective has some short comings, namely:

a. Problem of definition, that is, which profits, and capital are to be used.
b. The uncertainty that goes with the earning of the profits (risk) is ignored;
c. Time value of money is also ignored and
d. It fails to provide an operational feasible measure for ranking alternative courses of action in terms of their economic efficiency.

However, companies use it to assess performance and control in their organisations. It is useful for the comparison of widely differing divisions within a diverse multinational company and can provide something approaching a „level playing field‟ when setting targets for the different branches of the organisation. It is important, however, that the measurement techniques to be used in respect of both profits and the asset base are very clearly defined and that there is a clear and consistent approach to accounting for inflation to be able to solve the problem of definition. The selection of the time frame is also important in ensuring that the selected objectives work for the long-term health of the business.

iii) **<u>Risk adjusted returns to shareholders</u>**

It is assumed that the use of risk adjusted returns in this question relates to the criteria used for investment appraisal rather than to the performance of the firm. As such, it cannot be pursued solely as an organisational objective but used as a tool in achieving it.

It provides a useful input to the goal setting process as it focuses attention on the company's policy on making risky investments. Since investment decisions usually affect the value of the firm if the investments are profitable and add to shareholders‟ wealth, it is important that they are evaluated on a criteria which is compatible with the objective of the shareholders‟ wealth maximisation.

However, it is fundamental that a company uses the right technique to avoid wrong decisions, bearing in mind the financial implication such decisions can bring to the company. It should also be noted that an investment must firstly be properly evaluated before selection. It is the acceptable investments that should be included in the capital expenditure programme of the company. Thus, investments should be evaluated on the basis of a criterion, which is compatible with the objective of the shareholders‟ wealth maximisation, bearing in mind that an investment will add to the shareholders‟ wealth if it yields benefits in excess of the minimum benefits as per the opportunity cost of capital.

iv) **<u>Performance improvement in non-financial areas</u>**

Aside from the financial objectives which firms pursue, there are other objectives which are critical to the achievement of the shareholders' wealth maximisation and which should also be of concern to corporate organisations. These are the non-financial objectives. A company as an integral part of the society cannot be separated from the environment (internal and external) in which it operates. It therefore owes stakeholders, both within and outside the company, certain social and ethical obligations, among which are:

Employees: To provide a conducive work environment, job satisfaction and job security;

Customers: To produce good quality product(s) at affordable prices and devoid of any health hazards; good service and communication and open and fair commercial practice.

Suppliers: To pay as at and when due and avoid exploitation; and .

Local community: To protect the environment from pollution of the air or water through industrial wastage and oil spillages. Give financial aids to charities and support sports development programmes. Build schools and colleges to enhance educational opportunities of the children in the community etc.

However, the non-financial objectives stated above often work indirectly to the financial benefit of the firm in the long term, but in the short term they do often appear to compromise the primary financial objectives. It should be noted that a company does not stand alone; it forms part of the society and the environment in which it operates, hence it owes certain social and ethical obligations to the people in its environment to be able to survive.

**SOLUTION TO ILLUSTRATION 3**

(a) A large conglomerate spinning off its divisions

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

The stakeholders involved in potential conflicts include.

i. Shareholders

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

ii. Subsidiary company directors and employees

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

(b) A private company converting into a public company

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

Stakeholders involved in potential conflicts include:

i. Existing shareholders/managers

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

ii. New outside shareholders

Most of these will hold minority stakes in the company and will receive their rewards as dividends only. This may put them in conflict with the existing shareholders who receive dividends. On conversion to a public company, there should be clear policies on dividends and Directors' remuneration.

iii. Employees, including managers who are not shareholders

The success of the company depends partly on the efforts put in by employees. They may feel that they should benefit when the company goes public. One way of organising this is to create employee share options or other bonus schemes.

iv. Regulatory agencies

(c) Japanese car manufacturer building new car plants in other countries

The stakeholders involved in potential conflicts include:

i. The shareholders and management of the Japanese company

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

ii. Local employees and managers engaged by the Japanese company

They will gain enhanced skills and better work prospects.

iii. The government of the local country, representing the tax payers

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

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

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

v. Employees of car plants based in Japan

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

## 2.16 Chapter review

At the end of this chapter, ensure that you can:

a. explain how government has a profound influence on the economic; environment through the exercise of fiscal and monetary policy;
b. explain further government influences;
c. explain the role of the capital markets;
d. describe the characteristics of government securities;
e. list the participants in financial markets and comment on their roles;
f. explain the role of the money markets; and
g. describe money market instruments.

**Skills Level**
**Financial Management**

CHAPTER 3

# WORKING CAPITAL MANAGEMENT - INTRODUCTION

**Contents**

# 3 Working Capital Management - Introduction

## 3.0 Learning objectives

This chapter introduces the readers to working capital, its components and management.

## 3.1 Learning outcomes

At the successful completion of this chapter, readers should be able to:

a. discuss working capital and identify its components;

b. explain and discuss the conflicts between the objectives of working capital management;
c. discuss the importance of working capital management to good financial management;
d. explain the cash operating cycle and its implications for the company; and
e. calculate the level of investment in working capital and its implications for the company.

## 3.2. The nature and elements of working capital

Working capital is the finance needed by an organisation to manage its daily operations. It can also be defined as the excess of current assets over current liabilities, that is the net current assets of the business.

An entity to maintain its operations may:

a. invest and hold inventory [inventory];
b. sell goods on credit [receivables];
c. take credit from suppliers [payables];
d. obtain short term operating finance [bank overdrafts];
e. hold cash for some operational use to offset obligations [cash]; and
f. surplus cash can be invested short term for interest [investment].

The elements of working capital include inventory, receivables, payables, bank overdrafts, cash and short-term investment.

## 3.3 Working capital management

Managing working capital involves management of all the elements of the working capital both current assets and current liabilities to reduce the risk of running out of cash while increasing the return on the assets.

It involves understanding that the current assets require funding and so the need to focuses on reducing them while the current liabilities provide funding and the focus should be on increasing them. The extreme of any is unhealthy for the business and so a balance should be established.

### 3.3.1 The objectives of working capital management

Working capital management refers to the set of activities and strategies employed by organisations to efficiently manage their short-term assets and liabilities, ensuring that the company maintains sufficient liquidity to carry out its day-to-day operations smoothly. Effective working capital management can mean the difference between business growth and stagnation, resilience and vulnerability.

It is the process of overseeing and optimising a company's current assets (such as cash, accounts receivable, and inventory) and current liabilities (such as accounts payable and short-term debt). The goal is to ensure that a company has enough resources to meet its short-term obligations while also maximising profitability and efficiency. Working capital management is focused on ensuring that the investment in working capital is not excessive and ensuring that working capital is enough to support the entity's operations. The objective is to ensure that the organisation gets a right balance between their current assets and current liabilities.

Working capital management is focused on balancing liquidity [cashflow] and profitability [profit]. Poor management of working capital [overstocking, overtrading, shortage of cash] has led to several business failures.

### 3.3.2 Liquidity management

Liquidity management simply means trying to ensure that the organisation has sufficient cashflows for its operations [ability to pay liabilities when they fall due] to avoid liquidity problems.

Liquidity means having enough cash to meet all obligations when they are due. The sources of liquidity include the cash in the bank, the short-term investments, cash sales, payments received from receivables/debtors, sales of inventory and overdraft facilities.

Liquidity management involves ensuring that the current assets are sufficient to generate the cashflows that are needed when payment falls due. Extreme liquidity problems lead to insolvency.

### 3.3.3. Profitability management

This involves ensuring that the organisation avoids excessive investment in working capital, as this investment has a cost. Investment in inventory and trade receivables is a necessary activity that provides no additional return on investment. It could tie down capital.

### 3.3.4 Objectives of Working Capital Management

The fundamental objectives of working capital management are:

a. ensuring liquidity: maintaining adequate cash flow to meet immediate and short-term financial obligations;
b. profitability optimisation: balancing liquidity with the need to maximize returns on current assets;
c. efficient asset utilisation: ensuring that assets like inventory and receivables are managed efficiently to minimise wastage and delays;
d. minimising financial costs: reducing the cost of capital and short-term borrowing by optimising the use of available funds; and
e. risk management: guarding against the risk of insolvency and financial distress arising from poor liquidity management.

### 3.3.5 The conflict of objectives with working capital management

For a business entity, cashflow and profits are equally important. Profitable companies can fail if they run out of cash and liquid companies can also be unprofitable. The challenge with the objectives of working capital management is complex because over investment reduces profit and under investment affects availability of cashflow.

Let us look at some transactions that buttress these conflicts.

a. Goods sold on credit increases profitability but the cashflow is delayed.
b. Payment for non-current assets reduces cashflow but the impact on profit is delayed.
c. Purchasing large inventory to enjoy discounts increases profitability but reduces cashflow.

## 3.4 Cash Operating Cycle

### 3.4.1 Elements in the cash operating cycle

At its core, the cash operating cycle is the length of time, typically measured in days, that it takes for a company to turn its investments in inventory and other resources into cash flows from customers. The cycle begins when cash is spent on raw materials and ends when cash is received from customers after the sale of finished goods. A shorter cycle means a company recoups its cash faster, whereas a longer cycle implies cash is tied up in operations for an extended period.

Therefore, the cash operating cycle, also called the working capital cycle is the average length of time:

a. from cash outflow to suppliers for goods and services [payments],
b. to cash inflows from customers for sales of finished goods or services [receipts].

The cash operating cycle can be used to evaluate how adequate the working capital is, and the efficiency of working capital management. It is linked to the business cycle which is the time between when goods and services are obtained from suppliers to when those goods and services are sold to customers.

The faster an organisation can move things around the cycle [shorter cash operating cycle] the lower the investment in working capital will be. The cash operating cycle is different for the different types of business. For example, a retail business [supermarket] usually has a short cash operating cycle, as they see goods to customers for cash, before the suppliers are paid while a manufacturing company would likely have a longer cash operating cycle as it needs to hold inventory, take some time to convert them to finished goods before sales and the sales may be on credit.

The cash operating cycle has three major elements:

a. The average credit period taken from suppliers [payables payment period];
b. The average length of time inventory is kept before usage or sales [inventory holding/turnover period]. In a manufacturing setting the inventory turnover period would be the sum of the raw materials turnover period, the work in progress and the finished goods turnover period]; and
c. The average length of credit period to be given to customers [receivables collection period].

Calculation of cash operating cycle for a manufacturing company

| | Days/weeks/months |
|---|---|
| Raw material holding period | xx |
| Work in progress [WIP] holding period | xx |
| Finished goods holding period | xx |
| Receivables collection period | xx |
| Less payables payment period | [xx] |
| | xx |

For other businesses, the inventory holding period will not be broken down. The cycle may be measured in days, weeks or months.

**Example on cash operating cycle**

A manufacturing company has an average raw material holding period of 11 days, it takes the company 6 days to process the raw material to finished goods and an average of 18 days before the finished goods are sold to customers. Credit customers are given an average of 20 days to pay for the goods. The company purchases its raw materials on an average credit term of 15 days.

**Required:**

a. Calculate the length of the cash operating cycle; and
b. Comment on the likely factors that could influence the length of the cash operating cycle.

**Solution to the example on cash operating cycle**

| | Days |
|---|---|
| Raw material holding period | 11 |
| Work in progress [WIP] holding period | 6 |
| Finished goods holding period | 18 |
| Receivables collection period | 20 |
| Less payables payment period | [15] |
| | 40 |

The length of the cash operating cycle is 40 days.

The likely factors that could influence the cash operating cycle include:

a. The terms of the trade;
b. The efficiency of the company's management;
c. Industry specifics; and
d. The company's policy on addressing the working capital objective.

### 3.4.2 Working capital ratios

The cash operating cycle is calculated using some ratios which are collectively called working capital ratios. These ratios include:

a. Inventory turnover period;
b. Average collection period;
c. Average payables period;
d. Liquidity ratios; and
e. Sales revenue net working capital ratio.

### 3.4.3 Inventory turnover period

$$\textbf{Inventory turnover period} = \frac{\text{Average inventory}}{\text{Annual cost of sales}} \times 365 \text{ days}$$

$$\textbf{Raw material holding period} = \frac{\text{Average raw materials inventory}}{\text{Annual raw materials purchases}} \times 365 \text{ days}$$

$$\textbf{Work in progress [WIP] holding period} = \frac{\text{Average WIP}}{\text{Annual cost of sales}} \times 365 \text{ days}$$

$$\textbf{Finished goods inventory period} = \frac{\text{Average finished goods inventory}}{\text{Annual cost of sales}} \times 365 \text{ days}$$

a. The inventory turnover ratio shows how long the inventory is kept between purchase and sales.

b. The raw materials holding period shows the length of time between when raw materials are purchased and when they are used in production.

c. The WIP holding period shows the average time goods spend in production.

d. The finished goods inventory period shows the length of time between completion or purchase and sale of goods.

Average inventory is usually preferred in calculating this ratio because the year-end inventory might not be a reliable figure for the period. Average inventory is calculated as the average of the opening and closing inventory. The closing inventory can be used where the average cannot be calculated.

A low ratio for all inventory ratios is assumed to reflect good working capital management.

**Example 2**

The following draft has been extracted from the most recent accounts of Akoka Co

| | ₦m |
|---|---:|
| Cost of sales | 300 |
| Sales [75% on credit] | 360 |
| Material purchases on credit | 216 |
| Average Work in progress | 18 |
| Average raw materials inventory | 12 |
| Trade payables | 24 |
| Receivables | 48 |
| Average finished goods inventory | 24 |

**Required:**

Calculate

a. Raw material inventory holding period;

b. WIP holding period; and

c. Finished goods inventory period.

**Solution**

**Raw material holding period** = $\frac{\text{Average raw materials inventory}}{\text{Annual raw materials purchases}} \times 365 \text{ days}$

$= 12 / 216 \times 365 = 20 \text{ days}$

**Work in progress [WIP] holding period** = $\frac{\text{Average WIP}}{\text{Annual cost of sales}} \times 365 \text{ days}$

$= 18 / 300 \times 365 = 22 \text{ days}$

**Finished goods inventory period** = $\frac{\text{Average finished goods inventory}}{\text{Annual cost of sales}} \times 365 \text{ days}$

$24/300 \times 365 = 29 \text{ days}$

**Average collection period**

This is the average period granted to credit customers/receivables to pay their debts. It is usually expected that the collection period is shorter, but this depends on the nature of the business, the sales strategy and the credit control policy.

It is calculated as:

**Average collection period** = $\frac{\text{Average trade receivables}}{\text{Annual sales}} \times 365 \text{ days}$

**Average payables period**

This refers to the average period of credit taken from suppliers before payment.

It is calculated as:

**Average payment period** = $\frac{\text{Average trade payables}}{\text{Annual purchases}} \times 365 \text{ days}$

The average payment period should be close to the normal credit terms offered by suppliers in the industry.

**Example 3**

Realtor manufacturing company is a key player in the plastic manufacturing sector. Extracts from its financial statements is as shown below:

| | |
|---|---:|
| Annual purchases | ₦12,215,000 |
| Annual sales | ₦40,616,800 |
| Annual cost of sales | ₦36,904,896 |
| Average Trade receivables | ₦9,975,000 |

| | |
|---|---|
| Average Trade payables | ₦4,233,600 |
| Inventories: Raw materials | ₦6,048,000 |
| Work in progress | ₦3,136,896 |
| Finished goods | ₦10,975,251 |
| Industry average cash operating cycle | 250 days |

**Required:**

a. Calculate the length of the cash operating cycle of Realtor.
b. Comment on their working capital management.

**SOLUTION**

The length of the cash operating cycle of Realtor is calculated:

| | | Days |
|---|---|---|
| Raw material turnover period | 6,048,000 / 12,215,000 x 365 | 181 |
| WIP holding period | 3,136,896 / 36,904,896 x 365 | 31 |
| Finished goods turnover | 10,975,251 / 36,904,896 x 365 | 109 |
| Receivables collection period | 9,975,000 / 40,616,800 x 365 | 90 |
| Payables payment period | 4,233,600 / 12,215,000 x 365 | (127) |
| **Cash operating cycle** | | **284** |

Realtor takes 284 days between when it purchases raw materials to when it is paid for the finished goods sold, which is higher than the average industry standard of 250 days. The company would need to take measures to reduce its cash operating cycle by either improving its current assets management [reduction] or current liabilities management [increase].

**Example 4**

The following extracts has been taken from the current management accounts of Cooltar Co.

| | |
|---|---|
| Credit sales | ₦54,000,000 |
| Average Trade receivables | ₦4,590,000 |
| Gross profit margin | 25% on sales |
| Inventories: Raw materials closing balance | ₦2,250,000 |
| Work in progress | ₦5,250,000 |
| Finished goods | ₦3,000,000 |
| Average Trade payables | ₦1,950,000 |

Raw materials are 80% of cost of sales which are all on credit. The inventory levels are all constant.

**Required:**

a. Calculate the length of the cash operating cycle of Cooltar Co.

**Solution:**

The **first step in a question** of this nature is to calculate the cost of sales using the gross profit margin given.

Sales is ₦54,000,000, and the gross profit margin is 25%. This implies that the cost of sales is 75% of sales.

The cost of sales is 75% x ₦54,000,000 = ₦40,500,000

The **second step in a question** of this nature is to get the components of the cost of sales.

Raw materials are 80% of the cost of sales.

Raw materials = 80% x ₦40,500,000 = ₦32,400,000

Which means other part of the cost of sales is 20% x ₦40,500,000 = ₦8,100,000.

The **third step in the question** is calculation of the length of the cash operating cycle.

The length of the cash operating cycle of Cooltar Co is calculated:

| | | **Days** |
|---|---|---|
| Raw material turnover period | 2,250,000 / 32,400,000 x 365 | 25 |
| WIP holding period | 5,250,000 / 40,500,000 x 365 | 47 |
| Finished goods turnover | 3,000,000 / 40,500,000 x 365 | 27 |
| Receivables collection period | 4,590,000 / 54,000,000 x 365 | 31 |
| Payables payment period | 1,950,000 / 32,400,000 x 365 | (22) |
| **Cash operating cycle** | | **108** |

### 3.4.3 Liquidity ratios

Liquidity as previously defined means having enough cash to settle financial obligations as at when due. An organisation could generate cash from its cash sales, from its savings in the bank, from its investments or from borrowing.

The length of the cash operating cycle [discussed earlier] and the liquidity ratios can be used to evaluate the liquidity of an organisation.

Liquidity ratios help an organisation analyse their cashflow challenges and insolvency. It is assumed that the higher the liquidity ratios, the better the liquidity, but a higher liquidity ratio could also mean that the working is not efficiently used.

The liquidity ratios should be calculated using the closing balances in the statement of financial position. The ideal benchmarks used for evaluation of an organisation's liquidity are general in nature, but in practice they should be compared with the industry trend and past performances.

The acceptable liquidity ratios differ significantly across industries and so they should be monitored over time.

There are two liquidity ratios

a. **Current ratio** = current assets / current liabilities
The current ratio measures the proportion of the current assets that are financed by current liabilities. The ideal benchmark for a good current ratio is 2:1, which implies that the current liabilities can be settled at least twice over from the existing current assets.

b. **Quick ratio or acid test ratio** = current assets – inventory / current liabilities
This ratio measures how well liquid assets covers current liabilities. It assumes a situation where the inventory is not very liquid, that is not easily converted to cash. The ideal benchmark for a good quick ratio is 1:1, which implies that the company's current liabilities can be settled with the current assets when they fall due.

### 3.4.4 Sales revenue: net working capital ratio

It is also called working capital turnover ratio, and it tries to evaluate whether the investment in working capital is sufficient for the sales realised. It simply measures how well management is utilising its working capital investment to generate sales.

It is calculated as:

$$\frac{\text{Sales revenue}}{\text{Working capital}}$$

**Example 5**

The records of Rush Hour Ent for the past three years is as shown below:

| **Year** | **2023** | **2024** | **2025** |
|---|---|---|---|
| | **₦** | **₦** | **₦** |
| Trade receivables | 3,000,000 | 5,539,000 | 5,176,635 |

| | | | |
|---|---|---|---|
| Inventory | 5,654,000 | 7,200,700 | 9,203,000 |
| Cash | 2,308,000 | 1,245,000 | 530,000 |
| **Current Assets** | **10,962,000** | **13,984,700** | **14,909,635** |
| | | | |
| Trade payables | 4.616,000 | 7,000,000 | 9,000,500 |
| **Current liabilities** | **4.616,000** | **7,000,000** | **9,000,500** |
| Sales revenue | 79,325,000 | 83,816,400 | 67,364,139 |

**Required**

a. Evaluate Rush hour's liquidity position using the
   i. Current ratio
   ii. Quick ratio
b. Calculate the net working capital ratio for the past 3 years and comment on your results if the industry average is 12 times.

**Solution**

| Year | 2023 | 2024 | 2025 |
|---|---|---|---|
| Current ratio | 10,962,000 / 4,616,000 = **2.37 times** | 13,984,700 / 7,000,000 = **2 times** | 14,909,635/ 9,000,500 = **1.66 times** |
| Quick ratio | (10,962,000 – 5,654,000) / 4,616,000 = **1.15 times** | (13,984,700 – 7,200,700)/ 7,000,000 = **0.97 times** | (14,909,635 – 9,203,000) / 9,000,500 = **0.63 times** |
| Net working capital ratio | 79,325,000 / (10,962,000 – 4,616,000 ) = **12.5 times** | 83,816,400 / (13,984,700 – 7,000,000) = **12 times** | 67,364,139 / (14,909,635 – 9,000,500) = **11.4 times** |

### 3.4.4 Current Ratio

Based on the current ratios, the liquidity position of the business has worsened in 2025 when compared with 2023 & 2024. The creditor payments were covered by 2.37 times in 2023 and has fallen to 1.66 times in 2025 which reflects potential business problems in the future.

### 3.4.5 Quick ratio

The quick ratio further confirms the worsening liquidity position over the years especially since the ratios for 2024 and 2025 are below the ideal of 1:1. The company would need to investigate further to resolve this problem.

### 3.4.6 Net working capital ratio

The ratio is reducing over the years and has fallen below the industry average in year 2025. This lower ratio may imply larger working capital relative to sales. This may mean that the utilisation of the working capital is not efficiently used to generate sales or that the working capital is too large.

### 3.4.7 Conclusion

The ratio analysis over the trend is sufficient to justify further investigations into the reasons for the change in the ratios and measures that can be taken to improve the ratios to the ideal or industry standards.

## 3.5 Overtrading

Overtrading happens when a business tries to do too much, too quickly with too little long term capital. The business tries to support too large a volume of trade with the capital resources at its disposal.

### 3.5.1 Characteristics of overtrading

a. Rapid increase in revenue.
b. An increase in the payables and receivable days.
c. A significant drop in the liquidity ratios.
d. Most of the increase in assets financed by credit.

### 3.5.2 Over-capitalisation

This refers to an excess investment by a company in current assets which makes the working capital excessive.

### 3.5.3 Characteristics of capitalisation

a. Increase in inventory.
b. An increase in receivable days.
c. Increase in cash balance.
d. Reduced number of payables.

## 3.6 Chapter review

At the end of this chapter, ensure you can:

a. Discuss working capital and identify its components.
b. Explain and discuss the conflicts between the objectives of working capital management.
c. Discuss the importance of working capital management to good financial management.
d. Explain the cash operating cycle and its implications for the company.
e. Calculate the level of investment in working capital and its implications for the company.

**Skills Level**

**Financial Management**

CHAPTER 4

**INVENTORY CONTROL**

**Contents**

# 4 Inventory Control

## 4.0 Learning Objective

This chapter discusses inventory control system.

## 4.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. explain the objectives of inventory management;
b. understand and apply the basic economic order quantity principles;
c. calculate the EOQ under different scenarios; and
d. describe the main inventory management systems including the just-in-time systems.

## 4.2 The objectives of inventory management

Inventory is a key investment for many organisations. Inventory management refers to the process of planning, organising, and controlling the flow of goods, products, or materials from the point of origin to the point of consumption. It involves managing the storage, tracking, and maintenance of inventory levels to meet customer demand while minimising costs and maximizing efficiency.

The organisation should in its inventory management policy try to balance between holding enough inventory to avoid stock-out [profitability] and reducing inventory to the lowest possible amount to minimize funding costs [liquidity].

**Key Objectives**:

a. Optimise inventory levels: Maintain optimal inventory levels to meet customer demand while minimising excess stock and storage costs.
b. Improve inventory turnover: Increase inventory turnover by selling and replacing inventory quickly, reducing holding costs and minimising obsolescence.
c. Reduce stockouts and overstocking: Minimise stockouts and overstocking by accurately forecasting demand and adjusting inventory levels accordingly.
d. Enhance supply chain efficiency: Improve supply chain efficiency by streamlining inventory management processes, reducing lead times, and improving communication with suppliers and customers.

### 4.2.1 Inventory related cost

The costs related to inventory are categorised as follows:

a. purchase costs;
b. ordering costs;
c. holding or carrying costs; and
d. stock-out costs.

**Purchase costs**

Purchase costs refer to the total costs of acquiring materials from suppliers. It is simply the cost of materials purchased considering the quantity purchased, discounts given and other costs included in the acquisition cost.

**Ordering costs**

It is the expenses incurred when placing an order for materials. This refers to the costs incurred from the point when a decision is made to purchase inventory until it gets to the warehouse. It includes costs such as:

a. the costs of placing the orders like telephone calls, email cost, and other enquiry costs;
b. the costs of delivery of the purchased inventory such as logistics, carriage inwards and others; and
c. The costs associated with confirming the inventory received such as inspection cost before signing the goods received note.

**Holding or carrying cost**

This refers to expenses associated with storing and maintaining inventory over time. It includes costs such as

a. The interest cost of the investment tied up in inventory. [opportunity cost]
b. The storage related costs such as rent, utilities and maintenance costs
c. The insurance costs paid to hedge against damage, theft or loss.
d. Handling costs of moving and managing inventory.
e. Losses due to deterioration, or theft of inventory.

**Stock-out costs**

This refers to the costs and losses incurred for running out of stock, when there is a demand for the item. It includes lost sales, customer dissatisfaction, rush orders, production downtime and emergency purchases.

## 4.3 Economic order quantity [EOQ]

EOQ model is a mathematical model that can be used to calculate the quantity of inventory to order that will minimise total annual inventory costs.

EOQ is the optimum order quantity that minimises the holding and carrying cost.

**Assumptions of the EOQ model**

a. No discount - The purchase price per unit for the material is constant, that is there is no discount for purchasing large quantity.

b. Constant demand – the annual demand for the inventory is known and constant throughout the year.
c. No stock outs – the companies will never run out of stock.
d. Lead time is known – lead time is the time between placing an order and receiving delivery from the supplier. The lead time is predictable.
e. Known holding cost per unit -- This model assumes that the holding cost per unit is known. This means that, as the average level of inventory increases, the total annual holding costs will increase.
f. Fixed ordering costs – The model assumes that every time an order is placed, the cost associated per order is fixed. This means that as the quantity per order increases the total ordering cost will increase.
g. No buffer stock – Buffer stock refers to the minimum level of stock that should be kept to avoid stock-out. EOQ assumes that there is no buffer stock.

**EOQ model formula**

EOQ is the order size that will minimise the total of ordering costs and holding costs during a period [usually annually]. EOQ tries to balance

### 4.3.1 Total ordering costs per annum

This is a product of the constant ordering per order and the number of orders. The number of orders in a year is calculated by dividing the annual demand by the quantity ordered per time. The higher the quantity in an order, the lower the number of orders and vice versa.

Ordering costs each year = ordering cost per order x number of orders
= Ordering cost per order x Demand / quantity
= $C_o \times D/Q$
= $\mathbf{C_o D / Q}$

### 4.3.2 Total holding costs per annum

This is a product of the holding cost per unit and the average inventory. The average inventory is the quantity ordered divided by 2.

Holding costs each year = holding cost per unit x average inventory
= Holding cost per unit x Quantity / 2
= $C_H \times Q / 2$
= $\mathbf{C_H Q / 2}$

EOQ tries to balance holding and ordering cost. The EOQ is the quantity ordered where holding cost equals ordering cost, based on the assumptions above.

**The formula for the EOQ as follows**

Holding costs each year = Ordering costs per annum

Holding cost per unit x Quantity / 2 = Ordering cost per order x Demand / quantity

$$C_H Q / 2 = C_o D / Q$$

$$\mathbf{Q = \sqrt{2C_OD / C_H}}$$

Q is EOQ, $C_H$ is holding cost per unit, D is annual demand, and $C_o$ is ordering cost per order

**Example 1 on EOQ**

A company uses 600,000 units of an item annually, which costs ₦4 per unit. The cost of placing an order is ₦300 for each order. The annual cost of keeping inventory annually is 10% of the purchase cost.

**Required:**

a. Calculate the EOQ
b. Calculate the number of orders.
c. Calculate the total purchase cost
d. Calculate the total ordering cost
e. Calculate the total holding cost.

**Solution**

**a.** $\mathbf{Q = \sqrt{2C_OD / C_H}}$

$\mathbf{C_o}$ **=** ₦300

$C_H$ = 10% x ₦4 = ₦0.4

D = 600,000

Q = √2 x 600,000 X 300 / 0.04 = 30,000 units

b. Number of orders = D / Q = 600,000 / 30,000 = 20 orders
c. Total purchase cost = Demand x purchase cost = 600,000 x ₦4 = ₦2,400,000
d. Total ordering cost = ordering cost per order x number of orders = ₦300 x 20 orders = ₦6,000
e. Total holding cost = holding cost per unit x average inventory = ₦0.4 x 30,000/2 = ₦6,000

**Example 2 on EOQ**

The purchase price per unit is ₦100 per unit and the monthly demand is 400,000 units. The storage costs per unit per annum is ₦5 per unit and the supplier charges ₦300 per order for delivery. The company's cost of finance is 15% per annum.

**Required**

Calculate the EOQ

**Solution**

Always ensure that the demand is in quantity [not value] and the period aligns with other information. In this illustration, the demand is monthly and should be converted to per annum.

Annual demand = 400,000 x 12 months = 4,800,000

**$C_o$ = ₦300**

$C_H$ = 15% x ₦100 = ₦15 + storage cost of ₦5 = ₦20

D = 4,800,000

Q = √2 x 4,800,000 X 300 / 20 = **12,000 units**

### 1.1.1. EOQ with discounts

Discounts may be offered in large quantities. The discount has the following implications on the following:

a. Discount would encourage organisations to increase the order size and so the quantity [Q] is higher.
b. This implies that the number of orders would reduce as quantity increases which results in reduced ordering cost. The frequency of orders will reduce.
c. The average stock will increase as quantity increases which results in increased holding cost. You will incur more to keep the increased quantity ordered.

In summary, a discount will reduce the total ordering cost and increase the holding cost.

### 4.3.3 Steps on solving EOQ questions with discount

a. Calculate the EOQ without considering the discounts.
b. Calculate the total inventory costs [purchase cost + ordering cost + holding cost] at all quantity levels including the EOQ.
c. Compare all the totals from the different quantities given.

d. The quantity that gives the lowest totals should be chosen as it minimises cost.

**Example 3**

A company uses 600,000 units of an item annually, which costs ₦4 per unit. The cost of placing an order is ₦300 for each order. The annual cost of keeping inventory annually is 10% of the purchase cost.

Discount level

| Quantity range | Discount amount |
|---|---|
| 40,000 – 50,000 | ₦0.10 per unit |
| 50,000 and more | ₦0.20 per unit |

**Required:**

What is the order quantity that will minimise total inventory costs?

**Solution**

a. Calculate the EOQ which is same as in example 1 is 30,000 units and no discount will be enjoyed. The purchase cost is ₦4 per unit. Holding cost is 10% x ₦4.00 = ₦0.40
b. Purchase 31,000 units and get a discount of ₦0.10 per unit. The purchase cost is ₦3.90 per unit. Holding cost is 10% x ₦3.90 = ₦0.39
c. Purchase 35,000 units and get a discount of ₦0.20 per unit. The purchase cost is ₦3.80 per unit. Holding cost is 10% x ₦3.80 = ₦0.38

| **Quantity range** | **30,000 units** | **40,000 units** | **50,000 units** |
|---|---|---|---|
| | **₦** | **₦** | **₦** |
| Annual purchase cost | 2,400,000 | 2,340,000 | 2,280,000 |
| Annual ordering cost | 6,000 | 4,500 | 3,600 |
| Annual holding cost | 6,000 | 7,800 | 9,500 |
| **Total inventory cost** | **2,412,000** | **2,352,300** | **2,293,100** |

The order quantity that minimises total costs is 50,000 units as it gives the lowest total cost.

**Workings**

**EOQ 30,000 units**

| | | ₦ |
|---|---|---|
| Annual purchase cost | D x Pc = 600,000 x ₦4 | 2,400,000 |
| Annual ordering cost | $C_o$ D / Q = ₦300 x (600,000 / 30000) | 6,000 |
| Annual holding cost | $C_H$ Q / 2 = ₦0.40 x (30000/2) | 6,000 |
| **Total inventory cost** | | **2,412,000** |

**EOQ 40,000 units**

| | | ₦ |
|---|---|---|
| Annual purchase cost | D x Pc = 600,000 x ₦3.90 | 2,340,000 |
| Annual ordering cost | $C_o$ D / Q = ₦300 x (600,000 / 40000) | 4,500 |
| Annual holding cost | $C_H$ Q / 2 = ₦0.39 x (40000/2) | 7,800 |
| **Total inventory cost** | | **2,352,300** |

**EOQ 50,000 units**

| | | ₦ |
|---|---|---|
| Annual purchase cost | D x Pc = 600,000 x ₦3.80 | 2,280,000 |
| Annual ordering cost | $C_o$ D / Q = ₦300 x (600,000 / 50000) | 3,600 |
| Annual holding cost | $C_H$ Q / 2 = ₦0.38 x (50000/2) | 9,500 |
| **Total inventory cost** | | **2,293,100** |

## 4.4 Reorder level and buffer stock

The assumption that the delivery of a material would be done immediately may be unrealistic because of the existence of a lead time and uncertainty of usage/demand.

a. Lead time is the period between when an order is placed, and the delivery is received. Lead time refers to the time it takes for a product or service to be delivered from the moment an order is placed. It encompasses the entire process, from order processing and production to shipping and delivery.
b. Buffer stock or safety inventory is the average amount of inventory held in-excess of average requirements to eliminate the risk of stock-out.
c. Reorder level is the quantity of inventory that needs to be reached before an order is placed.

### 4.4.1 Calculations of reorder level

a. If the lead time and demand during the lead time is constant, reorder level is = Demand for the material item per day x lead time in days.

b. If the lead time and demand during the lead time is uncertain, the firm should keep a level of safety stock. The safety stock depends on the change in demand, the cost of holding inventory and the stock-out costs. Reorder level would be calculated as maximum demand for the material item per day x maximum lead time in days.

Note that the lead time and demand could be in weeks and months.

**Calculations of safety/buffer stock**

Where there is safety stock, the average inventory = Q/2 + safety stock

The size of the safety stock = reorder level – average usage in lead period.

**Other calculations**

Reorder level = maximum demand per day x maximum lead time in days

Average usage in the lead time = average demand per day x average lead time

Cost of keeping safety stock = safety stock units x holding cost per unit

Maximum inventory level = Reorder level + reorder quantity – [minimum demand per day x lead time in days]

Minimum inventory level = Reorder level – [average demand per day x average lead time in days]

**Example on EOQ with Safety stock**

A company orders 50,000 units of Jumbo tissue when the stock level falls to 100,000 units. Annual consumption of the item is 1,800,000 units. The holding cost per unit is ₦1.50 per unit and the delivery cost per order is ₦375. The lead time is 12 days and assume a 300-days year and constant daily demand.

**Required:**

Calculate the annual savings that could be obtained if the EOQ model is used when compared to the current ordering policy.

**Solution**

Daily demand = annual demand / number of days = 1,800,000 / 300 = 6,000 units

Current policy

| | |
|---|---|
| Reorder level | 100,000 units |
| Buffer stock = 100,000 units – [6,000 units x 12 days] | 28,000 units |
| Average inventory = 50,000 / 2 + 28,000 | 53,000 units |
| | |
| **Current policy annual cost** | **₦** |
| Ordering costs = ₦375 x [1,800,000 / 50,000] | 13,500.00 |
| Holding costs = 53,000 units x ₦1.50 per unit | 79,500.00 |
| **Total cost** | **93,000.00** |
| | |
| **EOQ model** | |
| EOQ = √2 x 1,800,000 x 375 / 1.50 | 30,000 units |
| Annual cost of EOQ model | ₦ |
| Ordering costs = ₦375 x [1,800,000 / 30,000] | 22,500 |
| Holding costs for EOQ = 30,000 units/2 x ₦1.50 per unit | 22,500 |
| Holding costs for buffer stock = 28,000 units x ₦1.50 per unit | 42,000 |
| Total costs | 87,000 |
| Current policy costs | 93,000 |
| Savings | 6,000 |

## 4.5 Just-In-Time [JIT] and other inventory management techniques

JIT technique is an inventory management approach based on the principle that producing items for inventory is wasteful as it adds no value. It believes keeping of inventory is an expense for which there is no benefit. Raw materials should be obtained only when they are needed.

JIT technique refers to a manufacturing and supply chain that aim to minimise inventory levels and improve customer service by producing the quantities they need at the appropriate time and at competitive prices.

Focus of JIT technique includes:

a. reduce capital tied up in inventory;
b. ensure a fast and flexible production process that meets customers' demand.; and
c. eliminate all activities that do not add value.

JIT Production is a production technique that ensures items should only be produced just in time to meet customer orders and not before. This implies that there should be no stock of finished goods. This implies that the production times must be fast and reliable.

JIT purchasing refers to a purchasing technique where purchases and delivery of materials and components from external suppliers are done just in time, when they are needed in production. This entails good relationship with major suppliers.

### 4.5.1 Challenges with JIT

The limitations of the just-in-time include

a. Zero inventory may be impracticable in industries where demand is highly uncertain, and production cycle is long.
b. It may be difficult to arrange a reliable supply contract with all key suppliers.
c. The suppliers may be unreliable, and JIT assumes reliable supply without disruption.
d. It is vulnerable to stock-outs.
e. It requires high quality products to minimise waste and defects.
f. There could be disruptions beyond the control of the firm such as weather-related disruptions and global events [Pandemics, economic downtime]

## 4.6 Periodic review system

This is an inventory management technique, where inventory levels are checked periodically usually at fixed intervals. It involves setting a reorder quantity and a reorder level for each item of inventory. A new order is placed immediately the item falls below its reorder level.

## 4.7 ABC method of inventory control

This is an inventory management technique that divides inventory into three categories based on their value and importance. The categories include

a. Category A inventory items refer to high value items that require close monitoring and high control.
b. Category B inventory items refer to medium value items that require regular monitoring, slightly below that required for high priority items.

c. Category C inventory items refer to low value items that require minimal monitoring.

This approach to inventory control aims at applying different control methods to the different categories based on their value and exposure.

### 4.7.1 Two bin system

This system is used in stores department where inventory is stored in two bins or containers. Inventory is taken from bin 1 until it is empty, and a new order is placed sufficient to fill bin 1 again. Bin 2 is used when bin 1 is empty and it should have enough quantity to avoid stock-out until bin 1 is filled again. It is a continuous cycle.

## 4.8 Chapter review

At the end of this chapter, ensure you can:

a. explain the objectives of inventory management;
b. understand and apply the basic economic order quantity principles;
c. calculate the EOQ under different scenarios; and
d. describe the main inventory management systems including the just-in-time systems.

**Skills Level**
**Financial Management**

CHAPTER 5

# ACCOUNT RECEIVABLES AND PAYABLES

## Contents

# 5 Accounts Receivables and Payables

## 5.0 Learning objective

This chapter discusses the management of accounts receivables and payables as components of working capital.

## 5.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. explain how to establish a credit policy for accounts receivable;
b. explain the measures involved in recovering amounts expected from accounts receivable;

c. explain the pros and cons of early settlement discounts offered to receivables and the financial implications; and
d. discuss the features and costs associated with factoring and invoice discounting.

## 5.2 Costs and benefits of giving credit

Companies normally sell goods on agreed credit terms such as a number of days from the date of the invoice. It is always assumed that credit customers would always take the full period of credit granted to them. If you ask a customer to pay you 30 days from invoice date, there is a tendency that good customers would pay on the 30th day. Note the word good customer because some customers may default.

### 5.2.1 Why do companies give credit

a. Giving credit may increase the sales volume, which increases the contribution and profit of the organisation.
b. It may give them competitive advantage over competitors.
c. It can help build customer loyalty and relationships.
d. It can support business growth by expanding the business market reach and attract new customers.

### 5.2.2 Costs of giving credit

Giving credit can result in several costs such as:

a. **Finance costs** – this refers to the cost of financing the trade receivables. The longer the credit period allowed, the larger the investment in working capital. The cost of investing in trade receivables = average trade receivables in the period x cost of capital for the period. [The average trade receivables is calculated as receivable days / 365 x credit sales.]. it is also assumed that receivables are financed using bank overdraft and so the interest cost is the cost of capital.
b. **Administration costs** – this refers to all costs associated with negotiating credit terms, monitoring the credit position of customers. The focus is the incremental administrative costs incurred because of the credit offered.
c. **Bad debt costs** – the risk of customers defaulting in their payments is known as bad debt. The amount of sales revenue from the customers that is written off is known as bad debt costs.

d. **Opportunity costs** – this refers to the cost of all opportunities that are lost as a result of the capital tied down with receivables.

**Example 1**

The annual sales of a company is ₦60 million and the contribution to sales ratio is 25%. The bad debts is currently 2% of sales and the customers currently have a 30-day credit period. The cost of capital is 9% and there are 360 days in a year.

A consultant has proposed a new credit policy with the following features

a. Credit period increased to 60 days
b. Bad debts would then be 2.5% of sales
c. Increase of 20% in annual sales.

**Required:**

Evaluate the viability of the credit policy proposed by the consultant.

**Solution**

A policy is said to be viable when the benefits/savings is higher than the cost of the new policy. The optimum level of credit given to customers is a balance between the:

a. increased contribution from the additional credit sales.
b. the cost of giving the credit

**Sales**
Current sales = ₦60 million
New sales = ₦60 million x 1.20 = ₦72 million
**Cost of financing receivables**
Current receivables = 30/360 x ₦60 million = ₦5 million
New receivables = 60/360 x ₦72 million = ₦12 million
Increase in receivables = ₦7 million
Cost of financing the increased receivables = 9% x ₦7 million = ₦0.63 million
**Contribution**
Contribution on current sales = 25% x ₦60 million = ₦15 million
Contribution on new sales = 25% x ₦72 million = ₦18 million
Increase in contribution = ₦3 million

**Bad debts**
Bad debt on current sales = 2% x ₦60 million = ₦1.2 million
Bad debt on new sales = 2.5% x ₦72 million = ₦1.8 million
Increase in bad debts = ₦0.6 million

Viability

| | ₦m | ₦m |
|---|---|---|
| Benefits | | |
| Increase in contribution | | 3.00 |
| Costs | | |
| Cost of financing the increased receivables | 0.63 | |
| Increase in bad debts | 0.60 | |
| Total costs | | 1.23 |
| Net gain | | 1.77 |

The policy is viable as it gives a net savings of ₦1.77m

## 5.3 Managing account receivables

The objective of managing receivables is to create a balance between profitability [increased sales due to more credit period] and liquidity [collecting the payments promptly to reduce the cost of the credit].

To manage the account receivables, every organisation should establish a credit policy. The company's credit policy will be influenced by the demand for the products, competitors' credit policy, costs of credit control, costs of financing and risks of bad debts.

The credit policy has the following key stages

a. Assessing credit worthiness
b. Credit Terms
c. Monitoring the credit system
d. Collecting amounts owing

### 5.3.1 Assessing credit worthiness

This involves setting procedures for deciding whether to give credit to a customer and the terms. A company should assess the credit worthiness of all new customers immediately and existing customers periodically.

For new customers, information for reference can be gotten from:

a. Supplier/trade references – this refers to references from suppliers already giving credit to the customer. The challenge here is that the potential customer would only nominate the suppliers it has good relationship with.
b. Bank references – asking from reference from the customer's bank. This should be with the permission of the customer and in alignment with the regulations in the country.
c. Published information – this includes looking at the customers annual reports [if listed] and checking through the press and social media to get information on its financial position or any court judgements for non-payment of debts.
d. Credit reference agencies – references could be gotten from credit agencies at a fee.

### 5.3.2 Credit terms

The company should set credit policy guidelines that should be adhered to when giving credit to new customers. The credit terms for each customer should include the credit period, the credit limit and the penalties on overdue payments.

a. The credit period shows the length of time allowed before payment is due. For example, 30 days or 60 days credit period.
b. The credit limit is the maximum amount of credit available to the customer. It is likely to be small for a new customer but increases as the relationship strengthens.
c. Penalties on overdue payments is an agreement with the customer on the charges for delayed.

### 5.3.3 Monitoring the payments

A company should have a system for monitoring credit customers payments on invoices. This involves regularly reviewing the position of receivables and taking actions promptly if needed.

This could be done using:

a. age analysis of the outstanding payments,
b. ratio analysis or
c. statistical data.

### 5.3.4 Age analysis

A regular report also known as “aged receivables list” shows how much is owed, for how long and a comprehensive list of the unpaid invoices in the period. A simple summary is shown below.

| | Total | 0 – 30 days | 31 – 60 days | 61 – 90 days | Over 90 days |
|---|---|---|---|---|---|
| | ₦ | ₦ | ₦ | ₦ | ₦ |
| Receivables | 12,500,000 | 9,000,000 | 1,200,000 | 2,000,000 | 300,000 |

The reports will help the team assess which customers to do a follow up and evaluate the credit control.

### 5.3.5 Ratio analysis

The ratios are compared with previous periods or target to show trends in the credit level and any overdue or bad debts.

### 5.3.6 Statistical data

This refers to identifying the causes of default and the incidence of bad debts among different classes of customer and trade type from the available data.

### 5.3.7 Collecting amounts owing

Efficient procedures should be put in place to ensure that customers who are given credit pay on time and that action is taken to obtain overdue payments.

### 5.3.8 Efficient Debt collection

The following measures could help ensure that debt collection system is efficient.

a. Prompt invoicing is essential.
b. Sending regular statements to credit customers showing totals owed and amount currently due for payment.
c. Ensure that credit terms are not exceeded that is they don’t take longer credit or more credit than agreed.

### 5.3.9 Collecting debts overdue

The longer a debt is allowed to stay, the higher the probability of eventual default. The follow-up procedures include:

a. reminder letter or emails;
b. telephone calls;
c. withholding supplies- putting the customers on stop list for further orders;
d. debt collection agencies; and

e. legal actions.

## 5.4 Debt factoring and invoice discounting

Invoice discounting and factoring are methods of speeding the receipt of funds from accounts receivable.

### 5.4.1 Invoice discounting

Invoice discounting is a financial arrangement where a business uses its outstanding invoices as collateral to secure a loan or advance from a third-party financier. It is a method of raising finance against the security of receivables without using the sales ledger administration services of a factor.

Invoice discounting could be **confidential** where the customer is not aware of the invoice discounter or **notified** where the customer is informed.

### 5.4.2 How it works:

a. Invoice submission: The business submits its outstanding invoices to the financier [invoice discounter];
b. Advance payment: The invoice discounter advances a percentage of the invoice value to the business less its fees. The discounter may exclude invoices from customers determined to be poor payers;
c. Customer payment: The customer pays the invoice directly to the business; and
d. Settlement: The business pays back what was advanced from the invoice discounter plus interest/fees. Note the fees may be deducted before the advance is given to the business.

### 5.4.3 Benefits of invoice discounting

a. Improved cash flow: Invoice discounting can provide immediate access to working capital.
b. Reduced credit risk: The financier may assume some credit risk.
c. Increased flexibility: Invoice discounting can be used to manage cash flow fluctuations.

**Example**

The Blues plc has issued an invoice of ₦5million to a customer with a credit period of 90 days. An invoice discounter has offered to finance 80% of the invoiced amount, at an interest rate of 10%.

**Required:**

Demonstrate the invoice discounting process showing how much will be paid to the invoice discounter.

**Solution**

a. The company has issued an invoice of ₦5million to the customer.
b. The invoice discounter provides the company with a payment of ₦4million [80% x ₦5m]
c. After 90 days, the invoice discounter will receive the ₦4million advance plus the interest of ₦98,630 [90/365 x ₦4million x 10%]
d. if the customer pays the ₦5million promptly, the invoice discounter will get ₦4,098,630 and the remaining ₦901,370 will go to the company.

### 5.4.4 Factoring

Factoring is a financial transaction where a business sells its accounts receivable (invoices) to a third-party financier (factor) at a discount. Debt factors are specialist organisations that specialise in three main services for clients.

a. Administer the client's account receivables ledger.
b. Provide short term debt finance to client firms, secured by the accounts receivables.
c. Provide insurance against bad debts in some cases.

Factoring could be with recourse or with non-recourse. **With recourse** means that the factor is not liable for credit risk while **factoring without recourse** or **non-recourse** means that the factor would be liable for the credit risk bad debts].

### 5.4.5 How it works

a. Invoice sale: The business sells its invoices to the factor.
b. Advance payment: The factor advances a percentage of the invoice value to the business.
c. Collection: The factor collects payment from the customer.
d. Settlement: The factor settles the balance with the business, minus fees and interest.

### 5.4.6 Cost of factoring services

The costs of factoring service might therefore include:

a. A service fee for the administration and collection of trade receivables.
b. A commission charge on the total amount of trade receivables for a non-recourse factoring service, and
c. Interest charges for finance advanced against the trade receivables.

### 5.4.7 Benefits of factoring:

a. Factoring is a source of finance for trade receivables.
b. The internal administration costs should be reduced since the factor administers the account receivables ledger.
c. This may lead to credit protection that is reduction in the cost of bad debts under the non-recourse factoring.

### 5.4.8 Disadvantages of factoring

a. Interest charges on factor finance are usually higher than other sources of finance.
b. This may negatively affect the company's relationship with the customers.
c. It might be mis-interpreted by customers as a sign of financial weakness.
d. Customers may not wish to deal with a factor.

**Example**

The Blues plc has annual credit sales of ₦5million. Credit customers are currently given a credit period of 90 days. Bad debts are 3% of sales. The company's account receivables is financed with a bank overdraft, on which interest is payable at an annual rate of 15%.

A factor has offered to take over administration of the receivable's ledger and collections for a fee of 4% of the credit sales. It has also guaranteed to reduce the payment period to 45 days. It will provide finance for 85% of the receivables, at an interest cost of 8% per year.

The company estimates that by using the factor, it will save administration costs of ₦90,000 per year.

**Required:**

a. What would be the effect on annual profits if the Blues plc decides to use the factor's services on a non-recourse basis? [assume a 360-day year].

b. Would your answer in "a" above change if the agreement was a factoring with recourse agreement?

**Solution**

**Receivables balance**

Current receivables = 90/360 x ₦5 million = ₦1,250,000

New receivables with the factor = 60/360 x ₦5 million = ₦625,000

**With the factor**, 85% will be financed by the factor at 8% and the balance of 15% will be financed by the bank overdraft at 15%.

**Interest costs**

Current situation = 15% x ₦1,250,000 = ₦187,500

Interest cost with factor = [85% x ₦625,000 x 8%] + [15% x ₦625,000 x 15%] = ₦56,562.50

Savings in annual interest costs = ₦130,937.50

**Summary on a factor without recourse basis**

The factor would be responsible for the bad debts since it is a without recourse factoring.

| | ₦ | ₦ |
|---|---|---|
| Savings in annual interests cost | | 130,937.50 |
| Savings in bad debts [3% x ₦5 million ] | | 150,000.00 |
| Annual savings in administration cost | | 90,000.00 |
| **Total savings** | | **370,937.50** |
| Annual cost of factor's services [ 4% x N5m] | | 200,000.00 |
| | | |
| **Net increase in profit using the factor** | | **170,937.50** |

The factoring is viable as it gives a net savings of ₦170,937.50

**Summary on a Factor with recourse basis**

**On** a with recourse basis, the Factor would not be liable for the bad debts and so this would not be included in the savings.

| | ₦ | ₦ |
|---|---|---|
| Savings in annual interests cost | | 130,937.50 |
| Annual savings in administration cost | | 90,000.00 |
| **Total savings** | | **220,937.50** |
| Annual cost of factor's services [ 4% x N5m] | | 200,000.00 |
| | | |
| **Net increase in profit using the factor** | | **20,937.50** |

The factoring is viable as it gives a net savings of ₦20,937.50

## 5.5 Early settlement discounts

The cost of financing account receivables may be high and could lead to cash flow problems. The organisation in a bid to avoid these problems would want to reduce its investment in account receivables. One good way to do this, is to give cash discounts which may encourage customers to pay early. This kind of discount is called a settlement discount.

### 5.5.1 Evaluating a settlement discount

The cost of the discount is balanced against the savings the company receives from a shorter receivables collection period. The discounts may also reduce bad debts.

Annual cost of discount = $[1 + \text{discount / amount left to pay}]^{\text{number of periods}} - 1$

Annual cost of discount = $[1 + d / (100 – d)]^{365/t} - 1$

Number of periods = 365 / number of days or 52 / number of weeks or 12 / number of months

The denominator in the number of periods is the difference between the current credit period and the credit period guaranteed by the discount.

Amount left to pay = gross amount net discount

### 5.5.2 Decision criteria

A discount should only be offered if the cost of discount is lower than the rate of overdraft interest.

**Example**

Chester limited obtains an overdraft at an annual interest rate of 15%. Currently customers are given a credit period of 45 days.

Chester is proposing offering a cash discount of 1.5% discount if payment is made within 10 days.

**Required:**

a. What is the effective annual cost of offering the discount?
b. Is the discount financially justified?

**Solution**

a. Annual cost of discount = $[1 + d / (100 - d)]^{365/t} - 1$

$$= 1 + 1.5 / (100 - 1.5)^{365/\,45 - 10} - 1 = 17\%$$

b. Offering the discount is not worthwhile, as it is cheaper to borrow an overdraft of 15%.

**Example 2 where receivables value is given**

Okoya motors had a sale of ₦120 million for the past year, receivables at the year-end of ₦24 million and the cost of financing receivables is covered by an overdraft at the interest rate of 14% per year. It is now considering offering a cash discount of 3% for payment of debts within 20 days.

**Required:**

Should it be introduced if 40% of customers will take up the discount?

**Solution**

To determine if the early settlement discount should be introduced, a comparison must be made between the cost and the benefit.

**Cost of the discount**

₦120m revenue x 40% that accept the discount x 3% discount = ₦1,440,000

**Benefits**

a. Calculate the current receivables and the cost of financing
b. Current receivables days = receivables / credit sales x 365 = 24/120 x 365 days = 73 days
c. Cost of financing current receivables = 14% x ₦24 million = ₦3,360,000
d. Calculate the new receivables level and the cost of financing

e. 40% of customers who accept the discount will pay in 20 days and the remaining 60% will continue to pay in 73 days, the new level of receivables will be [20/365 x ₦120m x 40%] + [73/365 x ₦120m x 60%] = ₦17,030,137

Cost of financing new receivables = 14% x ₦17,030,137 = ₦2,384,219.18

a. Savings in the cost of receivables = ₦3,360,000 - ₦2,384,219 = ₦975,781
b. Net benefit = savings on receivables – cost of discount
   i. = ₦975,781 - ₦1,440,000 = ₦464,219

The conclusion is that the discount should not be offered.

**Example 3 where receivables days is given**

Mokoya motors had an annual credit sale hank God for safe of ₦50 million, and all customers buy on credit. Customers are normally required to pay within 45 days. The cost of financing receivables is covered by an overdraft at an annual interest rate of 15%. It is now considering offering a cash discount of 1.5% for payment of debts within 10 days.

**Required:**

Should it be introduced if 60% of customers will take up the discount?

**Solution**

To determine if the early settlement discount should be introduced, a comparison must be made between the cost and the benefit.

**Cost of the discount and receivables without the discount**

₦50m revenue x 60% that accept the discount x 1.5% discount = ₦450,000

Average receivables without the discount = 45/365 x ₦50m = ₦6,164,380

**Benefits**

a. Calculate the cost of financing the current receivables without discount
b. Cost of financing current receivables = 15% x ₦6,164,380 = ₦924,660
c. Calculate the new receivables level and the cost of financing

60% of customers who accept the discount will pay in 10 days and the remaining 40% will continue to pay in 45 days, the new level of receivables will be [10/365 x ₦50m x 60%] + [45/365 x ₦50m x 40%] = ₦3,287,670

Cost of financing new receivables = 15% x ₦3,287,670 = ₦493,150

a. Savings in the cost of receivables = ₦924,660 - ₦493,150 = ₦431,510

b. Net benefit/cost = savings on receivables – cost of discount
= ₦431,510 - ₦450,000 = ₦18,490

The conclusion is that the discount should not be offered as the cost of discount exceeds the savings.

## 5.6 Trade payables as a source of finance

Trade credit allows the buyer to hold or make use of goods obtained from suppliers without yet having to pay for them. Trade credit is a common source of finance for businesses, where suppliers provide goods or services without immediate payment. Trade credit has no explicit interest charges. It is a short-term spontaneous financing with no cost.

It is a flexible and convenient source of finance that may not require formal agreements as they are automatically provided for by the supplier.

A company should take advantage of the trade credit terms offered, negotiate the best credit terms it can get, because it is a free source of finance for working capital. It should ensure that the credit period and amount is not exceeded, as this might destroy the trading relationship and shut this free source of finance.

The company should consider along with the credit terms, the penalties for late payments and the opportunity costs of early settlement discounts offered by the suppliers.

## 5.7 Early settlement discounts from suppliers

Settlement discounts may be given by suppliers to encourage the company to pay early. The value of a discount from a supplier is evaluated in the same way as the cost of settlement to a customer.

Discount from a supplier should only be accepted if the value of taking the discount is higher than the cost of financing the payment by bank overdraft and vice versa.

**Example**

Plateau stores buy goods from Shahad stores. Shahad has offered a 2% discount to Plateau stores if it pays in 10 days rather than after the normal credit period of 30 days.

Plateau Stores funds its working capital using overdraft at an annual interest rate of 12% per annum.

**Required:**

Should Plateau Stores accept the discount offered by Shahad Stores?

**Solution**

Value of the discount is $[1 + d / (100 - d)]^{365/t} - 1 = \{1 + 2/ 100 - 2\}^{365/ 30 - 10} - 1 =$ 44.6%

The value of the discount is higher than the overdraft finance cost. Plateau Stores should accept the discount from Shahad Stores.

## 5.8 Chapter review

At the end of this chapter, ensure you can:

a. explain how to establish a credit policy for accounts receivable;
b. explain the measures involved in recovering amounts expected from accounts receivable;
c. explain the pros and cons of early settlement discounts offered to receivables and the financial implications; and
d. discuss the features and costs associated with factoring and invoice discounting.

**Financial Management**

CHAPTER 6

# CASH MANAGEMENT

**Contents**

# 6 Cash management

## 6.0 Learning objective

This chapter discusses cash management as a component of working capital.

## 6.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. explain the reasons why a business should hold cash;
b. explain the use of cashflow forecast to determine future cash shortages or surpluses;
c. assess the benefits of a centralised treasury management system;
d. calculate the optimum cash management strategy using Baumol cash management model;
e. calculate the optimum cash management strategy using Miller-Orr cash management model; and
f. explain the ways in which a firm can invest or borrow cash short-term.

#### 6.1.2.1 Reasons for holding cash

There are several reasons why businesses need to hold cash which include:

a. Transactions motive: Cash required to settle transactions such as pay expenses and settle debts;
b. Precautions motive: Cash held to guide against unplanned expenditure; and
c. Speculative motive: Cash kept available to take advantage of market investment opportunities.

### 6.1.3 Objectives of good cash management

Every organisation should strive to balance between minimising the amount of idle cash held [profitability] and the ability to meet short term obligations when they fall due [liquidity]. There are three aspects of cash management which include:

a. cashflow forecasting to estimate the cashflow requirements and operational cashflows using a cash budget or cashflow forecast;
b. investment opportunities for any surplus cash; and
c. deciding on the optimal cash level.

## 6.2 Cash flow forecasts

A **cash flow forecast** is an estimate of cash receipts and payments for a future period under existing conditions before taking account of possible actions to adjust cash flow, raise new capital or invest surplus funds.

A **cash budget** is a commitment to a plan for cash receipts and payments for a future period after taking any action necessary to bring the cash forecast in alignment with the business plan.

Cash flow forecasts are different from cash budgets because, unlike cash budgets:

a. they are not part of a formal budget plan;
b. they are often prepared in less detail than a cash budget; and
c. they are prepared throughout the financial year.

### 6.2.1 Objectives of a cash flow forecast

a. Predict liquidity: Forecast cash inflows and outflows to predict liquidity needs.
b. Manage cash flow: Identify potential cash flow problems and take corrective action.
c. Inform business decisions: Provide insights for inform business decisions, such as investments or financing.
d. Identify funding needs: Determine funding requirements to meet cash flow needs.
e. Monitor and control: Monitor and control cash flow to ensure the business remains solvent.

### 6.2.2 Preparing cash flow forecasts from receipts and payments

Ensure that every type of cash inflow and receipts from customers, along with their timings are determined.

**Example**

ABC limited is preparing a cash flow forecast for the three-month period from October to the end of December for one of its branches. The following sales volumes have been forecast:

| Month | September | October | November | December | January |
|---|---|---|---|---|---|
| Sales units | 1,200 | 1,250 | 1,300 | 1,400 | 1,500 |

**Notes**

a. The selling price per unit is ₦800 and a selling price increase of 5% will occur in November. Sales are all on one month's credit.
b. Production of goods for sale takes place one month before sales.
c. Each unit produced requires two units of raw materials, costing ₦200 per unit. No raw materials inventory is held. Raw material purchases are on one month's credit.
d. Variable overheads and wages equal to ₦100 per unit are incurred during production and paid in the month of production.
e. The cash balance as at October 1 is expected to be ₦40,000.
f. A long-term loan of ₦300,000 will be received at the beginning of December.
g. A machine costing ₦400,000 will be purchased for cash in December.
h. Another machine costing ₦250,000 will be purchased in February.

**Required:**

Prepare a cash flow forecast showing the cash balance at the end of each month, October to December

**Solution**

| | October | November | December |
|---|---|---|---|
| | ₦'000 | ₦'000 | ₦'000 |
| Sales | 960 | 1,000 | 1,092 |
| Loan | | | 300 |
| **Total inflow** | **960** | **1,000** | **1,392** |
| | | | |
| Raw materials | 500 | 520 | 560 |
| Variable costs | 130 | 140 | 150 |
| Machine | | | 400 |
| **Total outflow** | **630** | **660** | **1,110** |
| | | | |
| Opening balance | 40 | 370 | 710 |
| Net cash flow | 330 | 340 | 282 |
| **Closing balance** | **370** | **710** | **992** |

**Workings 1- sales**

| | September | October | November | December | January | |
|---|---|---|---|---|---|---|
| | 1,200 | 1,250 | 1,300 | 1,400 | 1,500 | |
| Selling price | 800 | 800 | 840 | 840 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sales | 960 | 1,000 | 1,092 | 1,176 | | |

**Workings 2 – Raw materials**

| | September | October | November | December |
|---|---|---|---|---|
| Production [units] | 1,250 | 1,300 | 1,400 | 1,500 |
| Raw materials [units] | 2,500 | 2,600 | 2,800 | 3,000 |
| Raw materials [₦'000] | 500 | 520 | 560 | 600 |
| Month payable | October | November | December | January |

**Workings 3 – Variable costs**

| | September | October | November | December |
|---|---|---|---|---|
| Production [units] | 1,250 | 1,300 | 1,400 | 1,500 |
| Variable costs [[₦'000] | 125 | 130 | 140 | 150 |
| Month payable | September | October | November | December |

## 6.3 Cash Models [Baumol model and Miller-Orr model]

Cash models can be used to assess the cash decisions an organisation should take when it has surplus cash or cash deficit. This implies that a cash model can assist with deciding:

a. how much cash to hold;
b. when cash is needed;
c. when cash is in surplus or deficit;
d. how much cash to invest in the short term to earn interest; and
e. how many investments to sell to obtain cash.

Cash management models are usually structured to minimise the total cost involved in holding and investing cash.

Two of such models are the

a. Baumol model
b. Miller-Orr model

### 6.3.1 Baumol cash management model

This model is based on similar principles to the economic order quantity [EOQ] model for inventory control which assumes that companies regularly sell investments to raise cash for settling their operational expenses.

The Baumol model shows the optimal amount of cash that should be obtained each time short-term investments are sold.

### 6.3.2 Assumptions of the Baumol model include:

a. Cash usage is constant daily throughout the year and predictable.
b. Cash inflows are known and regular.
c. Cash can be replenished immediately, once there is shortage.
d. Holding cash has a cost which is the opportunity cost for not investing to earn interest.
e. Cash is replenished by selling short term investments.
f. There is a transaction cost involved in selling securities or investments to obtain cash.

### 6.3.3 Formulae for optimal cash under Baumol model

The optimal amount of cash can be represented with Q just like in inventory
Average cash holding is Q/2
$C_o$ represents transaction cost which covers all costs involved in making a trade or moving funds like brokerage cost, commission cost and others
D represents demand for cash over the period relates to cash needs for today's transactions.
$C_H$ represents the cost of holding cash which represents the opportunity cost of the lost return for not investing or the cost of borrowing to get cash.
Annual cost of holding cash = $Q/2 \times C_H$
Annual transaction costs of selling investments = $D/Q \times C_o$

| Annual cash holding costs = Annual transaction cost |
|---|

| Holding cost x Quantity / 2 = transaction cost x Demand / quantity |
|---|

$$C_H Q / 2 = C_o D / Q$$

$$\mathbf{Q = \sqrt{2C_oD / C_H}}$$

Q is optimal amount of cash, $C_H$ is cash holding cost , D is demand for cash over the period, and $C_o$ is transaction costs.

The model tries to calculate Q, which is the amount of cash that minimises the total cost of holding cash and the transaction cost of selling investments.

The model results imply that when interest rates are high, the cash balance held in accounts should be low.

Its major limitation is the fact that the assumptions seem unrealistic.

**Example**

Springboard limited makes payments to its suppliers worth ₦18 million a year. The transaction charge of ₦150 will be paid each time investments are converted to cash. The opportunity cost of holding cash rather than investing is 6% per annum.

The payment is assumed to be constant daily.

**Required:**

Using the Baumol model,

a. calculate what quantity of investments should be sold whenever cash is needed by Springboard
b. calculate the number of cash transfers during the year

**Solution**

$\mathbf{Q = \sqrt{2C_O D / C_H}}$

**D =** ₦18 million

$C_o$ = ₦150

$C_H$ = 6%

$Q = \sqrt{2 \times 150 \times 18{,}000{,}000 / 0.06}$ = ₦300,000

Number of transfers = D/Q = 18,000,000 / 300,000 = 60 transfers per annum.

**Example 2**

Talkshop has a monthly cash surplus of ₦30,000. It plans to invest the constant monthly surplus in short term securities. The interest rate expected on its investment is 8% per annum. The constant transaction cost for each fund invested is ₦25.

**Required:**

a. What is the optimum cash to be invested per transaction?
b. How many transactions will be made per annum.

c. What is the total transaction cost per annum.
d. What is the opportunity cost of holding cash per annum?

**Solution**

The demand per annum would be the monthly cash surplus of ₦30,000 x 12 = ₦360,000

a. **$Q = \sqrt{2C_OD / C_H}$ =** $\sqrt{2 \times 25 \times 360{,}000 / 0.08}$ = ₦15,000
b. number of transactions per year = D / Q = 360,000 / 15,000 = 24
c. annual transaction cost = $C_O$ x number of transactions = 24 x ₦25 = ₦600
d. annual holding cost = Q / 2 x $C_H$ = 15,000 / 2 x 8% = ₦600

### 6.3.3 Miller Orr Model

The Miller-Orr model is a cash management model that helps firms determine the optimal cash balance. This model controls the uncertainty of cash by the setting of

### 6.3.4 Assumptions of Miller Orr Model

a. The cash flows are uncertain and can be measured statistically
b. Upper and lower control limits can be set for cash balances
c. Transaction costs will arise for buying/selling securities
d. There is an opportunity costs for holding cash

How the model works

a. Management decides the minimum cash to be held known as the lower limit.
b. There is also a maximum cash that can be held known as the upper limit.
c. The difference between the lower limit and the upper limit is the spread.
d. The cash balance is expected to fluctuate between the upper and lower limits but should not exceed these limits.
e. The distance between the lower limit and the return point is usually 1/3 of the total spread.
f. The distance between the upper limit and the return point is usually 2/3 of the total spread.
g. If the cash balance falls to the lower limit, then investments will be converted to cash, to take the balance to the predetermined amount known as the return point.
b. If the cash balance reaches the upper limit, cash is used to buy investments. The amount of cash used to buy investments is sufficient to return the cash balance to the return point.

**Formula for Optimal cash under Miller Orr model**

**Spread** =

3 x 3√{3/4 x transaction cost x variance of cashflows / interest rate as a proportion}

**Upper limit**

= lower limit + Spread

**Return point**

= lower limit + [1/3 x Spread]

a. The transaction cost is the cost of sale and purchase of securities.
b. The variance of cash flows shows the measure of variation in the daily net cashflows. The variance should relate to the same period of time as the interest rate. Variance is the square of standard deviation.
c. Variance and interest rates are preferably expressed in daily terms.

**Example**

The management of Akagum plc has agreed that its minimum cash balance should be ₦25,000. The anticipated standard deviation of its daily cashflows based on trend is ₦2,000.

The estimated transaction cost per purchase or sale of short-term investments is ₦75 and the annual market interest rate on short term investments is 8%.

**Required:**

calculate the upper cash limit and the return point using the Miller Orr model.

**Solution**

The variance and the interest rate period must be on same basis.

Variance of daily cashflows = standard deviation$^2$ = 2000$^2$ = 4,000,000

Daily interest rate = 0.08 / 365 = 0.000219

**Spread** = 3 x 3√{3/4 x transaction cost x variance of cashflows / interest rate as a proportion}

Spread = 3 x 3√{3/4 x 75 x 4,000,000 / 0.000219} = ₦30,263

Lower limit = ₦25,000

Upper limit = lower limit + spread = ₦25,000 + ₦30,263 = ₦55,263

Return point = lower limit + [1/3 x spread] = = ₦25,000 + [1/3 x ₦30,263] = ₦35,088

## 6.4 Short term investment

Short term cash investments are used for temporary cash surpluses. Cash surplus arises when an organisation has cash that it does not need immediately for its daily operations. Every entity should plan to invest any surplus cash identified, as it is wasteful to hold it or keep it in the bank that pays minimal or no interest.

Surplus cash are usually temporary and should be invested in short term investments.

### 6.4.1 Factors to consider when making decisions on temporary surplus cash

a. Liquidity – the investment should be easily and quickly convertible to cash at a fair price.

b. Safety – the investment risk level must be acceptable. There should be little or no risk of loss.

c. Profitability – the investment chosen should be the one that gives the highest possible return on the surplus cash balancing the objectives of liquidity and safety.

### 6.4.2 Short term investment options

a. Savings accounts and interest earning deposits

b. Money market investments such as treasury bills and certificate of deposits.

   i. A Treasury bill (T-bill) is a short-term government debt security with a maturity period ranging from a few weeks to a year. T-bills are used by governments to finance their short-term expenditures and are considered low-risk investments.

   ii. A Certificate of Deposit (CD) is a type of savings account offered by banks with a fixed interest rate and maturity date. CDs tend to be low-risk investments, providing a slightly higher interest rate than traditional savings accounts in exchange for keeping your money locked in the CD for the agreed-upon term.

c. Short-dated government bonds are debt securities issued by governments with a maturity period of less than 5 years. They are used to finance government activities and offer returns in the form of interest payments. They are an attractive short-term investment when they are nearing their maturity.

## 6.5 Treasury management

Treasury management involves managing an organisation's financial resources, including cash, investments, and funding. It aims to optimise liquidity, minimize risk, and maximize returns.

The central treasury department is responsible for making sure that cash is available in the right amounts, at the right time and in the right place.

### 6.5.1 Functions of a treasury department

A Treasury Department typically performs the following functions:

a. Cash management: Managing cash inflows and outflows, forecasting cash needs.
b. Funding and financing: Arranging loans, credit facilities, and other funding sources.
c. Investment management: Investing surplus funds, managing investment portfolios.
d. Risk management: Identifying and mitigating financial risks, such as interest rate and foreign exchange risks.
e. Banking relationships: Managing relationships with banks and other financial institutions.
f. Financial planning and forecasting: Providing financial insights and forecasts to support business decisions.
g. Liquidity management: Ensuring sufficient liquidity to meet financial obligations.
h. Payment and settlement: Managing payment processes, settlements, and transactions.

### 6.5.2 Benefits of centralised treasury management

Centralised Treasury Management refers to the concentration of treasury functions and decision-making within a single team or department, typically at the corporate or headquarters level.

a. Improved control: Enhanced oversight and management of cash, risk, and investments.
b. Increased efficiency: Streamlined processes, reduced duplication, and better resource allocation.
c. Better risk management: Consolidated risk management, hedging, and mitigation strategies.
d. Optimised liquidity: More effective cash management, reduced idle balances, and improved funding.

e. Enhanced visibility: Consolidated reporting, improved transparency, and informed decision-making.
f. Cost savings: Reduced banking fees, improved negotiation power, and optimised funding costs.
g. Standardisation: Consistent policies, procedures, and systems across the organisation.

## 6.6 Chapter review

At the end of this chapter, ensure you can:

a. explain the reasons why a business should hold cash
b. explain the use of cashflow forecast to determine future cash shortages or surpluses
c. assess the benefits of a centralized treasury management system
d. calculate the optimum cash management strategy using baumol cash management model.
e. calculate the optimum cash management strategy using miller-orr cash management model.
f. explain the ways in which a firm can invest or borrow cash short-term

**Skills Level**

**Financial Management**

CHAPTER 7

**WORKING CAPITAL INVESTMENT AND FUNDING STRATEGIES**

**Contents**





## 7 Working capital investment and funding strategies

## 7.0 Learning objective

This chapter discusses working capital investment and funding strategies.

## 7.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. calculate the appropriate amount of investment in working capital;
b. explain the factors that determine the appropriate level of investment in working capital; and
c. evaluate and discuss the key factors in determining working capital funding strategies.

## 7.2 Investment in working capital

Investment in working capital refers to the total amount an organisation invests in working capital. The total amount an entity invests in working capital should be managed carefully, that is not too high nor too low.

The total investment in working capital is calculated as:

| | ₦ | ₦ |
|---|---|---|
| **Current assets** | | |
| Inventory | | xxx |
| Trade receivables | | xxx |
| Short term investment | | xxx |
| Cash | | xxx |
| | | **xxx** |
| **Minus current liabilities** | | |
| Bank overdraft | xxx | |
| Trade payables | xxx | |
| Other current liabilities | xxx | |
| | | **[xxx]** |
| **Investment in working capital** | | **xxx** |

Investment in working capital involves the cost of financing or the opportunity cost of lost investment opportunities since the cash is tied up and unavailable to other uses. Working capital is financed with long term capital [debt or equity].

**The cost of investing in working capital is calculated as**

Annual cost of working capital = average investment in working capital multiplied by the annual cost of finance [%]

The amount to invest in working capital is a decision between having sufficient finance [not excess] and the cost of financing the working capital.

### 7.2.1 The required level of investment in working capital

Every organisation should establish a policy on what the required investment in working capital should be. The required investment in working capital is dependent on the following factors:

a. The length of the working capital cycle;
b. The working capital risk management policy; and
c. The industry in which the organisation operates.

### 7.2.2 The length of the working capital cycle

Different sectors would have different working capital requirements. The working capital cycle refers to the time taken from when payment is made to the raw materials suppliers to when payment is received from customers.

The length of the working capital cycle in the manufacturing industry is likely to be higher than the retailing industry due to the nature of the business. The retail business is usually on a cash basis and may not hold goods in inventory for long resulting in a shorter working capital cycle.

In a manufacturing company, the working capital cycle also includes three additional stages:

a. raw materials storage: the time raw materials are stored before being used in production.
b. work-in-progress (WIP): the time products spend in the production process, from the start of manufacturing to completion.
c. finished goods inventory: the time finished goods are held in inventory before being sold to customers.

The terms of trade will also affect the working capital cycle.

### 7.2.3 Working capital investment levels

The working capital ratios can be used to estimate the future levels of investment required.

**Example**

Kobaje holdings has the following expectations for the next period

| | ₦ |
|---|---|
| Sales | 100 |
| Materials | [60] |
| Other costs | [20] |
| Profit | 20 |

The following working capital ratios are expected to apply

| | |
|---|---|
| Inventory days | 15 days |
| Receivables days | 30 days |
| Payables days | 20 days |

**Required:**

Calculate the working capital requirement of Kobaje, if there are 365 days in a year.

**Solution**

| | | ₦m |
|---|---|---|
| Inventory | 15/365 x 60 | 2.47 |
| Receivables | 30/365 x 100 | 8.22 |
| Payables | 20/365 x 60 | [3.29] |
| Working capital required | | 7.40 |

**Example**

The following data relate to Kabari Co, a manufacturing company.

| | |
|---|---|
| Sales revenue for the year | ₦4,500,000 |
| Costs as percentage of sales | |
| Direct materials | 30% |
| Direct labour | 25% |
| Variable overheads | 10% |
| Fixed overheads | 15% |
| Selling and distribution | 5% |

Average statistics relating to working capital are as follows

a. Receivables take 2.5 months to pay.
b. Raw materials are in inventory for three months.
c. WIP represents two months half produced goods.
d. Finished goods represent one month's production
e. Credit is taken

| | | |
|---|---|---|
| i. | Materials | 2 months |
| ii. | Direct labour | 1 week |
| iii. | Variable overheads | 1 month |
| iv. | Fixed overheads | 1 month |
| v. | Selling and distribution | 0.5 month |

WIP and finished goods are valued at the cost of material, labour and variable expenses.

**Required:**

Calculate the working capital requirement of Kabari Co, assuming that the labour force is paid for 50 working weeks in a year.

**Solution**

| Cost incurred | | ₦ |
|---|---|---|
| Direct materials | 30% x 4,500,000 | 1,350,000 |
| Direct labour | 25% x 4,500,000 | 1,125,000 |
| Variable overhead | 10% x 4,500,000 | 450,000 |
| Fixed overhead | 15% x 4,500,000 | 675,000 |
| Selling and distribution | 5% x 4,500,000 | 225,000 |

Working capital investment

| **Current assets** | | **₦** |
|---|---|---|
| Finished goods | 1/12 x 2,825,000 | 235,417 |
| Raw materials | 3/12 x 1,350,000 | 337,500 |
| WIP | 1/12 x 2,825,000 | 235,417 |
| Receivables | 2.5/12 x 4,500,000 | 937,500 |
| **Total current assets** | | **1,745,834** |
| **Current liabilities** | | |
| Materials | 2/12 x 1,350,000 | 225,000 |
| Labour | 1/50 x 1,125,000 | 22,500 |
| Variable overhead | 1/12 x 450,000 | 37,500 |
| Fixed overhead | 1/12 x 675,000 | 56,250 |
| Selling and distribution | 0.5/12 x 225,000 | 9,375 |

| | | |
|---|---|---|
| **Total current liabilities** | | **350,625** |
| **Working capital required** | | **1,395,209** |

The WIP is based on 1 month because it is 2 months half produced which is equivalent to 1 month.

### 7.2.4 Working capital risk management policy

The organisation could decide to go for an aggressive or a conservative working capital policy. A management team with a high-risk appetite will prefer the aggressive policy while a risk averse management would prefer a more conservative working capital policy**.**

### 7.2.5 Aggressive working capital policy

An organisation that decides to have a lower level of working capital than competitors is said to have an **aggressive working capital policy**. The aggressive policy is one that is focused on keeping the working capital to a minimum.

An aggressive working capital policy is a strategy that aims to minimize the investment in working capital by reducing the levels of current assets, such as inventory and accounts receivable, and maximizing the use of current liabilities, such as accounts payable. An aggressive policy will result in higher profitability and higher risk.

**Characteristics and implications of the aggressive working capital policy**

a. Low level of finished goods which brings the risk of lost sales.
b. Low raw material stock which could lead to stock outs, idle time and high cost of replacement.
c. A short receivables collection period via tight credit controls may lead to loss of customers.
d. The long payables payment period may create a risk of the suppliers cancelling orders.
e. Low level of investment in working capital is cheaper to finance

**Benefits**:

a. Improved liquidity: Aggressive working capital policies can improve liquidity by reducing the investment in working capital.
b. Increased efficiency: Implementing efficient working capital management practices can lead to cost savings and improved productivity.

c. Enhanced profitability: By reducing the investment in working capital, companies can increase their profitability and return on investment.

**Risks**:

a. Increased risk of stockouts: Maintaining low inventory levels can increase the risk of stockouts and lost sales.
b. Damage to supplier relationships: Aggressive accounts payable management can damage relationships with suppliers and vendors.
c. Increased risk of liquidity crises: Relying heavily on short-term financing can increase the risk of liquidity crises if the company is unable to meet its short-term obligations.
d. Reduced flexibility: Aggressive working capital policies can reduce a company's flexibility to respond to changes in the market or economy.

### 7.2.6 Conservative working capital policy

A **conservative working capital** policy is a strategy that prioritizes liquidity and minimizes risk by maintaining high levels of current assets, such as cash, inventory, and accounts receivable, and minimising the use of current liabilities, such as accounts payable.

**Characteristics and implications of the aggressive working capital policy**

a. High cash reserves: Maintaining high levels of cash and cash equivalents to ensure liquidity and meet unexpected expenses.
b. High inventory levels: Holding high levels of inventory to ensure that the company can meet customer demand and avoid stockouts.
c. Lenient credit terms: Offering flexible credit terms to customers to encourage sales and build customer relationships.
d. Low reliance on short-term financing: Minimising the use of short-term financing options, such as commercial paper and lines of credit, to reduce the risk of liquidity crises.
e. Focus on long-term relationships: Prioritizing long-term relationships with suppliers and customers to ensure stability and predictability.

**Benefits**

a. Reduced risk: A conservative working capital policy can reduce the risk of liquidity crises and ensure that the company can meet its short-term obligations.
b. Increased flexibility: Maintaining high levels of liquidity can provide the company with the flexibility to respond to changes in the market or economy.
c. Improved relationships: Prioritising long-term relationships with suppliers and customers can lead to improved relationships and increased loyalty.

**Risks**

a. Opportunity cost: Maintaining high levels of cash and inventory can result in opportunity costs, as these funds could be invested in other areas of the business.
b. Increased costs: Holding high levels of inventory can result in increased storage and handling costs.
c. Reduced profitability: A conservative working capital policy can result in reduced profitability, as the company may be holding excess cash and inventory that could be invested more productively.

## 7.3 Working Capital Funding Strategies

A firm must decide what source of finance is best used for the funding of working capital requirements. In determining the best finance policy for working capital, there is a need to understand the following:

a. The extent to which current assets are permanent or fluctuating;
b. Working capital may be permanent or fluctuating;
c. Finance could be short term or long term which has its costs and risks; and
d. The risk attitude of management.

### 7.3.1 Permanent and fluctuating current assets

**Permanent current assets** refer to that proportion of the current assets that are fixed over time such as buffer stock, receivables during the credit period and minimum cash balance.

**Fluctuating current assets** refer to assets that constantly change in value or quantity due to business operations. Examples include inventory held for sale, amount owed to the company by customers and liquid funds available for daily operations.

These assets fluctuate due to factors like: Seasonal demand, Sales cycles, Production levels and Customer payment terms.

**Permanent and fluctuating working capital**

a. **Permanent working capital** refers to the minimum amount of working capital that a company needs to maintain to support its ongoing operations and meet its short-term obligations. It is the working capital which is required all the time. It includes the minimum level of inventory, trade receivables and trade payables. As the name implies it is fixed in nature, a long-term requirement and is essential for the day-to-day running of the business.

b. **Fluctuating working capital** refers to the variable amount of working capital that a company needs to support its operations and meet its short-term obligations, which can change over time due to various factors such as seasonal fluctuations, changes in demand, or production schedules. It is required at certain times in the business cycle. It is variable in nature, a short term requirement and usually tied to a business cycle.

## 7.4 Funding of working capital

Short term finance is less expensive but has a higher risk of being withdrawn while long term finance [debt and equity] is more expensive but with lower risk.

a. **Aggressive funding policy** uses long term finance to fund non-current assets and short-term finance to fund all working capital requirements. It is risky but profitable.

b. **Matching funding policy** uses long term finance and permanent working capital but uses short term finance to fund fluctuating working capital. The duration of the finances is matched to the duration of the investment.

c. **Conservative funding policy** uses long term finance to fund non-current assets, permanent working capital and a proportion of fluctuating working capital. Little short-term finance may be used. It is stable but expensive.

In summary, the final choice of working capital funding should critically consider the following factors:

a. the size of the organization;
b. the willingness of creditors to lend;
c. the risks of the industry; and
d. past experiences or funding decisions.

## Test questions on working capital management

### Illustration 1

JEJELAIYE Plc is considering making the following changes in the area of working capital management.

**Inventory management**

It has been suggested that the economic order quantity model (EOQ) be adopted to determine the order size for its major product - Kidpack .

The company forecasts that demand for product Kidpack will be 120,000 units in the coming year and it has traditionally ordered 10% of annual demand per order. The ordering cost is expected to be ₦500 per order while the holding cost is expected to be ₦6 per unit per year. A buffer inventory of 2,000 units of Kidpack will be maintained, whether orders are made by the traditional method or using the economic ordering quantity model.

**Receivables management**

The company could introduce an early settlement discount of 2% for all customers who pay within 30 days and at the same time, through improved operational procedures, maintain a maximum average payment period of 60 days for credit customers who do not take the discount. It is expected that 35% of credit customers will take the discount if it were offered.

It is expected that administration and operating cost savings of ₦1,200,000 per year will be made after improving operational procedures and introducing the early settlement discount.

Credit sales of the company are currently ₦438 million per year and trade receivables are currently ₦90 million. Credit sales are not expected to change as a result of the changes in receivables management. The company has a cost of short-term finance of 7% per year.

**Required**:

a. Calculate the cost of the current ordering policy and the changes in the cost of inventory management that will arise if the economic order quantity is used to determine the optimum size order for product Kidpack.
b. Briefly describe the benefits of a JUST In Time (JIT) procurement policy.

c. Calculate and comment on whether the proposed changes in receivables management will be acceptable. Assuming that only 25% of customers take the early settlement discount, what is the maximum early settlement discount that could be offered.
d. Discuss the factors that should be considered in formulating working capital policy on the management of trade receivables.

**Illustration 2**

Last Attempt Group trades solely over the internet. In the last year, the company had sales of ₦75 million. All sales were on 30 days credit to commercial customers. Extracts from the company's most recent statement of financial position are trade receivables ₦12,330,000 trade payables ₦11,000,000 and overdraft ₦3,000,000.

In order to encourage customers to pay on time, it proposes introducing an early settlement discount of 2% for payment within 30 days, while increasing its normal credit period to 45 days. It is expected that on average, 20% of customers will take the discount and pay within 30 days, 30% of customers will pay after 45 days and 50% of customers will not change their current paying behaviour.

The company currently orders 25,000 units per month of Antivirus, demand for which is constant. There is only one supplier of the antivirus and the cost over the last year was ₦400,000. The supplier has offered a 1.5% discount for orders of 40,000 units or more of the antivirus. Each order costs ₦300 to place and the holding cost is 50kobo per unit per year. Last Attempt Group has an overdraft facility charging interest of 7.5% per year.

**Required**:

a. Calculate the net benefit or cost of the proposed changes in trade receivables policy and comment on your findings.
b. Calculate whether the bulk purchase discount offered by the supplier is financially acceptable and comment on the assumptions made by your calculations.
c. Critically discuss the similarities and differences between working capital policies in the following areas:
   i. Working capital investment
   ii. Working capital financing

**Illustration 3**

Tayo furniture, a company managed by the family representatives, that lack business management skills. They are a furniture making company.

The company has revenue of ₦28m, and all sales are on 30 days credit. Tayo furniture is a rapidly growing company with increasing revenue over the years. Its major customers are interior decorators who are often late in paying their invoices.

Its average trade receivables are currently ₦5.37m, and 2% of the current credit sales are bad debts. The company has suffered some liquidity challenges and has currently reached its overdraft limit partly due to poor credit control. The management team have spent large amounts of time chasing customers for payment.

To improve trade receivables management, Tayo furniture has approached a factoring company.

The factoring company has offered two possible options:

**Option 1**

Administration by the factor of Tayo furniture's invoicing, sales accounting and receivables collection on a full recourse basis. The factor would charge a service fee of 0.5% of credit sales revenue per year. Tayo furniture estimates that this would result in savings of ₦30,000 per annum in administration costs. Under this arrangement, the average trade receivables collection period would be 30 days

**Option 2**

Administration by the factor of Tayo furniture's invoicing, sales accounting and receivables collection on a non-recourse basis. The factor would charge a service fee of 1.5% of credit sales revenue per year. Tayo furniture estimates that this would result in savings of ₦30,000 per annum in administration costs. Under this arrangement, the average trade receivables collection period would be 30 days. Tayo furniture would be required to accept an advance of 80% of credit sales when invoices are raised at an interest rate of 9% per year.

Tayo furniture pays interest on its overdraft at a rate of 8% per year and the company operates for 365 days per year.

**Required:**

a. Calculate the costs and benefits of each of option 1 and option 2 and comment on your findings.

b. Discuss reasons [other than benefits and costs already calculated] why Tayo furniture may benefit from the services offered by the factoring company.
c. Discuss three factors which determine the level of a company's investment in working capital.

**Solutions**

**Illustration 1**

**A part of the question**

| **Current Ordering policy** | | |
|---|---|---|
| Order size = Q | 10% x 120,000 | 12,000 units per order |
| Number of orders per year | demand/quantity= 120,000 / 12,000 | 10 orders per year |
| Annual ordering cost | 10 x ₦400 | ₦4,000 |
| Holding cost excluding buffer stock | 12,000 /2 x ₦6 | ₦36,000 |
| Holding cost for buffer stock | 2,000 x ₦6 | ₦12,000 |
| **Total cost of current ordering policy** | 4,000 + 36,000 + 12,000 | **₦52,000** |
| | | |
| **Cost of the Ordering policy using EOQ model** | | |
| Order size = EOQ | √2 x 120,000 x 400 / 6 | 4,000 units per order |
| Number of orders per year | 120,000 / 4,000 | 30 orders per year |
| Annual ordering cost | 30 x ₦400 | ₦12,000 |
| Holding cost excluding buffer stock | 4,000 /2 x ₦6 | ₦12,000 |
| Holding cost for buffer stock | 2,000 x ₦6 | ₦12,000 |
| **Total cost with EOQ** | 12,000 + 12,000 + 12,000 | **₦36,000** |
| **Savings by using EOQ** | **₦52,000 - ₦36,000** | **₦36,000** |

**B Part of the question**

The benefits of a JIT procurement policy include:

a. Holding costs can be reduced by reducing the level of inventory held by a company. JIT procurement ensures that the company orders supplies only when it needs them, avoiding the need to keep inventory.

b. It leads to a lower investment in working capital since inventory level have been minimised, and reduction in material handling cost.
c. It ensures that there is an improved relationship with suppliers, since supplier and customer need to work closely together for success.
d. It leads to improved operational efficiency due to the need to streamline production methods to eliminate inventory between different production stages.
e. It would also lead to lower reworking costs as emphasis is placed on maintaining the quality of production.

**C Part of the question**

This involves assessing the changes in receivables management.

With reduced receivables, there would be a savings in the costs of financing the receivables and vice versa. To evaluate the receivables:

a. Calculate the revised receivable days due to the discount
Current level of receivables days = 90m/438m x 365 = 75 days
Since 35% of customers will take the discount and pay in 30 days, then 65% will reject the discount and continue to pay in 60 days
Revised receivable days = [35% x 30] + [65% x 60] = 49.5 days

b. Calculate the reduction in financing receivables and cost saved.
Current receivables amount = ₦90 million
Revised receivables amount due to discount = 49.5 / 365 x 438m = ₦59.4million
Reduction in receivables amount = ₦90 million - ₦59.4million = ₦30.6million
Savings in the Cost of financing = 7% x ₦30.6million = ₦2.14million
Total savings = savings in financing cost + savings in administrative cost
Total savings = ₦2.142million + = ₦1.2million = = ₦3.342million
Cost of early settlement discount = credit sales x % of customers accepting discount x cost of discount = ₦438 million x 35% x 2% = = ₦3.066million

c. Calculate the Net benefit
Total savings =₦3.342million
Total costs = ₦3.066million
Net benefit = ₦0.276million
The proposed changes in receivables management are therefore financially viable.

The maximum discount to be offered is one where the costs of the discount equals the benefit.
Total benefits = =₦3.342million
Annual credit sales = 35% x ₦438million = ₦153.3million
Maximum discount = Total benefits / annual credit sales x 365 = (3.342 / 153.3) x 100 = 2.18%

**D part of the question**

Factors to be considered when formulating working capital policy on the management of trade receivables include:

a. The level of investment in trade receivables – the aim is usually to reduce the amount by tighter control and improved methods of credit assessment.
b. The cost of financing trade credit – this involves reducing the amount of credit offered and the period in which they are offered.
c. The terms of trade offered by competitors – this must be considered to avoid loss of customers.
d. The acceptable risk level of the company – this involves balancing the expected increase in sales with the risk of bad debts from the credit period. The risks of the bad debts can be insured by factors or other ways.
e. The need for liquidity – this determines how we can convert our receivables to immediate cash at a cost.

**Solution to question 2**

**A Part of the question**

Current receivables days = (12,330,000 / 75,000,000) x 365 = 60 days

Revised receivables days = (20% x 30) + (30% x 45) + (50% x 60) = 49.5 days

Current receivables = ₦12,330,000

Revised receivables = 49.5 / 365 x 75,000,000 = ₦10,171,232.88

Decrease in receivables = ₦12,330,000 - ₦10,171,232.88 = ₦2,158,767.12

**Savings in financing costs** = 7.5% x ₦2,158,767.12 = ₦161,907.53

**Cost of discount** = 75,000,000 x 2% x 20% = ₦300,000

**Net cost of the proposed changes** = ₦300,000 - ₦161,907.53 = ₦138,092.47

The policy is not viable as the cost of the discount exceeds the savings in receivable. This analysis assumes constant sales and no bad debts which may be unrealistic.

**B Part of the question**

**Cost of current inventory policy**

Cost of materials = ₦400,000 per year

Annual ordering cost = number of orders x cost per order = 12 x 300 = ₦3,600

Annual holding cost = 25,000 / 2 x ₦0.50 = ₦6,250

Total cost = 400,000 + 3,600 + 6,250 = ₦409,850

**Cost of inventory after bulk discount**

Cost of materials = ₦400,000 x 98.5% = ₦394,000

Annual demand = 25,000 x 12 = 300,000 units

Revised number of orders = 300,000 / 30,000 = 10 orders per year

Revised ordering cost = 10 x 300 = ₦3,000

Revised holding cost = 30,000 / 2 x ₦0.50 = ₦7,500

Total cost = 394,000 + 3,000 + 7,500 = ₦404,500

Net benefit of the discount is ₦5350 {409,850 – 404,500}.

The policy seems viable based on the assumptions. In practice, most of these assumptions may be unrealistic.

**C Part of the question**

Working capital investment policy is concerned with the level of investment in current assets, with one company compared with another. Working capital financing policy is concerned with the relative proportions of short-term and long-term finance used by a company.

Working capital investment policy is evaluated on inter-company comparative basis while working capital financing policy involves analysing financial information for one company alone.

Working capital financing policy uses an analysis of current assets into permanent current assets and fluctuating current assets while working capital investment policy does not require the analysis. Permanent current assets represent the core level of investment in current assets that supports a given level of business activity while fluctuating current assets represent the changes in the level of current assets that arise through uncertainty of business operations like receivables increasing due to customers paying late or increase in inventory due to seasonal demand.

Working capital financing policy relies on the matching principle, which is not used by working capital investment policy. The matching principle holds that long term assets should be financed from a long-term source of finance. Non-current assets and permanent current assets should therefore be financed from a long-term source of finance like debt and equity while fluctuating current assets should be financed from a short term source like bank overdraft or short-term loan.

In summary, both policies use similar terminology but are different in meaning and application.

**Solution to Illustration 3**

**Option 1**

| | ₦ | ₦ |
|---|---|---|
| Current trade receivables | 5,370,000 | |
| Revised trade receivables [28,000,000 x 30/365] | 2,301,370 | |
| Reduction in receivables | 3,068,630 | |
| | | |
| Reduction in financing cost [3,068,630 x 7%] | 214,804 | |
| Reduction in admin costs | 30,000 | |
| Benefits | | 244,804 |
| Factor's fee [28,000,000 x 0.5%] | | [140,000] |
| **Net benefit** | | **104,804** |

**Option 2**

| | ₦ | ₦ |
|---|---|---|
| Current trade receivables | 5,370,000 | |
| Revised trade receivables [28,000,000 x 30/365] | 2,301,370 | |
| Reduction in receivables | 3,068,630 | |
| | | |

| | | |
|---|---|---|
| Reduction in financing cost [3,068,630 x 7%] | 214,804 | |
| Reduction in admin costs | 30,000 | |
| Bad debts saved [28,000,000 x 2%] | 560,000 | |
| **Benefits** | | 804,804 |
| Factor's fee [28,000,000 x 1.5%] | 420,000 | |
| Increase in finance cost [2,301,370 x 80% x 2%] | 36,822 | |
| | | [456,822] |
| **Net benefit** | | **347,982** |

Both options are financially acceptable with option 2 showing greater benefits and so should be accepted.

**B Part of the question**

The company may benefit from the services offered by the factoring company for a number of different reasons, as follows:

a. Economies of specialisation: Factors are specialist in trade receivables, management and therefore can help make the receivables pay on time.
b. Cost effective: Factors fees are usually cheaper that the internal cost of managing receivables.
c. Free up time: Factor frees time for management to focus on more important tasks rather than persuading receivables to pay.
d. Bad debts insurance: In a non-recourse basis, the factor shields the company from non-payment by customers.
e. Source of finance: Factor finance can be useful to companies who have exhausted other sources of finance.

**C Part of the question**

A company's working capital investment is equal to the sum of its inventories, accounts receivables and accounts payables.

The following factors will determine the level of company's investment in working capital:

a. The nature of the industry and the length of the working capital cycle – some sectors have long production processes which inevitably lead to long working capital cycles and large investments in working capital.

b. Working capital investment policy – some companies take a conservative approach to working capital investment, offering long periods of credit to customers, carrying high levels of inventory and paying suppliers promptly. Others take a more aggressive approach offering minimal credit, carrying low levels of inventory and delaying payment to suppliers.

c. Efficiency of management and terms of trade – if the components of working capital are well managed, the investment in working capital will decrease and vice versa.

## 7.5 Chapter review

At the end of this chapter, ensure you can:

a. calculate the appropriate amount of investment in working capital;

b. explain the factors that determine the appropriate level of investment in working capital; and

c. evaluate and discuss the key factors in determining working capital funding strategies.



**Skills Level**

**Financial Management**

CHAPTER 8

# INTRODUCTION TO INVESTMENT APPRAISAL

**Contents**





## 8 Introduction to investment appraisal

### 8.0 Learning objectives

This chapter introduces investment appraisal to readers.

### 8.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. ability to identify and apply relevant costs in capital investment decisions;
b. understanding the various investment evaluation methods;
c. ability to incorporate strategic factors in investment decision making;
d. incorporating taxation and inflation in investment decision;
e. understanding risk and uncertainty in investment evaluation; and
f. understanding specific investment decisions.

## 8.2 Capital expenditure

Capital expenditure is spending on non-current assets, such as buildings and equipment, or investing in a new business. As a result of capital expenditure, a new non-current asset appears on the statement of financial position (balance sheet), possibly as an 'investment in subsidiary'.

In contrast, revenue expenditure refers to expenditure that does not create long-term assets but is either written off as an expense in the income statement in the period that it is incurred, or that creates a short-term asset (such as the purchase of inventory).

Capital expenditure initiatives are often referred to as investment projects, or 'capital projects. They can involve just a small amount of spending, but in many cases large amounts of expenditure are involved.

A distinction might possibly be made between:

a. Essential capital spending to replace worn-out assets and maintain operational capability.
b. Discretionary capital expenditure on new business initiatives that are intended to develop the business make a suitable financial return on the investment.

   Examination questions usually focus on discretionary capital expenditure.

## 8.3 Investment Appraisal

Before capital expenditure projects are undertaken, they should be assessed and evaluated. As a general rule, projects should not be undertaken unless:

a. they are expected to provide a suitable financial return; and

b. the investment risk is acceptable.

Investment appraisal is the evaluation of proposed investment projects involving capital expenditure. The purpose of investment appraisal is to make a decision about whether the capital expenditure is worthwhile and whether the investment project should be undertaken.

### 8.3.1 Capital Budgeting

Capital expenditure by a company should provide a long-term financial return, and spending should therefore be consistent with the company's long-term corporate and financial objectives. Capital expenditure should therefore be made with the intention of implementing chosen business strategies that have been agreed by the board of directors.

Many companies have a capital budget, and capital expenditure is undertaken within the agreed budget framework and capital spending limits. For example, a company might have a five-year capital budget, setting out in broad terms its intended capital expenditure for the next five years. This budget should be reviewed and updated regularly, typically each year.

Within the long-term capital budget, there should be more detailed spending plans for the next year or two.

a. Individual capital projects that are formally approved should be included within the capital budget.
b. New ideas for capital projects, if they satisfy the investment appraisal criteria and are expected to provide a suitable financial return, might be approved if they are consistent with the capital budget and overall spending limits.

### 8.3.2 Investment appraisal and capital budgets

Investment appraisal therefore takes place within the framework of a capital budget and strategic planning. It involves:

a. generating capital investment proposals in line with the company's strategic objectives;
b. forecasting relevant cash flows relating to the project;
c. evaluating the projects;
d. implementing projects which satisfy the company's criteria for deciding whether the project will earn a satisfactory return on investment; and

e. monitoring the performance of investment projects to ensure that they perform in line with expectations.

### 8.3.3 Features of investment decisions

Many investment projects have the following characteristics:

a. The project involves the purchase of an asset with an expected life of several years and involves the payment of a large sum of money at the beginning of the project. Returns on the investment consist largely of net income from additional profits over the course of the project's life.
b. The asset might also have a disposal value (residual value) at the end of its useful life.
c. A capital project might also need an investment in working capital. Working capital also involves investment of cash.
d. Alternatively, a capital investment project might involve the purchase of another business or setting up a new business venture. These projects involve an initial capital outlay, and possibly some working capital investment. Financial returns from the investment might be expected over a long period of time, perhaps indefinitely.

## 8.4 Methods of Investment Appraisal

There are four methods of evaluating a proposed capital expenditure project. The four methods of appraisal are:

a. Accounting rate of return [ARR] method
b. Payback method
c. Discounted cash flow [DCF] methods
   i. Net present value [NPV] method
   ii. Internal rate of return [IRR] method

Each method of appraisal considers a different financial aspect of the proposed capital investment.

There are different financial reasons that might be used to make a capital investment decision. Management could consider:

a. The effect the investment will have on the accounting return on capital employed and so they might use ARR.
b. The time it will take to recover the cash invested in the project, and so they might use the payback period as the basis for the investment decision.

c. the expected investment returns from the project. If so, they should use discounted cash flow (DCF) as a basis for their decision. DCF considers both the size of expected future returns and the length of time before they are earned.

There are two different ways of using DCF as a basis for making an investment decision:

a. Net present value (NPV) approach. With this approach, a present value is given to the expected costs of the project and the expected benefits. The value of the project is measured as the net present value (the present value of income or benefits minus the present value of costs). The project should be undertaken if it adds value. It adds value if the net present value is positive (greater than 0).
b. Internal rate of return (IRR) approach. With this approach, the expected return on investment over the life of the project is calculated and compared with the minimum required investment return. The project should be undertaken if its expected return (as an average percentage annual amount) exceeds the required return.

### 8.4.1 Accounting rate of return [ARR] method

The accounting rate of return [ARR] from an investment project is the accounting profit, usually before interest and tax, as a percentage of the capital invested. ARR measures the financial return from specific capital project while ROCE is a measure of financial return for the company.

The essential feature of ARR is that it is based on accounting profits, and the accounting value of assets employed.

### 8.4.2 Definition and Decision rule for the ARR method

The project should be accepted if it gives ARR that is higher than a minimum target ARR or minimum acceptable ARR.

For multiple projects, the project with the highest ARR should be chosen provided it is also higher than the minimum target ARR.

$$ARR = \frac{\text{Average annual profit}}{\text{Average investment}} \times 100\%$$

or

ARR = Average annual profit x 100%

Initial investment

Average Investment or Capital employed = $\frac{\text{initial cost + residual value}}{2}$

***Note : The preferred formula for the examinations is the use of average annual profit and average investment except otherwise stated.***

**Example 1 where the cash flow is constant**

Blackrovers limited is considering a project that requires an investment of ₦1,200,000. The project is expected to last for 5 years and an expected scrap value of ₦400,000. The annual profit before depreciation is ₦240,000.

The company requires a minimum accounting rate of return of 15%.

**Required:**

Should the project be undertaken?

**Solution**

The profit required for ARR should be the profit after depreciation. So, calculate the depreciation and deduct from the profit given.

Annual Depreciation = Cost – scrap value / number of years

Annual Depreciation = ₦1,200,000 - ₦400,000 / 5 = ₦160,000

Average profit = profit before depreciation – depreciation = ₦240,000 - ₦160,000 = ₦80,000

Average investment = ₦1,200,000 + ₦400,000 / 2 = ₦800,000

ARR = Average profit / Average investment x 100%

ARR = [80,000 / 800,000] x 100% = 10%

The project gives an ARR lower than the minimum required ARR of 15% and so the project should not be undertaken.

**Example 2 where the cashflows are different annually**

Whiterovers limited is considering a project that requires an investment of ₦1,000,000. The project is expected to last for 4 years and an expected scrap value of ₦200,000. The annual profit before depreciation is for the 4 years are:

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | ₦ | ₦ | ₦ | ₦ |
| Profit before depreciation | 380,000 | 170,000 | 320,000 | 130,000 |

The company requires a minimum accounting rate of return of 7.5%.

**Required:**

Should the project be undertaken?

**Solution**

The profit required for ARR should be the profit after depreciation. So, calculate the depreciation and deduct from the profit given.

Annual Depreciation = Cost – scrap value / number of years

Annual Depreciation = ₦1,000,000 - ₦200,000 / 4 = ₦200,000

Annual profit before depreciation = [380,000 + 170,000 + 320,000 + 130,000] / 4 = ₦250,000

Average profit = profit before depreciation – depreciation = ₦250,000 - ₦200,000 = ₦50,000

Average investment = ₦1,000,000 + ₦200,000 / 2 = ₦600,000

ARR = Average profit / Average investment x 100%

ARR = [50,000 / 600,000] x 100% = 8.33%

The project gives an ARR higher than the minimum required ARR of 7.5% and so the project should be undertaken.

**Advantages of the ARR method**

a. It is simple to understand as it uses variables popular amongst business managers.
b. It is easy to calculate.
c. It places emphasis on the profitability of the business.
d. It uses readily available data from the financial statements.

**Disadvantages of ARR method**

a. It is based on accounting profits and not cash flows. Investment decisions are usually based on cashflows and not profits because it is cash that is invested.

b. The accounting profits used are not reliable because they can be easily manipulated using window dressing.
c. It does not consider the time value of money nor the timing of the profits.
d. There is no generally acceptable basis of selecting the minimum or target ARR, the minimum rate is usually subjective or based on industry standards.
e. It does not give an absolute result as it is a relative measure of appraisal.

### 8.4.2 Payback period method of investment appraisal

Payback period is the length of time usually in years, it will take a project to recover the cash invested in it, using the net cash returns from the project. It measures the time it takes for an investment to generate returns equal to its initial cost.

The payback period method makes use of cashflows and not accounting profits. It ignores the time value of money and the total returns on the investment.

**Decision rule for payback period method**

A project should be accepted if the payback period is within the maximum acceptable payback period of the organisation.

For multiple projects, the project with the shortest payback period should be accepted.

**Example 1 where the cash flow is constant**

Blackrovers limited is considering a project that requires an investment of ₦1,200,000. The annual cashflows from the project is ₦400,000.

The expected payback period is 2 years.

**Required:**

Should the project be undertaken?

**Solution**

**Payback period =** Initial investment / annual constant cashflow = 1,200,000 / 400,000 = 3 years.

The project will not be accepted because the payback period of the project [3 years] is longer than the minimum expected payback of the project [2 years].

**Example 2 where the cashflows are different annually**

Whiterovers limited is considering a project that requires an investment of ₦8,000,000 immediately. The project is expected to last for 4 years. The expected cash flows from the project are:

| **Year** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|
| | **₦** | **₦** | **₦** | **₦** |
| Profit before depreciation | 2,000,000 | 2,500,000 | 4,500,000 | 1,250,000 |

The company requires all investment projects to pay back their initial investment within 3 years.

**Required:**

Should the project be undertaken?

**Solution**

The initial year of the investment is year 0 and the initial investment is treated as an outflow to be recovered. The payback period can be calculated using the cumulative cashflows approach as shown below:

| Year | cashflows | Cumulative cashflows |
|---|---|---|
| | **₦** | **₦** |
| 0 | (8,000,000) | (8,000,000) |
| 1 | 2,000,000 | (6,000,000) |
| 2 | 2,500,000 | (3,500,000) |
| 3 | 4,500,000 | To be pro-rated |
| 4 | 1,250,000 | |

Payback period is 2 years + (3,500,000 / 4,500,000) year = 2.78 years {2 years 9 months}

The project is viable as it shows a payback period shorter than the target payback period.

**Advantages of Payback period method**

a. It is simple to calculate and understand.
b. It makes use of cash flows and not accounting profits.
c. It is popular amongst business managers.

**Disadvantages of payback period**

a. It ignores all cashflows after the payback period and ignores the total cashflow returns from the project.
b. It doesn't take account of risk.

c. It does not consider the time value of money.
d. It is short-term focused.

## 8.6 Chapter review

At the end of this chapter, ensure you can:

a. identify and apply relevant costs in capital investment decisions;
b. explain the various investment evaluation methods;
c. explain strategic factors in investment decision making;
d. incorporate taxation and inflation in investment decision;
e. discuss risk and uncertainty in investment evaluation; and
f. discuss specific investment decisions.



**Skills Level**

**Financial Management**

CHAPTER 9

**DISCOUNTED CASHFLOW TECHNIQUES**

**Contents**





# 9 Discounted cashflow techniques

## 9.0 Learning objective

This chapter discusses the discounted cash flow techniques.

## 9.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. ability to identify and apply relevant costs in capital investment decisions;
b. understanding the various investment evaluation methods;
c. ability to incorporate strategic factors in investment decision making;
d. incorporating taxation and inflation in investment decision;
e. understanding risk and uncertainty in investment evaluation; and
f. understanding specific investment decisions.

## 9.2 Introduction to discounted cash flow (DCF) analysis

Discounted cash flow is a technique for evaluating proposed investments, to decide whether they are financially worthwhile.

There are two methods of DCF:

a. Net present value (NPV) method: the cost of capital r is the return required by the investor or company; and
b. Internal rate of return (IRR) method: the cost of capital r is the actual return expected from the investment.

All cash flows are assumed to arise at a distinct point in time (usually, the end of a year). For example, sales of ₦20m in year four are discounted as if they arose as a single amount at the end of year 4.

For the use of the DCF technique, there is a need to understand the concept of relevant costing.

### 9.2.1 Relevant costs and decision-making

You should already be familiar with the concept that when any decision is evaluated in accounting, relevant costs should be used for the evaluation.

### 9.2.2 Definition of relevant costs and benefits

Relevant costs and benefits are future cash flows arising as a direct consequence of the decision under consideration.

a. Relevant costs are cash flows. Any items of cost that are not cash flows must be ignored for the purpose of decision. For example, depreciation expenses are not cash flows and must always be ignored.

b. Relevant costs are future cash flows. Costs that have already been incurred are not relevant to a decision that is being made now. The cost has already been incurred, whatever decision is made, and it should therefore not influence the decision. For example, a company might incur initial investigation costs of ₦20,000 when looking into the possibility of making a capital investment. When deciding later whether to undertake the project, the investigation costs are irrelevant, because they have already been spent.

c. Relevant costs are also costs that will arise as a direct consequence of the decision, even if they are future cash flows. If the costs will be incurred whatever decision is taken, they are not relevant to the decision.

Some examples of relevant costs are given below, but you should already be familiar with the concept of relevant costs from your previous studies.

### 9.2.3 Relevant costs of materials

When materials will have to be purchased for a project, because there are no existing inventories of the materials, their relevant cost is their future purchase cost.

However, if the materials required for a project are already held in inventory, their relevant cost depends on circumstances.

a. If the materials are in regular use, and quantities consumed for the investment project would be replaced in the normal course of trading operations, the relevant cost of the materials is their current replacement cost.

b. If the materials will not be replaced if they are used for the investment project, their relevant cost is the higher of:
   - their net disposal value and the net contribution that could be earned using the materials for another available use.

**Example: Relevant cost of materials**

A company is considering a project expected to last for 3 years which would require the use of three different materials with details below:

a. Material A: 20,000kg of material A is required for the project annually and there is none in inventory. The replacement price of the material is ₦4.20 per kg.

b. Material B: The project requires 15,000kg of material B annually. Material B is used regularly, and the company always keeps 5,000kg of material as buffer stock annually. The material cost ₦3.00 per kg when it was purchased but the price has now risen to ₦3.50 per kg.

c. Material C: Material C has no other use in the company and there are currently 12,000litres in stock which cost ₦144,000. The project requires 17,000litres annually. The available material C can be sold for ₦96,000 if not for used for the project. Material C can be replaced annually at ₦15.00 per litre.

**Required:**

What is the relevant cost of material A, B and C for the 3 years of the project.

**Solution**

When solving a question on the relevant cost of material, focus on

a. Material required for the contract. You can't use more than what is required.
b. Material available in inventory
c. Material not available in inventory
d. The status of the material [is it used regularly, or it has no alternative use]

**Material A**

Where a material is not available, the relevant cost is the replacement cost [cost needed to purchase the material now].

a. The quantity required is 20,000kg
b. The quantity available is 0kg
c. The quantity not available is 20,000kg and needs to be replaced annually at ₦ 4.20, that is 20,000kg x ₦4.20 = ₦84,000

**Material B**

Where material is annually available and used regularly, the relevant cost is the replacement cost.

a. The quantity required is 15,000kg.
b. The quantity available is just 5,000kg [buffer stock] and because it is used regularly, the relevant cost is 5,000kg x ₦3.50 = ₦17,500
c. The quantity not available is 10,000kg and needs to be replaced at ₦3.50 that is 10,000kg x ₦3.50 = ₦35,000
d. The total relevant costs is ₦17,500 + ₦35,000 = ₦52,500

**Material C**

Where material is annually available and has no alternative uses, the relevant cost is the realisable or scrap value.

a. The quantity required is 17,000 litres.
b. The quantity available in year 1 only is 12,000 litres and because it has no alternative uses, the relevant cost is 12,000L x ₦8 = ₦96,000
c. The quantity not available is 5,000litres and needs to be replaced at ₦15.00 that is 5,000L x ₦15.00 = ₦75,000
d. The total relevant costs for year 1 is ₦96,000 + ₦75,000 = ₦171,000
e. The relevant cost for subsequent years [years 2 and 3] would be the 17,000litres x ₦15.00 = ₦255,000

| Year | 1 | 2 | 3 |
|---|---|---|---|
| | ₦ | ₦ | ₦ |
| Material A | 84,000 | 84,000 | 84,000 |
| Material B | 52,500 | 52,500 | 52,500 |
| Material C | 171,000 | 255,000 | 255,000 |
| | | | |

### 9.2.4 Relevant cost of existing equipment

When new capital equipment will have to be purchased for a project, the purchase cost of the equipment will be a part of the initial capital expenditure, and so a relevant cost.

However, if an investment project will also make use of equipment that the business already owns, the relevant cost of the equipment will be the higher of:

a. The current disposal value of the equipment, and
b. The present value of the cash flows that could be earned by having an alternative use for the equipment.

**Example: relevant costs of existing equipment**

A company is considering a project which is expected to last for 3 years. The project would require 3 of the company's existing equipment with details below:

a. An assembly plant owned by the company with a current disposal value of ₦550,000. If not used for the project, the assembly plant could be used on another project that would generate future cashflows with a present value of ₦485,000.

b. A moulding machine will be required for the project. The moulding machine can also be used for an alternative project with present value of its future cashflows as ₦380,000. The current disposal value of the machine in year 3 is ₦300,000.

c. The company has a delivery truck which is no longer used for regular work and can be sold now for ₦250,000. An opportunity has arisen to use the truck for this project. The disposal value of the truck at the end of the project if used for this project will be ₦185,000 after spending ₦25,000 on repairs to get it into condition for sale.

**Required:**

Calculate the relevant cost of the three-equipment used for the project.

**Solution**

The relevant cost of an existing machine is the higher between the disposal value and the PV of the future cashflows.

**Assembly Machine**

If not used for the project, the machine could be sold for ₦550,000 or held to generate future cashflows of ₦485,000. Therefore, it is better to sell now. The relevant cost in year 0 would be the disposal value foregone of ₦550,000, as it is higher than the PV of the future cashflows of ₦485,000. This is an outflow as it is foregone for the project to take place.

**Moulding Machine**

If not used for the project, the machine could be sold for ₦300,000 or held to generate future cashflows of ₦380,000. Therefore, it is better to hold now.

The relevant cost in year 0 would be the PV of the future cashflows of ₦380,000, as it is higher than the disposal value of ₦300,000. This is an outflow as it is foregone for the project to take place.

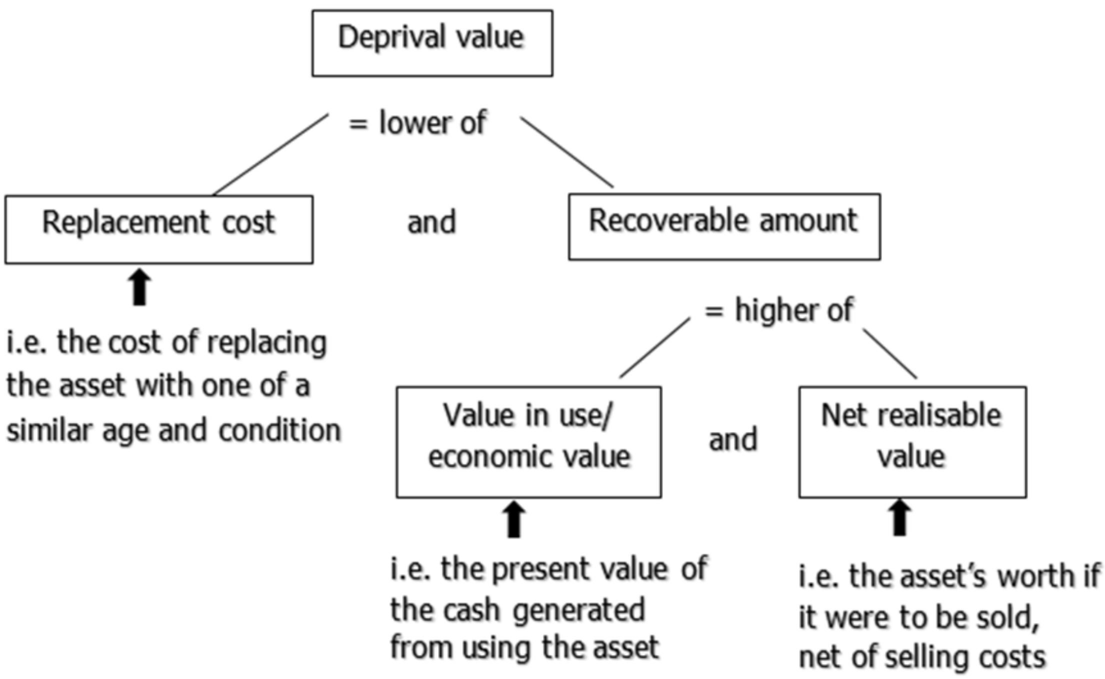
**Delivery Truck**

The relevant cashflows would be the ₦250,000 foregone in year 0, and the disposal value of ₦185,000 and the cost of ₦25,000 would be incurred in year 3. The disposal value foregone now is an outflow and also the cost for repairs, but the disposal value is an income at the end of the project.

| Year | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| | ₦ | ₦ | ₦ | ₦ |
| Assembly machine | [550,000] | | | |
| Moulding machine | [380,000] | | | |
| Delivery truck | [250,000] | | | 185,000 |
| Delivery truck | | | | [25,000] |

### Using Deprival Value

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




If the asset has a net realisable value in excess of its economic value, it should be sold, that is, it is better to sell it than keep on using it. If the economic value is higher than the net realisable value, it is worth keeping and using. At this point, therefore, were the firm to be deprived of the asset, the best alternative foregone is the higher of the net realisable value or economic value (the recoverable amount).

However, if the recoverable amount is less than the replacement cost, then the recoverable amount is the deprival value, that is, the asset would not be replaced were the firm to be deprived of its use. If the recoverable amount exceeds the replacement cost, the asset should be replaced as the latter represents its deprival value.

**Example**

A company has an existing machine which needs to be used on a new contract. The machine could be sold now for ₦4,000,000 or made use of to service the needs of existing customers for business which has a value (in present value terms) of ₦6,000,000.

**Required:**

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

a) Assuming that it could not be replaced?

b) If the machine could be replaced at a cost of either

i) ₦3,200,000

ii) ₦7,200,000

The opportunity cost can be computed as follows:

a) The existing customers create more value than selling the machine, so the machine would not be sold. Hence the opportunity cost is the value in use of ₦6 million. This is the higher of its net realisable value (₦4 million) and its value in an alternative use (₦6 million).

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

b) i) If the new contract will make use of a currently owned machine, then in principle, the cost of using it will be replacement cost. If the value in use is ₦6 million, and the replacement cost is ₦3.20 million, then the machine will be replaced. The equipment cost of the new contract would therefore be ₦3.20 million.

ii) If however, the replacement cost is ₦7.20million then it is not worth replacing. Thus, the relevant cost of equipment for the new contract will be the opportunity cost or benefit foregone i.e. the ₦6million.

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

### 9.2.5 Relevant cost of investment in working capital

It is important that you understand the relevance of investment in working capital for cash flows.

Strictly speaking, an investment in working capital is not a cash flow. However, it should be treated as cash flow, because:

a. When capital investment projects are evaluated, it is usual to estimate the cash profits for each year of the project.
b. However, actual cash flows will differ from cash profits by the amount of the increase or decrease in working capital.

You should be familiar with this concept from cash flow statements.

a. If there is an increase in working capital, cash flows from operations will be lower than the amount of cash profits. The increase in working capital can therefore be treated as a cash outflow, to adjust the cash profits to the expected cash flow for the year.
b. If there is a reduction in working capital, cash flows from operations will be higher than the amount of cash profits. The reduction in working capital can therefore be treated as a cash inflow, to adjust the cash profits to the expected cash flow for the year.

**Note** that the following should be noted when dealing with working capital.

a. It should be in advance.
b. It should be incremental.
c. It should be recovered at the end of the project.

Working capital could be a single figure, a percentage on sales or a percentage on increase in sales.

`

**Example: Relevant cost of working capital**

A company is considering whether to invest in the production of a new product. The project would have a six-year life. Investment in working capital would be

₦30,000 at the beginning of Year 1 and a further ₦20,000 at the beginning of Year 2.

It is usually assumed that a cash flow, early during a year, should be treated as a cash flow as at the end of the previous year.

The relevant cash flows for the working capital investment would therefore be as follows:

| Year | | ₦ |
|---|---|---|
| 0 | Cash outflow | (30,000) |
| 1 | Cash outflow | (20,000) |
| 6 | Cash inflow | 50,000 |

**Example: Relevant cost of working capital**

A company is considering a project with a 3-year life.

The project will require generate the following sales, and the working capital is expected to be 10% of sales. The sales for the period are as follows:

| Year | 1 | 2 | 3 |
|---|---|---|---|
| | ₦ | ₦ | ₦ |
| Sales | 1,250,000 | 2,000,000 | 1,800,000 |

**Required**

What is the working capital to be recognised for the project over the period.

**Solution**

Recall that the working capital is assumed to be made available in advance [a year before they are required], on an incremental basis and recovered in the end.

| Year | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| | ₦ | ₦ | ₦ | ₦ |
| 10% of sales | | 125,000 | 200,000 | 180,000 |
| Working Cap | (125,000) | (75,000) | 20,000 | 180,000 |

Note that an increase in working capital is an outflow and put in brackets, while a decrease in working capital is an inflow without brackets. In the final year, the balancing figure is recovered.

9.2.6 **Relevant cost of labour**

The relevant costs of a decision to do some work or make a product will usually include costs of labour.

The relevant cost of labour for any decision is the additional cash expenditure (or savings) that will arise as a direct consequence of the decision.

a. If the cost of labour is a variable cost and labour is not in restricted supply, the relevant cost of the labour is its variable cost.
b. If labour is a fixed cost and there is spare labour time available, the relevant cost of using labour is zero.
c. If labour is in limited supply, the relevant cost of labour should include the opportunity cost of using the labour time for the purpose under consideration instead of using it in its next-most profitable way. The cost of an hour of labour would be the pay per hour plus the lost contribution

### 9.2.7 Opportunity costs

Opportunity costs are the benefits forgone by using assets or resources for one purpose, instead of using them in the most profitable alternative way. Opportunity costs are commonly measured as contribution forgone but might also be measured as a present value (in DCF analysis).

When resources have more than one alternative use, and are in limited supply, their opportunity cost is the contribution forgone by using them for one purpose and so being unable to use them for another purpose.

**Example: Opportunity costs**

A company is considering investing in a major new information system. The investment will require the use of six of the company's IT specialists for the first one year of the project.

These IT specialists are each paid ₦100,000 each per year.

IT specialists are difficult to recruit. If the six specialists are not used on this project, they will be employed on other projects that would earn a total contribution of ₦500,000.

**Required:**

Calculate the relevant cost on this investment.

**Solution**

The relevant cost of the IT specialist in Year 1 of the project would be the labour cost plus the opportunity cost [which is the contribution that would be foregone if the specialists do not work on other projects]

| | ₦ |
|---|---|
| Basic salaries [100,000 x 6] | 600,000 |
| Contribution foregone | 500,000 |
| Total relevant cost | 1,100,000 |

**Example: Relevant cost of labour (including opportunity costs)**

A company is considering whether to invest in a new project which would run for 3 years.

The project requires labour as follows:

**Department 1**. This department has spare capacity. The contract requires 10 men from this department. The men each earn ₦2,000,000 per annum.

The company plan to make 15 men redundant in a year's time at a cost of ₦200,000 per person. If the project proceeds only 5 men will be made redundant.

**Department 2**. The contract would require 15 workers out of the 30 who work in department 2. The total annual labour cost of the department is ₦70,000,000. Department 2 labour is in short supply. The department produces services that earn a contribution of ₦30,000,000 per annum.

New workers would be recruited who would be capable of doing department 2 work but only in year 2 of the project.

**Department 3**. This department employs 100 workers each earning ₦2,500,000 per annum.

The department is operating at full capacity earning a contribution of ₦150 million.

The company could either divert 20 workers to the new project or could offer to pay an overtime premium of 50% to the workforce to encourage them to work extra hours.

**Required:**

What is the relevant cost for the contract of labour in the three departments?

**Solution**

**Note 1:**

The 10 men engaged on the project would have been paid in the first year whether the project proceeds or not. Therefore, the incremental cost is nil.

The 10 workers engaged on the project will not be made redundant at year 1 thus saving the redundancy payment.

**Note 2:**

Relevant cost in year 1 is the salaries of the 15 workers (50% of the workforce) plus the lost contribution:

(50% x ₦70,000,000) + (50% x ₦30,000,000) = ₦35,000,000) + ₦15,000,000= ₦50,000,000

In years 2-4 the relevant cost is the amount paid for the workers who are recruited to replace those diverted to the project.

**Note 3:**

The company have a choice between diverting 20 workers (20% of the workforce) from existing work or paying an overtime premium to obtain the effort of 20 workers. Costs of each course of action would be as follows:

Diverting 20 workers: (20 X ₦2,500,000) + (20% X₦150,000,000) = ₦80,000,000.

Paying overtime premium: (20 X ₦2,500,000) X 150% = ₦75,000,000. The company would choose the lower cost therefore the relevant cost is ₦75,000,000.

| Year | 1 | 2 | 3 |
|---|---|---|---|
| | ₦ | ₦ | ₦ |
| **Department 1 [note 1]** | | | |
| Redundancy payment saved; 10% x 200,000 | - | (20) | (20) |
| **Department 2 [note 2]** | (35) | (35) | (35) |
| Labour cost | (15) | | |
| Lost contribution | | | |
| **Department 3 [note 3]** | | | |
| Labour cost | 75 | 75 | 75 |

### 9.2.8 Discounting

One of the basic principles of finance is that a sum of money today is worth more than the same sum in the future. If offered a choice between receiving ₦10,000 today or in 1 year's time a person would choose today.

A sum today can be invested to earn a return. This alone makes it worth more than the same sum in the future. This is referred to as the time value of money.

The impact of time value can be estimated using one of two methods:

a. Compounding which estimates future cash flows that will arise as a result of investing an amount today at a given rate of interest for a given period. An amount invested today is multiplied by a compound factor to give the amount of cash expected at a specified time in the future assuming a given interest rate.
b. Discounting which estimates the present day equivalent (present value which is usually abbreviated to PV) of a future cash flow at a specified time in the future at a given rate of interest. An amount expected at a specified time in the future is multiplied by a discount factor to give the present value of that amount at a given rate of interest.

The discount factor is the inverse of a compound factor for the same period and interest rate. Therefore, multiplying by a discount factor is the same as dividing by a compounding factor. Discounting is the reverse of compounding.

**Discounting formula**

Formula: Discount factor

$$\text{Discount factor} = \frac{1}{(1 + r)^n}$$

Where:

r = the period interest rate (cost of capital)

n = number of periods

**Interpreting present values**

The present value of a future cash flow is the amount that an investor would need to invest today to receive that amount in the future. This is simply another way of saying that discounting is the reverse of compounding.

### Discount tables

Discount factors can be calculated as shown earlier but can also be obtained from discount tables. These are tables of discount rates which list discount factors by interest rates and duration. A discount table extract is as shown below.

| (n) | 5% | 6% | 7% | 8% | 9% | 10% |
|---|---|---|---|---|---|---|
| 1 | 0.952 | 0.943 | 0.935 | 0.926 | 0.917 | 0.909 |
| 2 | 0.907 | 0.890 | 0.873 | 0.857 | 0.842 | 0.826 |
| 3 | 0.864 | 0.840 | 0.816 | 0.794 | 0.772 | 0.751 |
| 4 | 0.823 | 0.792 | **0.763** | 0.735 | 0.708 | 0.683 |

### Annuity calculation

An annuity is a constant cash flow for a given number of time periods. A capital project might include estimated annual cash flows that are an annuity.

Examples of annuities are:

a. ₦30,000 each year for years 1 – 5;
b. ₦20,000 each year for years 3 – 10; and
c. ₦500 each month for months 1 – 24.

The present value of an annuity can be computed by multiplying each individual amount by the individual discount factor and then adding each product. This is fine for annuities of just a few periods but would be too time-consuming for long periods. An alternative approach is to use the annuity factor.

An annuity factor for a number of periods is the sum of the individual discount factors for those periods.

Annuity factor = $1 – (1 + r)^{-n} / r$

### Example of discounting Annuity

Calculate the present value of a constant cashflow of ₦30,000 for 3 years at a discount rate of 10%

### Solution

This can be calculated using individual years or annuity. Let's do both now.

**Individually**

| Year | Description | | DCF@ 10% | PV |
|---|---|---|---|---|
| | | ₦ | | ₦ |
| 1 | Cashflow | 30,000 | 0.909 | 27,273 |
| 2 | Cashflow | 30,000 | 0.826 | 24,793 |
| 3 | Cashflow | 30,000 | 0.751 | 22,539 |
| | | | | **74,606** |

Or **Annuity**

| Year | Description | | DCF@ 10% | PV |
|---|---|---|---|---|
| | | ₦ | | ₦ |
| 1 – 3 | Cashflow | 30,000 | 2.487 | 74,606 |
| | | | | **74,606** |

## 9.3 Calculating the NPV of an investment project

**Approach**

**Step 1:** List all cash flows expected to arise from the project. This will include the initial investment, future cash inflows and future cash outflows.

**Step 2**: Discount these cash flows to their present values using the cost that the company has to pay for its capital (cost of capital) as a discount rate. All cash flows are now expressed in terms of 'today's value'.

**Step 3**: The net present value (NPV) of a project is a difference between the present value of all the costs incurred and the present value of all the cash flow benefits (savings or revenues).

a. The project is acceptable if the NPV is positive.
b. The project should be rejected if the NPV is negative.

### 9.3.1 Basic Assumptions of NPV calculations

a. The initial year of a project is assumed to be year 0.
b. All cashflows are assumed to arise at the year-end except otherwise stated, which means that a cashflow expected at the start of year 5, will be recognized at the end of year 4.

c. Financing cashflows like interest, dividend and loan repayment should be ignored.
d. Only relevant costs should be considered.

### 9.3.2 Example on NPV appraisal

ABC plc intends to embark on a project in 2025 which would last for five years. The project would involve an initial outlay of ₦1,000,000. The expected cash flows from the project are

| Year | Cashflows |
|---|---|
| | ₦ |
| 1 | 250,000 |
| 2 | 180,000 |
| 3 | 300,000 |
| 4 | 400,000 |
| 5 | 150,000 |

The cost of capital is 10%.

**Required:**

Calculate the Net Present Value [NPV] of the project and advise ABC if the project should be accepted.

**Solution**

| **Year** | **Description** | | **Dcf @10%** | **PV** |
|---|---|---|---|---|
| | | ₦ | | ₦ |
| 0 | Initial outlay | (1,000,000) | 1.000 | (1,000,000) |
| 1 | Cash flows | 250,000 | 0.909 | 227,273 |
| 2 | Cash flows | 180,000 | 0.826 | 148,760 |
| 3 | Cash flows | 300,000 | 0.751 | 225,394 |
| 4 | Cash flows | 400,000 | 0.683 | 273,205 |
| 5 | Cash flows | 150,000 | 0.621 | 93,138 |
| | | | | **(32,229)** |

The project should be rejected as it shows a negative NPV, which implies that the return on the project is lower than the cost of capital.

## 9.4 Internal rate of return (IRR)

The internal rate of return method (IRR method) is another method of investment appraisal using DCF.

The internal rate of return of a project is the discounted rate of return on the investment.

a. It is the average annual investment return from the project
b. Discounted at the IRR, the NPV of the project cash flows must come to zero.
c. The internal rate of return is therefore the discount rate that will give a net present value of zero.

### 9.4.1 The investment decision rule with IRR

A company might establish the minimum rate of return that it wants to earn on an investment. If other factors such as non-financial considerations and risk and uncertainty are ignored:

a. If a project IRR is equal to or higher than the minimum acceptable rate of return, it should be undertaken
b. If the IRR is lower than the minimum required return, it should be rejected.

Since NPV and IRR are both methods of DCF analysis, the same investment decision should normally be reached using either method.

It is more correct to say that IRR is estimated rather than calculated. This is explained in more detail in the following sections.

### 9.4.2 Estimating the IRR of an investment project

To estimate the IRR, you should begin by calculating the NPV of the project at two different discount rates.

a. One of the NPVs should be positive, and the other NPV should be negative. (This is not essential. Both NPVs might be positive or both might be negative, but the estimate of the IRR will then be less reliable.)
b. Ideally, the NPVs should both be close to zero, for better accuracy in the estimate of the IRR.

When the NPV for one discount rate is positive NPV and the NPV for another discount rate is negative, the IRR must be somewhere between these two discount rates.

Although in reality the graph of NPVs at various discount rates is a curved line, as shown in the diagram above, using the interpolation method we assume that the graph is a straight line between the two NPVs that we have calculated. We can then use linear interpolation to estimate the IRR, to a reasonable level of accuracy

**Formula: IRR interpolation formula**

$$IRR = A\% + \left(\frac{NPV_A}{NPV_A - NPV_B}\right) \times (B - A)\%$$

Ideally, the NPV at A% should be positive and the NPV at B% should be negative.

**Where:**

$NPV_A$ = NPV at A%

$NPV_B$ = NPV at B%

### 9.4.3 IRR as an estimate

The interpolation method is only approximate and is not exact. This is because it assumes that the IRR decreases at a constant rate between the two NPVs.

For a 'typical' project, the IRR estimated by the interpolation method is slightly higher than the actual IRR. The interpolation method gives a more accurate estimate of the IRR when:

a. both NPVs in the calculation are close to 0; and
b. the NPV at A% is positive and the NPV at B% is negative.

(Note that the IRR function in excel estimates IRR in a similar way. However, excel uses the initial IRR to recalculate the NPV and inputs this into a new calculation of IRR, and so on, until it reaches a point where the both NPVs are very close to zero. This means that for all practical purposes, excel calculates the IRR rather than estimates it).

### 9.4.4 Advantages of DCF techniques

NPV and IRR have several advantages in common.

a. Both techniques are based on cash flows rather than accounting profits which are easier to manipulate and more difficult to interpret.
b. Both techniques take account of time value. This is a very important variable that is not considered by less sophisticated techniques like return on capital employed.
c. Both techniques take account of all cash flows modelled and not just those in a payback period.

**Advantages and disadvantages of the NPV method**

**Advantages of the NPV method (compared to the IRR method)**

a. NPV provides a single absolute value which indicates the amount by which the project should add to the value of the company.
b. The NPV decision rule is consistent with the objective of maximisation of shareholders' wealth.

**Disadvantages of the NPV method (compared to the IRR method)**

The following are often stated as the main disadvantages of the NPV method (compared to the IRR method).

a. The time value of money and present value are concepts that are not easily understood by those without a financial education. This might be true but decision makers tend to be intelligent and educated people. If they do not understand something, they can have it explained to them).
b. There might be some uncertainty about what the appropriate cost of capital or discount rate should be for applying to any project. The approach would give a perfect answer in a perfect world but companies do not operate with perfect information, so this undermines the usefulness of NPV. Capital markets may not be perfect, but they are often efficient. Companies should be able to arrive at a cost of capital that can be used. Also, the inability to measure a cost of capital could be considered a weakness of the IRR because the IRR has to be measured against a benchmark and the best of these would be the cost of capital.
c. **Advantages and disadvantages of the IRR method (compared to the NPV method)**

   The main advantage of the IRR method of investment appraisal (compared to the NPV method) is often given as it is easier to understand an investment return as a percentage return on investment than as a money value NPV.

   People are used to receiving information based on percentages and so would be more comfortable with the notion of IRR but this does not mean that they would understand it.

   The supposed simplicity of IRR is an illusion. The percentage return is an average which takes account of time value. Without a certain level of financial education it is difficult to fully appreciate what the percentage answer actually means.

   Also remember that the decision makers are not the average man on the street. They are clever, educated people so would understand NPV or be in a position to do so.

It is true that it is not necessary to know the cost of capital to calculate the IRR.

Another advantage of the IRR method is that it does not require an estimate of the cost of capital.

However, once calculated it must be compared to something and this is usually the cost of capital. Therefore, the cost of capital may not be necessary in the calculation of the IRR but is important in its use.

**Disadvantages of the IRR method (compared to the NPV method)**

One disadvantage of the IRR method compared to NPV is that it is a relative measure, not an absolute measure.

The technique cannot choose between a 10% IRR based on an initial investment of ₦10,000 or a 10% IRR based on an initial investment of ₦10,000,000 or would choose a project with an IRR of 11% on an initial investment of ₦10,000 instead of a 10% IRR based on an initial investment of ₦10,000,000. This is a weakness of the technique but techniques do not make decisions, people do.

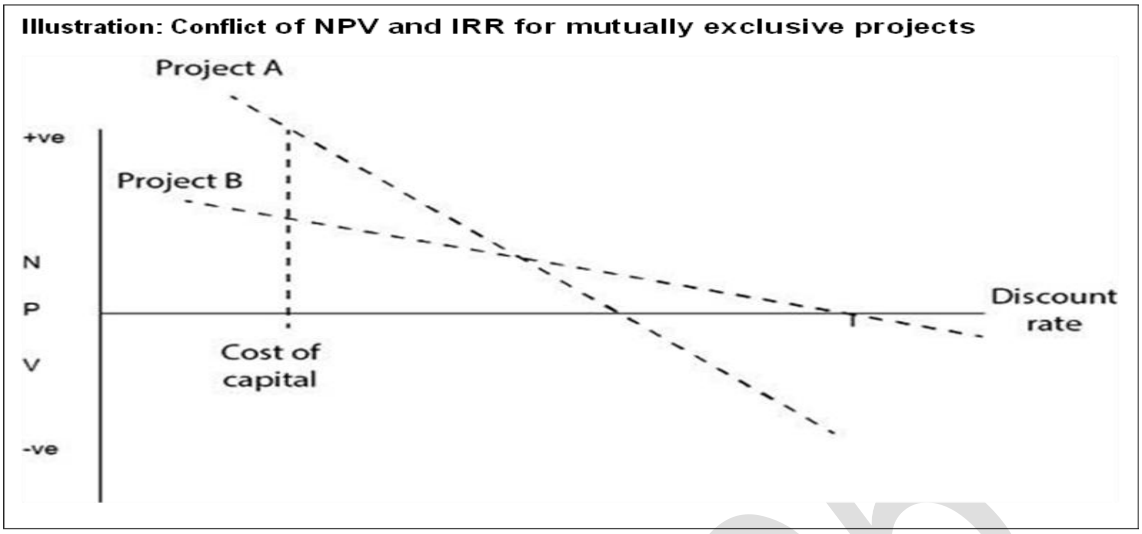
A decision maker should be able to understand the difference between these projects even if the technique does not provide that information.

**The following disadvantages of IRR compared to NPV are more fundamental**.

**Mutually exclusive projects**

For accept/reject decisions on individual projects, the IRR method will give the same decision as the NPV method. However, in making a choice between two mutually exclusive projects IRR might give a decision that is in conflict with NPV.

Consider the following graphs which illustrate NPV profiles at different costs of capital for two projects.

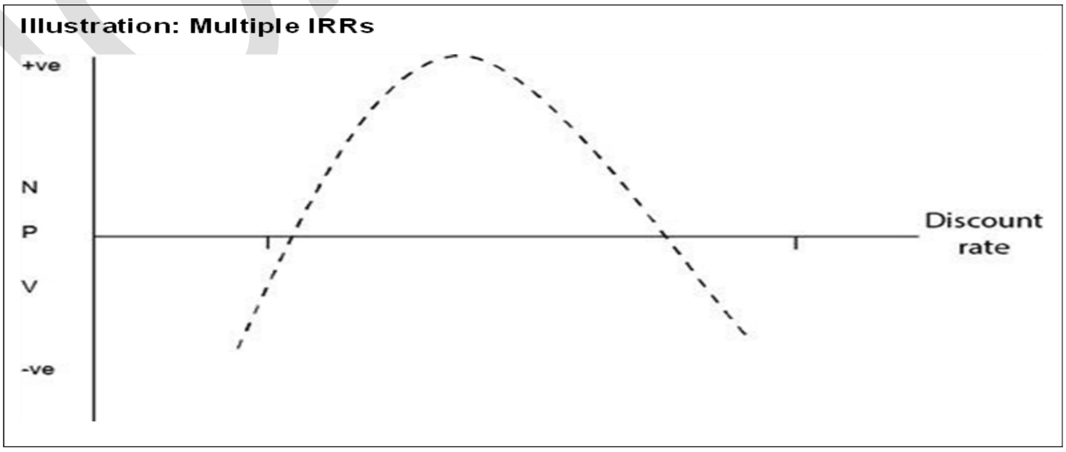



Project A has the higher NPV at the company's cost of capital but project B has the higher IRR.

Resolving the conflict is easy – use NPV! This can be justified on the basis that NPV has a more realistic reinvestment assumption than IRR. The concept of the reinvestment assumption refers to the discount rate used to re-express cash flows in different time terms. The NPV approach "time shifts" values using the cost of capital, whereas the IRR method "time shifts" values using the IRR. It is argued that using the cost of capital is more realistic as this is the cost faced by the company at the date of the appraisal.

**Multiple IRRs**

Another disadvantage of the IRR method is that a project might have two or more different IRRs, when some annual cash flows during the life of the project are negative. How should the different IRRs be interpreted?



### No IRRs

Some projects might not have an IRR at all. This problem is easily solved by appraising the project using NPVs.

## 9.5 Chapter review

At the end of this chapter, ensure you can:

a. calculate the appropriate amount of investment in working capital;
b. explain the factors that determine the appropriate level of investment in working capital; and
c. evaluate and discuss the key factors in determining working capital funding strategies.

**Skills Level**

**Financial Management**

CHAPTER 10

# INFLATION AND TAXATION IN DCF

**Contents**

# 10 Inflation and taxation in DCF

## 10.0 Learning objective

This chapter discusses the treatment of inflation and taxation in discounted cash flow.

## 10.1 Learning outcomes

On successful completion of this chapter, readers should be able to:

a. identify taxation cash flows;
b. distinguish the money cost of capital and the real cost of capital;
c. apply the fisher equation to evaluate an unknown variable;
d. explain the link between money cash flows and real cash flows;
e. identify money cash flows by taking inflation into account; and
f. perform discounted cash flow analysis taking both taxation and inflation into account.

## 10.2 Taxation cash flows in investment appraisal

In project appraisal, cash flows arise due to the effects of taxation. When an investment results in higher profits, there will be higher taxation. Tax cash flows should be included in DCF analysis. In DCF analysis it is normally assumed that tax is payable on the amount of cash profits in any year.

For example, if taxation on profits is 30% and a company earns ₦10,000 cash profit each year from an investment, the pre-tax cash inflow is ₦10,000, but there is a tax payment of ₦3,000.

Similarly, if an investment results in lower profits, tax is reduced. For example, if an investment causes higher spending of ₦5,000 each year and the tax on profits is 30%, there will be a cash outflow of ₦5,000 but a cash benefit from a reduction in tax payments of ₦1,500.

## 10.3 Interest costs and taxation

Interest cash flows are not included in DCF analysis. This is because the interest cost is in the cost of capital (discount rate).

Interest costs are also allowable expenses for tax purposes, therefore, present values are estimated using the post-tax cost of capital. The post-tax cost of capital is a discount rate that allows for the tax relief on interest payments. This means that because interest costs are allowable for tax purposes, the cost of capital is adjusted to allow for this and is reduced accordingly.

The cost of capital is explained in more detail in a later chapter. Briefly however, the following formula holds in cases where debt is irredeemable.

Post tax cost of debt = Pre-tax interest cost(1 – tax rate)

## 10.4 Timing of cash flows for taxation

When cash flows for taxation are included in investment appraisal, an assumption must be made about when the tax payments are made. The actual timing of tax payments depends on the tax rules that apply in the relevant jurisdiction. Usually, one or other of the following assumptions is used.

a. tax is payable in the same year as the profits to which the tax relates; or
b. tax is payable one year later ('one year in arrears'). (For example, tax on the cash profits in Year 1 is payable in Year 2).

Either of these two assumptions could be correct. An examination question should specify which assumption you should use.

**Example: Timing of cash flows for taxation**

A project costing ₦720,000 is expected to result in net cash inflows of ₦480,000 in year 1 and ₦600,000 in year 2.

Taxation at 30% occurs one year in arrears of the profits or losses to which they relate.

The post-tax cost of capital is 8%.

Assume that the cost of the project is not an allowable cost for tax purposes (i.e. capital allowances should be ignored).

**Required:**

Calculate the NPV of the project.

**Solution**

| Year | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| | | | | |
| Initial outlay | [720,000] | | | |
| Cash inflows | | 480,000 | 600,000 | |
| Tax on inflows | | | [144,000] | [180,000] |

| | | | | |
|---|---|---|---|---|
| **Net cashflows** | [720,000] | 480,000 | **456,000** | **[180,000]** |
| DCF@8% | 1.000 | 0.926 | 0.857 | 0.794 |
| **Present value** | **[720,000]** | **444,480** | **390,792** | **[142,920]** |
| **NPV** | | | | **[27,648]** |

## 10.5 Tax allowable depreciation - The nature of capital allowances

When a business buys a non-current asset, depreciation is charged in the financial accounts. However, depreciation in the financial accounts is not an allowable expense for tax purposes.

Instead, the tax rules provide for 'tax-allowable depreciation' or capital allowances, according to rules determined by the government.

Tax-allowable depreciation affects the cash flows from an investment, and the tax effects must be included in the project cash flows.

There are two ways of allowing depreciation for tax purposes:

a. The straight-line method; and
b. The reducing balance method.

## 10.6 The straight -line method

This is a method of calculating depreciation expense by allocating the cost of an asset evenly over its useful life.

Depreciation = [Asset cost – scrap value] / useful life  or X% x cost of asset.

**Example: Calculation of tax effect of capital allowances – straight line method**

An asset costs ₦120,000 and has an expected economic life of five years with no residual value. If depreciation is allowed for tax purposes over five years using the straight-line method. Tax rate is 30% and the scrap value of the asset at the end of year 5 is nil.

**Required:**

Calculate the tax savings on the annual capital allowances.

**Solution**

The capital allowance is (120,000 – 0) / 5 = N24,000

The tax rate on profits is 30%, the annual reduction/savings in tax from the capital allowance is ₦24,000 × 30% = ₦7,200 for five years.

The tax cash flows (tax savings) should be treated as cash inflows in the appropriate year in the DCF analysis. In the above example:

a. If tax cash flows occur in the same year as that the allowance is claimed, the cash inflows of ₦7,200 will occur in each of the years 1 – 5.
b. If tax cash flows occur in the year following the claim for the allowance, the cash inflows of ₦7,200 will occur in each of the years 2 – 6.

## 10.7 The reducing balance method

With the reducing balance method, the tax-allowable depreciation expense in each year is a constant percentage each year of the tax written down value (TWDV) of the asset as at the beginning of the year. The TWDV of the asset is its cost minus all accumulated capital allowances to date.

**Example: Calculation of tax effect of capital allowances – reducing balance method**

An asset costs ₦120,000. Tax-allowable depreciation is 25% on a reducing balance basis.

Tax on profits is payable at the rate of 30%. The cash flow benefits from the tax depreciation are calculated as follows:

| Year | Description | TWDV | Tax allowable depr [25%] | Tax savings 30% |
|---|---|---|---|---|
| | | ₦ | ₦ | ₦ |
| 0 | Cost | 120,000 | | |
| 1 | Allowance claimed | (30,000) | 30,000 | 9,000 |
| | TWDV | 90,000 | | |
| 2 | Allowance claimed | (22,500) | 22,500 | 6,750 |
| | TWDV | 67,500 | | |
| 3 | Allowance claimed | (16,875) | 16,875 | 5,063 |
| | TWDV | 50,625 | | |
| 4 | Allowance claimed | (12,656) | 12,656 | 3,797 |
| | TWDV at Yr 4 end | 37,969 | | |

The tax cash flows (tax savings) should be treated as cash inflows in the appropriate year in the DCF analysis (either in the same year that the allowance is claimed or one year in arrears, depending on the assumption used about the timing of tax payments).

Note that the relevant cash flow to be included in DCF analyses are the tax effects of the capital allowances not the capital allowances themselves.

### 10.7.1 Timing of the tax effect of capital allowances

The tax cash flows (tax savings) should be treated as cash inflows in the appropriate year in the DCF analysis (either in the same year that the allowance is claimed or one year in arrears, depending on the assumption used about the timing of tax payments).

There are a number of different assumptions that might be made about the timing of the tax effect of capital allowances. The two main assumptions are as follows:

a. Assumption 1: The capital allowance is claimed at the end of the year in which an asset is purchased, and this results in a cash benefit at the date of the claim.

b. Assumption 2: The capital allowance is claimed at the end of the year in which an asset is purchased. The tax liability resulting from this computation is paid one year later.

**Timing of the tax effect of capital allowance**

| | Assumption 1 | Assumption 2A | Assumption 2B |
|---|---|---|---|
| Date of purchase | 01/01/2025 | 01/01/2025 | 31/12/2024 |
| Relevant year | Year 0 | Year 0 | Year 0 |
| First claim of capital allowance for tax purpose | 31/12/2025 | 31/12/2025 | 31/12/2024 |
| Relevant year | Year 1 | Year 1 | Year 0 |
| Tax paid/received | 31/12/2025 | 31/12/2026 | 31/12/2025 |
| Relevant tax year | Year 1 | Year 2 | Year 1 |

In the above example, in assumption 2a, the company would have to wait for two years before the tax benefit of the purchase of the capital asset. It would be better as seen in assumption 2b reduces this wait by buying the asset one day earlier.

A company would usually want to receive tax benefit as soon as possible. In practice, a financial manager would time the purchase of an asset with the rules of the jurisdiction in mind. This means that the usual assumption is that the first tax benefit from purchasing a capital asset is one year after the date of purchase.

### 10.7.2 Balancing charge or balancing allowance on disposal

When an asset reaches the end of its useful life, it will be scrapped or disposed of. An asset might also be disposed of before the end of its useful life. On disposal, there might be a balancing charge or a balancing allowance. This is the difference between:

a. The written-down value of the asset for tax purposes (TWDV); and
b. Its disposal value (if any).

The effect of a balancing allowance or balancing charge is to ensure that over the life of the asset the total amount of capital allowances claimed is equal to the cost of the asset less its residual value.

### 10.7.2 Balancing allowance:

This occurs when the written-down value of the asset for tax purposes is higher than its disposal value. The balancing allowance is an additional claim against taxable profits.

### 10.7.2 Balancing charge

This occurs when the written-down value of the asset for tax purposes is lower than the disposal value. The balancing charge is a taxable amount and will result in an increase in tax payments.

### 10.7.3 Impact on DCF analysis

The cash saving or cash payment is included in the cash flows for DCF analysis, either in the year of disposal of the asset or in the following year, depending on the assumption used about the timing of tax payments.

Note: An annual capital allowance is not claimed in the year of disposal of an asset. Instead, there is simply a balancing allowance (or a balancing charge).

**Example: Impact on DCF analysis**

A company is considering an investment in a non-current asset costing ₦400,000. The project would generate the following cash inflows:

| Year | ₦ |
|---|---|
| 1 | 250,000 |
| 2 | 200,000 |
| 3 | 100,000 |
| 4 | 50,000 |

Capital allowances are claimed at 25%, by the reducing balance method and the first tax benefit will occur one year after the date of acquisition (i.e.at Y1).

It is expected to have a scrap value of ₦100,000 at the end of year 4. The post-tax cost of capital is 9%.

Tax on profits is 30% and paid one year in arrears.

**Required:**

Calculate the NPV of the project.

**Solution**

| **Year** | **0** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| | ₦'000 | ₦'000 | ₦'000 | ₦'000 | ₦'000 | ₦'000 |
| Cash inflows | | 250.00 | 200.00 | 100.00 | 50.00 | |
| Tax on cash inflows | | | [75.00] | [60.00] | [30.00] | [15.00] |
| Tax savings on CA | | 30.00 | 22.50 | 16.88 | 12.66 | 7.97 |
| Initial outlay/SV | [400.00] | | | | 100.00 | |
| Net cash flows | [400.00] | 280.00 | 147.50 | 56.88 | 132.66 | [7.03] |
| DCF @9% | 1.000 | 0.917 | 0.842 | 0.772 | 0.708 | 0.650 |
| PV | [400.00] | 256.76 | 124.20 | 43.91 | 93.92 | [4.57] |
| NPV | **₦114.22** | | | | | |

| **Year** | **Description** | **TWDV** | **Tax allowable depr [25%]** | **Tax savings 30%** |
|---|---|---|---|---|
| | | ₦'000 | ₦'000 | ₦'000 |
| 0 | Cost | 400.00 | | |
| 0 | Allowance claimed | (100.00) | 100.00 | 30.00 |
| | TWDV | 300.00 | | |
| 1 | Allowance claimed | (75.00) | 75.00 | 22.50 |
| | TWDV | 225.00 | | |
| 2 | Allowance claimed | (56.25) | 56.25 | 16.88 |
| | TWDV | 168.75 | | |
| 3 | Allowance claimed | (42.19) | 42.19 | 12.66 |

| | | | | |
|---|---|---|---|---|
| | TWDV | 126.56 | | |
| 4 | Scrap value | [100.00] | | |
| | Balancing allowance | 26.56 | 26.56 | 7.97 |

The impact of the balancing allowance (charge) is that the amount claimed in allowances is always equal to the cost of the asset less its disposal proceeds.

This means that the amount of tax saved is always the tax rate applied to this difference.

### 10.7.4 DCF and inflation

**Inflation and long-term projects**

When a company makes a long-term investment, there will be costs and benefits for a number of years. In all probability, the future cash flows will be affected by inflation in sales prices and inflation in costs. DCF analysis should take inflation into account.

There are two ways of incorporating inflation into DCF analysis. A company should either:

a. discount the money cash flows at the money cost of capital; or
b. discount the real terms cash flows at the real cost of capital.

Discounting real cash flows using a real cost of capital will give the same NPV as discounting money cash flows using the money cost of capital, where the same rate of inflation applies to all items of cash flow.

### 10.7.5 Money/real cash flows

Real terms cash flows are what an item would cost or be sold for in current prices (i.e. before considering inflation).

Money cash flows refer to the amount that is received or paid at different points in time in the future (i.e. taking inflation into account. The money cash flows are estimated by initially pricing cash flows at current prices and then inflating them by the expected inflation rates.

**Example: Money/real cash flows**

A component costs ₦1,000 at today's prices

Inflation for the next two years is expected to be 4% per year

The component will cost ₦1,082 (₦1,000 x 1.04 x 1.04) in 2 years

₦1,000 is the cost of the component in real terms (real terms cash flow)

₦1,082 is the cost of the component in money terms (money cash flow)

### 10.7.6 Money/real cost of capital

The cost of capital is explained in detail in later chapters, but briefly it is the rate of return required by the investors for investing in a project of a given risk. The models covered later estimate the money cost of capital.

Real cost of capital is the return that investors would require without inflation.

Money cost of capital is the return that investors would require with inflation. It follows that the money cost is higher than the real cost in times of inflation.

Investors want a return to compensate them for the risk in the project and an extra return to compensate them for the value of money falling.

A real rate of return can be calculated using the relationship

**Formula: Link between money cost, real cost and inflation (Fisher equation)**

$1 + m = (1 + r) \times (1+i)$

Where:

m = money cost of capital

r = real cost of capital

I = inflation rate

**Example: Money cost of capital to real cost of capital**

If a company has a cost of capital of 12% and inflation is 5% Therefore:

$(1 + m) = (1 + r) \times (1 + i)$

$(1 + 0.12) = (1 + r) \times (1 + 0.05)$ $(1 + r) = 1.12/1.05$

$r = 1.12/1.05 – 1 = 0.0667$ or 6.67%

### 10.7.7 Information availability

In practice companies would have access to current prices and the money cost of capital. In order to perform DCF one or other of these must be changed.

Either the money cost of capital is restated to the real cost and this is used to discount the cash flows expressed in current terms, or the cash flows expressed in current prices are inflated and these are discounted at the money cost.

The second of these approaches is the most commonly used and should be adopted by in the examination, unless a question says otherwise.

## 10.8 Discounting money cash flows at the money cost of capital

The cost of capital used in DCF analysis is normally a 'money' cost of capital. This is a cost of capital calculated from current market returns and yields.

When estimates are made for inflation in future cash flows, the rules are as follows:

a. Estimate all cash flows at their inflated amount. Since cash flows are assumed to occur at the year-end, they should be increased by the rate of inflation for the full year.
b. To estimate a future cash flow at its inflated amount, you can apply the formula:
c. Cash flow in year n at inflated amount = [Cash flow at current price level] × $(1 + i)^n$ (where i is the annual rate of inflation).
d. Discount the inflated cash flows at the money cost of capital, to obtain present values for cash flows in each year of the project and the NPV for the project.

**Example: Discounting money cash flows at the money cost of capital**

A company is considering investing in an item of equipment costing ₦225,000. The equipment would be used to make a product. The selling price of the product at today's prices would be ₦15 per unit, and the variable cost per unit (all cash costs) in today's prices would be ₦9.

The project would have a four-year life, and sales are expected to be:

| Year | Units of sale |
|---|---|
| 1 | 30,000 |
| 2 | 60,000 |
| 3 | 90,000 |
| 4 | 30,000 |

At today's prices, it is expected that the equipment will be sold at the end of Year 4 for ₦15,000. There will be additional fixed cash overheads of ₦75,000 each year as a result of the project, at today's price levels.

The company expects prices and costs to increase due to inflation at the following annual rates:

| Item | Annual inflation rate |
|---|---|
| Sales | 5% |
| Variable costs | 8% |
| Fixed costs | 8% |
| Equipment disposal value | 6% |

The company's money cost of capital is 12%. Ignore taxation.

**Required:**

Calculate the NPV of the project.

**Solution**

All the cash flows must be re-stated at their inflated amounts. An assumption needs to be made about what the cash flows will be in Year 1. Are 'today's' price levels the price levels to use in Year 1, or should the cash flows in Year 1 be increased to allow for inflation?

An examination question might tell you which assumption to use. If it does not, state your assumption in the answer. The usual assumption is that information is given in current prices so that Year 1 cash flows (which the model assumes to occur at the end of Year 1) must be inflated. The assumption is used to answer this question.

| Year | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Sales volume | | 30,000 | 60,000 | 90,000 | 30,000 |
| | ₦ | ₦ | ₦ | ₦ | ₦ |
| **Revenue** | | | | | |
| | | | | | |
| Price | | 15.00 | 15.00 | 15.00 | 15.00 |
| At today's prices | | 450,000 | 900,000 | 1,350,000 | 450,000 |
| Inflation factor | | $1.05^1$ | $1.05^2$ | $1.05^3$ | $1.05^4$ |
| Money cash flows | | **472,500** | **992,250** | **1,562,794** | **546,978** |

| | | | | | |
|---|---|---|---|---|---|
| **Costs** | | | | | |
| Variable cost [current price] | | 180,000 | 360,000 | 540,000 | 180,000 |
| Fixed cost [current price] | | 75,000 | 75,000 | 75,000 | 75,000 |
| Total cost [current price] | | 255,000 | 435,000 | 615,000 | 255,000 |
| Inflation factor | | $1.08^1$ | $1.08^2$ | $1.08^3$ | $1.08^4$ |
| **Money cash flows** | | **275,400** | **507,384** | **774,723** | **346,925** |
| | | | | | |
| Initial outlay | [225,000] | | | | 18,937 |
| **Net Cash flow** | **[225,000]** | **197,100** | **484,866** | **788,071** | **218,990** |
| Dcf@ 12% | 1.000 | 0.893 | 0.797 | 0.712 | 0.636 |
| **PV** | **[225,000]** | **175,921** | **386,438** | **561,107** | **139,278** |

NPV of the project is ₦1,037,743

### 10.8.1 Discounting real cash flows at the real cost of capital

The cost of capital given for use in DCF analysis is normally a 'money' rate of return (also known as a nominal rate of return). The money rate of return should be used to discount money cash flows which have been adjusted to take into account inflation increases.

An alternative approach to DCF analysis is to discount real cash flows using a real cost of capital. Real cash flows are shown at today's prices.

**Example: Both methods**

A company is considering investing in an item of equipment costing ₦225,000. Contribution per unit is expected to be ₦6 and sales are expected to be:

| Year | Units of sale |
|---|---|
| 1 | 30,000 |
| 2 | 60,000 |
| 3 | 90,000 |
| 4 | 30,000 |

At today's prices, it is expected that the equipment will be sold at the end of Year 4 for ₦15,000. There will be additional fixed cash overheads of ₦75,000 each year as a result of the project, at today's price levels. The inflation rate is expected to be 6% and the money cost of capital is 15%.

**Required:**

Calculate the NPV of the project:

(a) using money cash flows and the money cost of capital

(b) using the real value of cash flows and the real cost of capital

**Solution**

**Using money cash flows and a money discount rate**

| Year | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Sales volume | | 30,000 | 60,000 | 90,000 | 30,000 |
| | ₦ | ₦ | ₦ | ₦ | ₦ |
| **Contribution** | | | | | |
| | | | | | |
| Contribution per unit | | 6.00 | 6.00 | 6.00 | 6.00 |
| At today's prices | | 180,000 | 360,000 | 540,000 | 180,000 |
| Inflation factor | | $1.06^1$ | $1.06^2$ | $1.06^3$ | $1.06^4$ |
| Money cash flows | | **190,800** | **404,496** | **643,149** | **227,246** |
| | | | | | |
| **Costs** | | | | | |
| Fixed cost [current price] | | 75,000 | 75,000 | 75,000 | 75,000 |
| Inflation factor | | $1.06^1$ | $1.06^2$ | $1.06^3$ | $1.06^4$ |
| **Money cash flows** | | **79,500** | **84,270** | **89,326** | **94,686** |
| | | | | | |
| Initial outlay | [225,000] | | | | 18,937 |
| **Net Cash flow** | **[225,000]** | **111,300** | **320,226** | **553,823** | **151,497** |
| Dcf@ 15% | 1.000 | 0.870 | 0.756 | 0.658 | 0.572 |
| **PV** | **[225,000]** | **96,831** | **242,091** | **364,451** | **86,656** |

NPV of the project is ₦564,993.

**Using real cash flows and a real discount rate**

| Year | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Sales volume | | 30,000 | 60,000 | 90,000 | 30,000 |
| | ₦ | ₦ | ₦ | ₦ | ₦ |
| **Contribution** | | | | | |
| | | | | | |
| Contribution per unit | | 6.00 | 6.00 | 6.00 | 6.00 |
| At today's prices | | 180,000 | 360,000 | 540,000 | 180,000 |
| Fixed cost [current price] | | 75,000 | 75,000 | 75,000 | 75,000 |
| Initial outlay | [225,000] | | | | 15,000 |
| **Net Cash flow** | **[225,000]** | **105,000** | **285,000** | **465,000** | **120,000** |
| Dcf@ 8.5% | 1.000 | 0.922 | 0.849 | 0.783 | 0.722 |

| | | | | | |
|---|---|---|---|---|---|
| **PV** | **[225,000]** | **96,774** | **242,095** | **364,052** | **86,589** |

NPV of the project is ₦564,510

Both approaches give the same solution, with a small difference due to rounding errors.

### 10.8.2 General and specific inflation

Governments publish a rate (or rates) of inflation. The rate of inflation published by government is the average rate calculated on a "basket of goods" which the government believes to best reflect the spending patterns in the economy or in a part of the economy.

For example, the government might calculate an average rate based on what citizens buy on a day to day basis. This average rate might include different types of foodstuffs, fuel, rent etc.

On the other hand, the government might calculate an average rate based on what companies might buy (or what companies in a given sector might buy).

The point is that there is no single rate of inflation that should be used in investment appraisal.

A scenario might give a single, general rate of inflation or a series of rates that are specific to different types of cash flow.

### 10.8.3 Specific rates of inflation

In this case, money cash flows should be estimated and discounted at the money cost of capital as covered in previous lessons.

### 10.8.4 General rate of inflation

In this case, either approach could be used. A company might either estimate money cash flows and discount them at the money cost of capital (as covered above) or discount real cash flows at the real cost (as covered above).

When using the first of these approaches (i.e. money cash flows at money cost) it would only be necessary to inflate the net total cash inflows or outflows for each period, as shown in the example in section 3.3.

## 10.9 Chapter review

At the end of this chapter, ensure you can:

a. identify taxation cash flows;
b. distinguish between the money cost of capital and the real cost of capital;
c. apply the fisher equation to evaluate an unknown variable;
d. explain the link between money cash flows and real cash flows;
e. identify money cash flows by taking inflation into account; and
f. perform discounted cash flow analysis taking both taxation and inflation into account.

**Skills Level**

**Financial Management**

CHAPTER 11

# RISK AND UNCERTAINTY

## Contents

# 11. Risk and uncertainty

## 11.0 Learning objective

This chapter explains the treatment of risk and uncertainty in investment appraisal.

## 11.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. perform sensitivity analysis and comment on its results;
b. use expected values as a means taking account of risk and uncertainty;
c. construct decision trees and use them to solve problems;
d. estimate the value of perfect information and imperfect information;
e. explain how risk adjusted discount rates might be used to adjust for project risk; and
f. explain simulation.

## 11.2 The problem of risk and uncertainty

Investment projects are long-term projects, often with a time scale of many years. When the cash flows for an investment project are estimated, the estimates might be incorrect. Estimates of cash flows might be wrong for two main reasons:

a. Risk in the investment; and
b. Uncertainty about the future.

### 11.2.1 Risk

Risk exists when the actual outcome from a project could be any of several different possibilities, and it is not possible in advance to predict which of the possible outcomes will actually occur.

The simplest example of risk is rolling a dice. When a dice is rolled, the result will be 1, 2, 3, 4, 5 or 6. These six possible outcomes are known in advance, but it is not possible in advance to know which of these possibilities will be the actual outcome. With risk assessment, it is often possible to estimate the probabilities of different outcomes. For example, we can predict that the result of rolling a dice will be 1, 2, 3, 4, 5 or 6, each with a probability of 1/6.

Risk can often be measured and evaluated mathematically, using probability estimates for each possible future outcome.

### 11.2.2 Uncertainty

Uncertainty exists when there is insufficient information to be sure about what will happen, or what the probability of different possible outcomes might be. For example, a business might predict that sales in three years' time will be ₦500,000, but this might be largely guesswork and based on best-available assumptions about sales demand and sales prices.

Uncertainty occurs due to a lack of sufficient information about what is likely to happen.

It is possible to assess the uncertainty in a project, but with less mathematical precision than for the assessment of risk.

Management should try to evaluate the risk and uncertainty and take it into account when making their investment decisions. In other words, investment decisions should consider the risk and uncertainty in investment projects, as well as the expected returns and NPV.

## 11.3 Methods of assessing risk and uncertainty

There are several methods of analysing and assessing risk and uncertainty. In particular:

a. sensitivity analysis can be used to assess a project when there is uncertainty about future cash flows;
b. probability analysis can be used to assess projects in which there is risk. Other methods of risk and uncertainty analysis include:
c. risk modelling and simulation;
d. risk-adjusted discount rates; and
e. using discounted payback as one of the criteria for investing in capital projects.

## 11.4 Sensitivity analysis

### Introduction

Investment involves expenditure now in return for a stream of future returns. The investment could be in the form of physical assets (capital budgeting or working capital management) or securities. As in most decision-making situations data is based on forecasts which are subject to varying degrees of uncertainty. The task in investment appraisal involves deciding whether the uncertain cost of the investment is outweighed by its uncertain benefits.

### 11.4.1 Basic principle

Sensitivity analysis in investment appraisal is a technique for assessing the sensitivity of a project's return or NPV to a variation in each of the items of cost or benefit in the project. The technique is to take the estimate for each uncertain factor one by one and calculate the change necessary for the NPV to fall to zero, i.e. this is essentially breakeven analysis in NPV terms.

If sensitivity analysis is to be carried out, it is often useful to calculate net present values for each factor or cash flow item in such a way that PVs are found of individual elements of costs and revenues over the life of the project.

**Example**

Kola Ltd is considering a project with a life of 4 years. Details of the project include the following.

| | |
|---|---|
| Outlay (new machine) | ₦60,000,000 |
| Annual sales (units) | 120,000 |
| Unit selling price | ₦750 |
| Unit variable cost | ₦450 |
| Annual cash fixed cost | ₦12,000,000 |
| Project specific cost of capital | 10% |

**Required:**

a) Compute the NPV of the project.
b) Measure the sensitivity of the NPV to the various input factors.

**Solution**

| Year | items | CF | Discount factor | PV |
|---|---|---|---|---|
| | | ₦'000 | @10% | ₦'000 |
| 0 | Cost of machine | [60,000] | 1.000 | [60,000] |
| 1 - 4 | Sales | 90,000 | 3.170 | 285,300 |
| 1 - 4 | Variable costs | 54,000 | 3.170 | [171,180] |
| 1 - 4 | Fixed costs | 12,000 | 3.170 | [38,040] |
| | NPV | | | 16,080 |

Sales = N750 x 120,000 = N90,000,000

TVC = N450 x 120,000 = N54,000,000

Sales volume is based on contribution = N90m – N54m = N36m

Annual cashflows = 90,000,000 – 54,000,000 – 12,000,000 = N24,000,000

Sensitivity

It is usually calculated as the NPV / PV of variable x 100%

- Cost of machine

Sensitivity = 16,080 / 60,000 x 100 = 26.8%

This means that the cost of the machine can rise by maximum of 26.8% if negative NPV is to be avoided.

- Product selling price

Sensitivity = NPV/(PV of sales)×100=₦16,080 /₦285,300 ×100=5.6%

This means that if the project is to remain viable, the unit selling price of the product should not drop by more than 5.6%.

- Sales volume (units)

Sensitivity = NPV/(PV of total contribution) ×100=₦16,080/₦114,120 ×100=14.09%

This means that the project will remain viable (positive NPV) as long as the sales volume does not fall by more than 14,09%.

- Unit variable cost (VC)

Sensitivity= NPV/(PV of total variable costs) × 100 = ₦16,080/₦171,180 ×100=9.39%

This means that the unit variable cost should not rise by more than 9.39% if negative NPV is to be avoided.

- Fixed cost (FC)

Sensitivity= NPV/(PV of total fixed costs)×100=₦16,080 /₦38,040 ×100=42.27%

This means that the maximum percentage increase in the annual fixed cost is 42.27%.

- Cost of capital (COS)

Sensitivity = (IRR-COS)/COS×100

Thus, the maximum cost of capital allowed is the IRR. The IRR is the break-even cost of capital (NPV = 0)

- Life of the project

To calculate the sensitivity of the project's life, we first need to compute its discounted payback period – as detailed below.

| Year | | CF | DCF@10% | PV | CUM PV |
|---|---|---|---|---|---|
| 0 | Cost | [60,000] | 1.000 | [60,000] | [60,000] |
| 1 | Annual cashflow | 24,000 | 0.909 | 21,816 | [38,184] |
| 2 | Annual cashflow | 24,000 | 0.826 | 19,824 | [18,360] |
| 3 | Annual cashflow | 24,000 | 0.751 | 18,024 | [336] |
| 4 | Annual cashflow | 24,000 | 0.683 | 16,392 | |
| | | | | | |

Discounted payback = 2 + 336/16392=2.02 Years

This means that the project's life can be shortened to 2.02 years i.e. a maximum reduction of 49.5% ((2.02 – 4) / 4).

### 11.4.2 Strengths and weaknesses of sensitivity analysis

**Strengths**

Sensitivity Information will be presented to management in a form which facilitates subjective judgment to decide the likelihood of the various possible outcomes considered.

Critical issues Identifies those areas which are critical to the success of the project; if the project is undertaken, those areas can be carefully monitored.

For example, if sales volume and/or price is identified as critical, further market research may help to improve confidence in the estimates.

If the cost of materials or bought-in components is critical, then fixed price contracts may be a possible way of limiting the cost and uncertainty. Alternatively, it may be possible to use futures and options to limit materials costs.

However, it should be noted that these attempts to reduce risk are not costless-market research costs money, option premiums must be paid, suppliers may demand up-front payments on fixed price contracts.

Simple No complicated theory to understand; it is relatively straightforward

**Weaknesses**

Independence: It assumes that changes to variables can be made independently, e.g. material prices will change independently of other variables, which is unlikely. If material prices were to rise, the firm would probably increase selling price at the same time and there may be little effect on NPV (depending on the effect of a price rise on sales demand).

Ignores probability: It only identifies how far a variable needs to change, it does not look at the probability of such a change.

No clear answer: It is not an optimising technique. It provides information on the basis of which decisions can be made. It does not point directly to a correct decision.

## 11.5 Expected value

**Definition of expected value**

An expected value is a weighted average value, calculated using probability estimates of different possible outcomes. To calculate an expected value, the probability of each possible outcome is estimated, and the mean (average) outcome is calculated.

**Calculating and using the EV of the NPV**

The formula is expected value =

Formula: Expected value Expected value = $\Sigma px$

Where:

p = the probability of each outcome x = the value of each outcome

When expected values are used to assess the risk in capital investment appraisal, x would be the NPV for each possible outcome, and the EV would be the expected value of the project net present value (the EV of the NPV).

The basic decision rule is that an investment project should be undertaken if the expected value of its NPV is positive.

However, a project with a positive EV of NPV might not be undertaken if the risk involved seems too great in relation to the amount of the return expected.

**Example**

A company is considering an investment in a project.

The project is expected to run for five years and would cost ₦500,000.

The actual returns from the investment are subject to uncertainty, but the following estimates have been prepared for the different possible outcomes.

| Probability | NPV [₦] |
|---|---|
| 0.20 | 50,000 |
| 0.30 | 10,000 |
| 0.40 | 30,000 |
| 0.10 | (32,000) |
| | |

**Required:**

Calculate the expected value of the NPV

Solution

| Probability | NPV [₦] | EV [₦] |
|---|---|---|
| p | x | px |
| 0.20 | 50,000 | 10,000 |
| 0.30 | 10,000 | 3,000 |
| 0.40 | 30,000 | 12,000 |
| 0.10 | (32,000) | (3,200) |
| | | **21,800** |

The EV of the NPV is positive, +₦21,800. The decision should therefore be to undertake the investment, provided that the risk does not seem too great. In this example there is a 10% probability that the NPV will be negative, –₦32,000. Management might therefore consider whether the investment is worth undertaking, in view of this risk.

### 11.5.1 Advantages and disadvantages of using expected values

**The advantages of using the expected values of the NPV are as follows**:

It is a weighted average measure of all the possible outcomes. It is therefore, arguably, a more appropriate measure of return than the most likely or most probable EV of NPV.

It provides a single figure, not a range of different figures, for making an investment decision.

#### 11.5.2 The disadvantages of using the expected values of the NPV

The estimates of probabilities might be subjective and based on judgement and guesswork.

The EV of the NPV is not a value for any of the actual possible outcomes. In other words, the EV itself will not happen. It is simply an average representing a number of different possible outcomes.

An EV is much more reliable for estimating the average outcome from events that will happen repeatedly, many times over. A weighted average is not nearly as suitable for estimating the expected outcome for a once-only capital expenditure project.

Most important of all, an EV does not provide any analysis of the project risk. When capital investment projects are evaluated, and a decision is made whether or not to undertake the investment, there should be a thorough analysis of the risk as well as the expected returns.

### 11.6 Decision trees

Sometimes a decision might need to be taken in two or more stages, with the second-stage decision depending on what is the outcome from the first-stage decision.

A decision tree can be drawn to provide a methodical approach to calculating the expected value. A decision tree is built to show all possible outcomes and associated probabilities. A decision tree is drawn from its “root” up to its “branches” and then, once drawn, analysed from its “branches” back to its “root”.

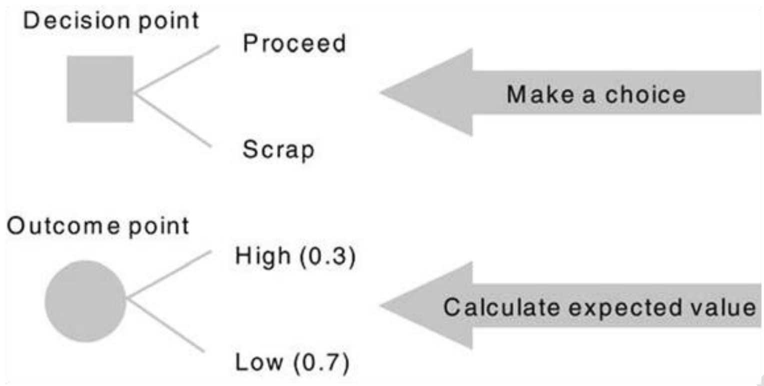
There are two different types of branching point in the tree:

Decision points – as the name suggests this is a point where a decision is made

Outcome points – an expected value is calculated here.

The following symbols are used for decision points and outcome points:

**Illustration: Symbols**




**Example: Expected value**

A company is considering whether to invest in a new project costing ₦12,000, which has an 80% chance of being successfully developed.

If it is developed successfully, the future cash flows from the project will depend on whether the economic conditions are good or poor.

The present value of the future cash flows expected depend on the economic conditions which are forecast as follows:

| Economic conditions | Present value of future cash flows | Probability |
|---|---|---|
| Good | 50,000 | 0.6 |
| Poor | (20,000) | 0.4 |

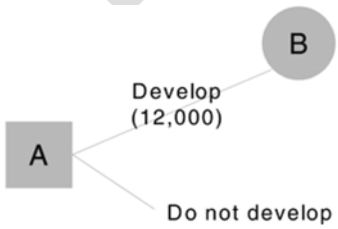
Required

Should the company undertake the project?

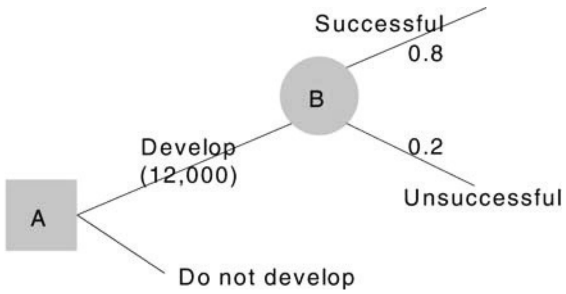
**Solution**

**Step 1: Build the Tree (in this direction)**

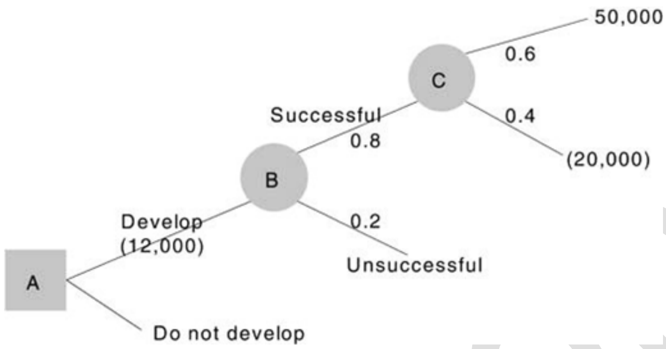
Start with the decision that is being made:




Then at point B draw the possibilities of the success or failure of the project together with the associated probabilities.




Then draw the possibilities of the different economic prospects together with the associated probabilities:




**Step 2: Analyse the tree (in this direction)**

Expected present value at point C:

= (0.6 ×50,000) + (0.4 ×(20,000)) = 22,000

Expected present value at point B (EPVB)

= (0.8 × EVC) + (0.2 × zero)

= (0.8 × 22,000) + (0.2 × zero) = 17,600

**Decision at point A (ENPVA)**

Proceed at a cost of 12,000 to earn cash flows with a present value of 17,600 giving a net present value of 5,600 or do not proceed for zero

The decision is to invest for an ENPV of 5,600.

**Example: Expected Value**

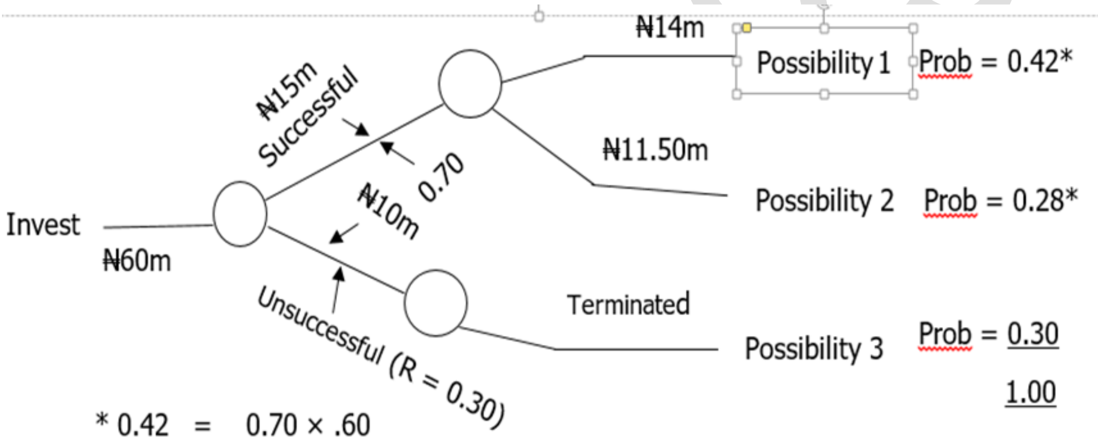
Kenny Ltd is considering an investment in a new project with an initial expenditure of ₦60 million, payable now. The net cash inflows in the following three years will dependent upon the success of the initial advertising, the cost of which is included in the initial expenditure. If it is successful, net annual cash inflows will be ₦15m and if unsuccessful they will be ₦10m. There is a 70% chance of success. If the advertising is unsuccessful then the project will be terminated in year 3 and the assets sold for ₦40m; if it is successful then there is a 60% chance of receiving net annual cash inflows of ₦14m, and a 40% chance of receiving ₦11.5m in the following 5 years. In both cases the residual value of the assets will be ₦4m. The relevant discount rate is 14%.

**Required:**

Calculate the possible net present values which could result from the investment, given the above information and find the expected net present value. What is the standard deviation of the project?

**Solution**

The information given is best represented in a probability tree




* 0.42 = 0.70 × .60

* 0.28 = 0.70 × .40

**Calculation of possible NPVs**

**Possibility 1**

| Year | Cashflow | DCF @14% | PV |
|---|---|---|---|
| | ₦m | | ₦m |
| 0 | (60) | 1.000 | (60) |
| 1 – 3 | 15 | 2.32 | 34.80 |
| 4 – 8 | 14 | 2.32 | 32.48 |
| 8 | 4 | 0.35 | 1.40 |
| | **NPV** | | **8.68** |

**Possibility 2**

| Year | Cashflow | DCF @14% | PV |
|---|---|---|---|

| | ₦m | | ₦m |
|---|---|---|---|
| 0 | (60) | 1.000 | (60) |
| 1 – 3 | 15 | 2.32 | 34.80 |
| 4 – 8 | 11.5 | 2.32 | 26.68 |
| 8 | 4 | 0.35 | 1.40 |
| | **NPV** | | **2.88** |

**Possibility 3**

| **Year** | **Cashflow** | **DCF @14%** | **PV** |
|---|---|---|---|
| | ₦m | | ₦m |
| 0 | (60) | 1.000 | (60) |
| 1 – 3 | 10 | 2.32 | 23.20 |
| 3 | 40 | 0.67 | 26.80 |
| | | | |
| | **NPV** | | **(10.00)** |

**Calculation of ENPV and Standard Deviation**

| **Possibility** | **NPV** | **Probability** | **Expected value** | **Variance** |
|---|---|---|---|---|
| | **[X]** | **[P]** | **[PX]** | **P[X – PX]** |
| **1** | 8.68 | 0.42 | 3.65 | 21.89 |
| **2** | 2.88 | 0.28 | 0.81 | 0.56 |
| **3** | [10.00] | 0.30 | [3.00] | 39.40 |
| | **ENPV** | | **1.46** | **61.85** |

**Standard deviation = √61.85 =** ₦7.86m

## 11.7 Value of perfect information

Sometimes a question might go on to ask how much a company would be willing to pay to be absolutely certain of an outcome. In other words what is the value of perfect information?

The answer to this question can be simply expressed as:

| | **₦** |
|---|---|
| Expected value without perfect information | Xx |
| Expected value with perfect information | Xx |
| Value of perfect information | Xx |

**Example: Value of perfect information from the Decision tree**

An organisation has offered to provide a perfect forecast of whether the future economic conditions will be good or bad.

**Required:**

What is the maximum amount that the company would pay for this forecast?

**Solution**

**At point C** – If the company knew that future economic conditions were good it would proceed but if it knew they were poor it would not proceed (thus avoiding the negative present value of ₦20,000).

The chance of the forecast being good is 60%. Therefore: Expected present value at point C (EPVC) = (0.6 ×50,000) = 30,000

**Expected present value at point B (EPVB)**

= (0.8 × EPVC) + (0.2 × zero) = (0.8 × 30,000) + (0.2 × zero) = 24,000

**Decision at point A (ENPVA)**

Proceed at a cost of ₦12,000 to earn cash flows with an expected present value of ₦24,000 (giving an expected net present value of ₦12,000.

The value of the perfect information is then calculated as follows:

| | ₦ |
|---|---|
| Expected net present value with perfect information | 12,000 |
| Expected net present value without perfect information | 5,600 |
| Value of perfect information | 6,400 |

### 11.7.1 Value of imperfect information

It might be possible to reduce uncertainty but not to remove it entirely. An expert might be able to make a forecast about the future, but that expert might be wrong.

The approach to valuing imperfect information is the same as before, but the calculations can be quite tricky.

| | ₦ |
|---|---|
| Expected value without imperfect information | Xx |

| | |
|---|---|
| Expected value with imperfect information | Xx |
| Value of Imperfect information | Xx |

**Example: Value of imperfect information from the Decision tree**

An organisation had offered to provide a perfect forecast of whether the future economic conditions will be good or bad.

The organisation normally achieves 85% accuracy [in other words they are wrong 15% of the time]. This means that when we say that the economy will be strong, it may well be bad and vice versa. [assume that the company will not proceed if a poor economy is forecast].

It is necessary to build a table of possible outcomes before solving the question.

| | Economic conditions are good [60] | Economic conditions are poor [40] | |
|---|---|---|---|
| Expert forecasts the economy will be good | 0.85 x 0.60 = 0.51 | 0.15 x 0.40 = 0.06 | 0.57 |
| Expert forecasts the economy will be good | 0.15 x 0.60 = 0.09 | 0.85 x 0.40 = 0.34 | 0.43 |
| | 0.60 | 0.40 | 1.00 |

Therefore, there is a 57% chance that the expert will forecast that the economy will be good. When the expert says the economy is good, he is correct 0.51 out of 0.57 times = 89.5% within that forecast. Therefore, he will be incorrect 10.5% within that forecast.

The calculation of the imperfect information is as follows:

| | ₦ |
|---|---|
| Expected present value at point C [EPVC] | |
| 0.895 x 50,000 | 44,750 |
| 0.105 x (20,000) | (2,100) |
| | 42,650 |
| Probability of good verdict | 0.57 |
| | 24,311 |
| Probability of successful development | 0.8 |
| **Expected present value at point B** | 19,448 |
| | (12,000) |
| **Expected net present at point A** | 7,448 |

The value of the imperfect information is then calculated as follows

| | ₦ |
|---|---|
| Expected net present value without imperfect information | 7,448 |
| Expected value with imperfect information | 5,600 |
| Value of Imperfect information | 1,848 |

## 11.8 Simulation

**Risk modelling: simulation modelling**

The risk in an investment can be assessed by constructing a 'model' for the investment, and then considering possible variations in the possible outcomes.

For capital investment appraisal, a risk model might be constructed using a spreadsheet.

Having constructed the model, the risk in the investment can be assessed by testing different scenarios, such as delays in achieving the benefits from an investment, and combinations of variations in costs and benefits.

### 11.8.1 Simulation modelling

A complex risk model can be used to assess the range of possible outcomes from the investment, and to construct a probability distribution of possible outcomes, for statistical analysis. One such type of risk model is Monte Carlo simulation model.

A Monte Carlo simulation is one that employs a random device for identifying what happens at a different point in a simulation.

A simulation model contains a large number of inter-related variables (for example sales volumes of each product, sales prices of each product, availability of constraining resources, resources per unit of product, costs of materials and labour, and so on).

For each variable, there are estimated probabilities of different possible values. These probabilities are used to assign a range of random numbers to each variable. (The random number allocation should reflect the probability distribution).

**Example: Simulation**

A company wishes to use simulation to provide forecasts of possible profit levels under different circumstances.

The company identifies four variables (sales volume, sales price, variable cost per unit and fixed costs) and believes that the value of each of these variables is independent of the other three variables. (Note that this would be very unlikely for sales volume and sales price).

The company has identified the possible values for each variable with their associated probability, and assigned a range of random numbers to these values as follows:

| **Sales volume** | | | **Variable cost per unit** | | |
|---|---|---|---|---|---|
| **Units** | **probability** | **Random number range** | **₦** | **probability** | **Random number range** |
| 10,000 | 20% | 01 – 20 | 2 | 10% | 01 – 10 |
| 20,000 | 50% | 21 – 70 | 3 | 30% | 11 – 40 |
| 30,000 | 30% | 71 – 00 | 4 | 40% | 41 – 80 |
| | | | 5 | 20% | 81 – 00 |

| **Sales price per unit** | | | **Fixed costs** | | |
|---|---|---|---|---|---|
| **₦** | **probability** | **Random number range** | **₦** | **probability** | **Random number range** |
| 14 | 15% | 01 – 15 | 200,000 | 85% | 01 – 85 |
| 15 | 40% | 16 – 55 | 220,000 | 10% | 86 – 95 |
| 16 | 35% | 56 – 90 | 240,000 | 5% | 96 -- 00 |
| 17 | 10% | 91 – 00 | | | |

The model is then used to calculate the value of the outcome or result, for a given set of values for each variable.

This simple model can be used to calculate the expected profit, given a combination of sales volume, sales price, variable cost and fixed costs.

The values for each variable are determined by generating random numbers for each variable.

For example: If random numbers 14856327 are generated these become 14, 85, 63, 27 and are assigned as follows:

| | Units | Probability | Number range | Random no |
|---|---|---|---|---|
| Sales volume | 10,000 | 20% | 00 – 19 | 14 |
| Sales price | ₦16 | 35% | 55 – 89 | 85 |
| Variable cost per unit | 4 | 40% | 40 –79 | 63 |
| Fixed cost | ₦200,000 | 85% | 00 - 84 | 27 |

With a complex model, a large number of different variables could be given various possible values, with associated probabilities and random number allocations.

The model is then used to produce a large number of possible outcomes and NPVs for the project. For each possible outcome, random values are given to each of the uncertain variables by generating random numbers and deciding the value in accordance with the random number generated.

If the model produces hundreds, possibly thousands, of different possible NPVs, each calculated using different values for the variables according to the random numbers generated, the different outcomes can be analysed into a probability distribution with a mean and a standard deviation.

In many cases, the probability distribution will show the characteristics of a normal statistical distribution.

Where a normal distribution is produced, the mean and standard deviation can be used to analyse the possible outcomes from the project in some detail. For example, the probability of a negative NPV can be calculated, or the minimum expected NPV at the 95% or the 99% confidence level.

The model can include all the possible values for each variable and their associated probabilities

Simulation can be very useful for the analysis of large and complex investment projects.

### 11.8.2 Disadvantages of simulation

Constructing a reliable simulation model can be complex, time-consuming and expensive. The benefits might not be worth the time and cost.

The probability estimates for each of the variables may be highly subjective and unreliable. This will affect the reliability of the risk assessment and probability distribution derived from the model.

## 11.9 Risk adjusted discount rate

**Introduction**

The calculation of NPV involves modelling the project cash flows and then discounting them. It is possible to take account of the riskiness of the project cash flows in this process. Two approaches are possible;

a. Cash flows can be restated to the risk free equivalent (certainty equivalents) and discounted at the risk free cost of capital; or

The cash flows as modelled can be discounted at the risk adjusted discount rate.

### 11.9.1 Certainty equivalent

A certainty equivalent is the risk free equivalent of a risky cash flow. This is difficult to understand at first and is best illustrated by way of example.

**Example : Certainty equivalent**

Suppose **John** was offered a chance to win ₦5,000,000 on the flip of a coin. Under the offer John would receive ₦5,000,000 if the coin landed on heads but zero if it landed on tails.

John owns an asset (being the opportunity to win ₦5,000,000) and this asset has an expected value of ₦2,500,000. However, John is not being offered any course of action that would result in this amount as he would either receive ₦5,000,000 or nothing.

Now suppose that Tony offered to buy the asset off him for ₦500. It is likely that John would reject this as a certain amount of ₦500 is not much compensation for a 50% chance of receiving 5 million.

However, if Tony kept increasing the offer, there would be a point where John would be indifferent between the certainty of the sum offered and a 50% chance of receiving a million. That point is the certainty equivalent.

For example, suppose that Tony increased his offer by increments until John accepted an offer of ₦1,000,000 for his right.

**The ₦1,000,000 is the certainty equivalent of the risky asset**.

Certainty equivalents can be used in discounted cash flow calculations. Each cash flow is multiplied by a certainty equivalent factor to give a certainty equivalent figure. These figures are then discounted at the risk-free rate.

**Example : Certainty equivalents**

A company is considering a project with the following cashflows. The company has also obtained the following certainty equivalent factors as shown in the table below:

| Year | Net cashflow | Certainty equivalent factor |
|---|---|---|
| | ₦ | |
| 0 | (550,000) | 1.00 |
| 1 | 150,000 | 0.94 |

| | | |
|---|---|---|
| 2 | 350,000 | 0.87 |
| 3 | 300,000 | 0.79 |
| 4 | 200,000 | 0.70 |

The company's cost of capital is 12% and the risk free rate is 8%.

**Required:**

Calculate the Net present value [NPV] using the certainty equivalent method.

**Solution**

| Year | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| | ₦ | ₦ | ₦ | ₦ | ₦ |
| Cashflows | (550,000) | 150,000 | 350,000 | 300,000 | 200,000 |
| Certainty equivalent factors | 1.00 | 0.94 | 0.87 | 0.79 | 0.70 |
| Certainty equivalents | (550,000) | 141,000 | 304,500 | 237,000 | 140,000 |
| DCF @8% | 1.000 | 0.926 | 0.857 | 0.794 | 0.735 |
| PV | (550,000) | 130,570 | 260,960 | 188,180 | 102,900 |
| **NPV** | | | | | **132,600** |

**Risk adjusted discount rates**

The discount rate should always reflect the risk of the underlying cash flows being discounted. (This is the case under the certainty equivalent approach where the risk free equivalent cash flows are discounted at the risk free rate).

The weighted average discount rate (WACC) of a company is the rate of return required by its owners to compensate them for tying up their capital in that company. The owners decide on the level of return they require for investing in a company by comparing the risk of the company to the risk of alternative investment opportunities. Therefore, in a very real sense, the WACC of a company reflects the risk of that company's assets and returns. The WACC of capital of a company reflects the risk of that company.

It is only appropriate for a company to use its WACC as a discount rate if the risk of the project is the same as the overall risk of the company. If this is not the case an alternative rate should be used to reflect the risk of the project.

Discount rates are increased to reflect future cash inflows of higher risk. The use of a higher discount rate results in a lower NPV. This is as expected.

Suppose a business expected two receipts of ₦10,000 in one year's time but one of these was more risky than the other. In that case the riskier asset would be worth less. A higher discount rate would achieve this.

The calculation of WACC is explained in a later chapter.

**Source of risk adjusted discount rates**

In practice the treasury department of a multinational might provide a list of rates to be used to appraise projects of different types. For example, they might specify 10% for asset replacement decisions but 12% for expansion decisions which by their nature are more risky. Such rates should be derived from a capital asset pricing model (CAPM) based approach but this is not always the case.

The CAPM will be explained in a later chapter. It is a technique which provides the required rate of return for an appropriate level of risk (measured as $\beta$) by adding a risk premium to the risk free rate.

## 11.10 Discounted payback period method

This is a capital budgeting technique that calculates the payback period considering the time value of money. Unlike the traditional payback period method that ignores the time value of money, this one considers the time value of money using a discount rate.

Steps in calculating the discounted payback period are as follows:

a. calculate the present value of each year's cashflow using the discount rate.
b. accumulate the present values until the initial investment is recovered.
c. determine the year in which the investment is fully recovered.

**Example on Discounted Payback Period**

Calculate the discounted payback period of Investment P with the following cashflows and details, if the cost of capital is 10%.

| | ₦ |
|---|---:|
| Initial outlay | 450,000 |
| Incremental cashflows | |
| Year 1 | 130,000 |
| Year 2 | 130,000 |
| Year 3 | 130,000 |

| | |
|---|---|
| Year 4 | 130,000 |
| Year 5 | 130,000 |

**Solution**

| Year | | DCF @ 10% | PV | CUM PV |
|---|---|---|---|---|
| | ₦ | | ₦ | ₦ |
| 0 | [450,000] | 1.000 | [450,000] | [450,000] |
| 1 | 130,000 | 0.909 | 118,000 | [332,000] |
| 2 | 130,000 | 0.826 | 107,000 | [225,000] |
| 3 | 130,000 | 0.751 | 98,000 | [127,000] |
| 4 | 130,000 | 0.683 | 89,000 | [38,000] |
| 5 | 130,000 | 0.621 | 81,000 | 43,000 |

Discounted Payback period = 4 + 38/81 = 4.47 years.

Before moving on to the next chapter check that you now know how to:

a. Perform sensitivity analysis and comment on its results
b. Use expected values as a means taking account of risk and uncertainty
c. Construct decision trees and use them to solve problems
d. Estimate the value of perfect information and imperfect information
e. Explain how risk adjusted discount rates might be used to adjust for project risk
f. Explain simulation

## 11.11 Chapter review

At the end of this chapter, ensure you can:

a. perform sensitivity analysis and comment on its results;
b. use expected values as a means taking account of risk and uncertainty;
c. construct decision trees and use them to solve problems;
d. estimate the value of perfect information and imperfect information;
e. explain how risk adjusted discount rates might be used to adjust for project risk; and
f. explain simulation.

**Skills Level**

**Financial Management**

CHAPTER 12

# SPECIFIC APPLICATIONS

Contents





## 12 Introduction: specific applications

### 12.0 Learning objective

This chapter discusses other sources of finance and financing decisions.

## 12.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. make lease or buy decision.
b. discuss the optimum replacement cycle of an asset needed on a continuous basis.
c. discuss the optimum investment plan when capital is rationed in a single period and project when the projects are divisible.

## 12.2 The nature of the lease versus buy decision

A company might be faced with a decision about whether or not to acquire a new non-current asset, and if the asset is acquired, whether the acquisition should be financed with a bank loan or by means of a lease arrangement. This is usually referred to as a 'lease versus buy' decision.
The decision should be considered in two separate stages.

The acquisition decision (or investment decision). The first step is to decide whether or not the asset should be acquired. This decision is based on the assumption that the asset will be purchased.

The financing decision. The second stage is to make a financing decision. If the decision is to acquire the asset, this stage of the decision is to select the preferred method of financing the acquisition. In other words, whether to buy the asset for cash (financed by a bank loan) or whether to lease it.

### 12.2.1 Types of lease

IAS 17 described two types of lease (with each type being accounted for in a different way):

a. Finance Leases
b. Operating Leases

The definitions of each type are repeated here for convenience

A lease is classified as a finance lease if it transfers substantially all the risks and rewards incidental to ownership. A lease is classified as an operating lease if it does not transfer substantially all the risks and rewards incidental to ownership.

Whether a lease is a finance lease or an operating lease depends on the substance of the transaction rather than the form of the contract.

The legal form of a finance lease is that the lessor is the legal owner of the leased asset.

The economic substance of a finance lease is that the lessee has all the benefits and costs associated with ownership of the asset. The finance lessee is in the same position as it would have been if it had borrowed money to buy the asset itself. That is why such leases are called finance leases; they provide finance for the use of an asset.

Key features of a lease that would indicate that it was a finance lease would be:

The lessee has the option, at a future date, to purchase the asset from the lessor, and the agreed purchase price is substantially lower than the expected fair value of the asset at the date the option to buy can be exercised;

The term of the lease is for a major part of the expected economic life of the asset; and

At the inception of the lease, the present value of all the future lease payments amounts to substantially all of the fair value of the leased asset, or more; The leased asset is of such a specialised nature that it can only be used by the lessee (without the need for a major modification).

### 12.2.2 IFRS 16

IAS 17 has been superseded by IFRS 16. Under the new rules in IFRS 16 lessees must capitalise all leases in their financial statements. The distinction between operating and finance leases no longer applies for a lessee.

However, the distinction between operating and finance leases continues to apply from the lessor's view as do the finance lease indicators given above.

This all might sound to be irrelevant for this paper but lease or buy decisions are based on relevant cash flows. Taxation is a relevant cash flow and the tax legislation continues to make reference to operating and finance leases in the rules on tax deductibility. So, in this respect the distinction is still important for lessees because it affects the deductibility of their lease payments.

## 12.3 The acquisition decision

The acquisition decision should be reached using the normal NPV method of investment appraisal. The cash flows include:
The purchase cost of the asset (usually as time 0 cash outflow).
The expected benefits and costs from the project, such as extra cash revenues and cash expenses each year, and working capital requirements.

The residual value at the end of the asset's life as a cash flow of the project in the final year.

The tax cash flows which consist of the tax effect on tax of higher or lower annual cash profits, and also the effect on cash flows of tax-allowable depreciation (capital allowances).

The cost of capital should be the company's normal (after-tax) cost of capital.

## 12.4 The financing decision

If the decision in stage 1 is that the asset should be acquired, the next stage – the financing decision – is to decide on the best method of financing for the asset.

The financing decision is only necessary once the investment decision has been made and that decision is to proceed with the project. This means that the NPV of the project must be positive after taking into account the cash cost of the asset. The finance decision then looks for a cheaper alternative to financing the use of the asset.

The preferred financing method is the one with the lower (or lowest) PV of cost.

## 12.5 Relevant cash flows

The asset will be acquired, no matter what financing
method is chosen. This means that all the cash flows that will occur regardless of the financing method can be ignored because they are not relevant to the financing decision.
The only relevant cash flows are the cash flows which will change as a result of the financing method.
The relevant cash flows can be summarised as follows:

### 12.5.1 Purchase price of the asset (the amount borrowed)

If the purchase of the asset is financed with a bank loan, the cash flows for the bank loan should be discounted to a PV at the after-tax cost of borrowing.

However, the PV of the cash flows associated with a loan (interest payments and the tax relief on interest payments) discounted at the after-tax cost of capital is equal to the amount of the loan. (This is explained in a later chapter where cost of capital is covered). This means that the amount borrowed can be used instead of discounting future interest and tax relief on that interest.

The PV of the option to purchase the asset with a loan is reduced by the reduction in tax payments that will occur by claiming capital allowances on the asset. The net PV of cost is therefore the amount of the loan minus the PV of the tax benefits from capital allowances.

### 12.5.2 Tax savings on capital allowances

Nigerian rules in regard to capital allowances are as follows:
A company that buys an asset to use in its business can claim capital allowances.
A company that leases an asset under a finance lease can also claim capital allowances.
A company leasing an asset under an operating lease cannot claim capital allowances. These are claimed by the lessor.
Therefore, the tax effect of the capital allowances is incremental to the financing decision between borrowing and buying an asset and leasing the asset under an operating lease.
The tax effect of capital allowances is not incremental to the financing decision between borrowing and buying an asset and leasing the asset under a finance lease.

### 12.5.3 Rentals

Rental payments by the lessee are incremental to borrowing and buying the asset for both finance leases and operating leases

### 12.5.4 Tax relief on the rentals

Operating lease rental payments are deductible in full. Therefore, the tax relief on the rentals is incremental to the financing decision between borrowing and buying an asset and leasing the asset under an operating lease

Only the interest element of a finance lease rental is tax deductible. Therefore, only the tax relief on the rentals is incremental to the financing decision between borrowing and buying an asset and leasing the asset under a finance lease.

### 12.5.5 Disposal proceeds

A lessee does not own the asset. Therefore, a lessee cannot benefit from the sale of an asset at the end of its useful life. This is incremental to the financing decision.

The relevant cash flows can be summarised as follows:

| Cash flow | Borrow and buy the asset | Finance lease | Operating lease |
|---|---|---|---|
| Purchase price of the asset (the amount borrowed) | Yes | | |
| Disposal proceeds from | Yes | | |
| Tax savings on capital | Yes | Yes | |
| Lease rentals | | Yes | Yes |
| Tax relief on full lease rentals | | | Yes |
| Tax relief on interest element of the lease rental | | Yes | |

1

### 2.5.6 Discount rate

The financing cash flows of the alternative financing method should be discounted at the post-tax cost of the borrowing.

## 12.6 Example: Lease or buy decision Finance lease

Crimson is considering a project requiring a new machine. The machine costs ₦4.5 million and it would have a useful life of three years and no residual value at the end of that time.

The machine will produce cash operating surpluses of ₦2.5 million each year. Tax allowable depreciation is 15% on a straight-line basis.

Tax is 30% on operating cash flows and is payable one year in arrears. Crimson has an after-tax cost of capital of 20%.

It is considering either borrowing from the bank at the pre-tax interest rate of 14% and buying the asset outright, or leasing it at a cost of ₦1.9 million each year for three years, with the lease payments payable in arrears at the end of each year. (The lease is a finance lease).

**Required:**

Evaluate the project. Should the asset be acquired, and if so which financing method should be used?

**Solution**

**Stage 1: The acquisition decision (investment decision)**

Acquisition decision

| **Year** | **0** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|---|
| | ₦'000 | ₦'000 | ₦'000 | ₦'000 | ₦'000 |
| Machine cost | (4,500.00) | | | | |
| Tax relief on machine | | 202.50 | 202.50 | 202.50 | 742.50 |
| operating cash flows | | 2,500.00 | 2,500.00 | 2,500.00 | |
| Tax on operating cashflows | | | (750.00) | (750.00) | (750.00) |
| Net cashflows | **(4,500.00)** | **2,702.50** | **1,952.50** | **1,952.50** | **(7.50)** |

| | | | | | |
|---|---|---|---|---|---|
| DCF @ 20% | 1.000 | 0.833 | 0.694 | 0.579 | 0.482 |
| PV | **(4,500.00)** | **2,252.08** | **1,355.90** | **1,129.92** | **(3.62)** |
| **NPV** | | | | | **234.29** |

**Workings:**

Tax-allowable depreciation = 15% × ₦4,500,000 = ₦675,000 per annum in years 1 – 3.

Therefore, total tax allowable depreciation = 3 × ₦675,000 = ₦2,025,000. Therefore, balancing allowance at end of Year 3 = ₦2,475,000 (₦4,500,000 – ₦2,025,000).

It is assumed that the first tax allowance for depreciation would be claimed early in Year 1, i.e. in Year 0, resulting in a tax saving (one year later) at the end of Year 1. The savings in tax payments will therefore be (one year in arrears): For Years 1 – 3: ₦675,000 × 30% = ₦202,500.

For Year 4: ₦2,475,000 × 30% = ₦742,500

**Stage 2: The financing decision**

There are two financing options: to buy the asset with a bank loan or to obtain the asset under a finance lease arrangement.

The present value of the cash flows associated with the two financing options should be compared.

Tax impact of the capital allowances can be ignored as they would be claimed, however the asset is financed.

The PV is calculated using the post-tax cost of borrowing which is:

| **Year** | **0** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|---|
| | ₦'000 | ₦'000 | ₦'000 | ₦'000 | ₦'000 |
| Lease payments | | (1,900.00) | (1,900.00) | (1,900.00) | |
| Tax relief on payments | | | 174.24 | 123.16 | 65.49 |

| | | | | | |
|---|---|---|---|---|---|
| Net cashflows | **-** | **(1,900.00)** | **(1,725.76)** | **(1,776.84)** | **65.49** |
| DCF @9.8% | 1.000 | 0.911 | 0.829 | 0.755 | 0.688 |
| PV | **-** | **(1,730.42)** | **(1,431.45)** | **(1,342.28)** | **45.05** |
| **PV of leasing cost** | | | | | **(4,459.09)** |

14% × (1 – 30%) = 9.8%.

**The PV of the cost of purchasing is the ₦4,500,000.**

**The PV of the leasing cost is ₦4,459,090.**

### 12.6.1 Financing decision

Leasing is cheaper than borrowing the cash to buy the asset. Crimson should lease the assets.

**Workings**

**Calculating the tax relief on rentals**

| Year | ₦'000 | DCF@10% | PV @10% | DCF@15% | PV @ 15% |
|---|---|---|---|---|---|
| 0 | (4,500.00) | 1.000 | (4,500.00) | 1.000 | (4,500.00) |
| 1--3 | 1,900.00 | 2.487 | 4,725.30 | 2.283 | 4,337.70 |
| | | | 225.30 | | (162.30) |

IRR = LR + $NPV_{LR}$ / $NPV_{HR}$ – $NPV_{LR}$] X HR – LR

IRR = 10 + {225.30 / 225.30 + 162.30} X [15 – 10] = 13%

The cost of the lease is 13%

**Step 2: construct an amortization table and calculate the tax relief on interest**

| Amortization Table | | 13% | | | |
|---|---|---|---|---|---|
| Year | Bal at start | interest | lease rent | Bal at end | Tax on interest |
| 1 | 4,500.00 | 580.79 | (1,900.00) | 3,180.79 | 174.24 |
| 2 | 3,180.79 | 410.52 | (1,900.00) | 1,691.31 | 123.16 |
| 3 | 1,691.31 | 218.29 | (1,900.00) | 9.60 | 65.49 |

The balancing figure at the end should be 0 or insignificant. Tax on interest is tax rate multiplied by the interest rate.

## 12.7 Finance decision: borrow and buy or operating lease

**Example: Lease or buy decision**

Crimson is considering a project requiring a new machine. The machine costs ₦3 million and it would have a useful life of three years and no residual value at the end of that time.

Tax allowable depreciation is 15% on a straight-line basis.

Tax is 30% on operating cash flows and is payable one year in arrears. Crimson has an after-tax cost of capital of 20%.

It is considering either borrowing from the bank at the pre-tax interest rate of 14% and buying the asset outright, or leasing an equivalent facility at a cost of ₦1.3 million each year for three years, with the lease payments payable in advance at the beginning of each year. (Assume that this lease is an operating lease).

**Required:**

Which financing method should be used?

**Solution**

**PV of cost of purchasing**

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | ₦'000 | ₦'000 | ₦'000 | ₦'000 |
| Machine cost | | | | |
| Tax relief on machine | 135.00 | 135.00 | 135.00 | 495.00 |
| Net cashflows | **135.00** | **135.00** | **135.00** | **495.00** |
| DCF @9.8% | 0.911 | 0.829 | 0.755 | 0.688 |
| PV | **122.95** | **111.98** | **101.98** | **340.56** |
| **PV of purchasing** | | | | **(2,322.53)** |

**PV of leasing cost**

| Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | ₦'000 | ₦'000 | ₦'000 | ₦'000 |
| Lease payments | (1,300.00) | (1,300.00) | (1,300.00) | |
| Tax relief on payments | | 390.00 | 390.00 | 390.00 |
| Net cashflows | **(1,300.00)** | **(910.00)** | **(910.00)** | **390.00** |
| DCF @9.8% | 0.911 | 0.829 | 0.755 | 0.688 |
| PV | **(1,183.97)** | **(754.81)** | **(687.44)** | **268.32** |
| **PV of leasing cost** | | | | **(2,357.90)** |

### Financing decision

An operating lease is more expensive than borrowing the cash to buy the asset. Crimson should borrow money at 14% and buy the asset.

## 12.8 Asset replacement decisions

### 12.8.1 The nature of asset replacement decisions

An asset replacement decision involves deciding how frequently a non-current asset should be replaced, when it is in regular use, so that when the asset reaches the end of its useful life, it will be replaced by an identical asset.

In other words, this type of decision is about identifying the most appropriate useful economic life of a non-current asset, and how frequently it should be replaced.

Here we are not dealing with a one-off decision about whether or not to acquire an asset. Instead we are deciding when to replace an asset we are currently using with another new asset; and then when the new asset has been used up, replacing it again with an identical asset; and so on in perpetuity. We are evaluating the cycle of replacing the machine – considering the various options for how long we should keep it before replacing it.

The decision rule is that the preferred replacement cycle for an asset should be the least-cost replacement cycle. This is the frequency of replacement that minimises the PV of cost.

### 12.7.2 **Relevant cash flows**

The cash flows that must be considered when making the asset replacement decision are:

a. The capital cost (purchase cost) of the asset.
b. The maintenance and operating costs of the asset: these will usually increase each year as the asset gets older.
c. Tax relief on the running costs (which are allowable expenses for tax purposes).

d. Tax relief on the asset (tax-allowable depreciation).
e. The scrap value or resale value of the asset at the end of its life.

The main problem with evaluating an asset replacement decision is comparing these costs over a similar time frame. For example, how can we compare the PV of costs for asset replacement cycles of one, two, three, four and five years?

For example, you cannot simply compare the PV of cost over a two-year replacement cycle with the PV of cost over a three-year replacement cycle, because you would be comparing costs over two years with costs over three years, **which is not a fair comparison.**

### 12.8.3 The equivalent annual cost method

The equivalent annual cost method of calculating the most cost-effective replacement cycle for assets is as follows:

a. For each choice of replacement cycle, the PV of cost is calculated over one full replacement cycle, with the asset purchased in year 0 and disposed of at the end of the life cycle.
b. This PV of cost is then converted into an equivalent annual cost or annuity. The equivalent annual cost is calculated by dividing the PV of cost of the life cycle by the annuity factor for the cost of capital, for the number of years in the life cycle.

### 12.8.4 Equivalent annual cost [EAC] Formula

EAC for replacement every n years =

<u>PV of costs over one replacement cycle of length n</u>

Annuity factor for the number of years [year 1 to year n]

a. The replacement cycle with the lowest equivalent annual cost is selected as the least-cost replacement cycle.
b. n represents the number of years.

**Example: Equivalent annual cost**

NTN is considering its replacement policy for a particular machine, which it intends to replace every year, every two years or every three years.

The machine has purchase cost of ₦17,000 and a maximum useful life of three years.

The following information is also relevant:

| Year | Running costs of the machine | Scrap value at the end of the year |
|---|---|---|
| | ₦ | ₦ |
| 1 | 1,900 | 8,000 |
| 2 | 2,400 | 5,500 |
| 3 | 3,750 | 4,000 |
| | | |

The cost of capital for NTN is 10%.

**Required:**

What is the optimum replacement cycle? Ignore taxation. Use the equivalent annual cost method.

**Solution**

**Replace every year**

| Year | Description | Cash flow | DCF@10% | PV |
|---|---|---|---|---|
| | | ₦ | | ₦ |
| 0 | Purchase | (17,000) | 1.000 | (17,000) |
| 1 | Maintenance costs | (1,900) | 0.909 | (1,727) |
| 1 | Resale value | 8,000 | 0.909 | 7,272 |
| | | | | **(11,455)** |

EAC = PV of cost / Annuity factor @10% for 1 year = 11,455 / 0.909 = **₦12,602**

**Replace every two years**

| Year | Description | Cash flow | DCF@10% | PV |
|---|---|---|---|---|
| | | ₦ | | ₦ |
| 0 | Purchase | (17,000) | 1.000 | (17,000) |
| 1 | Maintenance costs | (1,900) | 0.909 | (1,727) |
| 2 | Maintenance costs | (2,400) | 0.826 | (1,982) |
| 2 | Resale value | 5,500 | 0.826 | 4,543 |
| | | | | **(16,166)** |

EAC = PV of cost / Annuity factor @10% for 2 years = 16,166 / 1.736 = **₦9,312**

**Replace every three years**

| Year | Description | Cash flow | DCF@10% | PV |
|---|---|---|---|---|
| | | ₦ | | ₦ |

| | | | | |
|---|---|---|---|---|
| 0 | Purchase | (17,000) | 1.000 | (17,000) |
| 1 | Maintenance costs | (1,900) | 0.909 | (1,727) |
| 2 | Maintenance costs | (2,400) | 0.826 | (1,982) |
| 3 | Maintenance costs | (3,750) | 0.751 | (2,816) |
| 3 | Resale value | 4,000 | 0.751 | 3,004 |
| | | | | **(20,521)** |

EAC = PV of cost / Annuity factor @10% for 3 years = 20,521 / 2.487 = **₦8,251**

**Summary**

| Replace | Equivalent annual cost |
|---|---|
| | ₦ |
| Every year | 12,602 |
| Every two years | 9,312 |
| Every three years | 8,251 |

**Conclusion**

The least-cost decision is to replace the asset every three years, because a three-year replacement cycle has the lowest equivalent annual cost.

**The lowest common multiple (LCM) method**

The lowest common multiple (LCM) method is a tool used in asset replacement decisions to find the optimal replacement period by comparing the total cost of different replacement cycles over a common period. It's particularly useful when inflation or changing operating conditions are expected, as it allows for a consistent comparison of costs over different time horizons.

### 12.8.5 Steps in using the LCM method

a. Identify Replacement Options:
   Determine the possible replacement periods for the asset (e.g., 1 year, 2years, 3 years).
b. Calculate LCM:
   Find the Least Common Multiple of the replacement periods. This determines the common time period for comparison.
c. Estimate cash flows:
   For each replacement option, estimate the cash flows (initial investment, operating costs, maintenance, and salvage value) over the LCM period.

d. Discount cash flows:
   Discount all cash flows to their present value using the appropriate discount rate (cost of capital).
e. Compare NPVs:
   Calculate the Net Present Value (NPV) for each replacement option over the LCM period. The option with the lowest NPV (for cost-related assets) or highest NPV (for revenue-generating assets) is the most cost-effective.

Example:

Let's say you're considering replacing a machine with two options:

Option 1: Replace every 3 years.

Option 2: Replace every 4 years.

The LCM of 3 and 4 is 12. So, you'd compare the total costs of both options over a 12-year period, discounting the cash flows for each year and calculating the NPV for each option. The option with the lower NPV would be the most economical.

**12.8.6 Advantages of the LCM Method:**

Consistent Comparison: Allows for a clear comparison of different replacement periods over a common time horizon.

Useful with Inflation: Handles situations where inflation or changing operating costs are expected, making it easier to compare costs over time.

Identifies Optimal Replacement Period: Helps determine the most cost-effective replacement timing for an asset.

**12.8.7 Limitations of the LCM Method**:

Complexity:

Can become computationally complex and time-consuming when dealing with many replacement options or long time horizons.

Finite Horizon:

For long-lived assets, the LCM method may lead to an extremely long calculation period, prompting the use of the finite horizon method, which focuses on a practical time horizon instead.

In essence, the LCM method provides a systematic approach to asset replacement decisions by comparing the total cost of different replacement options over a common time period, helping businesses make informed decisions about when to replace assets to minimize costs and maximize efficiency.

**Example on LCM**

NTN is considering its replacement policy for a particular machine, which it intends to replace every two years or every three years.

The machine has purchase cost of ₦17,000 and a maximum useful life of three years.

The following information is also relevant:

| Year | Running costs of the machine | Scrap value at the end of the year |
|---|---|---|
| | ₦ | ₦ |
| 1 | 1,900 | 8,000 |
| 2 | 2,400 | 5,500 |
| 3 | 3,750 | 4,000 |

The cost of capital for NTN is 10%.

**Required:**
What is the optimum replacement cycle? Ignore taxation. Use the Lowest common multiple method.

**Solution**
**The LCM of 2 and 3 is 6years.** The NPV would be calculated over 6 years.

**Replace every two years**

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| | ₦ | ₦ | ₦ | ₦ | ₦ | ₦ | ₦ |
| Cost | (17,000) | | (17,000) | | (17,000) | | |
| Running cost | | (1,900) | (2,400) | (1,900) | (2,400) | (1,900) | (2,400) |
| Scrap value | | | 4,000 | | 4,000 | | 4,000 |
| **NCF** | **(17,000)** | **(1,900)** | **(15,400)** | **(1,900)** | **(15,400)** | **(1,900)** | **1,600** |
| Dcf@10% | 1.000 | 0.909 | 0.826 | 0.751 | 0.683 | 0.621 | 0.564 |
| **PV** | **(17,000)** | **(1,727)** | **(12,720)** | **(1,427)** | **(10,518)** | **(1,180)** | **902** |

**NPV = (₦43,670)**

**Replace every three years**

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| | ₦ | ₦ | ₦ | ₦ | ₦ | ₦ | ₦ |
| Cost | (17,000) | | | (17,000) | | | |
| Running cost | | (1,900) | (2,400) | (3,750) | (1,900) | (2,400) | (3,750) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Scrap value | | | | 5,500 | | | 5,500 |
| **NCF** | **(17,000)** | **(1,900)** | **(2,400)** | **(15,250)** | **(1,900)** | **(2,400)** | **1,750** |
| Dcf@10% | 1.000 | 0.909 | 0.826 | 0.751 | 0.683 | 0.621 | 0.564 |
| **PV** | **(17,000)** | **(1,727)** | **(1,982)** | **(11,453)** | **(1,298)** | **(1,490)** | **987** |

**NPV = (₦33,963)**

**It would be better to replace every 3 years as it has a lower PV of cost.**

## 12.9 Capital rationing decisions

### 12.9.1 The nature of capital rationing

Capital rationing occurs where there are insufficient funds available to invest in all projects that have a positive NPV.

As capital is in short supply, a decision has to be made about which projects to invest in with the capital that is available.

A distinction is sometimes made between 'hard' and 'soft' capital rationing.

a. Hard capital rationing occurs when there is a real shortage of capital for investment. For example, a company might be unable to raise new capital in the capital markets or borrow large amounts from a bank. Its capital for investment might therefore be limited to the amount of capital it adds to the business each year as cash flows from retained profits.
b. Soft capital rationing occurs when there is sufficient capital to invest in every project, but management has taken a policy decision that spending on capital investment should be limited to a budgeted maximum amount. The policy decision therefore sets a limit on the amount of capital available.

Several methods have been devised for indicating which projects should be selected for investment when there is capital rationing. These methods are based on the following assumptions:

a. The choice of projects or investments should have the objective of maximising total NPV.
b. The projects that are available for investment are comparable in terms of risk.

The method used to identify which projects to select depends on how many years of capital rationing there will be. Capital rationing might be for one year only (single period capital rationing) or might be for several years, and the investment projects will require some additional investment in each of the years when there will be capital rationing (multi-period capital rationing).

### 12.9.2 Types of problems

There are three types of problem to solve:

a. single period capital rationing where the projects are freely divisible;
b. single period capital rationing where the projects are indivisible; and
c. multi-period capital rationing where the projects are freely divisible

We will focus on single period problems at this level.

## 12.10 Single period capital rationing: divisible projects

Single period capital rationing describes a situation where the capital available for investment is in limited supply, but for one time period only (one year only). The limitation in supply is usually at time 0 (now) with capital freely available in other periods.

A decision needs to be made about which projects to invest in. Projects will not be undertaken unless they have a positive NPV, but when there is capital rationing a choice must be made between alternative projects that all have a positive NPV.

The method of reaching the decision about which projects to select for investment depends on whether the investments are fully divisible or indivisible.

**Assumption**

**Projects are fully divisible**. This means that a part of a project can be undertaken leading to a partial return (proportional to the amount invested).

For example, suppose that an investment costing ₦100,000 is fully divisible and has an expected NPV of + ₦20,000. If capital is in short supply, the assumption is that it would be possible to invest a proportion of the ₦100,000, to obtain the same proportion of the NPV of + ₦20,000.

For example, it would be possible to invest only ₦50,000 in the project and the expected NPV would then be + ₦10,000.

This assumption looks very unrealistic at first sight but it often might occur in practice where companies construct joint ventures to exploit major opportunities.

**Decision approach**

**Fully divisible projects** are selected to maximise the NPV of the project mix.

The technique is to calculate NPV per ₦1 of capital invested (in the year of capital rationing) for each project, and to prioritise the projects for investment by ranking them in order of NPV per ₦1 invested.

The ratio of NPV to capital investment is called the profitability index.

The decision rule is therefore to invest in the projects with the highest profitability index, up to the limit of the investment capital available.

The approach is very similar to that used in key factor analysis which you covered in performance management.

**Example single period capital rationing: divisible projects**

A business has ₦5 million available in year 0 for investment.

Four divisible projects are available

| Project | NPV | Investment required in year 0 |
|---|---|---|
| | ₦ | ₦ |
| A | 1,000,000 | 5,000,000 |
| B | 500,000 | 1,000,000 |
| C | 840,000 | 1,000,000 |
| D | 450,000 | 1,500,000 |

**Required**

Which projects should be undertaken to maximize total NPV.

**Solution**

Step 1: calculate the profitability index and rank the projects based on the PI in descending order.

| Project | PI = NPV/Initial outlay | Ranking |
|---|---|---|
| | | |
| A | 1,000,000/5,000,000 = 0.20 | 4th |
| B | 500,000/ 1,000,000 = 0.50 | 2nd |
| C | 840,000 / 1,000,000 = 0.84 | 1st |
| D | 450,000 / 1,500,000 = 0.30 | 3rd |

Step 2: allocate available funds based on ranking

| Ranking | Project | Available funds | NPV |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Initial fund | | 5,000,000 | |
| 1st | C | 1,000,000 | 840,000 |
| Balance fund | | 4,000,000 | |
| 2nd | B | 1,000,000 | 500,000 |
| Balance fund | | 3,000,000 | |
| 3rd | D | 1,500,000 | 450,000 |
| Balance fund | | 1,500,000 | |
| 4th | A | **1,500,000* | *135,000 |
| **Total NPV** | | | **1,925,000** |

Note for divisible projects, projects can be done in part and the NPV will be in the proportion of investment done. In the illustration above, Project A's NPV was calculated as a proportion of the total NPV. [1,500,000 / 5,000,000 x 450,000 = 135,000]

Note that negative NPV projects would be rejected outrightly.

## 12.11 Single period capital rationing: non-divisible projects

When investment projects are non-divisible, the investment in a project can be either all or nothing. Part-investment is not possible.

The selection of investments should be those that offer the maximum NPV with the capital available. Finding the combination of projects that maximizes NPV is a matter of trial-and-error and testing all the possible combinations of investments that can be undertaken with the capital available.

**Example single period capital rationing: Non-divisible projects**

A business has ₦5 million available in year 0 for investment.

Four divisible projects are available

| Project | NPV | Investment required in year 0 |
|---|---|---|
| | ₦ | ₦ |
| A | 6,250,000 | 5,000,000 |
| B | 4,200,000 | 2,100,000 |
| C | 1,540,000 | 1,400,000 |
| D | 1,950,000 | 1,500,000 |

**Required:**

Which projects should be undertaken to maximize total NPV.

**Solution**

Step 1: assess all possible combinations of projects within the available funds

| Possible combinations | projects | Total investment | NPV |
|---|---|---|---|
| | | ₦'000 | ₦'000 |
| 1 | A alone | 5,000,000 | 6,250,000 |
| 2 | *B, C & D | *5,000,000 | *7,690,000 |
| | | | |

The decision would be to invest in projects B, C and D as it gives a higher combined total NPV.

Where projects are combined, their NPVs and investment should be combined.

Note that in some scenarios there may be balance cash after considering all the projects, this would not affect the decision to be taken.

## 12.13 Possible complications

A scenario might contain further complications which must be taken into account when using the above methods

**Mutually exclusive projects**

It might be that projects are mutually exclusive. In other words, it is not possible to participate in both projects at the same time. For example, there may be two projects, each of which involves building a facility on the same piece of land. Building one facility would exclude the possibility of building the other.

**Example Single period capital rationing with mutually exclusive projects – divisible projects**

A business has ₦5 million available in year 0 for investment.

Four divisible projects are available. Projects B and D are mutually exclusive. The investment required for each project and the project NPVs are as follows:

| Project | NPV | Investment required in year 0 |
|---|---|---|
| | ₦ | ₦ |
| A | 6,250,000 | 5,000,000 |
| B | 4,200,000 | 2,100,000 |

| | | |
|---|---:|---:|
| C | 1,540,000 | 1,400,000 |
| D | 1,950,000 | 1,500,000 |

**Required**

Which projects should be undertaken to maximize total NPV.

**Solution**

Step 1: calculate the profitability index and rank the projects based on the PI in descending order.

| **Project** | **PI = NPV/Initial outlay** | **Ranking** |
|---|---|---|
| | | |
| A | 6,250,000/5,000,000 = 1.25 | 3rd |
| B | 4,200,000/2,100,000 = 2.00 | 1st |
| C | 1,540,000 / 1,400,000 = 1.10 | 4th |
| D | 1,950,000 / 1,500,000 = 1.30 | 2nd |

Step 2: allocate available funds based on ranking. Since B and D are mutually exclusive, the company can either invest in A, B and C or A, C and D [that is B and D cannot be taken together, it is either B or D]

**Group 1: projects A, B and C**

| **Ranking** | **Project** | **Available funds** | **NPV** |
|---|---|---:|---:|
| | | **₦** | **₦** |
| Initial fund | | 5,000,000 | |
| 1st | B | 2,100,000 | 4,200,000 |
| Balance fund | | 2,900,000 | |
| 3rd | A | *2,900,000 | 3,625,000 |
| **Total NPV** | | | **7,825,000** |

*NPV for A is 2,900,000 / 5,000,000 x 4,200,000 = 3,625,000

**Group 2: projects A, C and D**

| **Ranking** | **Project** | **Available funds** | **NPV** |
|---|---|---:|---:|
| | | **₦** | **₦** |
| Initial fund | | 5,000,000 | |
| 2nd | D | 1,500,000 | 1,950,000 |
| Balance fund | | 3,500,000 | |
| 3rd | A | *3,500,000 | 4,375,000 |
| **Total NPV** | | | **6,325,000** |

*NPV for A is 3,500,000 / 5,000,000 x 4,200,000 = ₦4,375,000

**Decision**

The company should invest in 100% of B and 58% of A to earn the higher NPV of ₦7,825,000.

**Example Single period capital rationing with mutually exclusive projects – Indivisible projects**

A business has ₦5 million available in year 0 for investment.

Four projects with positive NPVs are available. The projects are indivisible. Projects B and D are mutually exclusive. The investment required for each project and the project NPVs are as follows:

| Project | NPV | Investment required in year 0 |
|---|---|---|
| | ₦ | ₦ |
| A | 6,250,000 | 5,000,000 |
| B | 4,200,000 | 2,100,000 |
| C | 1,540,000 | 1,400,000 |
| D | 1,950,000 | 1,500,000 |

**Required**

Which projects should be undertaken to maximize total NPV?

**Solution**

Step 1: assess all possible combinations of projects within the available funds

| **Possible combinations** | **projects** | **Total investment** | **NPV** |
|---|---|---|---|
| | | ₦'000 | ₦'000 |
| 1 | A only | 5,000,000 | 6,250,000 |
| 2 | B & C | 3,500,000 | 5,740,000 |
| 3 | C & D | 2,900,000 | 3,490,000 |

The decision would be to invest in projects A only as it gives a higher combined total NPV.

**A project that must be undertaken regardless of profitability**

A project might have to be accepted regardless of circumstance. In this case, capital is first allocated to that project. The balance of available capital is then allocated to the remaining projects using the approaches explained earlier.

**Example Single period capital rationing with a project which must be undertaken – divisible projects**

A business has ₦5 million available in year 0 for investment.

Four projects with positive NPVs are available. The projects are divisible. The investment required for each project and the project NPVs are as follows:

| Project | NPV | Investment required in year 0 |
|---|---|---|
| | ₦ | ₦ |
| A | 6,250,000 | 5,000,000 |
| B | 4,200,000 | 2,100,000 |
| C | 1,540,000 | 1,400,000 |
| D | 1,950,000 | 1,500,000 |

Project C must be undertaken for strategic reasons.

**Required:**

Which projects should be undertaken to maximize total NPV?

**Solution**

Step 1: calculate the profitability index and rank the projects based on the PI in descending order.

| **Project** | **PI = NPV/Initial outlay** | **Ranking** |
|---|---|---|
| | | |
| A | 6,250,000/5,000,000 = 1.25 | 3rd |
| B | 4,200,000/2,100,000 = 2.00 | 1st |
| C | 1,540,000 / 1,400,000 = 1.10 | 4th |
| D | 1,950,000 / 1,500,000 = 1.30 | 2nd |

Step 2: allocate available funds based on ranking after considering the project C that must be undertaken for strategic reasons.

| **Ranking** | **Project** | **Available funds** | **NPV** |
|---|---|---|---|
| | | ₦ | ₦ |
| Initial fund | | 5,000,000 | |
| Strategic project | C | 1,400,000 | 1,540,000 |
| Balance fund | | 3,600,000 | |
| 1st | B | 2,100,000 | 4,200,000 |
| Balance fund | | 1,500,000 | |
| 3rd | D | 1,500,000 | 1,950,000 |
| **Total NPV** | | | **7,690,000** |

**Example Single period capital rationing with a project which must be undertaken – Indivisible projects**

A business has ₦5 million available in year 0 for investment.

Four projects with positive NPVs are available. The projects are indivisible. The investment required for each project and the project NPVs are as follows:

| Project | NPV | Investment required in year 0 |
|---|---|---|
| | ₦ | ₦ |
| A | 6,250,000 | 5,000,000 |
| B | 4,200,000 | 2,100,000 |
| C | 1,540,000 | 1,400,000 |
| D | 1,950,000 | 1,500,000 |

Project C must be undertaken for strategic reasons.

**Required:**

Which projects should be undertaken to maximize total NPV?

**Solution**

Step 1: assess all possible combinations of projects within the available funds if project C is undertaken, there would be ₦3,600,000 left to invest in other projects. All possible combinations must include C as it must be undertaken.

| **Possible combinations** | **projects** | **Total investment** | **NPV** |
|---|---|---|---|
| | | ₦'000 | ₦'000 |
| 1 | C & B | 3,500,000 | 5,740,000 |
| 2 | C & D | 2,900,000 | 3,490,000 |
| 3 | C , B and D | 5,000,000 | 7,690,000 |

The decision would be to invest in projects A only as it gives a higher combined total NPV.

## 12.14 Chapter review

At the end of this chapter, ensure that you can:

a. make lease or buy decision;
b. discuss the optimum replacement cycle of an asset needed on a continuous basis;
c. discuss the optimum investment plan when capital is rationed in a single period and project when the projects are divisible; and
d. discuss the optimum investment plan when capital is rationed in a single period and project when the projects are indivisible.

**Skills Level**

**Financial Management**

CHAPTER 13

# SOURCES OF FINANCE



**Contents**

# 13. Sources of finance

## 13.0 Learning objective

This chapter discusses source of finance open to business organisations.

## 13.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. Identify the optimum replacement cycle of an asset needed on a continuous basis.
b. Identify the optimum investment plan when capital is rationed in a single period and project when the projects are divisible.
c. Identify the optimum investment plan when capital is rationed in a single period and project when the projects are indivisible.

## 13.2 Sources of long-term and short-term finance

### 13.2.1 Sources of finance and financial management

An important aspect of financial management is the choice of methods of financing for a company's assets. Companies use a variety of sources of finance and the aim should be to achieve an efficient capital structure that provides:

a. a suitable balance between short-term and long-term funding;
b. adequate working capital; and
c. a suitable balance between equity and debt capital in the long-term capital structure.

## 13.3 Sources of short-term funds

Sources of short-term funding are used to finance some current assets. (In some cases, companies operate with current liabilities in excess of current assets, but this is unusual.)

Most of the usual sources of short-term finance have been described in an earlier chapter on working capital. Briefly, these are:

a. bank overdraft;
b. short-term bank loans; and
c. suppliers (trade payables).

The main points to note about these sources of finance are as follows.

### 13.3.1 Bank overdraft

A company might arrange a bank overdraft to finance its need for cash to meet payment obligations. An overdraft facility is negotiated with a bank, which sets a limit to the amount of overdraft that is allowed. From the point of view of the bank, the company should be expected to use its overdraft facility as follows:

a. The overdraft should be used to finance short-term cash deficits from operational activities. The company's bank balance ought to fluctuate regularly between deficit (overdraft) and surplus. There should not be a 'permanent' element to the overdraft, and an overdraft should not be seen as a long-term source of funding.
b. An overdraft facility is for operational requirements and paying for running costs. An overdraft should not be used to finance the purchase of long-term (non-current) assets.
c. The bank normally has the right to call in an overdraft at any time, and might do so if it believes the company is not managing its finances and cash flows well.

### 13.3.2 Short-term bank loans

Short-term bank loans might be arranged for a specific purpose, for example to finance the purchase of specific items. Unlike an overdraft facility, a bank loan is for a specific period of time, and there is a repayment schedule.

### 13.3.3 Trade payables

As explained in an earlier chapter, a company should try to negotiate favourable credit terms from its suppliers. Trade credit from suppliers has no cost, and is therefore an attractive method of short-term finance. However, a company should honour its credit arrangements and pay its suppliers on time at the end of the agreed credit period. It is inappropriate for a company to increase the amount of its trade payables by taking excess credit and making payments late.

### 13.3.4 Debt factoring

Companies that use debt factors to collect their trade receivables might obtain financing for most of their trade receivables from the factor. Factoring was explained in the earlier chapter on the management of trade receivables. One of the services offered by a factor is to provide finance for up to 70% or 80% of the value of outstanding trade receivables that the factor has undertaken to collect.

### 13.3.4 Operating leases

In some cases, operating leases might be an alternative to obtaining short-term finance. Operating leases are similar to rental agreements for the use of non-current assets, although they might have a longer term. (Rental agreements are usually very short term.).

Companies that obtain the use of non-current assets with operating lease agreements avoid the need to purchase the assets and to finance these purchases with capital.

Operating leases might be used extensively by small and medium-sized business enterprises which find it difficult to obtain finance to pay for non-current asset purchases.

### 13.3.5 Sources of long-term funds

Long-term funding is required for a company's long-term assets and also to finance working capital. The main sources of long-term capital are:

a. Equity finance
b. Debt finance
c. Lease finance (finance leases).

Debt finance and lease finance are dealt with in the next chapter.

For some companies, long-term finance might be provided in the form of venture capital. Venture capital is described in the later chapter on sources of finance for small and medium-sized enterprises.

### 13.3.6 Sources of finance: equity

#### Introduction to equity finance

Equity finance is finance provided by the owners of a company – its ordinary shareholders, also called equity shareholders. (Some forms of irredeemable preference share might be regarded as equity finance, but in practice irredeemable preference shares are rare in public companies.)

New equity finance can be raised by issuing new shares for cash, or issuing new shares to acquire a subsidiary in a takeover. Methods of issuing new shares are described in the next section of this chapter.

For most companies, however, the main source of new equity finance is internal, from retained profits.

### 13.3.6 Internal sources of finance and dividend policy

When companies retain profits in the business, the increase in retained profits adds to equity reserves. The retained capital, in principle, is reinvested in the business and contributes towards further growth in profits.

Increasing long-term capital by retaining profits has several major benefits for companies.

a. When new equity is raised by issuing shares, there are large expenses associated with the costs of the issue. When equity is increased through retained earnings, there are no issue costs because no new shares are issued.
b. The finance is readily-available, without having to present a case to a bank or new shareholders. Shareholder approval is not required for the retention of earnings.

However, there may be a limit to the amount of earnings available for retention. There are three main reasons for this.

a. The company might not earn large profits. Earnings can only be retained if the company is profitable.
b. Retained earnings must be used efficiently, to provide a suitable return on investment. Unless retained earnings contribute to future growth in earnings and dividends, shareholders will demand higher dividends and lower earnings retention.
c. Earnings are either retained or paid out to shareholders as dividends. By retaining earnings, a company is therefore withholding dividends from its shareholders. A company might have a dividend policy, and its shareholders might have expectations about what future dividends ought to be. Earnings retention is therefore restricted by the constraints of dividend policy.

### 13.3.7 Long-term finance and working capital management

Improvements in working capital efficiency can also release cash. Efficient inventory management, collection of trade receivables and payment of trade payables can reduce the requirement for working capital. A reduction in working capital generates a one-off additional source of cash funding that can be used for investment.

## 13.4 Private companies and public companies: issuing new shares

Companies can raise equity capital externally by issuing new shares for cash, but the opportunity to do so is much more restricted for private companies than for public companies.

### 13.4.1 Private companies and issuing shares for cash

Private companies cannot offer their shares for sale to the general investing public, and shares in private companies cannot be traded on a stock market. They can sell shares privately to investors, but it is usually difficult to find investors who are willing to put cash into equity investments in private companies.

The existing owners of a company might not have enough personal capital to buy more shares in their company. Existing shareholders are therefore a limited source of new capital.

Other investors usually avoid investing in the equity of private companies because the shares are not traded on a stock exchange, and consequently they might be:

a. difficult to value;
b. difficult to sell when the shareholder wants to cash in the investment.

Small companies and most medium-sized companies are private companies, and most are unable to raise significant amounts of new equity capital by issuing shares. They rely on retained earnings for new equity capital, but given their small size, profits are relatively small and this restricts the amount of retained profits they can reinvest in the business.

### 13.4.2 Public companies and new share issues

Public companies may offer their shares to the general public. Many public companies arrange for their shares to be traded on a stock market. The stock market can be used both as a market for issuing new shares for cash, and a secondary market where investors can buy or sell existing shares of the company. The existence of a secondary market and stock market trading in shares means that:

a. The shares of a company have a recognisable value (their current stock market price); and
b. Shareholders can sell their shareholdings in the market whenever they want to cash in their shareholding.

However, before their shares can be traded on a stock exchange, a public company must:

a. Satisfy the regulatory authorities that the company and its shares comply with the appropriate regulatory requirements, and appropriate information about the company and its shares will be made available to investors; and
b. Obtain acceptance by the appropriate stock exchange for trading in the shares.

In Nigeria, there is a main stock market operated by the Nigerian Exchange Group (NGX), and a secondary market for shares in smaller companies, the Emerging market. (Companies wanting to have their shares accepted for trading on this must meet certain regulatory requirements, but these are not as onerous as the requirements for companies on the main market.)

Electronic trading platforms for secondary market trading in shares have been developed and are capturing a substantial proportion of the total volume of secondary market trading in shares of the major companies, especially in the USA and the European Community.

## 13.5 Methods of issuing new shares for cash

There are three main methods of issuing new shares for cash:

a. issuing new shares for purchase by the general investing public: this is called a public offer;
b. issuing new shares to a relatively small number of selected investors: this is called a placing; and
c. issuing new shares to existing shareholders in a rights issue.

**13.5.1 Public offer:** A public offer is an offer of new shares to the general investing public. Because of the high costs involved with a public issue, these are normally large share issues that raise a substantial amount of money from investors.

In many countries, including Nigeria, UK and USA, a company whose shares are already traded on the stock market cannot make a public offer of new shares without shareholder permission (which is unlikely to be obtained, because existing shareholders would suffer a dilution in their shareholding in the company and would own a smaller proportion of the company).

Instead, companies whose shares are already traded on the stock market will use a rights issue or a placing when it wishes to issue new shares for cash.

A public offer might be used to bring the shares of a company to the stock market for the first time. The term for this type of share issue is an Initial Public Offering or IPO. The company comes to the stock market for the first time in a 'stock market flotation'. In Nigeria and the UK, the terms 'prospectus issue' and 'offer for sale' are also used to describe a public offer. A distinction is often made between an Offer for subscription and an Offer for sale. Unlike in the case of the former, an offer for sale does not bring about an increase in the share capital of the company and the proceeds go to the vendor and not the company as it involves mere redistribution of shares from the current owner/vendor (who is selling) to the public

The shares that are offered to investors in an IPO might be a combination of:

a. new shares (issued to raise cash for the company); and
b. shares already in issue that the current owners are now selling.

Only the new shares issued by the company in the IPO will provide new equity capital for the company.

**Example IPO**

Stabba is a company that is being converted from private to public company status and is planning a stock market flotation with a public offer of shares.

In the flotation, the company wants to raise ₦800 million in cash for investment in its businesses. Issue costs will be 5% of the total amount of capital raised.

The company's investment bank advisers have suggested that a share price of ₦800 to ₦900 per share should be sustainable after the flotation, and a suitable issue price per share would therefore be ₦800.

**Required:**

How many new shares should be issued and sold in the public offer?

**Solution**

Cash required after issue costs = 95% of the total amount, this means the ₦800 million is 95% of the total amount to be raised.

The total amount to be raised = 800m / 95% = ₦842.1m

Number of shares to raise = ₦842.1m / ₦800 = 1,052,625 shares

### 13.5.2 Offer for sale by tender

In a normal public offer, the issue price for the new shares is a fixed price and the new shares are offered at that price. With an offer for sale by tender, investors are invited to apply to purchase any amount of shares at a price of their own choosing. The actual issue price for the new shares is the minimum price tendered by investors that will be sufficient for all the shares in the issue to be sold. Offers for sale by tender are now very uncommon.

### 13.5.3 Placing

A placing involves the sale of a relatively small number of new shares, usually to selected investment institutions. A placing raises cash for the company when the company does not need a large amount of new capital. A placing might be made by companies whose shares are already traded on the stock exchange, but which now wishes to issue a fairly small amount of new shares.

The prior approval of existing shareholders for a placing should be obtained.

### 13.5.4 Stock exchange introduction

In a stock exchange introduction, a company brings its existing shares to the stock market for the first time, without issuing new shares and without raising any cash. The company simply obtains stock market status, so that its existing shares can be traded on the stock market.

The rules of the stock exchange might require that a minimum percentage of the shares of the company should be held by the general investing public. If so, a stock exchange introduction is only possible for a company that has already issued shares to the public, without trading them on the stock market.

A stock market introduction is rare but might be used by a well-established company (formerly a private company) whose shares are now held by a wide number of individuals and institutions.

When a company makes a stock market introduction, it is able at some time in the future to issue new shares for cash, should it wish to do so, through a placing or a rights issue.

#### 13.5.5 Rights issue

A rights issue is a large issue of new shares to raise cash, by a company whose shares are already traded on the stock market.

Company law about rights issues varies between countries. In Nigeria and the UK, any company (public or private) wishing to issue new shares to obtain cash must issue them in the form of a rights issue, unless the shareholders agree in advance to waive their 'rights'. Large new share issues by existing stock market companies will therefore always take the form of a rights issue.

A rights issue involves offering the new shares to existing shareholders in proportion to their existing shareholding. For example, if a company has 8 million shares in issue already, and now wants to issue 2 million new shares to raise cash, a rights issue would involve offering the existing shareholders one new share for every four shares that they currently hold (2 million: 8 million = a 1 for 4 rights issue).

Rights issues are described in more detail in the next section.

## 13.6 Underwriting of new share issues

Large new issues of shares for cash are usually underwritten. When an issue is underwritten, a group of investment institutions (the underwriters) agree to buy up to a maximum stated quantity of the new shares at the issue price, if the shares are not purchased by other investors in the share issue. Each underwriter agrees to buy up to a maximum quantity of the new shares, in return for an underwriting commission (an agreed percentage of the issue value of the shares they underwrite).

The advantage of underwriting is that it ensures that there will be no unsold shares in the issue, and the company can be certain of raising the expected amount of cash.

The main disadvantage of underwriting is the cost (the underwriting commission payable by the company to the underwriters).

If a company does not want to pay to underwrite a rights issue, it might offer the new shares at a very low price compared to the market price of the existing shares.

The very low price should, in theory, attract investors and ensure a successful share issue. This type of low-priced share issue is called a deep- discounted issue.

Both public offers and rights issues are commonly underwritten. In Nigeria, every public offer must be 80% underwritten by the Issuing House(s). This ensures that the Issuer of securities receive proceeds of at least 80% of the total volume of securities on offer notwithstanding the level of subscription of the offer by the public.

## 13.7 Share repurchases

Instead of increasing their equity capital by issuing new shares, a company might repurchase some of its equity shares and cancel them. The shares might be repurchased in the stock market or bought back directly from some shareholders. The effect of repurchasing shares and cancelling them is to reduce the company's equity capital, with a corresponding fall in cash.

**Example: Share repurchases**

A company has 200 million shares of ₦100 each (par value) in issue and the shares have a market price of ₦300.

The company repurchases 50,000 shares at this market price and cancels them.

**Required:**

What would be in the impact of this on the organisation.

**Solution**

The cost of ₦15 million would result in a reduction in share capital and reserves of ₦15 million, and a reduction in cash of ₦15 million.

The company would be left with 199,950,000 shares in issue.

### 13.7.1 Reasons for share repurchases

There are two main reasons why a company might repurchase and cancel shares.

a. It has more cash than it needs and the surplus cash is earning a low return. There is no foreseeable requirement for the surplus cash. Buying back and cancelling some shares will therefore increase the earnings per share for the remaining shares, and so might result in a higher share price for the remaining shares. In this situation, the company is overcapitalised and share repurchases can bring its total capital down to a more suitable level.

b. Debt capital is readily-available and is cheaper than equity. A company might therefore repurchase some of its shares and cancel them, and replace the cancelled equity with debt capital, by issuing new corporate bonds or by borrowing from a bank. The result will be a capital structure with higher financial gearing.

## 13.8 Rights issue

A rights issue is an issue for shares for cash, where the new shares are offered to existing shareholders in proportion to their current shareholding.

### 13.8.1 The issue price

The share price of the new shares in a rights issue should be lower than the current market price of the existing shares. Pricing the new shares in this way gives the shareholders an incentive to subscribe for them. There are no fixed rules about what the share price for a rights issue should be, but as a broad guideline the issue price for the rights issue might be about 10% - 15% below the market price of existing shares just before the rights issue.

### 13.8.2 The theoretical ex-rights price

When a company announces a rights issue, the market price of the existing shares just before the new issue takes place is called the 'cum rights' price. ('cum rights' means 'with the rights').

The theoretical ex-rights price is what the share price ought to be, in theory, after the rights issue has taken place.

a. All the shares will have the same market price after the issue.
b. In theory, since the new shares will be issued at a price below the cum rights price, the theoretical price after the issue will be lower than the cum rights price.

The theoretical ex-rights price is simply the weighted average price of the current shares 'cum rights' and the issue price for the new shares in the rights issue.

**Example: Theoretical ex-rights price**

A company announces a 2 for 5 rights issue at a price of ₦300 per share. The market price of the existing shares before the rights issue is ₦370.

**Required:**

Calculate the theoretical ex-rights price [TERP]

**Solution**

| | | ₦ |
|---|---|---|
| Market value | 5 existing shares @ ₦370 | **1,850** |
| Issue price | 2 new shares @ ₦300 | **600** |
| **Total** | **7 shares** | **2,450** |

Theoretical ex-rights price is Total value of shares/total number of shares = ₦2,450/7 = ₦350

### 13.8.3 The value of rights

The holder of five shares in the company in the previous example could buy two new shares in the rights issue for ₦300 each, and these two shares will be expected to rise in value to ₦350, a gain of ₦50 for each new share or ₦100 in total for the five existing shares.

We can therefore say that the theoretical value of the rights is:

a. ₦50 for each new share issued; or
b. ₦20 (₦100/5 shares) for each current share held.

Shareholders are allowed to sell their rights to subscribe for the shares in the rights issue, and investors who buy the rights are entitled to subscribe for shares in the rights issue at the rights issue price. The most common way of stating the value of rights is the value of the rights for each existing share. In the example, the theoretical value of the shares would normally be stated as ₦20.

There is no real gain as the shareholder has paid cash to the company equal to the amount of the change in share price.

### 13.8.4 Yield – adjusted theoretical ex-right price (TERP)

Normally, we presume that when we do a rights issue, the money from it generates the same rate of return as existing funds.

But, if the new money raised is likely to earn a different return from the current return, the yield-adjusted theoretical ex-rights price should be calculated.

The yield-adjusted price demonstrates how the market will view the rights issue.

**Example Yield – adjusted theoretical ex-right price (TERP)**

A company with a current WACC of 10% is planning a 1 for 4 rights issue. The issue is to be made at a discount of 25% to the current share price of ₦2.50. The fund raised is to be used to finance a project that has a yield of 14%.

**Required**:

Calculate the yield adjusted theoretical ex-right price (TERP).

**Solution**

Yield adjusted TERP is applicable because the yield on the new project (14%) is not the same as the yield on existing projects (10%).

In computing the yield adjusted TERP, simply apply the following index to the issue price:

Ynew/Yold, where:

Ynew = Yield on new project

Yold = Yield on existing projects

Issue price = ₦2.50 × 0.75 = ₦1.875

Adjusted issue price = ₦1.875 × 0.14/0.10 = ₦2.625

The yield adjusted TERP can now be computed as follows:

| | | |
|---|---|---|
| | | ₦ |
| 4 existing shares@₦2.50 | = | 10.00 |
| 1 new share@2.625* | = | 2.625 |
| 5 | | 12.625 |

Yield-adjusted TERP = ₦12.625/5 = ₦2.525

(*Note that this adjustment is only for the purpose of calculating TERP. It does not affect the total amount of fund raised).

### 13.8.5 The shareholders' choices

When a company announces a rights issue, the shareholders have the following choices:

a. They can take up their rights and buy the new shares that have been offered to them.
b. They can renounce their rights and sell the rights in the market. By selling rights, the shareholder is selling to another investor the right to subscribe for the new shares at the issue price.
c. They can take up some rights and renounce the rest. This is a combination of the two options above.
d. They can do nothing. If they do nothing, their existing shares will fall in value after the rights issue (perhaps from the cum rights price to the theoretical ex-rights price), and they will suffer a loss in the value of their investment. The company might try to sell the new shares to which the 'do- nothing' shareholders were entitled and pay them any surplus receipts above the rights issue price. However, the 'do-nothing' shareholders are still likely to suffer a loss.

If a shareholder takes up his rights, in theory he will be no worse and no better off. Similarly, if a shareholder renounces his rights and sells them, he will be no better and no worse off.

**Example: Shareholders' choices**

A company announces a 1 for 4 rights issue. The issue price is ₦500 per share. The current market price per existing share is ₦625. The company currently has 1,000,000 shares.

**Required:**

a. Calculate the theoretical ex-rights price [TERP]
b. Calculate the value of the rights per share and in total.
c. What are the alternatives available to an investor who has 20,000 shares.

**<u>Solution</u>**

a. The theoretical ex-rights price can be calculated as follows:

| | | ₦ |
|---|---|---|

| | | |
|---|---|---|
| Market value | 4 existing shares @ ₦625 | **2,500** |
| Issue price | 1 new share @ ₦500 | **500** |
| **Total** | **5 shares** | **3,000** |

Theoretical ex-rights price is Total value of shares / total number of shares = ₦3,000 /5 = ₦600

b. **Part of the question**

Value of rights in total = TERP – Issue price = N600 – N500 = N100

Value of rights per share = Value of rights in total / number of existing shares = N100/4 = N25

**c. Part of the question**

The alternatives available to an investor when rights are issued include

a. Take up or accept the rights
b. Sell the rights
c. Ignore or reject the rights

The investor's value would not change if he takes action, but he will lose if he ignores the rights. The calculations below would provide clarity.

Value of the investor before the rights = 20,000 x ₦625 = ₦12,500,000

Shares after the rights issues are valued at the theoretical ex-rights price.

Shares accepted is paid for at the issue price of the rights while shares disposed is sold at the value of the rights.

**Option1: Rights taken up**

If a shareholder takes up his rights, he will be required to subscribe ₦500 in cash to purchase each new share. If he accepts the rights, the number of his shares will increase.

Number of rights available ¼ x 20,000 = 5,000 shares

New number of shares = 20,000 + 5,000 = 25,000 shares

| | | ₦ |
|---|---|---|
| Value after rights issue | 25,000 shares x N600 | 15,000,000 |
| Payment for rights accepted | 5,000 rights x N500 | [2,500,000] |
| Net value after rights | | 12,500.000 |
| | | |

***In theory, he will therefore be neither better off nor worse off***. In practice, the gain or loss on his investment will depend on what the actual share price is after the rights issue (since the actual share price might be higher or lower than the theoretical ex-rights price)

**Option 2: Rights renounced and sold**

If the shareholder renounces his rights and sells them, the theoretical value of his rights will be ₦25 (₦(600 – 500)/4 shares)) for each existing share. If he sells his rights at this price, he will earn ₦100 for every four shares that he owns.

| | | ₦ |
|---|---|---|
| Value after rights issue | 20,000 shares x N600 | 12,000,000 |
| Proceeds from the rights sold | 5,000 rights x N500 | 500,000 |
| Net value after rights | | 12,500.000 |

In theory, he will therefore be neither better off nor worse off.

**Option 3: Ignore the rights**

Value after rights issue = 20,000 x N600 = ₦12,000,000. In theory he will have a loss of ₦500,000.

**Advantages and disadvantages of rights issues**

Rights issues give existing shareholders the right to buy the new shares in a share issue. If an issue did not have to be a rights issue, the company would be able to offer the shares to all investors.

**Advantages**

The advantages of a rights issue are as follows:

a. A rights issue gives shareholders the right to retain the same percentage of the company's total share capital, and so avoid a 'dilution' in the proportion of the company that he owns.
b. A rights issue prevents the company from selling new shares at below the current market price to other investors.

**Disadvantages**

The disadvantages of a rights issue are as follows:

a. The company might want to raise a large amount of cash for new investment, but the existing shareholders might be unwilling or unable to invest in the new shares.
b. Shareholders can retain the same proportion of shares in the company by subscribing for new shares in the issue. There is no reason to give them preferential treatment.
c. If a new share issue is offered to all investors, the issue price might be at or near the current market price, instead of at a discount to the current 'cum rights' price.

**Illustration on rights issue**

James Obasi plc is a medium sized manufacturing firm making drones. It is considering a 1 for 5 rights issue at a 15% discount to the current market price of ₦4.00 per share. Issue costs are expected to be ₦2m and these costs will be paid out of the funds raised. It is proposed that the rights issue funds raised will be used to redeem some of the existing bonds at par. Financial information relating to James Obasi is as follows:

**Statement of financial position**

| | ₦'000 | ₦'000 | ₦'000 |
|---|---|---|---|
| Fixed Assets | | | 8,000 |
| Current Assets | | | |
| Inventory | | 3,000 | |
| Receivables | | 2,500 | |
| Cash | | 500 | |
| | | 6,000 | |
| Current Liabilities | | | |
| Trade payables | 2,100 | | |
| Overdraft | 2,250 | 4,350 | |
| Net Current Assets | | | 1,650 |
| Total Assets less Liabilities | | | 9,650 |
| 12% Bonds | | | 4,500 |
| | | | 5,150 |
| Ordinary shares [50k par value] | | | 4,000 |
| Reserves | | | 1,150 |
| | | | 5,150 |
| Other information: | | | |
| PE Ratio of James Obasi plc | | | 15.24 |
| Overdraft Interest rate | | | 6% |
| Corporate tax rate | | | 30% |

| | | | |
|---|---|---|---|
| Sector averages: debt/equity [book value] | | | 100% |
| Interest cover | | | 6 times |
| | | | |

**Required:**

a. Ignoring issue costs and any use that may be made of the funds raised by the rights issue, calculate
   i. The theoretical ex rights per share
   ii. The value of rights per existing share

b. What alternative actions are open to the owner of 1,500 shares in James Obasi plc as regards the rights issue? Determine the effect of each of these actions on the wealth of the investor.

c. Calculate the current earnings per share and the revised earnings per share if the rights issue funds are used to redeem some of the existing debentures.

**Solution to the rights issue question**

a. Rights issue price at a discount of 15% = 4 x 0.85 = N3.40

5 existing shares @ N4 N20

1 new share @ N3.40 N3.40

6 shares N23.40

TERP = weighted value / weighted number = 23.40/6 = N3.90

Value of rights in total = TERP – rights issue price = 3.90 – 3.40 = N0.50

Value of rights per existing shares = value in total / number of old shares 0.50/5 = N0.10

b. . **Alternatives open to a shareholder which has 1,500 shares in the company**.

Value of the investor before the rights = 1,500 shares x ₦4 = ₦6,000

The alternatives available when rights are issued include

**Option 1 – Accept the rights**

1 for 5 rights issue = 1/5 x 1,500 shares = 300 shares.

| | | ₦ |
|---|---|---|
| Value after rights issue | 1,800 shares x ₦3.90 | 7,020 |
| Payment for rights accepted | 300 rights x ₦3.40 | [1,020] |
| Net value after rights | | 6,000 |

- **Option 2 – Sell the rights**

| | | ₦ |
|---|---|---|
| Value after rights issue | 1,500 shares x ₦3.90 | 5,850 |
| Payment for rights accepted | 300 rights x ₦0.50 | 150 |
| Net value after rights | | 6,000 |

d. . **Calculation of revised EPS**

Existing EPS = MPS/PE Ratio = ₦4/15.24 = 26.25K

Number of shares = 2m / 0.50 = 4 million shares

Total earnings = number of shares x EPS = 4m x 26.25k = ₦1.05 million

POST RIGHTS EPS

Additional number of shares = 4m x 1/5 = 800,000 shares

Total number of shares after rights = 4,000,000 + 800,000 = 4,800,000 shares

Gross funds raised = 800,000 x N4 x 0.85 = ₦2,720,000

Issue cost = ₦220,000

Net funds raised = 2,720,000 – 220,000 = ₦2,500,000

Debenture interest saved net of tax = 2,500,000 x 0.12 x (1-0.30) = ₦210,000

Revised PAT = ₦1.05m + ₦210,000 = ₦1,260,000

Revised EPS = revised PAT/revised shares = 1,260,000/4,800,000 = 26.25k

## 13.9 Islamic Finance

### Introduction to Islamic finance

Islamic finance rests on the application of Shariah. Sharia law is derived from the Quran (believed to be Allah's divine revelation to the prophet Muhammed) and the teachings of Muhammed.

Muslims believe that Sharia law shows the path to be followed as ordained by Allah. It covers all aspects of life and Muslims believe that following this path will lead to physical and spiritual wellbeing.

Sharia law sets out five categories of actions that guide a Muslim's actions: These are acts that are:

a. obligatory;
b. meritorious;
c. commendable;
d. reprehensible; and
e. forbidden.

The main principles of Islamic finance are that:

a. wealth must be generated from legitimate trade and asset-based investment (the use of money for the purposes of making money is expressly forbidden);
b. investment should have a social and an ethical benefit to wider society beyond pure return;
c. risk should be shared; and
d. harmful activities (haram) should be avoided.

The intention is to avoid injustice, asymmetric risk and moral hazard (where the party who causes a problem does not suffer its consequences) and unfair enrichment at the expense of another party.

It is estimated US $1.6 trillion of assets are managed according to these principles under the rules of Islamic finance.

### 13.9.1 Specific guidance

The following activities are prohibited:

a. Charging and receiving interest (riba).
b. This contradicts the principle that risk must be shared and is also contrary to the ideas of partnership and justice.
c. Using money to make money is forbidden.
d. Investment in companies that have too much borrowing is also prohibited. What constitutes "too much borrowing" is a matter for interpretation but is typically

defined as debt totalling more than 33% of the stock market value over the last 12 months.

e. Investments in businesses involved in alcohol, gambling, or anything else that the Shariah considers unlawful or undesirable (haram).
f. Investments in transactions that involve speculation or extreme risk. (This is seen as gambling).
g. Entering into contracts where there is uncertainty about the subject matter and terms of contracts (This includes a prohibition on short selling, i.e. selling something not yet owned).

### 13.9.1 Permitted activities

Islamic banks are allowed to obtain their earnings through profit-sharing investments or fee-based returns. If a loan is given for business purposes the lender should take part in the risk. This usually involves the lender buying the asset and then allowing a customer to use the asset for a fee.

### 13.9.2 Types of finance

The following Islamic financial instruments provide Shariah-compliant finance. Often the cash flows from these techniques might be the same as they would have been under standard western practice. However, the key difference is that the rate of return is based on the asset transaction and not based on interest on money loaned.

**a. Murabaha**

In traditional western finance a customer would borrow money from a bank in order to finance activity, say the purchase of an asset. However, under Sharia the bank cannot charge interest.

Murabaha is a form of trade credit for asset acquisition that avoids the payment of interest. The bank buys the asset and then sells it on to the customer on a deferred basis at a price that includes an agreed mark-up for profit. Payment can be made by instalments but the mark-up is fixed in advance and cannot be increased, even if there is a delay in payment.

**b. Ijarah**

A form of lease finance agreement where a bank buys an asset for a customer and then leases it to the customer over a specific period at an agreed rental which allows the bank to recover the capital cost of the asset and a profit margin.

c. **Mudaraba**
The bank provides capital and the customer provides expertise to invest in a project. Profits generated are distributed according in a predetermined ratio but cannot be guaranteed. The bank does not participate in the management of thebusiness. This is like the bank providing equity finance. The project might make a loss. In this case, the bank loses out. The customer cannot be made to compensate the bank for this loss as that would be contrary to the mutual sharing of risk.

d. **Musharaka**
This is a joint venture or investment partnership between two parties who both provide capital towards the financing of new or established projects. Both parties share the profits on a pre-agreed ratio, allowing managerial skills to be remunerated, with losses being shared on the basis of equity participation.

e. **Sukuk**
This is debt finance but Islamic bonds cannot bear interest. Sukuk holders must have an ownership interest in the assets which are being financed. The sukuk holders' return for providing finance is a share of the income generated by theassets. Modern sukuk share many features with western securitisations.

f. There are many different types of sukuk including:
   i. Ijarah sukuk (sukuk al-ijarah);
   ii. Mudaraba sukuk (sukuk al-mudaraba);
   iii. Murabaha sukuk (sukuk al-murabaha); and
   iv. Musharaka sukuk (sukuk al-musharaka).

**Types of sukuk**

Sukuk are shariah compliant "bonds". Typically sukuk are certificates that represent ownership of an asset or its usufruct. (usufruct refers to all of the benefits that the ownership of an asset would convey).

This section explains types of sukuk arrangements in more detail. There are different ways in which each type of sukuk might be structured. The detail of a structure might vary from those in the following explanations.

**a. Sukuk al-ijarah**

This is a sale and leaseback transaction. Suppose Business A wishes to raise finance.

A sponsor (say Business A's bank) would set up a special purpose vehicle (SPV) with the purpose of buying an asset off Business A (which would be later leased back to it) at a pre-agreed price.

The SPV would issue ownership certificates (sukuk) to investors for cash. The amount raised would be the amount needed to buy the asset off Business A.

The SPV would buy the asset off Business A. The SPV would own the asset and in turn be owned by the sukuk holders.

Business A would lease the asset back from the SPV for a series of pre-agreed rentals. The cash thus collected by the SPV would be paid as distributions to the sukuk holders.

Note that Business A would be described as being the "obligator" in this transaction.

**b. Mudaraba sukuk (sukuk al-mudaraba)**

Business B wishes to raise finance for a major, new, construction project. The approach is to set up an SPV which would own the project and engage Business B to run it.

A sponsor (say Business B's bank) would set up a special purpose vehicle (SPV) with the purpose of investing in the project.

The SPV would issue ownership certificates (sukuk) to investors for cash. The amount raised would be the amount needed to finance the project.

Business B is contracted to run the project and would be entitled to a fee/share of profit.

On completion of the project the SPV transfers ownership of the asset to the customer.

The fees received from the customer are used to pay Business B's fee and to provide distributions to the sukuk holders.

**c. Murabaha sukuk (sukuk al-murabaha)**

Business C wishes to raise finance to buy a large amount of iron ore.

A sponsor (say Business C's bank) would set up a special purpose vehicle (SPV) with the purpose of buying the ore.

The SPV would issue ownership certificates (sukuk) to investors for cash. The amount raised would be the amount needed to buy the ore.

The SPV buys the ore.

The SPV then sells the ore to Business C at a profit. Business C pays for the ore according to a pre-agreed schedule of payments and these are passed on to the sukuk holders.

**d. Musharaka sukuk (sukuk al-musharaka)**

Business D wishes to raise finance for a major, new, construction project. The approach is to set up an SPV which would enter into a joint venture with Business D. Business D would provide the expertise needed to run the project and the sukuk holders (through) the JV would provide the finance.

The sukuk holders participate in the management of the joint venture.

The profits and losses of the JV are shared between Business D and the sukuk holders.

**The Sharia Board**

There is no ultimate authority for Sharia compliance.

Each Islamic bank's adherence to the principles of Sharia law is governed by its own Sharia board. This is a body within an Islamic financial institution that has the responsibility for ensuring that all products and services offered by that institution are compliant with the principles of Sharia law.

## 13.10 Chapter review

At the end of this chapter, readers should be able to:

a. decide on the optimum replacement cycle of an asset needed on a continuous basis;

b. decide on the optimum investment plan when capital is rationed in a single period and project when the projects are divisible; and

c. decide the optimum investment plan when capital is rationed in a single period and project when the projects are indivisible.

**Skills Level**

**Financial Management**

CHAPTER 14

# COST OF CAPITAL

**Contents**

# 14 Cost of Capital

## 14.0 Learning objective

This chapter discusses cost of capital.

## 14.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. use the dividend valuation model to measure the value of equity;
b. measure the cost of equity using the dividend valuation model with or without growth;
c. measure the pre-tax and post-tax cost of both redeemable and irredeemable debt;
d. measure the cost of convertible bonds; and
e. calculate the weighted average cost of capital.

## 14.2 Cost of equity, cost of debt and the weighted average cost of capital (WACC)

**Relative costs of equity and debt**

The cost of capital for investors is the return that investors require from their investment. Companies must be able to make a sufficient return from their own capital investments to pay the returns required by their shareholders and holders of debt capital. The cost of capital for investors therefore establishes a cost of capital for companies.

a. For each company there is a cost of equity. This is the return required by its shareholders, in the form of dividends or share price growth.
b. There is a cost for each item of debt finance. This is the yield required by the lender or bond investor.
c. When there are preference shares, there is also a cost of preference share capital.
a. The cost of capital for a company is the return that it must make on its investments so that it can afford to pay its investors the returns that they require.

The cost of capital for investors and the cost of capital for companies should theoretically be the same. However, they are different because of the differing tax positions of investors and companies.

a. The cost of capital for investors is measured as a pre-tax cost of capital.

b. The cost of capital for companies recognises that interest costs are an allowable expense for tax purposes, and the cost of debt capital to a company should allow for the tax relief that companies receive on interest payments, reducing their tax payments. The cost of debt capital for companies is measured as an after-tax cost.

The weighted average cost of capital (WACC) is the average cost of all the sources of capital that a company uses. This average is weighted, to allow for the relative proportions of the different types of capital in the company's capital structure.

### 14.3.1 Average and marginal cost of capital

One approach to the evaluation of capital investments by companies is that all of their investment projects should be expected to provide a return equal to or in excess of the WACC. If all their investment projects earn a return in excess of the WACC, the company will earn sufficient returns overall to meet the cost of its capital and provide its investors with the returns they require. An alternative is to use the marginal cost of capital when evaluating investment projects.

The marginal cost of capital is the cost of the next increment of capital raised by the company.

### 14.3.2 Comparing the cost of equity and the cost of debt

The cost of equity is always higher than the cost of debt capital. This is because equity investment in a company is always more risky than investment in the debt capital of the same company.

a. Interest on debt capital is often fixed: Bondholders, for example, receive a fixed amount of annual interest on their bonds. In contrast, earnings per share are volatile and can go up or down depending on changes in the company's profitability.

b. Providers of debt capital have a contractual right to receive interest and the repayment of the debt principal on schedule. If the company fails to make payments on schedule, the debt capital providers can take legal action to protect their legal or contractual rights. Shareholders do not have any rights to dividend payments.

c. Providers of secured debt are able to enforce their security if the company defaults on its interest payments or capital repayments.

d. In the event of insolvency of the company and liquidation of its assets, providers of debt capital are entitled to payment of what they are owedby the company before the shareholders can receive any payment themselves out of the liquidated assets.

Since equity has a higher investment risk for investors, the expected returns on equity are higher than the expected returns on debt capital.

In addition, from a company's perspective, the cost of debt is also reduced by the tax relief on interest payments. This makes debt finance even lower than the cost of equity.

The effect of more debt capital, and higher financial gearing, on the WACC is considered in more detail later.

## 14.3 Cost of equity

**Methods of calculating the cost of equity**

The cost of equity is the annual return expected by ordinary shareholders, in the form of dividends and share price growth. However, share price growth is assumed to occur when shareholder expectations are raised about future dividends. If future dividends are expected to increase, the share price will also increase over time. At any time, the share price can be explained as a present value of all future dividend expectations.

Using this assumption, we can therefore say that the current value of a share is the present value of future dividends in perpetuity, discounted at the cost of equity (i.e. the return required by the providers of equity capital).

There are two methods that you need to know for estimating what the share price in a company ought to be:

a. the dividend valuation model; and
b. the dividend growth model (Gordon growth model).

Each of these methods for obtaining a share price valuation uses a formula that includes the cost of equity capital.

The same models can therefore be used to estimate a cost of equity if the share price is known. In other words, the dividend valuation model and dividend growth model can be used either:

a. To calculate an expected share price when the cost of equity is known; or

b. To calculate the cost of equity when the share price is known.

Another method of estimating the cost of capital is the capital asset pricing model (CAPM). This is an alternative to using a dividend valuation model method, and it produces a different estimate of the cost of equity.

### 14.3.1 The dividend valuation model method of estimating the cost of equity

If it is assumed that future annual dividends are expected to remain constant into the foreseeable future, the cost of equity can be calculated by re-arranging the dividend valuation model.

$Mv = d_1 / r_E$ rearranging $r_E = d_1 / Mv$

D is the expected future annual dividend starting at year 1, $r_E$ is the cost of equity and Mv is the share price ex-dividend.

The formula assumes that dividends are paid annually and that the first dividend is received in one year's time. It is the present value of a constant perpetuity.

'Ex dividend' means that if the company will pay a dividend in the near future, the share price must be a price that excludes this dividend.

For example, a company might declare on 1 March that it will pay a dividend of ₦0.60 per share to all holders of equity shares on 30 April, and the dividend will be paid on 31 May. Until 30 April the share price allows for the fact that a dividend of ₦0.60 will be paid in the near future and the shares are said to be traded 'cum dividend' or 'with dividend'.

After 30 April, if shares are sold, they are traded without the entitlement to dividend, or 'ex dividend'. This is the share price to use in the cost of equity formula whenever a dividend is payable in the near future and shares are being traded cum dividend.

**Example: DVM**

A company's shares are currently valued at ₦15 and the company is expected to pay an annual dividend of ₦1.50 per share for the foreseeable future.

**Required:**

Calculate the cost of equity.

**Solution**

The cost of equity in the company can therefore be estimated as: (1.50 / 15) = 10%.

**Example 2: DVM**

A company's shares are currently valued at ₦15 and the company is expected to pay an annual dividend of ₦1.50 per share for the foreseeable future.

The next annual dividend is payable in the near future and the share price of ₦15 is a cum dividend price.

**Required:**

Calculate the cost of equity.

**Solution**

Recall that the market price should be ex-div which is calculated as MV Cum-div minus dividend per share = ₦15 - ₦1.50 = ₦13.50

Cost of equity = 15/135 = 11.11%

**The dividend growth model method of estimating the cost of equity**

If it is assumed that the annual dividend will grow at a constant percentage rate into the foreseeable future, the cost of equity can be calculated by re-arranging the dividend growth model.

**Formula: Dividend valuation model (with growth)**

$$MV = \frac{d(1+g)}{r_e - g}$$

Note: this formula gives the present value of any cash flow which starts in one year's time and grows at a constant rate in perpetuity

rearranging:

$$r_e = \frac{d(1+g)}{MV} + g$$

**Where:**

$r_E$ = the cost of equity

d = the annual dividend for the year that has just ended

g = the expected annual growth rate expressed as a proportion (4% = 0.04, 2.5% = 0.025 etc.)

Therefore, d(1 + g) = expected annual dividend next year or $d_1$

MV = the share price ex dividend.

**Example: DVM with growth**

A company's share price is ₦8.20. The company has just paid an annual dividend of ₦0.70 per share, and the dividend is expected to grow by 3.5%. The next annual dividend will be paid in one year's time.

Calculate the cost of equity.

**Solution**

The cost of equity = $r_E$ = 0.70(1.035) / 8.20 + 0.035 = 12.3%

**Estimating growth**

The growth rate used in the expression is the growth rate that investors expect to occur in the future. This can be estimated in one of two ways:

a. Extrapolation of historical growth; and
b. Gordon's growth model.

This is based on the idea that the shareholders' expectations will be based on what has been experienced in the past. An average rate of growth is estimated by taking the geometric mean of growth rates in recent years.

Formula: Geometric mean

$$\text{Geometric mean growth rate} = \sqrt[n]{\frac{\text{value at end of period of n years}}{\text{value at start}}} - 1$$

**Where:**

n = number of terms in the series (e.g. years of growth)

**Example: Extrapolation of historical growth**

A company has paid out the following dividends in recent years.

| Year | Dividend |
|---|---|
| | ₦ |
| 2025 | 100 |
| 2026 | 115 |
| 2027 | 125 |
| 2028 | 133 |
| 2029 | 148 |

**Required:**

What is the average growth rate?

**Solution**

The average growth rate is calculated as:

$$g = \sqrt[4]{\frac{148}{100}} - 1 = 0.103 \text{ or } 10.3\%$$

Note there are 5 years – 1 giving the 4th root used.

| |
|---|
| *The examiner could say the dividend 5 years ago is **₦**xxx and the current dividend is **₦**xxy, this simply implies that there are six years.* |

**Gordon growth model (or earnings retention model)**

The Gordon growth model is similar to the dividend growth model, with the difference that the expected growth in annual dividends is calculated from the proportion of annual earnings that are retained and the rate of return on those retained profits.

The growth estimate is based on the idea that retained profits are the only source of funds. With no re-invested profits, the investment base of the company would not increase. Practically, this means no new funds are invested in new products, new market, new factories, stores, and so on. Therefore, profit will not grow, and by implication, dividends (taking a long-term view) will not grow.

Growth therefore, comes about by retaining and reinvesting profits on which a return is earned. The relationship between these variables is shown by:

g = rb

Where: g = growth in future dividends

r = the current accounting rate of return

b = the proportion of profits (earnings) retained

If all measures are constant, then it may be shown that g, the rate of growth of dividends, is equal to the rate of growth of profits and is equal to the rate of growth in the share price. Given sufficient data, you may be required to estimate a growth rate based on the above model, as illustrated below.

**Example**

Consider the following summarised financial statements for XL Plc.

Statement of financial position as at December 31, 2019

| | **₦m** |
|---|---|
| Assets | 400 |
| Ordinary shares | 200 |
| Reserves | 200 |
| | 400 |
| | |
| Profit after tax [PAT] for the year ended 31 December, 2020 | 40 |
| Dividend at 40% payout | 16 |
| Retained earnings for the year | 24 |
| | |

**Statement of financial position as at December 31, 2020**

| | **₦m** |
|---|---|
| Assets | 424 |
| Ordinary shares | 200 |
| Reserves | 224 |
| | 424 |

**Required**

Calculate the growth rate in dividend in the next year, if the company's accounting rate of return and earnings retention rate remain the same.

**Solution**

PAT as a percentage of opening capital employed=₦40m/₦400m=10%

Applying this to the end – 2020 capital employed (10% × ₦424), gives a profit for 2021 estimated at ₦42.40m.

Therefore, the dividends for 2021 will be 40% × ₦42.40m = ₦16.96m, representing growth of 6% on the previous year's dividends ((16.96m/16m) – 1 = 6%).

Normally, this is more directly calculated by the following equation: g = r × b, where

r = accounting rate of return

b = earnings retention rate.

Thus: g = 10% × 60% = 6%

(Note that in computing 'r', opening capital employed is used. This is the recommended approach in this Study Text).

**Problems with the Gordon growth model/earnings retention model**

The major problem with this model is:

a. Its reliance on accounting profits;
b. The assumption that r and b will be constant;
c. Inflation can substantially distort the accounting rate of return if assets are valued on an historical costs basis; and
d. The model also assumes all new finance comes from equity.

**14.3.2 Shortcomings of the dividend valuation model (DVM)**

Whilst the basic premise of the DVM is perhaps reasonable, being that a share is worth more if it is expected to pay out higher future dividends, there are a few problems with the underlying assumptions and with the data used.

**14,3.3 Underlying assumptions**:

a. Shares have value because of the dividends. This is not always true – some companies have a deliberately low payout policy which can attract investors who prefer capital gains to an income stream. Some companies pay no dividends at all; for example, until some years ago Microsoft paid no dividends but Microsoft shares had a high value.
b. Dividends either do not grow, or grow at a constant rate – the former is unrealistic, the latter is true in the long term if one takes the view we are estimating a long-term average. Nevertheless, short-term variations in expected dividend growth would change the share price.
c. Estimates of future dividends based on historical data, such as historical growth rate and retention rates, implicitly assume dividend patterns will remain unchanged – it will be more useful to consider future market conditions, investor confidence, economic conditions, and so on when making the estimate of future dividends.

**Data used:**

a. The share price is used in the DVM to help estimate the cost of equity to the company or the required rate of return to the investor. Share prices change on a daily basis, and not always in a perfectly efficient or rational manner.
b. The growth in future dividends.

This is perhaps more likely to be linked to the growth in future earnings, than to past dividends. Earnings do not feature as such in the dividend valuation model. However, earnings should be an indicator of the company's long-term ability to pay dividends and therefore, in estimating the rate of growth of future dividends, the rate of growth of the underlying profits must also be considered. For example, if dividends grow at 10% while earnings grow at 5%, before long the firm will run out of funds with which to pay dividends. Similarly, if dividends grow at 5% and profits at 10%, the firm will soon accumulate excess funds.

## 14.4 The CAPM method of estimating the cost of equity

Another approach to calculating the cost of equity in a company is to use the capital asset pricing model (CAPM). The CAPM is considered in more detail in the next chapter.

The formula for the model is as follows:

$R_E = R_{RF} + \beta (R_M - R_{RF})$

Where

$R_E$ is the cost of equity of the company's shares

$R_{RF}$ is the risk-free rate of return [return that investors receive on riskfree investments.

$R_M$ is the average return on market investments as a whole excluding risk-free investments.

Β is the beta of the company's equity shares.

**Example: CAPM**

The rate of return available for investors on government bonds is 4%. The average return on market investments is 7%. The company's equity beta is 0.92.

Using the CAPM, the company's cost of equity is therefore: 4% + 0.92 (7 – 4)% = 6.76%.

### 14.4.1. Introduction

Each item of debt finance for a company has a different cost. This is because different types of debt capital have differing risk, according to whether the debt is secured, whether it is senior or subordinated debt, and the amount of time remaining to maturity. (Note: Longer-dated debt normally has a higher cost than shorter-dated debt).

Calculation of the cost of debt uses the same sort of approach as that used to calculate the cost of equity using the dividend valuation model.

The market value of debt is the present value of all future cash flows in servicing the debt. A difference between debt and equity is that interest payments are tax deductible whereas dividend payments are not.

This means that debt might be valued from two different viewpoints:

a. The lenders' viewpoint: discount the pre-tax cash flows (i.e. ignoring the tax relief on the interest) at the lenders' required rate of return (the pre-tax cost of debt.
b. The company's viewpoint: discount the post-tax cash flows (i.e. including the tax relief on the interest) at the cost to the company (the post-tax cost of debt). This is the rate that is input into WACC calculations.

**Example: Pre and post tax cost of debt**

The company takes out a bank loan with an interest rate of 10%. The company pays interest of 10% but obtains tax relief at 30%. The pre-tax cost of debt is the 10%, while the post tax cost of debt is 10[1 – 0.30]% = 7%.

The required rate of return can be found by calculating the IRR of the cash flows associated with the debt using the market value as the amount of cash flow at time 0.

This is easily achieved if debt is irredeemable (i.e. it is never paid back so interest must be paid into infinity) by rearranging the expressions for cost of debt.

Calculating the cost of redeemable debt requires a full IRR calculation.

**Nominal rate of interest**

This is another rate that appears in cost of debt calculations. The nominal interest rate is used to identify the cash flow paid on a nominal amount of debt.

**Example: Nominal interest rate**

A company borrows ₦1,000,000 by issuing ₦1,000, 10% bonds.

This means that it has issued 1,000 bonds and each of these is for ₦1,000.

The company has to pay interest of 10% which totals to be ₦100,000 per annum (or ₦100 per annum for each individual bond).

Suppose the market value of the bonds changed to ₦2,000 (perhaps because the company's debt was looked on very favourably by the market).

This would have no effect on the nominal interest rate which is still 10% of the nominal value of the bonds.

However, the bondholders (the lenders) are now receiving ₦100,000 on an investment worth ₦2,000,000. This is a return of 5%. This is the pre=tax return and is also known as the yield on the bond.

### 14.4.2 Cost of irredeemable fixed rate debt (perpetual bonds)

The expressions for the market of irredeemable fixed rate bonds (perpetual bonds) and the rearrangement to provide an expression for the cost of debt are as follows:

**Formula: Cost of irredeemable fixed rate debt**

Pre-tax cost of debt (the lender's required rate of return)

$$MV = \frac{i}{r_d}$$

Post tax cost of debt

$$MV = \frac{i(1-t)}{\text{Post tax } r_d}$$

rearranging:

$$r_d = \frac{i}{MV}$$

$$\text{Post tax } r_d = \frac{i(1-t)}{MV}$$

**Where:**

$r_D$ = the cost of the debt capital

i = the annual interest payable

t = rate of tax on company profits.

MV = Ex interest market value of the debt

Note that calculations are usually performed on a nominal amount of 100 or 1,000.

### 14.4.3 Cost of redeemable fixed rate debt (redeemable fixed rate bonds)

**Value of redeemable debt**

This is calculated as the present value of the future cash flows:

a. to be received by the lender discounted at the pre-tax cost of debt (the lender's required rate of return); or

b. to be paid by the company (net of tax relief on the interest flows) discounted at the post-tax cost of debt (the cost to the company).

**Example: Market value of loan stock**

A company has issued 7% loan stock. Annual interest has just been paid. The bonds will be redeemed at par after four years. The lenders' required rate of return is 8.14%.

**Required:**

Calculate the market value of the loan stock.

**Solution**

| Year | Cashflow | | DCF @ 8.14% | PV |
|---|---|---|---|---|
| | | ₦ | | ₦ |
| 1 | Interest | 7.00 | 0.925 | 6.48 |
| 2 | Interest | 7.00 | 0.855 | 5.99 |
| 3 | Interest | 7.00 | 0.791 | 5.55 |
| 4 | Interest | 7.00 | 0.731 | 5.13 |
| 4 | Redemption value | 100.00 | 0.731 | 73.10 |
| | | | | **96.25** |

### 14.4.3 Cost of redeemable debt

The cost of redeemable bonds is their redemption yield. This is the return, expressed as an average annual interest rate or yield, that investors in the bonds will receive between 'now' and the maturity and redemption of the bond, taking the current market value of the bonds as the investment. It is the investment yield at which the bonds are currently trading in the bond market.

This is calculated as the rate of return that equates the present value of the future cash flows payable on the bond (to maturity) with the current market value of the bond. In other words, it is the IRR of the cash flows on the bond to maturity, assuming that the current market price is a cash outflow.

The redemption of the principal at maturity is not an allowable expense for tax purposes. This means that post-tax cost of redeemable debt cannot be calculated by multiplying the pre-tax cost by (1 - t). A full IRR calculation must be carried out.

The approach is to calculate the post-tax cost of debt as the IRR of the future cash flows, allowing for tax relief on the interest payments and the absence of tax relief on the principal repayment using the market value as the cash flow at time 0.

### 14.4.4 The cash flows for calculating the cost of redeemable debt

The cash flows used to calculate an IRR (redemption yield) are:

a. The current market value of the bond, excluding any interest payable in the near future (shown as a cash outflow).
b. The annual interest payments on the bond (shown as a cash inflow).
c. Tax relief on these annual interest payments : these are cash outflows (the opposite of the interest payments) and occur either in the same year as the interest payments or one year in arrears, depending on the assumption used about the timing of tax payments (shown as a cash outflow)
**d.** The redemption value of the bonds, which is often par (shown as a cash inflow).

### 14.4.5 Approximate Internal rate of return [AIRR]

When calculating the cost of redeemable debt, the best trial and error figure to start with is the AIRR and is calculated as follows:

AIRR = {I + [(R – P)/n] / R + P / 2 where

I = annual interest net of tax

R = the redemption value

P = the current market price

n = number of years to redemption

**Example: Post-tax cost of debt**

The current market value of a company's 7% loan stock is 96.25.

Annual interest has just been paid. The bonds will be redeemed at par after four years. The rate of taxation on company profits is 30%.

**Required:**

Calculate the after-tax cost of the bonds for the company

**Solution**

| Year | Cashflow | | DCF@6% | PV | DCF@5% | PV |
|---|---|---|---|---|---|---|

| | | ₦ | | ₦ | | ₦ |
|---|---|---|---|---|---|---|
| 0 | Market value | (96.25) | 1.000 | (96.25) | 1.000 | (96.25) |
| 1 | Interest net tax | 4.90 | 0.943 | 4.62 | 0.952 | 4.66 |
| 2 | Interest net tax | 4.90 | 0.890 | 4.36 | 0.907 | 4.44 |
| 3 | Interest net tax | 4.90 | 0.840 | 4.12 | 0.884 | 4.23 |
| 4 | Interest net tax | 4.90 | 0.792 | 3.88 | 0.823 | 4.03 |
| 4 | Redemption | 100.00 | 0.792 | 79.20 | 0.823 | 82.30 |
| | **NPV** | | | **(0.07)** | | **3.41** |

After tax cost of debt = 5% + {3.41 / 3.41 + 0.07} x [6% - 5%] = 6% approximately.

**To calculate the IRR, we can start with the AIRR**

{6 + [(100 – 96.25) / 4] / 100 + 96.25 /2 } = 7%. We can start with 7% as the first interest rate using AIRR, as it will always give a result close to the actual IRR.

**14.4.6 Cost of convertible debt**

The cost of a convertible bond is the higher of:

a. The cost of the bond as a straight bond that will be redeemed at maturity, and
b. The IRR of the relevant cash flows assuming that the conversion of the bonds into equity will take place in the future.

The cost of capital of the bond as a straight bond is only the actual cost of the bond if the bonds are not converted into shares at the conversion date. The IRR of the relevant cash flows is the cost of the convertible bond assuming that conversion will take place.

The relevant cash flows for calculating this yield (IRR) are:

a. the current market value of the bonds (Year 0 outflow);
b. annual interest on the bonds up to the time of conversion into equity (annual inflows);
c. tax relief on the interest (annual outflows); and
d. the expected market value of the shares, at conversion date, into which the bonds can be converted.

**Example**:

The current market value of a company's 7% convertible debenture is ₦108.70. Annual interest has just been paid.

The debenture will be convertible into equity shares in three years' time, at a rate of 40 shares per debenture.

The current ordinary share price is ₦3.20 [no growth expected] and the rate of taxation on company profits is 30%.

**Required:**

Calculate the after-tax cost of bonds

**Solution**

| Year | Cashflow | | DCF@10% | PV | DCF@9% | PV |
|---|---|---|---|---|---|---|
| | | ₦ | | ₦ | | ₦ |
| 0 | Market value | (108.7) | 1.000 | (108.7) | 1.000 | (108.7) |
| 1 – 3 | Interest net tax | 4.90 | 2.457 | 12.19 | 2.531 | 12.40 |
| 3 | Conversion value | *128 | 0.751 | 96.13 | 0.772 | 98.82 |
| | **NPV** | | | **(0.38)** | | **2.52** |

After tax cost of debt = 9% + {2.52 / 2.52 + 0.38} x [10% - 9%] = 9.9% approximately.

The conversion value is calculated as share price at the time of conversion x number of shares on conversion = N3.20 x 40 = N128.

The cost of the convertibles as a straight bond is obviously less than 9.9% (since the market value is above par and the coupon is only 7%). The market therefore expects the bonds to be converted into equity, and the after-tax cost is 9.9%.

## 14.5 Cost of preference shares

**For irredeemable preference shares**, the cost of capital is calculated in the same way as the cost of equity assuming a constant annual dividend and using the dividend valuation model.

**Formula: Dividend valuation model (without growth)**

$$MV = \frac{d}{r_p}$$ This is the present value of a perpetuity

rearranging:

$$r_p = \frac{d}{MV}$$ This is an IRR of a perpetuity

**Where:**

$r_p$ = the cost of preference shares

d = the expected future annual dividend (starting at time 1)

MV = the share price ex dividend

**For redeemable preference shares**, the cost of the shares is calculated in the same way as the pre-tax cost of irredeemable debt. (Dividend payments are not subject to tax relief, therefore, the cost of preference shares is calculated ignoring tax, just as the cost of equity ignores tax.)

### 14.5.1 Calculating the weighted average cost of capital (WACC)

**Method of calculating the weighted average cost of capital (WACC)**

The weighted average cost of capital (WACC) is a weighted average of the (after-tax) cost of all the sources of capital for the company.

The different costs are weighted according to their market values. This can be done using a formula or a table.

There would be a different term for each type of capital in the above formula.

| Source of finance | Market value | Cost | MV x cost |
|---|---|---|---|
| Equity | $MV_E$ | $r_E$ | Xxx |
| Preference shares | $MV_P$ | $r_p$ | Xxx |
| Debt | $MV_D$ | $r_D$ | Xxx |
| Total | $MV_O$ | | xxx |

WACC = xxx / $MV_O$

**Example: WACC**

A company has 10 million shares each with a value of ₦4.20, whose cost is 7.5%.

It has ₦30 million of 5% bonds with a market value of 101.00 and an after-tax cost of 3.5%.

It has a bank loan of ₦5 million whose after-tax cost is 3.2%.

It also has 2 million 8% preference shares of ₦1 whose market price is ₦1.33 per share and whose cost is 6%.

**Required:**

Calculate the WACC.

**Solution**

| **Source of finance** | **Market value** | **Cost** | **MV x cost** |
|---|---|---|---|
| | ₦million | | ₦million |
| Equity | 42,00 | 7.5% | 3.15 |
| Preference shares | 2.66 | 6% | 0.16 |
| Debt | 30.30 | 3.5% | 1.061 |
| | 5.00 | 3.2% | 0.16 |

| | | | |
|---|---|---|---|
| Total | 79.96 | | 4.531 |

WACC = xxx / $MV_O$ = 4.531 / 79.96 = 5.7%

## 14.6 WACC and market values

For a company with constant annual 'cash profits', there is an important connection between WACC and market value. (Note: 'Cash profits' are cash flows generated from operations, before deducting interest costs.)

If we assume that annual earnings are a constant amount in perpetuity, the total value of a company (equity plus debt capital) is calculated as follows:

Total market value of a company = Earnings [1 – t] / WACC

From this formula, the following conclusions can be made:

a. The lower the WACC, the higher the total value of the company will be (equity + debt capital), for any given amount of annual profits.

b. Similarly, the higher the WACC, the lower the total value of the company.

For example, ignoring taxation, if annual cash profits are, say, ₦12 million, the total market value of the company would be:

a. ₦100 million if the WACC is 12% (₦12 million/0.12)
b. ₦120 million if the WACC is 10% (₦12 million/0.10)
c. ₦200 million if the WACC is 6% (₦12 million/0.06).

The aim should therefore be to achieve a level of financial gearing that minimises the WACC, in order to maximise the value of the company.

Important questions in financial management are:

a. For each company, is there an 'ideal' level of gearing that minimises the WACC?
b. If there is, what is it?

These issues are addressed in a later chapter on gearing and capital structure.

## 14.7 Weighted average cost of capital (WACC) and capital asset pricing model (CAPM)

The weighted average cost of capital (WACC) can be used as the discount rate in investment appraisal provided that some restrictive assumptions are met. These assumptions are:

a. The investment project is small compared to the value of the investing organisation;
b. The business activities of the investment project are similar to the business activities currently undertaken by the investing organisation;
c. The financing mix used to undertake the investment project is similar to the current financing mix (or capital structure) of the investing company; and
d. Existing finance providers of the investing company do not change their required rates of return as a result of the investment project being undertaken.

These assumptions are essentially saying that WACC can be used as the discount rate provided that the investment project does not change either the business risk or the financial risk of the investing organisation.

If the business risk of the investment project is different to that of the investing organisation, the CAPM can be used to calculate a project-specific discount rate.

The benefit of using a CAPM-derived project-specific discount rate is illustrated in the figure below. Using the CAPM will lead to better investment decisions than using the WACC in the two shaded areas, which can be represented by projects A and B.

Project A would be rejected if WACC is used as the discount rate, because the internal rate of return (IRR) of the project is less than the WACC. This investment decision is incorrect, however, since project A would be accepted if a CAPM-derived project-specific discount rate is used because the project IRR lies above the security market line (SML). The project offers a return greater than that needed to compensate for its level of systematic risk, and accepting it will increase the wealth of shareholders.

Project B would be accepted if WACC was used as the discount rate because its IRR is greater than the WACC.

This investment decision is also incorrect, however, since project B would be rejected if using a CAPM-derived project-specific discount rate, because the project IRR offers insufficient compensation for its level of systematic risk.

### 14.7.1 Advantages of the CAPM

The CAPM has several advantages over other methods of calculating required return, explaining why it has been popular for more than 40 years. These are:

a. It considers only systematic risk, reflecting a reality in which most investors have diversified portfolios from which unsystematic risk has been essentially eliminated;

b. It is a theoretically-derived relationship between required return and systematic risk which has been subject to frequent empirical research and testing;

c. It is generally seen as much better method of calculating the cost of equity than the dividend growth model (DGM) in that it explicitly considers a company's level of systematic risk relative to the stock market as a whole; and

d. It is clearly superior to the WACC in providing discount rates for use in investment appraisal.

e. Among the major difficulties inherent in the practical application of the CAPM are:

f. Determining the excess return Rm – Rf. The term relates to the expected return of the market portfolio over the riskless asset. This is difficult to determine in practice.

g. Determining the risk-free rate - Problems are found in identifying a riskless security. In view of the term structure of interest rates, the interest rate to be used is the yield on a security with the same approximate life as the project to be appraised.

h. Estimation of beta for the firm's equity and for the firm as a whole - The coefficient for equity may be estimated by simple linear regression of security returns on market returns. To overcome possible sampling error, confidence limits on the beta estimate may be required. Unless the firm is all equity-financed, the equity beta must be converted into a firm beta in order to obtain an overall average required return.

i. Determining beta for individual projects – Frequently, there is little objective evidence concerning a project's beta and so an estimate, necessarily subjective and open to argument, must be made.

j. The concentration only on systematic, rather than overall, risk - A risky project which has a return uncorrelated with the market will be treated as financially equivalent to a risk-free project. Whilst this may be justified in the context of a well-diversified portfolio, they are unlikely to be considered equal by corporate management.

k. The CAPM is a single period return model - Hence it should be used with caution in the analysis of any multi-period capital project.

### 14.7.2 Illustration on WACC

The capital structure of 2017 Double star plc is as follows:

| | ₦ |
|---|---|
| ₦1 Ordinary shares | 500,000,000 |
| Revenue reserves | 185,000,000 |
| Share premium | 375,000,000 |
| Retained earnings | 250,000,000 |
| 12% ₦1 preference shares | 100,000,000 |
| 6% convertible debenture stock | 150,000,000 |
| 8% unsecured loan stock | 300,000,000 |
| 9% irredeemable debt | 100,000,000 |

The ordinary shares have a current market price of ₦3.50 each on the 28th of December 2017. The dividend for 2017 of 70 kobo per share was proposed on the 25th of November 2017 but paid on the 30th of December 2017. Dividends per share in the preceding years were as follows:

2012 – 45 kobo 2013 – 50 kobo 2014 – 55 kobo 2015 – 60 kobo

Dividends are paid once a year and are expected to grow in the future at the same annual rate as they have since 2012.

The preference shares have a market price of ₦0.80 each. The 2017 preference dividend of 12 kobo per share has just been paid. Dividends on the preference shares are paid once a year.

The convertible debenture stock has a market price of ₦120 per nominal. The stock is convertible into ordinary shares in five years' time at a rate of ₦100 nominal stock for 50 ordinary shares. The market price of the shares at the time of conversion is expected to be ₦4.00 each. If the debt is not converted the stock will be redeemed in four years' time at a price of ₦125 percent. Interest has been paid.

The unsecured loan stock has a market price of ₦80 per nominal and is redeemable at par in six years' time. Interest has just been paid.

The market price on the irredeemable bond is at par. The company has just paid the interest for 2017 on all bonds except the irredeemable bond. The company pays corporate tax at a rate of 25%.

The shareholders complained bitterly on the 2016 Dividend of 64 kobo as it was lower than what other similar companies paid as dividend.

The Finance Director is not satisfied with the cost of capital figure calculated. He believes the Capital Asset Pricing Model (CAPM) model is preferable to the Dividend Valuation Model (DVM) Approach. He is also of the view that Gordon's model of growth be adopted in determining the growth rate.

The average market return over the period is 23%, return from treasury bills is 8% while the systematic risk of the company has been estimated to be 120% of that of the market. The company usually reinvests its retained earnings. They have a payout ratio of 24% and the average return on investment is 25%.

**Required:**

Estimate the weighted average cost of capital of Double star plc without the Finance Director's recommendation using the dividend valuation model and dividend growth approach when computing cost of equity.

**Solution**

This is a question on WACC with different types of finance.
$V_E$ represents value of equity, $K_E$ represents cost of equity, $K_P$ represents cost of preference shares, $V_P$ represents value of preference shares, $K_D$ represents cost of debt and $V_D$ represents value of debt.

**<u>Equity</u>**
Note that all reserves are considered in determining the market value per share and so it would not be relevant in WACC calculation.
Note also that the market price is cum-div (market price before dividend is paid) and so needs to be converted to ex-div= 3.50 – 0.70 = ₦2.80

**<u>Ordinary shares</u>**
Growth rate = $\sqrt[n-1]{LD/ED} - 1 = \sqrt[6-1]{70/45} - 1 = 9.24\ \%$
$K_E = D_0(1 + g)/P_0 + g = 0.70(1.0924)/2.80 + 0.0924 = 36.55\%$
$V_E = P_0$ X number of shares = 2.80 x 500 m = ₦1,400m

**<u>Preference shares</u>**
$K_P = P_D/P_0 = 12/80 = 15\%$
$V_P = P_0$ X number of shares = 0.80 x 100m = ₦80m

**Convertible debt**: always compare conversion value with redemption value for the final year decision. The higher value should be taken. Where the examiner is silent,

| year | Description | Cash flow | DCF@5% | PV | DCF@15% | PV |
|---|---|---|---|---|---|---|
| 0 | Market value | (80) | 1.000 | (80) | 1.000 | (80) |
| 1-6 | Interest net tax; 8(1-0.25) | 6 | 5.076 | 30.46 | 3.784 | 22.70 |
| 6 | Redemption value | 100 | 0.746 | 74.60 | 0.432 | 43.20 |
| | | | | 25.06 | | (14.10) |

redemption value is at par. Note also that the years differ for both debts and so the one with the highest value determines the number of years interest will be received.
Conversion value = price of shares at conversion time x number of shares per debt = 4 x 50 = ₦200
Redemption value = ₦125
The conversion value is higher and would be chosen.
Cost of debt is calculated based on IRR of cash flows

| Year | Description | Cash flow | DCF@5% | PV | DCF@15% | PV |
|---|---|---|---|---|---|---|
| 0 | Market value | (120) | 1.000 | (120) | 1.000 | (120) |
| 1-5 | Interest net tax ; 6(1-0.25) | 4.5 | 4.329 | 19.48 | 3.352 | 15.08 |
| 5 | Conversion value | 200 | 0.784 | 156.8 | 0.497 | 99.40 |
| | | | | 56.28 | | (5.52) |

$K_D$ = LR + (NPV LR)/ (NPV HR – NPV LR) X (HR – LR) = 5 + (56.28)/(56.28 + 5.52) X (15 – 5) = 14.1%
$V_D$ = $P_0$ X number of debt = 120/100 x 150 m = ₦180 m

**Redeemable debt:** the cost should be calculated using IRR of cash flows
$K_D$ = LR + (NPV LR)/ (NPV HR – NPV LR) X (HR – LR) = 5 + (25.06)/(25.06 + 14.10) X (15 – 5) = 11.4%
$V_D$ = $P_0$ X number of debt = 80/100 x 300 m = ₦240 m

**Irredeemable debt**
Ex Int = 100 – 9 = 91
Cost of Debt = 9(1 – 0.25) / 91 = 7.4%
Value of Debt = 91 x 100m = ₦91 m

**WACC calculation**

| Finance source | Market value (₦ m) | Cost | Average total (₦m) |
|---|---|---|---|
| EQUITY | 1,400 | 36.55% | 511.70 |
| Preference shares | 80 | 15% | 12.00 |
| Convertible debt | 180 | 14.1% | 25.38 |
| Redeemable debt | 240 | 11.4% | 27.36 |
| Irredeemable debt | 91 | 7.4% | 6.73 |
| | **1,991** | | **583.17** |

WACC = average total/ market value in % = 583.17 /1,991 = 29.29%

## 14.8 Project specific cost of capital or adjusted WACC

This refers to the cost of capital that is specifically applicable to a particular project or investment. It is the minimum return required by investors or lenders to justify investing in the project, taking into consideration the project's unique characteristics, risks and opportunities.

The use of project specific cost of capital arises whenever the assumptions of WACC are violated.

Factors that influence project specific cost of capital are:

a. the project risk;
b. the industry and market;
c. the project size and scope;
d. project duration;
e. financing structure;
f. regulatory environment; and
g. market conditions.

To calculate the project specific cost of capital, there is a need to have a deeper understanding of Beta factor.

### 14.8.1 Beta factor

We learnt under cost of capital [CAPM] that beta factor is a measure of the systematic risk. Beta factor measures the volatility of a security or portfolio to changes in the overall market. Beta factor calculates the covariance between the returns of a security or portfolio and the returns of the overall market divided by the variance of the market returns. [$\beta$ = Cov SM / Var M]

Factors that affect Beta are:

a. industry and sector;

b. company size and style – smaller companies with a growth style have higher beta and vice versa;
c. leverage and debt – the higher the debt, the higher the beta and vice versa; and
d. market conditions such as interest rates and economic growth.

### 14.8.2 Factors that influence beta factor

a. Nature of the business, that is the industry or sector.
b. The financial leverage, that is the debt. The higher the debt the higher the beta factor.
c. The operating leverage, that is the change in the EBIT because of the asset management. The higher the operating leverage, the higher the risk and beta factor.
d. The choice of the market index used in calculating the beta factor.
e. The time-period or frequency used to calculate the beta.

### 14.8.3 Types of beta factor

a. Beta Equity/Equity Beta/Geared Beta [Be] is a beta factor that measures the market risk of a company considering both the business and financial risk.
b. Beta Asset/Asset Beta/Ungeared Beta [Ba] is a beta that measures the market risk of a company without the impact of the debt. It only measures the business risk [risk associated with the assets only] without the financing effect.
c. Beta Debt/Debt Beta [Bd] is a measure of the sensitivity of equity to changes in debt financing. It is derived from the ratio of the credit spread to the equity risk premium. It measures the systematic risk of debt returns. It is often assumed to be zero on the basis of default proof debt.

The asset beta formula

$$\beta_a = \left[\frac{V_e}{(V_e + V_d(1-T))}\beta_e\right] + \left[\frac{V_d(1-T)}{(V_e + V_d(1-T))}\beta_d\right]$$

### 14.8.4 Risk adjusted WACC / Project specific cost of capital

WACC should only be used as a discount rate for a new investment project if the business risk and the capital structure [financial risk] are likely to stay constant.

Risk adjusted WACC refers to a WACC which incorporates the new return required by shareholders [Ke]. Where the business risk of a new project is different from the business risk of a company's existing operations, the shareholders will expect a different return to compensate for this new level of risk which necessitates the risk adjusted WACC.

### 14.8.5 The risk adjusted WACC will be required when:

a. If the business risk of the new project differs from the entity's existing business risk. A risk adjusted WACC is calculated by degearing and regearing to get a cost of equity that reflects the business risk of the new project.
b. If the capital structure [Financial risk] is expected to change when the new project is undertaken.
   i. If the change in the capital structure is not significant: the Risk Adjusted WACC will be calculated using the new capital structure weighting.
   ii. If the change in the capital structure is significant: the Adjusted Present Value [APV] will be used.

### 14.8.6 Steps in calculating risk adjusted WACC

**In a scenario where the proxy company has only one business**

a. Find the appropriate beta equity from a suitable quoted company [Proxy company]
b. Degear the beta equity [remove financial risk of proxy company] to get Beta Asset of the new industry.
c. Regear the beta asset [add the financial risk of the concerned company] to get beta equity of the concerned company.
d. Use the beta equity of the concerned company to calculate Ke
e. Use the Ke to calculate the risk adjusted WACC.
f. Evaluate the project.

**In a scenario where the proxy company has more than one business**

Where the proxy company has more than one business, then there is a need to eliminate two things

a. The Financial risk of the proxy company. [Degearing]
b. The unwanted project [from the company's portfolio]

The challenge here is which of the two factors above should be eliminated first.

a. If the beta of the proxy company and the beta of the unwanted project are on same level [that is beta equity of both or beta debt of both], we would need to eliminate the unwanted project first before degearing.
b. If the beta of the proxy company and the beta of the unwanted project are on different levels [that is beta equity on proxy company and beta asset on project or vice versa], we would need to degear first before eliminating the unwanted business.
c. After the above steps
d. Regear the beta asset [add the financial risk of the concerned company] to get beta equity of the concerned company.
e. Use the beta equity of the concerned company to calculate Ke
f. Use the Ke to calculate the risk adjusted WACC.
g. Evaluate the project.

**Example on Beta Factor**

Aka PLC is a listed company on the Newyork stock exchange. It is involved in property development and sales. It has decided to expand into cement production. Its equity beta is 1.6, its asset beta is 1.2, risk free rate is 5% while the market risk premium is 7%.

It has identified a proxy company which produces cement and packaged fruit drinks. The proxy company has an equity beta of 1.82, debt beta of 0.4 and a debt/equity ratio of 40%. 60% of their market value is attributed to cement. The fruits division has an equity beta of 0.8.

The expected gearing ratio of Aka plc after the expansion is debt/equity ratio of 30%. Tax rate is 25%.

**Required:**

Calculate the appropriate project specific cost of equity to the nearest whole number.

**Solution**

Cost of Equity specific to the project should be calculated using Beta equity that reflects the business risk of the project and the financial risk of the company.

Ke = Rf + Be (Rm – Rf) = 5% + 2.46 (7%) = 22.22% = 22%

Beta equity (business risk of cement and the financial risk of Aka plc)

a. Identify Proxy coy; Be = 1.82; D:E = 40:100

b. Be company = (% in fruits x Be fruits) + (% in cement x Be cement)

1.82 = (40% x 0.8) + (60% x Be cement)

1.82 = 0.32 + (60% x Be cement)

1.82 – 0.32 = 60% x Be cement

Be cement = 1.50 / 0.60 = 2.5

c. Remove financial risk of the proxy company

Ba = Be x (Ve / Ve + Vd(1 –t) + (Bd x Vd(1-t)/ve + vd(1-t)

Ba = 2.5 x (100/ 100 + 40(1 – 0.25) + (0.4 x 40(1 – 0.25)/ 100 + 40(1 – 0.25)

= 2.01

d. Add the financial risk of Aka plc

Be = Ba x Ve + Vd (1 – t) / ve = 2.01 x {100 + 30(1-0.25) / 100} = 2.46 or

Be = Ba + [Ba – Bd] Vd{1 – T}/Ve = 2.01 + [2.01 – 0] {30[1 – 0.25] / 100 = 2.46

Ke = Rf + Be[Rm – Rf] = 5% + 2.46 (7%) = 22.22% = 22%

## 14.9 Chapter review

At the end of this chapter, ensure that you can:

a. use the dividend valuation model to measure the value of equity;
b. measure the cost of equity using the dividend valuation model with or without growth;
c. measure the pre-tax and post-tax cost of both redeemable and irredeemable debt;
d. measure the cost of convertible bonds; and
e. calculate the weighted average cost of capital.

Skills Level

Financial Management

CHAPTER 15

# CAPITAL ASSET PRICING MODEL (CAPM) AND PORTFOLIO THEORY

## Contents

# 15 CAPM and Portfolio Theory

## 15.0 Learning objective

This chapter discusses CAPM and portfolio theory.

## 15.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. describe gearing theories;
b. apply the M and M equations; and
c. degear and regear betas and hence find project specific discount rate.

## 15.2 Introduction to portfolio theory

### 15.2.1 Introduction

A **Return** is a reward that investors expect for providing funds and keeping those funds invested, plus a return for the compensation for risk. As a basic rule, an investor will expect a higher return when the investment risk is higher.

**Investment risk** refers to the risk associated with investing funds in shares or bonds. The **risks associated with bonds** are the fact that the bond issuer may default in paying the interests on the bonds or the principal at maturity; or there may be a change in the market rates of interest which may affect the bond value negatively.

The **risks associated with equity shares** are the fact that the company might go into liquidation, or the company profits might fluctuate and the dividends too. The investment risk when a company invests in a new project is the risk that actual returns from the investment will be different from the expected return. Some types of investment are riskier than others, because of the nature of the industry and markets. When business risk is higher, returns are less predictable or more volatile, and the expected returns should be higher to compensate for the higher business risk.

**Risk** can be **measured** statistically either from an analysis of historical returns achieved in the past, or from probability estimates of returns in the future. The volatility is measured as either the **variance or standard deviation of expected returns**.

An investor can **reduce the investment risk** (volatility of expected returns) by **diversifying** his investments and holding a portfolio of different investments. A portfolio of different investments can reduce the variation of returns from the total portfolio, because if some investments provide a lower-than-expected return, others will provide a higher-than-expected return. The unsystematic and company related risk can be reduced by diversification into various securities and assets whose variability is different and offsetting or put in different words which are negatively correlated or not correlated at all.

Markowitz postulated that diversification should not only aim at reducing the risk of a security by reducing its variability or standard deviation, but by reducing the covariance or interactive risk of two or more securities in a portfolio. The theory of portfolio diversification attaches importance to standard deviation, to reduce it to zero, if possible, covariance to have as much as possible negative interactive effect among the securities within the portfolio and coefficient of correlation to have -1 {negative} so that the overall risk of the portfolio as a whole is nil or negligible.

Similarly, a company could reduce the investment risk in its business by diversifying and building a portfolio of different investments. **There is an argument that there is no reason for a company to diversify its investments because an investor can achieve all the diversification, he requires by selecting a diversified portfolio of equity investments.**

An investment portfolio consisting of all stock market securities excluding risk free securities weighted according to the total market value of each security is called the **market portfolio**.

**Risk aversion** refers to the fact that individuals prefer less risk to more risk for a given level of expected returns and will only accept a riskier investment if they are compensated in the form of greater expected return. The fact that individuals buy some sort of insurance, whether auto, health or homeowners indicates that they are generally risk averse.

### 15.2.2 Expected return, variance and standard deviation on single investment

Expected return is the average return expected on an investment or portfolio based on the returns for the security in each state and the probability of their outcomes.

The variance and standard deviation of returns are common measures of investment risk which determine the variability of a distribution of returns about its mean or expected value. **Variance is calculated as the sum of probability (actual return – expected return)$^2$ = $P(r - \bar{r})^2$ while standard deviation is the square root of variance**.

**Illustration 1: Calculation of expected return from a single investment**

From the table below, compute the expected return, variance and standard deviation.

| State | Probability | Expected Return |
|---|---|---|
| Expansion | 0.25 | 5% |
| Normal | 0.50 | 15% |
| Recession | 0.25 | 25% |

**Solution to illustration 1**

| State | Probability | Return % | Expected return % | P (R – Er)$^2$ |
|---|---|---|---|---|
| Expansion | 0.25 | 5 | 1.25 | 0.25{5 – 15}$^2$ = 25 |
| Normal | 0.50 | 15 | 7.5 | 0.50{15 – 15}$^2$ = 0 |
| Recession | 0.25 | 25 | 6.25 | 0.25{25 – 15}$^2$ = 25 |
| | | | **15** | Variance = 50% |

## 15.3 Portfolio theory

Portfolio theory is concerned with how investors should build a portfolio of investments that give them a suitable balance between return and investment risk. Portfolio theory provides a theoretical basis for the capital asset pricing model, which is an important model in financial management.

### 15.3.1 General assumptions of portfolio theory

**The general assumptions of portfolio theory are:**

a. investors are rational and behave in a manner that will maximise their utility;
b. investors have free access to fair and correct information on returns and risk;
c. the markets are efficient and absorb information quickly and perfectly;
d. investors are risk averse and try to minimize their risk while maximising return;
e. investors base decisions on expected returns and variance or standard deviation of these returns from the mean; and
f. investors choose higher returns to lower returns for a given level of risk.

### 15.3.2 Portfolio return: two asset portfolios {Portfolio with two investments}

The return of a portfolio is equal to the weighted average of the returns of individuals assets (or securities) in the portfolio with weights being equal to the proportion of investment value in each asset.
The expected rate of return on a portfolio or portfolio return is the weighted average of the expected rates of return on assets in the portfolio.

Return on a portfolio = $(W_A \times R_A) + (W_B \times R_B)$

$W_A$ is the proportion or percentage of total portfolio value invested in security A = amount invested in A / Total investment or portfolio value

$W_B$ is the proportion or percentage of total portfolio value invested in security B = amount invested in B / Total investment or portfolio value

$R_A$ and $R_B$ represent expected return on amount invested in A and B respectively.

The weight is based on value and not quantity.

In a 2 Asset portfolio, $W_A + W_B = 100\%$ which is $W_A + W_B = 1$. This becomes relevant where the weights in a scenario are unknown for both securities.

**Illustration 2 on expected return on a portfolio**

**An investor holds the** following portfolio which is invested in three stocks: Total, GTB and MTN.

| Security | Number of Shares | Share Price | Expected Return |
|---|---|---|---|
| TOTAL | 15,000 | ₦20 | 8% |
| GTB | 10,000 | ₦30 | 10% |
| MTN | 40,000 | ₦10 | 12% |

Calculate the expected return on this portfolio.

**Solution to illustration 2**

Rp = (WA RA) + (WBRB) + (WCRC)

Rp = (0.30 x 8) + (0.30 x 10) + (0.40 x 12) = 10.2%

| Security | Number of Shares | Share Price | Value | Weight |
|---|---|---|---|---|
| TOTAL | 15,000 | ₦20 | 300,000 | 0.30 |
| GTB | 10,000 | ₦30 | 300,000 | 0.30 |
| MTN | 40,000 | ₦10 | 400,000 | 0.40 |
| | | | 1,000,000 | |

**Illustration 3**

An investor requires 25% return from his portfolio of 2 investments. If the return from the first investment is 30% and the second investment is 20%. How much from the available finance of N100,000 should be invested in each investment.

**Solution to illustration 3**

Let A represent first investment and B represent second investment

WA + WB = 1
**WA = 1 - WB**

Rp = {WARA} + {WBRB}
25 = {WA X 30} + {WB X 20}
25 = 30{1 – WB) + 20WB
25 = 30 – 30WB + 20WB
30WB – 20WB = 30 – 25
10WB = 5
WB = 5/10 = 50%
WA = 1 – 0.50 = 0.50 = 50%
This implies 50% should be invested in both securities.

**Illustration 4**

ABC plc has 3 investments in its portfolio {A, B & C} with 15%, 25% and 30% returns respectively. The board has decided that 20% of its total investment would be on Agricultural companies of which company B falls under.

**Required:**

a. Advise the company on how the portfolio should be constructed so as to get a **total return of 20%** from the portfolio.

b. Would the answer above be different if the **return expected from the portfolio was 13%**; explain your answer.

**Solution to illustration 4**

a.
RP = {WARA} + {WBRB} + {WCRC}
WA + WB + WC = 1
WA + WC = 1 – 0.20
WA + WC = 0.80
**WA = 0.80 – WC**
RP = {WARA} + {WBRB} + {WCRC}
20 = (0.80 – WC)15 + {0.20 X 25} + {WC X 30}
20 = 12 – 15WC + 5 + 30WC
20 -12 – 5 = -15WC + 30WC
3 = 15WC
WC = 3/15 = 0.20
WA = 0.80 – 0.20 = 0.60
60% IN A, 20% in B and 20% in C

**b.**

RP = {WARA} + {WBRB} + {WCRC}
13 = (0.80 – WC)15 + {0.20 X 25} + {WC X 30}
13 = 12 – 15WC + 5 + 30WC
13 -12 – 5 = -15WC + 30WC
-4 = 15WC
WC = -4/15 = - 0.27
WA = 0.80 – (- 0.27) = 1.07
107% IN A, 20% in B and -27% in C
This means that an investor can short sell C by 27%.

### 15.3.3 Covariance and correlation coefficient

Covariance = correlation coefficient x standard deviation of X x standard deviation of Y

Correlation coefficient = covariance / standard deviation of X x standard deviation of Y

There are two important statistical measures used to describe the association between two variables. They are Covariance and Correlation coefficient. The portfolio variance or standard deviation {Risk} depends on the co-movement of returns on two assets. {Covariance measures the co-movement of returns on two or more assets.

**Covariance** measures the extent to which two variables move together over time. A **positive covariance** means that the variables tend to move together in same direction. **Negative covariance** means that the two variables tend to move in opposite directions while a **covariance of zero** means that there is no linear relationship between the two variables. A covariance of zero between two assets implies that knowing the return for the next period on one of the assets tells you nothing about the return of the other asset for the period.

### 15.3.4 Steps in calculating co-variance

a. Determining the expected returns on assets or investments
b. Determine the deviation of possible returns from the expected returns for each asset.
c. Determining the sum of the product of each deviation of returns of two assets and respective probability.

**$COV_{AB}$ = sum of $P\{R_A - ER_A\}\{R_B - ER_B)$ where**

**P is probability; $R_A$ & $R_B$ refer to returns on A and B: $ER_A$ & $ER_B$ represent expected return value (mean) on A and B.**

The magnitude of the covariance depends on the **magnitude of the individual stock's standard deviations and the relationship between their co-movements**. The covariance is an absolute measure and is measured in return units squared. Covariance can be standardized by dividing by the product of the standard deviation of the securities being computed.

### 15.3.4 Correlation coefficient

Correlation is a measure of the linear relationship between two variables. The correlation coefficient ranges between -1.0 to +1.0. A correlation coefficient of +1.0 implies a perfectly positive correlation while a correlation coefficient of -1.0 indicates a perfectly negative correlation.

**This standardized measure of CO-movement is called Correlation** and is computed as : **$Cov_{AB}$ / $\sigma_A$ X $\sigma_B$** where $\sigma_A$ & $\sigma_B$ represents the standard deviation of A and B. The correlation coefficient has no units . it is a pure measure of the co-movement of two stock returns and is bounded by -1 and +1.

a. A correlation coefficient of +1 means that returns always change proportionally in the same direction. They are perfectly positively correlated.
b. A correlation coefficient of -1 means that the returns always move proportionally in the opposite direction. They are perfectly negatively correlated.
c. A correlation coefficient of zero means that there is no linear relationship between the two stock returns. They are uncorrelated.

As the correlation between the two assets decreases, the benefits of diversification increase because the separate movements of each stock serve to reduce the volatility of the portfolio.

Correlation coefficient is calculated as {Where the two securities are X and Y}

When there is no probability; **$n\sum xy - \sum x\sum y$ / $\sqrt{}\{\sum x^2 - [\sum x]^2\}\{\sum y^2 - [\sum y]^2\}$**

Where there is probability: **$n\sum pxy - \sum px\sum py$ / $\sqrt{}\{\sum px^2 - [\sum px]^2\}\{\sum py^2 - [\sum py]^2\}$**

### 15.3.5 Portfolio risk: Two asset portfolio

Portfolio risk depends on the correlation between the securities as the standards deviation of portfolio X and Y is considerably lower than the weighted standard deviation of these individual securities due to the diversification effect. This shows that investing wealth in more than one security reduces portfolio risk. However, the extents of the benefits of portfolio diversification depend on the correlation between returns on securities.

The portfolio variance or standard deviation depends on the co-movement of returns on two assets is measured by the co-variance of returns.

To calculate co-variance

i) Determine the expected return on assets
ii) Determine the deviation of possible returns from the expected return for each asset.
iii) Determine the sum of product of each deviation of returns of two assets and respective probability.

Covariance XY = Standard deviation X x Standard Deviation Y x Correlation XY

$$COV_{XY} = \sigma x \ \sigma y \ CORxy$$

Correlation is a measure of the linear relationship between two variables.

$$\text{Correlation X, Y} = \frac{\text{Covariance XY}}{\text{Standard deviation of X\} x \{standard deviation y \}}} = \frac{COV\ xy}{\sigma x \ \sigma y}$$

The value of correlation is called the correlation co-efficient which would be positive, negative or zero/neutral and ranges between -1.0 and + 1.0

$$\sigma P = \sqrt{(\sigma A \times WA)^2 + (\sigma B \times WB)^2 + 2WA\,WB\,\mathbf{COV_{AB}}}$$

$$\sqrt{\sigma A^2 WA^2 + \sigma B^2 WB^2 + 2WA\,WB\,\boldsymbol{\sigma A\ \sigma B}\ \mathbf{COr_{AB}}}$$

σP = Standard deviation of the portfolio
σA = Standard deviation of the returns from investment A
σB = Standard deviation of the returns from investment B
WA = Proportion of investment A in the portfolio
WB = Proportion of investment B in the portfolio
CorAB = Correlation between A and B
COVAB = Covariance between A and B

**When correlation is +1.0, the risk is $\sigma p = \sigma A w A + \sigma B W B$. There is no advantages of diversification when the returns of securities have perfect positive correlation.**

**Where correlation is -1.0, the portfolio risk is given by $\sigma p = \sigma A W A - \sigma B W B$**

**Minimum variance portfolio**

It is the best combination of two securities so that the portfolio variance is minimum. It is also called optimum portfolio. The weights can be calculated using the formula below:

**Weight of A = $\sigma^2 B$ – CovAB / $\sigma^2 A + \sigma^2 B$ – 2COVAB**

## 15.2 Systematic and unsystematic risk

Unsystematic risk arises from the unique uncertainties of individual securities. It is also called unique risk.

Unsystematic risk is a risk unique to individual investments or securities, which can be eminated through diversification while Systematic (or Market) risk is a risk that cannot be diversified because it affects the market as a whole, and all investments in the market in the same way.

**Examples of unsystematic risk includes ; strike declared by the company workers, a formidable competitor enters the market, a company loses a big contract in a bid, the government increases custom duty on the material used by the company, company's inability to obtain adequate quantity of raw material and others**

When you diversify across assets that are not perfectly correlated, the portfolio's risk is less than the weighted sum of the risks of the individual securities in the portfolio. The risk that disappears in the portfolio construction process is called the asset's unsystematic risk (also called unique, diversifiable or firm specific risk).

The risk that is left, cannot be diversified away, since there is nothing left to add to the portfolio. The risk that remains is called the systematic risk (non-diversifiable risk or market risk)

Systematic risk arises on account of the economy-wide uncertainties and the tendency of individual securities to move together with changes in the market. It is also known as market risk.

**Examples of systematic risk include government changes the interest rate policy, the government resorts to massive deficit financing, the inflation rate increases, government relaxes the foreign exchange controls, government reduces capital gains tax.**

### 15.4.1 Total risk

Total risk of an individual security is the variance or standard deviation of its return. It consists of two parts ; systematic risk and unsystematic risk. Total risk is not relevant for an investor who holds a diversified portfolio.

### 15.4.2 Implication of systematic and unsystematic risk

a. Investors expect a return on investment that is higher than the risk free rate of return unless they invest 100% in risk-free investments.
b. The higher expected return is to compensate investors for the higher investment risk
c. By diversifying in a wide range of different securities, investors can eliminate unsystematic risk as good performing and bad performing investments will cancel one another.
d. In a well-diversified portfolio, the unsystematic risk is therefore zero. Investors should therefore not require any additional return to compensate them for unsystematic risk.
e. The only risk for which investors should want a higher return is systematic risk. This is a risk that the market as a whole may not perform as expected.
f. Firms that are very responsive to market or systematic changes such as luxury goods producers are said to have high systematic risk while firms with little response to market changes such as utility companies are said to have low systematic risk.
g. Total risk (measured by standard deviation) can be broken down into its component parts: unsystematic risk and systematic risk.
h. Systematic risk is represented with beta factor while unsystematic risk is represented with alpha value.

### Illustration 5

a. In the context of the selection and holding of investments, discuss each of the following scenarios:
    i. An investor holding only one security needs to be concerned with unsystematic risk of that security (3 marks)
    ii. However, an investor who holds a number of securities should take account of total risk (3 marks)

iii. An investor should never add to a portfolio, investment that yields a return less than the market rate of return (3 marks)

b. The equity beta of KT plc is 1.2 and the alpha is 1.4. explain the meaning and significance of these values to the company (6 marks)

a. **Solution to illustration 5**

i. An investor holding only one security needs to be concerned with both systematic and unsystematic risk. An investor with only one security is totally faced with the unsystematic risk of that security and the whole systematic risk in the market.

ii. An investor with investments in a number of securities does not need to consider total risk which is made up of systematic and unsystematic risk. If the portfolio is well diversified, the investor will reduce or eliminate the unsystematic risk and so should only be concerned with systematic risk that cannot be avoided.

iii. Decisions as regards what investments to be added to a portfolio are made based on the objective of the investor. Every investor wants to maximise return and minimize risk, to do this there may be need to add investments with return less than the market return as they have lower risk also. Addition of risk free assets for instance, reduce the risk of the portfolio.

b. The equity beta of 1.2 implies that the systematic risk of KT plc is higher than that of the market and so should give a higher return. It also implies that the company is geared. If the market rises or falls by 1% then the shares of KT will fall or rise by 1.2%.

The alpha value is a temporary abnormal return for unsystematic risk due to the inefficiency of the CAPM. A positive alpha value signifies an undervalued asset with an expected return higher than the required return & vice versa. KT's alpha value of 1.4% signifies that the company's return is undervalued by 1.4% and the company is advised to buy more of such securities, so as to make a gain when the market corrects the pricing.

**Assumptions of capital market theory**

a. Investors can borrow or lend any amount at the risk-free rate.
b. Investors have similar expectations on the risk/return distribution from company securities.
c. All investors have the same one period time horizon.
d. All investments are infinitely indivisible.
e. There are no taxes or transaction costs.

f. There is no inflation, and interest rates do not change.
g. The capital markets are in equilibrium.

## 15.3 Efficient portfolio and efficient frontier

***Where portfolios have different returns and different risks, an Efficient portfolio is one that has the highest return AND the lowest risk***

***Efficient frontier is a curve that shows returns on all efficient portfolios.***

***Market portfolio is a portfolio of all risky investments traded in the stock market {except risk free securities} and is located where the indifference curve meets the efficient frontier.***

**Formula for return and risk on a CML**

There are two major investments in a CML; Risk-free securities and the market portfolio.

Wm + Wrf = 1

Wrf = 1 - Wm

$ER_P = (1 – W_M)R_F + W_MR_M = R_F (1 – W_M) + W_M(R_M – R_F)$

Where $ER_P$ is return on portfolio in a capital market line

$R_F$ is risk free rate

$W_M$ is the percentage of total portfolio invested in portfolio of risky assets

$(1 – W_M)$ is percentage of total portfolio invested in the risk free asset.

Risk of portfolio = $\sqrt{(WA\sigma A]^2 + [WB\sigma B]^2 + 2WAWBCOVAB}$

Let A represent risk free security which has a standard deviation of 0, this also makes the covariance 0 leaving Risk of portfolio = $\sqrt{WB\sigma B^2}$ {let B represent the market}.

Risk of the portfolio on a CML is now = $W_M\sigma_M$

The risk free asset has no risk and hence is not considered when calculating the portfolio risk.

**Decision criteria in portfolio theory**

The portfolio with the highest return and lowest risk should be chosen as the optimal portfolio when making decisions in portfolio theory.

Where no portfolio can give the highest return and lowest risk, the coefficient of variation should be used to determine the optimal portfolio. Coefficient of variation is the total risk per return of the portfolio {Total risk / expected return}. The portfolio with the lowest coefficient of variation is chosen as optimal.

## 15.4 Capital asset pricing model (CAPM)

CAPM is an equilibrium model that predicts the expected return on a stock, given the expected return on the market, the stock's beta coefficient and the risk-free rate. It is a model used to determine a theoretically appropriate required rate of return of an asset to make decisions about adding assets to a well-diversified portfolio. It takes into account the assets sensitivity to non-diversifiable risk {systematic risk or market risk} often represented by Beta.

CAPM establishes a relationship between investment risk and expected return from individual securities. CAPM assumes that investors hold diversified portfolios and are therefore concerned with systematic risk only and not unsystematic risk.

A security might have a higher systematic risk than the market portfolio. This means that the security should rise by a larger amount for any increase in average market return and vice versa.

A security might have a lower systematic risk than the market portfolio, so that when the average market return rises, the return from the security will rise by a smaller amount.

Risk free return is the theoretical rate of return of an investment with zero risk. It represents the interest an investor would expect from an absolutely risk-free investment over a specified period of time. The real risk-free rate of return can be calculated by subtracting the inflation rate from the yield of the treasury bond matching your investment duration. A risk-free security has no systematic risk because returns on these securities are unaffected by changes in market conditions.

### 15.6.1 Assumptions of CAPM

a. Investors can borrow and lend at the risk -free rate. This is the assumption that makes the CML straight.

b. The market is efficient.
c. Investors are risk averse.
d. There are no transaction costs.
e. All investors have same or homogeneous expectations about the returns and risk of securities.
f. All investors decisions are based on a single time period.
g. Individuals pay tax on dividend income and capital gains tax on realised gains.

### 15.6.2 Beta factor of a security

The systematic risk for an individual security is measured as a beta factor. This is a measurement of the systematic risk of the security, in relation to the systematic risk of the market portfolio as a whole. The beta factor for the market portfolio itself is 1.0.

The beta factor for risk free securities is zero as they have no systematic risk.

**Beta factor is calculated as covariance of the returns of the investment and market returns/variance of the market. Beta (β) = $COV_{SM}$ / $VAR_M$**
**where $COV_{SM}$ = $correlation_{SM}$ X $\sigma_S$ X $\sigma_M$ and $VAR_M = \sigma_M$ X $\sigma_M$**
**Formula for the CAPM**
$R = R_F + \beta(R_M - R_F)$
R is return on the security
$R_f$ is risk free rate
$R_M$ is market returns
$R_m - R_F$ is market risk premium
Beta factor is β
The above formula implies that the expected return from an individual security will vary as the market return fluctuates. The size of rise or fall in expected return will depend on the beta factor of the individual security and the size of the change in the returns from the market as a whole.

### 15.6.3 Beta of a portfolio

This is the weighted average of all the beta factors in the portfolio.

$\beta_P = (W_A \text{ X } \beta_A) + (W_B \text{ X } \beta_B)$

**Security market line (SML)**

SML is derived from the CML. It is a line drawn on a chart that serves as a graphical representation of CAPM which shows different levels of systematic or market risk of various marketable securities plotted against the expected return of the entire market at any given time. It is also called “Characteristic line”

SML is a graph that shows the required return from any investment or portfolio given its level of systematic risk ( beta factor). Actual returns from investments can be compared to the required returns from the SML to determine whether the investment is under or overvalued.

a. An asset with an estimated return greater than its required return from the SML is undervalued; we should buy more of such assets. (falls above the SML)
b. An asset with an estimated return less than its required return from the SML is overvalued; we should sell more of such assets. (falls below the SML)
c. An asset with an estimated return equal to its required return from the SML is properly valued; we are indifferent between buying or selling such assets and may just hold it. (falls on the SML)

***CML uses total risk and so only efficient portfolios will plot on the CML while SML uses systematic risk (beta factor) and so all properly priced securities and portfolios of securities will fall on the SML***

### 15.6.4 Alpha factor

ALPHA Factor is that **abnormal** return that arises when shares yield more or less than their expected return based on CAPM. It is a **temporary** return for unsystematic risk arising due to the inefficiency of the CAPM. The company is advised to take steps on the securities before normalcy returns.

| Security | Expected Return | Required Return (CAPM) | Alpha Value | Comment |
|---|---|---|---|---|
| A | 20 | 15 | +5 | The security is undervalued as the actual return is understated by the market. The company is advised to buy more of such securities with positive alphas. |
| B | 20 | 23 | 3 | The security is overvalued as the market rates it higher than its expected return. The company is advised to sell more of such securities with |

| | | | | |
|---|---|---|---|---|
| | | | | negative alphas |
| C | 20 | 20 | 0 | The security is properly priced as it has a zero alpha value. Companies are advised to hold such securities. |

**Tips for CAPM and portfolio theory calculation**

> - ***FOR PORTFOLIO THEORY, choose the portfolio that has the highest return and the lowest risk using the formulas stated above.***
> - ***FOR CAPM, choose the portfolio that has the highest positive alpha factor. The expected return on the security is compared to the required return based on CAPM to get Alpha value***

### 15.6.4 Assumptions of CAPM

a. There exists a perfect capital market in which all investors have access to all available information about the financial markets.
b. There is uniformity of investors expectations.
c. There is only one time period.
d. Investors are rationale.

### 15.6.4 Advantages of CAPM

a. It provides a measurable relationship between risk and return.
b. It can be used to estimate the cost of capital for securities.
c. It considers systematic risk in its computation.

### 15.6.5 Challenges of CAPM

a. It may be difficult in practice to estimate the risk free rate, beta factor and market returns.
b. It focuses on systematic risk only.

## 15.5 Arbitrage pricing theory (APT)

The CAPM is a single factor model which calculates the return on an investment by relating the market risk premium to the systematic risk of the investment. The CAPM is not always able to account for the difference in assets' returns using their betas, which paved a way for the development of an alternative approach, called the Arbitrage-Pricing -Theory {APT}, for estimating the assets' expected returns. APT unlike CAPM believes there are a number of industry-specific and macro-economic factors that affect the security returns. {this implies that a number of factors measure the systematic risk of the asset under APT unlike CAPM that believes there is only one factor that measures the systematic risk}

APT calculates the return on an investment by relating it to other factors aside the market such as company size, interest rate changes, inflation, oil prices fluctuations and others. APT describes the method of bringing a mispriced asset in line with its expected price. {an asset is said to be mispriced if its current price is different from the predicted price as per the model.

$R = R_F + \beta_1(R_1 - R_F) + \beta_2(R_2 - R_F) + \beta_3(R_3 - R_F)$..........

Where $\beta_{1,2,\&\ 3}$ are beta factor of all the factors and {sensitivity of the asset's return to the changes in the factor}.

$R_{1,\ 2\ \&\ 3}$ are the risk premium attached to the factors. {compensation over and above the risk free rate}

**Illustration 6**

You have purchased the following data from an investment bank.

| Company | Forecast total equity return | Standard deviation of total equity return | Covariance with market return |
|---|---|---|---|
| A | 16.88% | 6.3% | 32% |
| B | 12% | 4.8% | 19% |
| C | 14% | 4.7% | 24% |
| D | 21.5% | 6.9% | 43% |

The market return and market standard deviation are 14.5% and 5% respectively, and the risk free rate is 6%. Returns and all other data relate to a one-year period.

**Required:**
Estimate the alpha value for each of these companies shares and explain what use alpha values might be to financial managers.

**Solution to illustration 6**

| Securities | Expected return as given | Required return as calculated | Alpha value | Remark | Advice |
|---|---|---|---|---|---|
| A | 16.88 | 16.88 | 0 | Properly priced: on the SML | Hold |
| B | 12 | 12.46 | -0.46 | Overpriced: below the SML | Sell |
| C | 14 | 14.16 | -0.16 | Overpriced: below the SML | Sell |
| D | 21.5 | 20.62 | 0.88 | Underpriced ; above the line | buy |

Use the betas to calculate required return for each security under CAPM , A is 32/25, B is 19/25, C is 24/25 and D is 43/25 = 1.72.

## 15.6 Chapter review

At the end of this chapter, ensure that you can:

a. describe gearing theories;
b. apply the M and M equations; and
c. degear and regear betas and hence find project specific discount rate.

**Skills Level**

**Financial Management**

CHAPTER 16

# CAPITAL STRUCTURE



**Contents**

# 16 Capital Structure

## 16.0 Learning objective

This chapter discusses capital structure.

## 16.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. describe gearing theories;
b. apply the m and m equations; and
c. degear and regear betas and hence find project specific discount rate.

## 16.2 Introduction to Capital Gearing

Capital structure refers to the mixture of equity and debt finance used by the company to finance its assets. The financing decision helps an organisation determine its capital structure.

This refers to the proportion of debt and equity in a company's capital structure.

a. Equity is the proportion of the company which is financed by ordinary shareholders.
b. Prior Charge Capital [PCC] is the capital which has to be serviced prior to the equity capital receiving any return. PCC will be represented by preference share capital plus long term liabilities.

## 16.3 Formulas of capital gearing

a. Equity / PCC x 100%
b. PCC / Equity x 100%

c. Equity / Equity + PCC x 100%
d. PCC / Equity + PCC x 100%

### 16.3.1 Preferred form of capital gearing for the examinations

Except otherwise stated, the preferred formula for capital gearing is PCC / Equity + PCC.

a. Wherever possible, market values should be used when calculating capital gearing ratio rather than book values.
b. The book value of equity should be ordinary share capital plus reserves.
c. The market value of equity does not include reserves, as they are assumed to have been considered in determining the market price per share. The market value of equity = number of shares x share price.
d. Bank overdraft should only be considered as part of the PCC if it is a source of relatively permanent capital.

### 16.3.2 Types of capital gearing

a. High gearing – where there is a high proportion of PCC in the capital structure. It increases the financial risk of the equity investor.
b. Low gearing – where there is a low proportion of PCC in the capital structure. It may not be in the best interest of equity investors, as they may be failing to exploit the benefits of debt.

**Example on capital gearing**

One Chance plc's extract from its statement of financial position as at 31st December 2025

| | ₦ |
|---|---:|
| Ordinary shares of 50k each | 1,000,000 |
| Reserves | 1,400,000 |
| 14% preference shares of ₦1 each | 1,000,000 |
| 15% unsecured loan stock | 600,000 |
| Total long term funds | 4,000,000 |

The ordinary shares are currently quoted at ₦5 each, the loan stock is trading at ₦75 per ₦100 nominal and the preference shares at ₦0.60 each.

**Required:**

➢ Calculate the gearing ratios for One Chance plc using:
   a. Book values

b. Market values

**Solution**

**Book values**

PCC = preference shares plus debt = 1,000,000 + 600,000 = ₦1,600,000

Equity = Ordinary share capital plus reserves = 1,000,000 + 1,400,000 = ₦2,400,00

**Market values**

Value of equity = share price x number of shares = N5 x [1,000,000 / 0.50] = ₦10,000,000

Value of preference shares = share price x number of shares = ₦0.60 x 1,000,000 = ₦600,000

Loan stock = share price x number of shares = ₦75/100 x 600,000 = ₦450,000

PCC = 600,000 + 450,000 = ₦1,050,000

| | | | |
|---|---|---|---|
| Book values | PCC / PCC + Equity | 1,600,000 / 1,600,000 + 2,400,000 | 40% |
| Market values | PCC / PCC + Equity | 1,050,000 / 1,050,000 + 10,000,000 | 9.5% |

### 16.3.3 Leverage

This refers to the use of debt and other financial instruments to amplify potential returns on investment.

**Types of leverage**

a. **Financial leverage** indicates by how much interest rates could increase without the company making a pre-tax loss. It measures the financial risk.
b. Financial Leverage = profit before interest payable and tax / profit before tax or % change in EPS / % change in EBIT.
c. **Operating leverage** indicates by how much fixed cost could increase without the company making an operating loss.
d. Operating leverage = contribution / profit before interest payable and tax or % change in EBIT / % change in sales.

**Example on leverage**

The extract of Ozugo limited is as shown below:

| | Year 2025 | Year 2026 |
|---|---|---|
| | ₦ | ₦ |
| Sales | 4,000 | 4,400 |
| Variable costs | [1,600] | [1,760] |
| Fixed costs | [800] | [800] |
| Operating profit | 1,600 | 1,840 |
| Interest payments | [200] | [200] |
| Profit before tax | 1,400 | 1,640 |

**Required:**

a. Calculate financial leverage.
b. Calculate operating leverage.

**Solution**

a. Financial leverage = EBIT / PBT = **Year 1** : 1,600 / 1,400 = 1.14 ; **Year 2** 1,840 / 1,640 = 1.12
b. Operating leverage = contribution / EBIT = **year 1** = 2,400 / 1,600 = 1.5 and **Year 2** = 2,640 / 1,840 = 1.43

## 16.4 Business and financial risk

**Business risk**

This refers to the inherent exposure to losses or negative impacts on a company's operations, finances or reputation due to various internal or external factors such as employee errors, inadequate processes, poor management decisions, economic downturns, changes in market conditions, natural disasters etc.

It is influenced by the nature of the industry in which the company operates. It is sometimes called operational risk [as it affects the operations of the business] or revenue risk [as it has the capacity of reducing the revenue potential].

It is usually reflected using the degree of operating leverage and the beta asset.

**Financial Risk**

This is the risk affected by the method of financing. It is the additional risk an organisation suffers for introducing external financing. It is a risk that the shareholders are exposed to based on the introduction of debt finance such as credit risk, liquidity risk, interest rate risk and market risk.

### 16.4.1 Capital structure theory introduction

For a given level of annual cash profits before interest and tax, the value of a company (equity + debt) is maximised at the level of gearing where WACC is lowest. This should also be the level of gearing that optimises the wealth of equity shareholders.

The question is therefore how does a change in gearing affect the WACC, and is there a level of gearing where the WACC is minimised?

The most important analysis of gearing and the cost of capital, for the purpose of your examination, is the analysis provided by Modigliani and Miller that allows for tax relief on debt interest.

However, the traditional view of WACC and gearing, and Modigliani and Miller's propositions ignoring tax relief on debt are also described briefly.

## 16.5 The traditional view of gearing and WACC

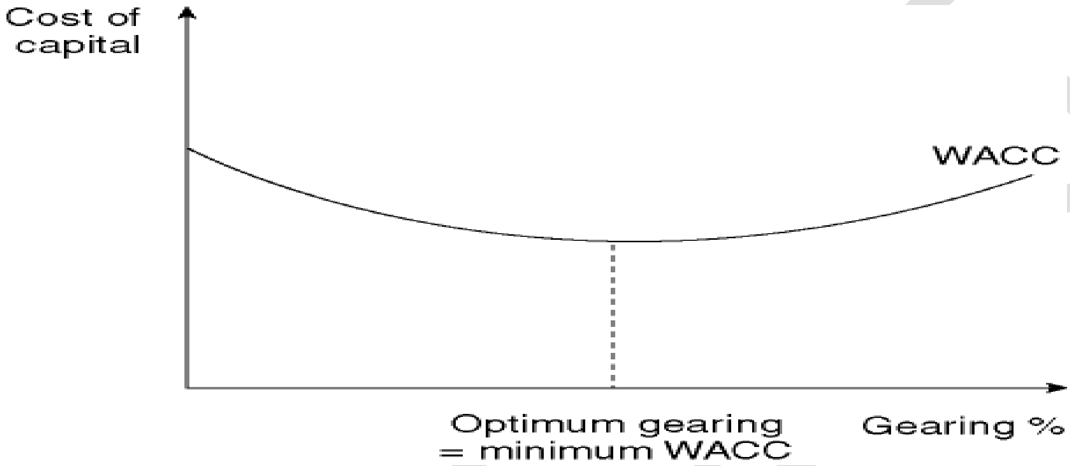
The traditional view of gearing is that there is an optimum level of gearing for a company. This is the level of gearing at which the WACC is minimised.

As gearing increases, the cost of equity rises. However, as gearing increases, there is a greater proportion of debt capital in the capital structure, and the cost of debt is cheaper than the cost of equity. Up to a certain level of gearing, the effect of having more debt capital has a bigger effect on the WACC than the rising cost of equity, so that the WACC falls as gearing increases.

However, when gearing rises still further, the increase in the cost of equity has a greater effect than the larger proportion of cheap debt capital, and the WACC starts to rise.

The traditional view of gearing is therefore that an optimum level of gearing exists, where WACC is minimised and the value of the company is maximised.

**Illustration: Traditional view of gearing and the WACC**




## 16.6 The Modigliani-Miller propositions: Ignoring corporate taxation

Modigliani and Miller sought to explain the real-world influences on gearing. Their objective was to build models that would aid financial managers in making decisions about gearing levels.

Their starting point was to construct a model based on a series of simplifying assumptions to see what would be expected in this simple world. The assumptions include the following:

a. Capital markets are perfect when:
   i. all investors value securities in the same way;
   ii. there are no dealing costs; and
   iii. perfect information (all participants know and understand any new information the instance it comes into existence).

b. No taxation;
c. No bankruptcy risk; and
d. Investors are indifferent between borrowing directly themselves or investing in companies that borrow for them.

Remember that they did not say the world was like this. The nature of mathematical modelling is such that the model is constructed to describe a simplified version of what is being studied. Predictions based on the model can then be compared with the real world in an attempt to understand the impact of real world influences. Often, people write that their model was incorrect or was open to criticism but the more accurate statement is that the model does not accurately describe the real world. However, they did not expect it to!

### 16.6.1 MM (no tax) predictions

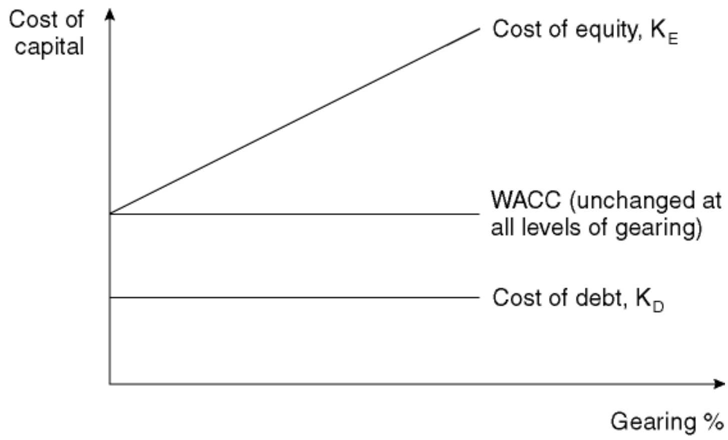
You do not need to know Modigliani and Miller's arguments, only the conclusions they reached.

Their model predicted that if corporate taxation is ignored, an increase in gearing will have the following effect:

a. as the level of gearing increases, there is a greater proportion of cheaper debt capital in the capital structure of the firm;
b. however, the cost of equity rises as gearing increases;
c. as gearing increases, the net effect of the greater proportion of cheaper debt and the higher cost of equity is that the WACC remains unchanged;
d. the WACC is the same at all levels of financial gearing; and
e. the total value of the company is therefore the same at all levels of financial gearing.

Modigliani and Miller therefore reached the conclusion that in this simple world, the level of gearing is irrelevant for the value of a company. There is no optimum level of gearing that a company should be trying to achieve.

### 16.6.2 Illustration: Modigliani-Miller view of gearing and the WACC: no taxation




### 16.6.3 Modigliani and Miller's propositions: (no taxation)

Modigliani and Miller's arguments, ignoring taxation, can be summarised as two propositions.

**Proposition 1**. The WACC is constant at all levels of gearing. For companies with identical annual profits and identical business risk characteristics, their total market value (equity plus debt) will be the same regardless of differences in gearing between the companies.

**Proposition 2**. The cost of equity rises as the gearing increases. The cost of equity will rise to a level such that, given no change in the cost of debt, the WACC remains unchanged.

### 16.6.4 Modigliani-Miller formulae: ignoring taxation

There are three formulae for the Modigliani and Miller theory, ignoring corporate taxation. These are shown below.

**Formula: Modigliani and Miller's propositions: (no taxation)**

**Proposition 1:**

The WACC in a geared company and the WACC in an identical (same size earnings and same risk class) but ungeared (all-equity) company are the same:

WACCG = WACCU

The total value of an ungeared company is equal to the total value of an identical geared company (combined value of equity + debt capital):

VG = VU

**Proposition 2**

The cost of equity in a geared company is higher than the cost of equity in an ungeared company. The cost of equity in a geared company is equal to the cost of equity of an ungeared company plus a financial risk premium.

Where:
WACCG = Weighted average cost of capital of a geared company
WACCU = Weighted average cost of capital of an ungeared company
VG = Total market value (E + D) of a geared company
VU = Total market value (E + D) of an ungeared company
E = Market value of equity of the geared company
D = Market value of debt
KEU = Cost of equity of an ungeared company
KEG = = Cost of equity of a geared company
KD = Cost of debt

**Example: M and M (no tax)**

An all-equity company has a market value of ₦150 million and a cost of equity of 10%. It borrows ₦50 million of debt finance, costing 6%, and uses this to buy back and cancel ₦50 million of equity. Tax relief on debt interest is ignored.

**Required:**

According to Modigliani and Miller, if taxation is ignored, what would be the effect of the higher gearing on

(a) the WACC;
(b) the total market value of the company; and
(c) the cost of equity in the company?

**Solution**

According to Modigliani and Miller:

(a) WACC. The WACC in the company is unchanged, at 10%.

(b) Total value. The total market value of the company with gearing is identical to the market value of the company when it was all equity, at ₦150 million. This now consists of ₦50 million in debt and ₦100 million equity (₦150 million – ₦50 million of debt)

(c) Cost of equity. The cost of equity in the geared company is 10% + [50/100 x {10 – 6]% = 12%

**Example: M and M (no tax)**

A company has ₦500 million of equity capital and ₦100 million of debt capital, all at current market value. The cost of equity is 14% and the cost of the debt capital is 8%.

The company is planning to raise ₦100 million by issuing new shares. It will use the money to redeem all the debt capital.

**Required:**

According to Modigliani and Miller, if the company issues new equity and redeems all its debt capital, what will be the cost of equity of the company after the debt has been redeemed?

**Solution**

In the previous example, the Modigliani-Miller formulae were used to calculate a cost of equity in a geared company, given the cost of equity in the company when it is ungeared (all-equity). This example works the other way, from the cost of equity in a geared company to a cost of equity in an ungeared company. The same formulae can be used.

Using the known values for the geared company, we can calculate the cost of equity in the ungeared company after the debt has been redeemed.

KEG = KEU + D/E [KEU - KD]

14.0 = KEU + 100/500 [KEU – 8.0]

1.2 KEU = 14.0 + 1.6

KEU = 13.0% (15.6/1.2).

## 16.7 The Modigliani-Miller view: allowing for corporate taxation

M and M model without tax leads to the conclusion that gearing is irrelevant. However, this is clearly not true in the real world as many companies are geared.

This leads to the question of what is there in the real world which would cause the model to behave differently. One possibility is the existence of corporate taxes. The existence of tax relief on interest reduces the cost of debt and this puts an additional downward pressure on WACC.

Modigliani and Miller revised their model to include corporate taxes.

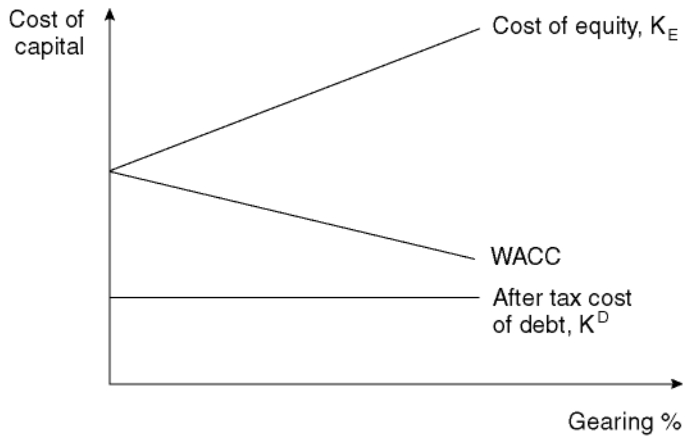
You do not need to know the arguments they used to reach their conclusions, but you must know what their conclusions were. You should also know and be able to apply the formulae described below.

Their model predicted that if corporate taxation is taken into account, an increase in gearing will have the following effect:

a. As the level of gearing increases, there is a greater proportion of cheaper debt capital in the capital structure of the firm. However, the cost of equity rises as gearing increases.
b. As gearing increases, the net effect of the greater proportion of cheaper debt and the higher cost of equity is that the WACC becomes lower. Increases in gearing result in a reduction in the WACC.
c. The WACC is therefore at its lowest at the highest practicable level of gearing. (There are practical limitations on gearing that stop it from reaching very high levels. For example, lenders will not provide more debt capital except at a much higher cost, due to the high credit risk).
d. The total value of the company is therefore higher for a geared company than for an identical all-equity company. The value of a company will rise, for a given level of annual cash profits before interest, as its gearing increases.

Modigliani and Miller therefore reached the conclusion that because of tax relief on interest, there is an optimum level of gearing that a company should be trying to achieve. A company should be trying to make its gearing as high as possible, to the maximum practicable level, in order to maximise its value.

**Illustration: Modigliani-Miller view of gearing and the WACC: with taxation**




### 16.7.1 Modigliani and Miller's propositions: allowing for taxation

Modigliani and Miller's arguments, allowing taxation, can be summarised as two propositions.

**Proposition 1**. The WACC falls continually as the level of gearing increases. In theory, the lowest cost of capital is where gearing is 100% and the company is financed entirely by debt. (Modigliani and Miller recognised, however, that 'financial distress' factors have an effect at high levels of gearing, increasing the cost of debt and the WACC.) For companies with identical annual profits and identical business risk characteristics, their total market value (equity plus debt) will be higher for a company with higher gearing.

**Proposition 2**. The cost of equity rises as the gearing increases. There is a positive correlation between the cost of equity and gearing (as measured by the debt/equity ratio).

**Formula: Modigliani and Miller's propositions: (with taxation)**

**Proposition 1:**

The WACC in a geared company is lower than the WACC in an all-equity company.

$$WACC_G = WACC_U\left[1 - \frac{Dt}{(D+E)}\right]$$

The total value of a geared company is greater than the total value of an identical ungeared company: The total value of a geared company (equity + debt) is equal to the total value of an identical ungeared company plus the value of the 'tax shield'.

This is the market value of the debt in the geared company multiplied by the rate of taxation (Dt).

$$V_G = V_U + Dt$$

**Proposition 2**

(The proposition is the same as without tax but the equation now includes a tax term).

The cost of equity in a geared company is higher than the cost of equity in an ungeared company.

The cost of equity in a geared company is equal to the cost of equity of an ungeared company plus a financial risk premium.

$$K_{EG} = K_{EU} + (1-t)(K_{EU} - K_D)\frac{D}{E}$$

Where the terms are as given above

**Example: M and M with tax**

An all-equity company has a market value of ₦60 million and a cost of equity of 8%. It borrows ₦20 million of debt finance, costing 5%, and uses this to buy back and cancel ₦20 million of equity. The rate of taxation on company profits is 25%.

**Required:**

Calculate the market value and WACC of the geared company using M&M

**Solution**

According to Modigliani and Miller:

(a) Market value

The market value of the company after the increase in its gearing will be: Vg = Vu + Dt

VG = ₦60 million + (₦20 million × 0.25) = ₦75 million.

The market value of the debt capital is ₦20 million; therefore the market value of the equity in the geared company is ₦55 million (₦75 million – ₦20 million).

(b) WACC of the geared company

The WACC of the company after the increase in its gearing is calculated as follows:

WACCg = WACCu x [1 – Dt / D + E] = 8% x [1 – (20m x 25%) / 65 = 7.38%

(c) Cost of equity in the geared company

KEG = 8% + [(1 – 0.25) (8 – 5) 20/45] = 8% + 1% = 9%

## 16.8 Change in gearing, the WACC and capital investment appraisal

### Modigliani and Miller with taxation: from one level of gearing to another

When a company is considering a major new capital investment project (where the business risk is similar to the risk with the company's other business operations), the method of financing the investment might alter the company's gearing. For example, if a project is financed entirely by new debt capital, its gearing level will increase.

A change in gearing will alter the cost of equity (Modigliani and Miller proposition 2).

There might be a change in the cost of debt, where the gearing level rises to such a high level that 'financial distress' concerns make debt capital more expensive. However, at lower levels of gearing it is assumed that the cost of debt is unaffected by changes in the gearing level.

There will be a reduction in the WACC (Modigliani and Miller proposition 1).

If the project is evaluated using the WACC to estimate the NPV, the new WACC should be used for the NPV evaluation.

This means that when a new capital project will result in a change in gearing, it is necessary to calculate a new WACC before going on to the NPV calculations.

The Modigliani and Miller formulae can be used to do this. The explanation that follows concentrates on the formula for the cost of equity, because this is the formula that you will be given in the examination.

### The method

The approach should be as follows:

**Step 1.** Start with the company at its original level of gearing. You should be given the value of the company (the value of its equity and the value of its debt capital) and the cost of its equity and debt capital.

**Step 2**. Use these values to calculate the value of a comparable ungeared company, and the cost of equity in the ungeared company. Use the Modigliani and Miller formulae to do this. (You now have the cost of equity in a comparable ungeared company).

**Step 3**. Use these values for the ungeared company to work out values for the company at its new level of gearing: total value, value of equity, WACC and cost of equity.

**Example: M and M with tax**

A company has a total current value of ₦100 million, consisting of ₦80 million equity and ₦20 million of debt capital.

The cost of equity is 10% and the pre-tax cost of the debt capital is 6%.

The rate of tax on company profits is 25%.

The company proposes to borrow an additional ₦20 million of debt capital, and use the money to buy back and cancel ₦20 million of its equity.

**Required:**

According to Modigliani and Miller, what will be the following values for the company at its new level of gearing?

(a) Its total value, divided into a value for the equity and a value for the debt capital

(b) Its WACC

(c) The cost of its equity capital.

This is a long example, but you should work through the solution carefully.

**Solution**

**Total value of the company**

(i) Step 1: Value of a similar all-equity company.

We have the current value of the geared company, which is ₦100 million, consisting of ₦80 million equity and ₦20 million debt capital. We can calculate the value of a similar company that is all-equity financed.

100 million = VU + (20 million × 0.25)

VU = 95 million.

(ii) Step 2: Value of the company at the new level of gearing.

The company will be replacing ₦20 million of equity with ₦20 million of debt capital, so in the new gearing structure, debt capital increases.

The market value of the debt will be ₦20 million + ₦20 million = ₦40 million.

We can calculate the total value of the company at its new gearing level, using the same MM formula.

VG = 95 million + (40 million × 0.25) = 105 million.

The total value of the company at the new gearing level will be ₦105 million. Of this, ₦40 million will be debt capital; therefore the value of the remaining equity will be ₦65 million.

**Answer**

(b) WACC

i. Step 1: WACC of a similar all-equity company.

The WACC of the company at its current level of gearing is calculated as follows:

| Source of finance | Market value | Cost | Market value x cost |
|---|---|---|---|
| | ₦ million | | |
| Equity | 80.00 | 10% | 8.00 |
| Debt | 20.00 | 4.5% | 0.90 |
| | 100.00 | | 8.90 |

WACC = 8.90 / 100 = 8.9%

We can use the MM formula for WACC to calculate what the WACC would be in a similar ungeared company.

The WACC of a similar ungeared company is:

0.089 = 0.95 WACCU

WACCU = 0.09368

ii. Step 2: WACC of the company at the new level of gearing.

Having established the WACC in an all-equity company, we can now use the same formula to calculate the WACC in the company at its new level of gearing, with ₦40 million debt and ₦65 million of equity.

(The value of equity and debt capital at the new level of gearing were calculated in (a).WACCG = 0.09368 × 0.90476

WACCG = 0.085 = 8.5%.

(c) **Cost of equity**

Step 1: Cost of equity of a similar all-equity company.

A similar approach is taken for calculating the cost of equity. We start by calculating the cost of equity in a similar all-equity company, using the MM formula for Proposition 2. We know the value of KEG and we need to calculate a value for KEU.

In the original geared company, the value of equity is ₦80 million and the value of debt capital is ₦20 million.

The cost of equity in a similar all-equity company is calculated as follows:

10 = KEU + [(1 – 0.25) (KEU – 6) 20/80]
10 = KEU + 0.1875 KEU – 1.125
1.1875 KEU = 11.125
KEU = 9.3684.
Step 2: Cost of equity of the company at the new level of gearing.

Having calculated the cost of equity in a similar all-equity company, we can now calculate the cost of equity in the company at its new level of gearing. Debt capital is ₦40 million and equity is ₦65 million.

(The value of equity and debt capital at the new level of gearing were calculated in (a).)

KEG = 9.3684 + (1 – 0.25) (9.3684 – 6) 40/65

KEG = 9.3684 + 1.5546 = 10.923, say 10.9%.

**Relevance for capital investment appraisal**

The Modigliani and Miler formulae can be used to re-calculate the cost of equity and the WACC in a company where the level of gearing changes, provided there is no change in the overall business risk and the company is therefore similar in all respects except for its gearing.

When a company plans a new capital investment that will alter its gearing, without affecting its business risk profile, the MM formulae can be used to calculate the cost of equity and WACC at the new level of gearing. The new WACC can then be used as the discount rate for calculating the NPV of the proposed project.

## 16.9 Theories about selecting the financing method for an investment

Capital investments have to be financed, and management must choose which method of financing they will use. There are different theories about how the method of financing is decided. These include:

a. Static trade-off theory;
b. Pecking order theory;
c. Market timing theory.

There is also a view that the choice of financing method is affected by agency costs.

These differing theories are considered in this section.

### 16.9.1 Static trade-off theory

Static trade-off theory argues that for each company there is an optimal capital structure, with an optimal level of gearing.

There is a trade-off between the benefits of taking on more debt and the costs of higher indebtedness.

a. The benefits of taking on debt (rather than equity) are mainly in the tax relief that is obtained on debt interest. Modigliani and Miller have argued that although the cost of equity rises as gearing increases, the tax relief on debt means that the company's weighted average cost of capital falls as gearing rises. It is therefore beneficial to take in more debt and increase gearing up to the point where the marginal costs of extra debt start to exceed the marginal benefits of extra debt.

b. The marginal costs of extra debt are related to the greater risks from 'financial distress.' If lenders perceive that a company with high levels of debt could be in financial distress (and in danger of failing to make payments of interest and repayments of loan capital on schedule), it becomes much more difficult to raise extra debt finance. The cost of debt might therefore increase substantially to compensate a lender for the high credit risk.

The optimal gearing level for a company is reached at a point where:

a. the marginal benefits of taking on additional debt capital
b. equals the marginal costs of taking on the extra debt.

The optimal gearing level varies between companies, depending on their profitability. A very profitable company can take on higher gearing because the marginal costs of financial distress will not become significant until the gearing level is very high.

For a company with low profitability, the situation is different. These companies provide low returns to their shareholders, and increasing the gearing level by borrowing more would increase the risks of bankruptcy and the cost of borrowing. Companies with low profits will therefore try to avoid additional borrowing, and they will also be reluctant to incur the costs of making new equity issues. To finance an investment, they will therefore rely on retained profits. They might even decide against investing in a capital project with a positive NPV unless they can finance it with funds from retained profits.

### 16.9.2 Static trade-off theory summarised

Static trade-off theory therefore states that:

a. Companies have an optimal level of gearing.
b. In choosing the method of financing for a new investment, they will try to maintain or achieve the optimal gearing level.
c. The optimal gearing level is higher for companies with high profits than companies with low profits.
d. This means that there is a positive correlation between profitability and gearing level.

### 16.9.3 Pecking order theory

Pecking order theory takes a different view of gearing and methods of financing new investments. It was put forward by Myers in 1984 as a challenge to static trade-off theory.

This theory states that companies show preferences for the source of finance that they use. There is an order of preference or 'pecking order'.

a. 1st. The source of finance that is preferred most is retained earnings.
b. 2nd. Debt capital is the source of finance second in the order of preference.
c. 3rd. New equity capital (an issue of new shares) is the least preferred source of finance for investment.

This means that if a company has an opportunity to invest in a capital project with a positive NPV, it will prefer to fund the project from retained profits. If it is unable to do this, it will look for debt capital to finance the investment. Only if retained profits and debt capital are unavailable (because cash flows are weak and profitability is low) will the company consider a new issue of shares.

Companies are likely to choose a long-term dividend policy that will allow them to finance future investments largely through retained earnings.

The reasons for the pecking order of preferences for sources of finance can be explained by practical considerations.

a. Using retained earnings is convenient. If a company wants to finance a new investment with equity, it is much simpler and cheaper to use retained earnings than to arrange a new share issue. Retained earnings are also much more convenient than new borrowing.
b. If a company cannot finance an investment with retained earnings, it will prefer new borrowing to a new issue of shares because borrowing is cheaper. It is cheaper to arrange a loan than to issue new shares. The cost of debt is also less because of the tax relief on interest payments.

Pecking order theory states that the gearing of a company is the result of a series of financing decisions based on these preferences for sources of finance. An optimal level of gearing does not exist, and companies do not try to achieve an optimal gearing level.

### 16.9.3 Pecking order theory summarised

Pecking order theory therefore states that:

a. Companies do not have an optimal level of gearing.

b. In choosing the method of financing for a new investment, they have an order of preference: retained earnings followed by new debt capital followed by an issue of new shares.
c. Companies with high profits can rely on retained profits as a source of finance more than companies with low profits.
d. This means that there is a negative correlation between profitability and gearing level.

### 16.9.4 Market timing theory

Market timing theory states that the choice of financing method for companies can be driven by opportunities in the capital markets. These opportunities occur because of 'asymmetries of information'. These occur when the managers of a company have more information and better information about the company than shareholders and other investors.

Management should know when the future prospects for the company are better than investors are expecting, and when the prospects for the future are worse than investors are expecting. Company management might therefore recognise occasions when the company's shares are currently under-valued or over-valued.

a. Companies will therefore wish to make a new issue of shares when they consider the share price to be over-valued.
b. They will consider share repurchases when they consider the share price to be under-valued.

Taking advantage of opportunities in the market to issue new shares or buy back existing shares affects the gearing level. A company therefore does not have a target optimal gearing level. Its financing decisions are determined more by market opportunity and market timing.

### 16.9.4 Agency effects on capital structure

Agency theory can be used to explain the capital structure of a company and its choices of financing for new investment. Agency theory, which was developed by Jensen and Meckling (1976), states that the governance of a company is based on conflicts of interest between the company's owners (shareholders), its managers and major providers of debt finance.

Each of these groups has different interests and objectives.

a. The shareholders want to increase their income and wealth. Their interest is with the returns that the company will provide in the form of dividends, and also in the value of their shares. The value of their shares depends on the long-term financial prospects for the company. Shareholders are therefore concerned about dividends, but they are even more concerned about long-term profitability and financial prospects, because these affect the value of their shares.

b. The directors and managers are employed to run the company on behalf of the shareholders. However, if the managers do not own shares in the company, they have no direct interest in future returns for shareholders, or in the value of the shares. Unless they own shares, or unless their remuneration is linked to profits or share values, their main interests are likely to be the size of their remuneration package, and other benefits from their job and position such as their status as company managers.

c. The major providers of debt have an interest in sound financial management by the company's managers, so that the company will be able to pay its debts in full and on time. Major lenders will often be concerned that a company will borrow more because the cost of borrowing is fairly low, and invest the money in high-risk ventures.

These conflicts of interest can have implications for capital gearing and preferences for financing method.

a. Shareholders might prefer debt finance as a new source of funding. When managers own shares in the company, a new issue of shares might dilute their interest in the company's equity, and other shareholders should want to prevent this from happening. Borrowing to finance growth rather than relying on equity also reduces the amount of free cash for managers to spend on personal interests and benefits.

b. Providers of debt capital might be worried by the fact that debt capital gives shareholders an incentive to invest in high-risk projects. They might therefore oppose new borrowing by a company when they think that this will put their interest (the security of their investment and returns) at risk.

Jensen and Meckling argued that the 'optimal' capital structure for a company is obtained by trading off not just the marginal benefits and marginal costs of extra debt (as suggested by static trade-off theory) but also by trading off the 'agency costs' of additional debt and the 'agency costs' of additional equity.

## 16.9 Chapter review

At the end of this chapter, ensure that you can:

a. discuss gearing theories;
b. apply the M and M equations; and
c. degear and regear betas and hence find project specific discount rate.



**Skills Level**

**Financial Management**

CHAPTER 17

# FINANCE FOR SMALL AND MEDIUM-SIZED ENTITIES

## Contents

# 17 Finance for Micro, Small and Medium Sized Entities (MSMEs)

## 17.0 Learning objective

This chapter discusses finance for micro, small and medium sized entities.

## 17.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. understand the importance of SMEs in the economy;
b. explain possible sources of finance to an SMEs;
c. explain venture capital;
d. explain supply chain capital and crowd funding;
e. explain different types of government assistance;

f. the features of different sources of finance; and
g. finance for small and medium sized entities (SMEs).

## 17.2 The characteristics of SMES

### Definition

While there is no universally accepted definition of what constitutes a small or medium sized enterprise, they are:

a. Private companies; and
b. Owned by a few individuals, typically a family group.

The precise definition of what constitutes a SME may differ according to the industry in which the firm operates.

The Central Bank of Nigeria's communiqué No 69 of the monetary policy committee meeting of April 15, 2010 acknowledged the existence of several definitions of SMEs one of which states that an enterprise that has an asset base (excluding land) of between ₦5 million to ₦500million and labour force of between 11 and 300 belongs to the SME sub-sector.

## 17.3 Relative importance

The National Bureau of Statistics (NBS) put the total number of SMEs in Nigeria at over 17 million in 2014.

Of the total number of businesses in the EU, less than 0.5% is classified as large businesses. In the EU, small and medium enterprises account for almost 66% of employment and more than 54% of turnover. The majority of employment growth has come from small firms in the EU and the US.

This means that small and medium-sized enterprises make up a very large part of a national economy. For a company to grow its economy, it is therefore important that SMEs should be able to grow their businesses. To do this, they need long-term capital.

The problem of raising sufficient long-term capital to grow their business is much greater for SMEs than for larger companies.

## 17.4 The financing problem

### Equity finance and SMEs

SMEs are normally owned by a few individuals. These existing owners are often reluctant to issue new equity to new investors as this will dilute their control of the business. External investors might also be reluctant to buy shares in a SME, because of the high investment risk.

One possible source of new equity capital for a SME would be a new issue of shares to the existing owners, who would then put more of their personal wealth into their company. However, the existing owners might not be willing to put more of their own money into their company. Even if they were willing to put more money into their company, they might not have enough personal wealth to meet the company's capital requirements.

If SMEs cannot raise extra equity capital by issuing new shares, retained earnings are their only source of new equity. Even in profitable small companies, it takes a long time to build up capital through retained earnings, and it might be too late to take advantage of the required investment opportunities. Opportunities for growing the business even faster might be lost.

Short-term sources of capital can be used to some extent to help a small company to grow its business, but SMEs cannot rely extensively on short-term finance. SMEs might even face difficulties in negotiating trade credit if they have not been in business long enough to build up a track record for creditworthiness. Banks are also reluctant to offer a large overdraft, unless the owner of a company is willing to provide a personal guarantee for the facility (perhaps in the form of a bank mortgage over the family home). Too much reliance on short-term finance also increases the risk of overtrading, which was explained in an earlier chapter.

Without additional external capital, many SMEs are unable to grow as quickly as their owners would wish. Many SMEs try to obtain finance in the form of medium-term or longer-term debt, or to acquire assets through leasing.

### 17.4.1 Debt finance and SMEs

The main source of external finance available to SMEs is bank finance. There are many problems for a SME in negotiating bank finance:

a. SMEs are often limited companies or partnerships for which financial information does not have to be published to a wide audience. There may be only limited requirements for external audit, or no legal requirement for an annual audit. The SME will have to provide the bank with sufficient financial information and also convince the bank that it has a credible business plan that should ensure its ability to repay the money it borrows.

b. The SME may lack experienced management and a bank may be unwilling to trust them with its money. For example a bank might suspect that the profit forecasts provided by the management of an SME might be far too optimistic and inaccurate.

c. The SME might have few assets to offer the bank as security for a loan. It is often the case that long-term loans are easier to obtain as these can be secured with mortgages against property (land and buildings) owned by the SME. The main problem arises with short and medium-term loans, for which adequate security does not exist, and this is known as the 'maturity gap'.

d. The high-risk nature of investment projects by SMEs might mean that even if a bank is willing to lend money, it will require a high risk premium to be incorporated into the interest rate.

### 17.4.2 Leasing and SMEs

SMEs make extensive use of leasing as a method of obtaining long-term assets. Both operating leases and finance leases might be used. A feature of a lease is that the leasing company remains the owner of the asset. In the event that a company cannot make the scheduled lease payment, the lessor is able to take back the asset. This provides some form of security. A lessor might therefore be more willing to agree a leasing deal with an SME than a bank is willing to make a loan or offer a large bank overdraft facility.

## 17.5 Venture capital

### The nature of venture capital

SMEs will usually try to raise the finance they need from retained earnings and bank finance, and by leasing assets. Working capital requirements can be reduced by negotiating credit terms with suppliers, and possibly by factoring trade receivables and obtaining some factor finance.

For SMEs with an ambitious strategy for growth, these sources of finance are unlikely to be sufficient. In some cases, it might be possible to raise new finance in the form of venture capital.

Venture capital is capital provided to a SME by one or more external investors, in the form of equity capital, preference shares or debt finance – perhaps a mixture of all three. Some investment institutions specialise in providing venture capital finance to private companies to support their growing businesses.

Venture capital investors require large returns on their investment, because of the high risks involved. They want the profits on their successful investments to cover the losses they inevitably suffer on business ventures that fail.

## 17.6 Business angel finance

Business angels are wealthy individuals who invest directly in small businesses, usually by purchasing new equity shares. The business angel does not get involved personally in the management of the company, but hopes to make a large return on his investment from dividends and eventually from the sale of the shares when the company has grown.

The main problems with business angel finance are as follows.

a. There are not many business angels, and it is usually very difficult for a small company to identify an individual who might be willing to consider making an equity investment in the company.
b. Since there are not many business angels, there is far too little business angel finance available to meet the potential demand for equity capital from small companies.

### 17.6.1 Obtaining venture capital

The term 'venture capital' is normally used to mean capital provided to a private company by specialist investment institutions, sometimes with support from banks.

Venture capitalists might be willing to provide finance to new businesses in return for an equity stake in the business. In addition to equity capital they might also agree to provide extra finance in the form of preference shares. With some venture capital arrangements, a bank might also be willing to provide loan capital as part of an overall financing package for the company.

The company will have to demonstrate to the venture capitalist organisation that it has a clear strategy and a convincing business plan. It must demonstrate that its management are experienced, have sufficient skills to make a success of the business and are committed to achieving success. Sometimes the venture capital organisation will require a representative to be on the board or will appoint an independent director.

### 17.6.2 Exit route for the venture capital investor

A venture capital organisation will not invest money in a company unless it is satisfied that there is a strategy for the company that will enable them to withdraw their investment at a profit, if the company is successful. This is known as an 'exit route' for their investment, and a venture capitalist might expect an exit route to be available after about five years or so from the time of making the investment in the company.

The exit route might be:

a. a stock market listing, if the company grows quickly and is successful. When the company's shares are brought to the stock market, the venture capitalist can sell its shares.
b. a 'trade sale' of the company to a larger company. A venture capitalist investor might insist that the company should be sold to a larger rival, so that they can take their profits and disinvest.
c. refinancing by another venture capital organisation. A venture capitalist might be able to transfer its investment in a company to another venture capitalist.

### 17.6.3 Problems with obtaining venture capital finance

The main problem with obtaining venture capital finance is finding a venture capital organisation that is prepared to look at the possibility of investing in the company.

The problem is particularly severe for companies that want to raise 'seed corn' finance to build up their business from a very small beginning. Venture capitalists are often reluctant to spend time and resources looking at small ventures where the potential returns are likely to be small. They are much more likely to be interested in financing well-established medium-sized private companies, such as private companies that gain 'independence' in a management buyout. Medium-sized businesses often need new equity to enable them to build their business to a point where a stock market flotation is possible, and the risk of business failure is lower than with smaller 'start-up' ventures.

In the UK, for example, most of the larger venture capital organisations are not prepared to consider providing finance for start-up companies or newly-established small companies and focus instead on more well-established companies such as management buyout companies.

On the other hand, there are some very large financial institutions that provide venture capital to companies on a global scale, including the provision of capital to companies in China and India. For example, in April 2008 US-based private equity group Warburg Pincus announced the creation of a $15 billion global fund for investing mainly in venture capital investments and ‘growth capital’ for private companies. The company announced at the time that it was looking at a five-year to seven-year time frame for its investments.

## 17.7 Other sources of capital

### 17.7.1. Supply chain financing

The globalisation of businesses has led to worldwide supply chains with multinational buyers purchasing from a diverse group of suppliers in numerous countries.

Supply chain finance involves a supplier selling its invoices to a bank at a discount as soon as they are approved by the buyer. This means that the supplier receives their cash earlier than would have been the case had the supplier waited for the buyer to pay in the usual way.

The buyer makes payment to the party that has bought the invoice from the supplier. This party would usually be a bank. The buyers are usually large multinationals with good credit risk. The bank will pay an amount for the invoice based on the buyer’s credit risk rather than the higher credit risk of the smaller supplier. Therefore, the supplier receives more cash than they would have through, say factoring arrangements.

Supply chain finance is often described as a win-win situation for the buyer and supplier. The buyer optimises working capital by delaying payment, and the supplier accelerates operating cash flow.

### 17.7.2 Crowdfunding

Crowdfunding (also known as peer-to-peer funding) involves raising money from a large number of people via the internet in order to fund a project.

A crowdfunded project typically involves three groups of participants:

a. Project initiators: People (companies) who wish to raise cash to fund a project. Project initiators will produce a business plan in order to tempt others to invest in their project.
b. Crowdfunding websites: Various organisations provide internet platforms which allow the project initiator to advertise the project in order to solicit contributions and allow investors to appraise the projects on offer.

c. Investors Crowdfunding can be used to raise money from investors who wish to support a project that interests them rather than making a financial return. For example, some musicians have raised cash to fund the production of an album. However, it is also available to fund commercial ambition and large amounts have been raised. For example, a project aimed at funding the development of a video game raised $75m against an initial target of $500,000.

### 17.7.2 Government assistance

The Central Bank of Nigeria development finance initiatives involve the formulation and implementation of various policies, to encourage and enable financial institutions to deliver services in an effective, efficient and sustainable manner. The initiatives are mainly targeted at agricultural sector, rural development and micro, small and medium enterprises.

### 17.7.3 Small and Medium Enterprises Equity Investment Scheme (SMEEIS)

The Scheme requires all banks in Nigeria to set aside 10% of their profit after tax for equity investment and promotion of small and medium enterprises.

Funding provided under the scheme is in the form of equity investment in eligible enterprises and/or cheap loans (at single digit interest rates) in order to reduce the burden of interest and other financial charges of normal bank lending. In addition, the banking industry provides financial, advisory, technical and managerial support.

The scheme applies to all business activities except for trading and financial services businesses.

### 17.7.4 Small and Medium Enterprises Credit Guarantee Scheme (SMECGS)

The Central Bank of Nigeria guarantees loans of up ₦100 million made by participating banks to businesses involved in manufacturing, agricultural value chain, education or any other activity that might be agreed from time to time.

### 17.7.5 Agric credit guarantee scheme

This scheme is to encourage banks to provide funding to farmers by providing guarantee cover to banks who give loans to the agricultural sector.

## 17.8 Summary of sources and costs of finance

### Introduction

An important aspect of financial management is the choice of methods of financing for a company's assets. Companies use a variety of sources of finance and the aim should be to achieve an efficient capital structure that provides:

a. A suitable balance between short-term and long-term funding
b. Adequate working capital
c. A suitable balance between equity and debt capital in the long-term capital structure.

### 17.8.1 Factors that must be considered include:

a. amount needed;
b. cost;
c. duration;
d. flexibility;
e. repayment; and
f. impact on financial statements.

### 17.8.2 Equity

**Features**

Finance raised through sale of shares to existing or new investors (existing investors often have a right to invest first – pre-emption rights).

Providers of equity are the ultimate owner of the company. Issue costs can be high.

Cost of equity is higher than other forms of finance.

New issues to new investors will dilute control of existing owners.

Equity can be used, when appropriate:

a. to provide long term finance; and
b. in preference to debt finance, if company is already highly geared.

Private companies may not be allowed to offer shares for sale to the public at large (e.g. in the UK).

### 17.8.2 Debt

Debt can be short or long term. Short term includes:

a. bank overdrafts; and
b. bank loans.

### 17.8.3 Bank overdrafts – Features

a. Flexible with regard to amount and available immediately within pre-arranged limits.
b. Interest and fees are tax deductible.
c. Interest is only paid when the account is overdrawn.
d. Penalties for breaching overdraft limits can be severe.
e. Overdrafts are repayable on demand.

Overdraft, when appropriate can be:

i. used to finance day to day operations; and
ii. an important component of working capital management policies.

### 17.8.4 Bank loans – Features

a. Available for specified periods and must be repaid according to a pre agreed schedule. This means that the company knows when it needs to make cash payments.
b. Interest and fees are tax deductible.
c. Once the loan is taken, interest is paid for the duration of the loan.
d. A loan might be repayable, if loan covenants are breached, but failing that, the cash is available for the term of the loan.
e. Can be taken out in a foreign currency as a hedge of a foreign investment.
f. A company can offer security in order to secure a loan.

When appropriate:

i. short term loans are suitable for funding smaller investments; and
ii. long term loans are suitable for funding major investments.

### 17.8.5 Hybrids

Features

a. A hybrid is a financial instrument that combines features of equity and debt for example, convertible debt.
b. Interest is paid at an agreed rate for a specified period. At the end of the period the holder can choose to be repaid in cash or to change the debt into

equity shares. Whether or not conversion occurs depends on the share price at the conversion date.

c. The issuing company will to raise cash in order to pay back the amount if conversion is not chosen.
d. Lower interest rates than straight forward (vanilla) debt as the lender is, in effect, lending money and buying a call option on the company's shares.
e. Interest and fees are tax deductible.

When appropriate:

a. Can be used for long term investments.
b. Useful if the share price is low at the time of issue thus making equity issue too dilutive.

### 17.8.6 Leases

Features

Two types:

a. operating leases – right-of-use assets; and
b. finance leases – on statement of financial position.

Legal ownership of the asset remains with the lessor.

Lessee has the right of use of the asset in return for a series of rental payments.

Tax deductibility of rental payments depends on the tax regime but typically they are tax deductible in one way or another.

All leases are capitalised and affect key ratios (ROCE, gearing)

**When appropriate:**

Operating leases

a. For the acquisition of smaller assets but also for very expensive assets; and
b. Common in the airline industry.

Finance leases – Can be used for very big assets (e.g. oil field servicing vessels).

### 17.8.7 Venture capital

Features

a. The term 'venture capital' is normally used to mean capital provided to a private company by specialist investment institutions, sometimes with support from banks in the form of loans.
b. The company must demonstrate to the venture capitalist organisation that it has a clear strategy and a convincing business plan.
c. A venture capital organisation will only invest if there is a clear 'exit route' (e.g. a listing on an exchange).
d. Investment is typically for 3-7 years.

When appropriate:

i. can be an important source of finance for management buy-outs;
ii. can provide finance to take young private companies to the next level; and
iii. may provide cash for start-ups but this is less likely.

### 17.8.8 Business angels

Features

a. Business angels are wealthy individuals who invest directly in small businesses, usually by purchasing new equity shares but do not get involved in the management of the company.
b. Business angels are not that common.
c. There is too little business angel finance available to meet the potential demand for equity capital from small companies.

When appropriate – it is a way for small companies to raise equity finance.

### 17.8.9 Private equity funds

Features

a. Private equity is equity in operating companies that are not publicly traded on a stock exchange.
b. Private equity as a source of finance includes venture capital and private equity funds.
c. A private equity fund looks to take a reasonably large stake in mature businesses.

d. In a typical leveraged buyout transaction, the private equity firm buys majority control of an existing or mature firm and tries to enhance value by eliminating inefficiencies or driving growth.
e. Their view is to realise the investment possibly by breaking the business into smaller parts.

When appropriate:

i. If used as a source of funding a private equity fund will take a large stake (30% is typical) and appoint directors.
ii. It is a method for a private company to raise equity finance where it is not allowed to do so from the market.

### 17.8.10 Asset securitisation and sale

Features

Securitisation is the process of conversion of existing assets or future cash flows into marketable securities.

Typically, the following occur simultaneously:

a. Company A sets up Company B (described as a special purpose vehicle or SPV) and transfers an asset to it (or rights to future cash flows);
b. Company B issues securities to investors for cash. These investors are then entitled to the benefits that will accrue from the asset; and
c. The cash raised by Company B is then paid to Company A.

In substance this is like Company A raising cash and using the asset as security. Accounting rules might require Company A to consolidate Company B even though it might have no ownership interest in it.

Conversion of existing assets into marketable securities is known as asset- backed securitisation and the conversion of future cash flows into marketable securities is known as future-flows securitisation.

Used extensively in the financial services industry.

When appropriate:

a. allows the conversion of assets which are not marketable into marketable ones.
b. securitisation allows the company to borrow at rates that are commensurate with the rating of the asset. A company with a credit rating of BB might hold

an asset rated at AA. If it securitises the asset it gains access to AA borrowing rates.

## 17.9 Chapter review

At the end of this chapter, ensure that you can:

a. discuss the importance of SMES in the economy;
b. explain possible sources of finance to a SME;
c. explain venture capital;
d. explain supply chain capital and crowd funding;
e. explain different types of government assistance;
f. theexplain features of different sources of finance; and
g. Discuss finance for small and medium sized entities (SMEs).

**Skills Level**

**Financial Management**

CHAPTER 18

# BUSINESS VALUATIONS

**Contents**

# 18 Business Valuations

## 18.0 Learning objective

This chapter discusses business valuation.

## 18.1 Learning outcomes

At the end of this chapter, readers should be able to:

a. estimate the market value of a business using dividend yield;
b. estimate the market value of a business using price earnings ratio;
c. estimate the market value of a business using asset based valuations;
d. estimate the market value of a business using the dividend valuation model;
e. estimate the market value of debt and preference shares; and
f. explain the efficient market hypothesis.

## 18.2 Reasons for business valuation

This chapter describes various techniques for calculating a value for the shares of a company, or the value of an entire company (equity plus debt). There are several reasons why a valuation might be required.

**18.2.1 Quoted companies** - Quoted companies already have a share price valuation: this is the current market price of the shares. The main reason for making a business valuation for a quoted company is when there is a takeover bid. In a takeover bid, the bidder always offers more for the shares in the target company than their current market price. A valuation might be made by the bidder in order to establish a fair price or a maximum price that he will bid for the shares in the target company. The valuation placed on a target company by the bidder can vary substantially, depending on the plans that the bidder has for the target company after the takeover has been completed.

**18.2.2. Unquoted companies -** For unquoted companies, a business valuation may be carried out for any of the following reasons:

a. The company might be converted into a public limited company with the intention of launching it on to the stock market. When a company comes to the stock market for the first time, an issue price for the shares has to be decided.
b. When shares in an unquoted company are sold privately, the buyer and seller have to agree a price. The buyer has to decide the minimum price he is willing to accept and the seller has to decide the maximum price he is willing to pay.

c. When there is a merger involving unquoted companies, a valuation is needed as a basis for deciding on the terms of the merger.
d. When a shareholder in an unquoted company dies, a valuation is needed for the purpose of establishing the tax liability on his estate.

### 18.2.3 Valuation models

All valuation methods are based on estimates and assumptions.

Each method produces a different valuation, but each valuation can provide useful information and help with deciding what the offer price should be. You should be prepared to use each of the different valuation methods, and then discuss the assumptions and estimates on which the valuation is based. You might also be required to compare the different valuations produced by each method and then recommend (with reasons) a valuation that you consider appropriate as a basis for making an offer to the target company shareholders.

There are several approaches to making a valuation of the shares in a company:

a. **Asset-based valuation** which as the name suggests are based on the asset value of the target company.
b. **Market-based valuations**, using estimates of future earnings or dividends.
c. **Cash-flow based valuations**, using discounted cash flow of expected future returns from the acquisition. The expected value added (EVA) model is another form of cash flow-based model.

There are many different techniques within these three broad approaches, and they lead to different valuations of the business.

All the valuation methods described in this chapter have a rational basis. This means that there is logic to the valuation, and the valuation is obtained through objective analysis and assessment.

Valuation methods can be used to decide on an offer price in a mergers and acquisitions scenario or may be used to justify an offer price. The final price is often agreed through negotiation, and the management of the bidding company must use judgement in deciding how high a price they might be willing to pay. The only 'correct' valuation is the price that the bidder makes and the shareholders in the target company accept.

## 18.3 Asset-based valuation models

### 18.3.1 Net asset value ('balance sheet basis', taken from the statement of financial position)

Asset based valuation models use the net tangible assets of a business as a valuation. Different figures arise from the different valuation placed on the business assets and liabilities.

This approach uses the book values for assets and liabilities. These figures are readily-available from the accounts ledgers of the company. However, non- current assets might be stated at historical cost less accumulated depreciation, and this might bear no resemblance to a company's current value.

Some important intangible assets such as internal goodwill and the value of the company's human capital (e.g. the skills of its employees) are ignored because they are not included in the statement of financial position. At best this method will provide the minimum value of a target company.

In practice, a minimum valuation for a target company might be based on the book value of its assets. The minimum value of the equity would then be the book value of the assets minus the book value of the liabilities.

Some assets might be under-valued, but where non-current assets are re-valued regularly book value might be sufficient for an asset-based valuation without the need for further adjustments.

If you are required to make an asset-based valuation in your examination, you should be prepared to consider some adjustments to the valuation of certain assets, where information in the question indicates that the valuation of certain assets (particularly intangible assets) might be too high or too low.

A valuation based on the book value of net assets should be considered a minimum valuation, and not one that the target company shareholders are likely to accept. An offer price would have to be in excess of book value ('book value plus') for the bid to have any chance of success.

### 18.3.2 Net asset value (net realisable value)

The minimum value of a target company is the value of its net assets. (Net assets are the value of the company's total assets minus its liabilities.) If net assets can be valued according to the disposal value of the assets, this would indicate the amount that could be obtained for the shareholders of the company in the event that the company is liquidated and its assets sold off.

However, the net disposal value (or 'break-up' value) of the target company's assets is usually irrelevant, unless the asset value is higher than the value of the business as a going concern. A target company is usually acquired with the intention of continuing its business operations, and the value of assets in a going concern should be higher than their break-up value.

In a takeover bid, it is also impractical to estimate the disposal value of the target company's assets, except perhaps as a very approximate estimate.

However, this method may be used when the assets of the company are valuable, and their current disposable value might be worth more than the expected future dividends or earnings that the company will provide from using the assets. This valuation may be appropriate if the intention is for the business to be liquidated and the assets sold.

A company can never be worth less than its break-up value.

### 18.3.3 Net asset value (replacement value)

Replacement value measures the value of net assets at their cost of acquisition on the open market. Whilst this is likely to be a more accurate cost than book values it will still undervalue the company as intangible assets will be excluded. In addition it will be very difficult to identify and value individual assets and liabilities.

All asset-based valuation methods can be criticised, because unless there is an intention to sell off all or some of a company's assets, the value of a business comes from the expected returns it will generate, not the reported value of its assets.

**Example: Net asset value**

The directors of Dangote plc, a large conglomerate, are considering the acquisition of the entire share capital of Ozone Limited, a private limited company which manufactures a range of engineering machinery. Neither company has any long term debt capital. The directors of Dangote plc believe that if Ozone is taken over, the business risk of Dangote will not be affected.

The statement of financial position of Ozone as at 31/12/20x5 is expected to be as follows:

| **Total assets** | **₦** | **₦** |
|---|---|---|

| | | |
|---|---|---|
| Non-current assets [net of depreciation] | | 1,303,200 |
| Current assets; stock and wip | 1,031,800 | |
| Receivables | 1,490,000 | |
| Bank | 316,200 | 2,838,000 |
| | | **4,141,200** |
| **Equity and liabilities** | | |
| Issued ordinary shares @ ₦1 each | | 100,000 |
| Distributable reserves | | 808,200 |
| **Shareholders fund** | | **908,200** |
| Payables | 1,507,200 | |
| Bank overdraft | 1,725,800 | 3,233,000 |
| | | **4,141,200** |

The estimated values of Ozone's non current assets and work in progress as on 31/12/25. are;

| | Replacement cost (₦) | Realisable value (₦) |
|---|---|---|
| Non-current assets | 1,450,000 | 900,000 |
| Stock and WIP | 1,100,000 | 1,140,000 |

**Required:**

Calculate the value of Ozone plc using:

a. Net asset historic method.
b. Net asset net realizable value method.
c. Net asset replacement value.

**Solution**

a. **Net asset valuation historic method**: it does not include intangible assets and so is equivalent to shareholders' fund. No adjustment should be done on the statement of financial position when using the historic method. The net asset valuation is ₦908,200.

b. **Replacement value:** The replacement value method replaces the historic cost of the asset with their replacement values. You start with the net asset value and adjust the value of all assets in the additional information using the replacement value.

The replacement value method replaces the historic cost of the asset with their replacement values. You start with the net asset value and adjust the value of all assets in the additional information using the replacement value.

| | ₦ |
|---|---|
| Net asset value | 908,200 |
| Less old value of non current assets | 1,303,200 |
| Less old value of stock and work in progress | 1,031,800 |
| Add new value of non current assets | 1,450,000 |
| Add new value of stock and work in progress | 1,100,000 |
| **Replacement Net Asset value** | **1,123,200** |

**c. Realizable value**

| | ₦ |
|---|---|
| Net asset value | 908,200 |
| Less old value of non current assets | 1,303,200 |
| Less old value of stock and work in progress | 1,031,800 |
| Add new value of non current assets | 900,000 |
| Add new value of stock and work in progress | 1,140,000 |
| Less Bad debt (4% x 1,490,000) | 59,600 |
| Realizable value | **553,600** |
| | |

## 18.4 Income based valuation methods

This method includes:

a. Price earnings ratio method.
b. Earnings yield method.
c. Dividend yield method.

### 18.4.1 P/E ratio method

A price/earnings ratio or P/E ratio is the ratio of the market value of a share to the annual earnings per share. For every company whose shares are traded on a stock market, there is a P/E ratio. For private companies (companies whose shares are not traded on a stock market) a suitable P/E ratio can be selected and used to derive a valuation for the shares.

A simple method of estimating a value for a company in the absence of a stock market value is:

Value = EPS × Estimated P/E ratio.

a. The EPS might be the EPS in the previous year, an average EPS for a number of recent years or a forecast of EPS in a future year
b. The P/E ratio is selected as a ratio that seems appropriate or suitable. The selected ratio might be based on the average P/E ratio of a number of similar companies whose shares are traded on a stock market, for which a current P/E ratio is therefore available.

**Example: P/E ratio method**

The EPS of a private company, ABC Company, was ₦15 last year and is expected to rise to ₦18 next year. Similar companies whose shares are quoted on the stock market have P/E ratios ranging from 10.0 to 15.6. The average P/E ratio of these companies is 12.5.

A valuation of the company might be to take the prospective EPS and apply the average P/E ratio for similar companies:

Valuation = ₦18 × 12.5 = ₦225 per share.

An alternative evaluation might be to take the actual EPS last year and apply the lowest P/E ratio of any other similar stock market company, reduced by, say, 10% to allow for the fact that ABC Company is a private company and does not have a stock market quotation.

Valuation = ₦18 × (90% × 10) = ₦162.

Here, a P/E ratio of 9 (= 90% × 10) has been used in the valuation.

Another valuation might be to use the EPS for last year and a P/E ratio of 9. This would give a share value of ₦15 × 9 = ₦135.

From this example, it might be apparent that the P/E ratio valuation method has a number of weaknesses:

It is based on subjective opinions about what EPS figure and what P/E ratio figure to use.

a. It is not an objective or scientific valuation method.
b. It is based on accounting measures (EPS) and not cash flows. However, the value of an investment such as an investment in shares ought to be derived from the cash that the investment is expected to provide to the investor (shareholder).

However, the P/E ratio valuation method is commonly used as one approach to valuation for:

a. The valuation of a private company seeking a stock market listing for the first time
b. The valuation of a company for the purpose of making a takeover bid.

The main advantage of a P/E ratio valuation is its simplicity. By taking the annual earnings of the company (profits after tax) and multiplying this by a P/E ratio that seems 'appropriate', an estimated valuation for the company's shares is obtained. This provides a useful benchmark valuation for negotiations in a takeover, or for discussing the flotation price for shares with the company's investment bank advisers.

### 18.4.2 Earnings yield method

With the earnings yield method of valuation, a company's shares are valued using its annual earnings and a suitable earnings yield.

**Formula: Earnings yield**

$$\text{Earnings yield} = \frac{\text{Earnings per share}}{\text{Current market price per share}} \times 100$$

Using the earnings yield method of valuation, this formula is adapted as follows:

$$\text{Current market price per share} = \frac{\text{Earnings per share}}{\text{Earnings yield}}$$

A suitable earnings yield for a private company might be similar to the earnings yield on shares in similar quoted companies.

It might be more appropriate to select an earnings yield that is higher than the earnings yield for similar quoted companies, to allow for the higher risk of investing in private companies.

The earnings yield method of valuation is essentially a variation of the P/E ratio method of valuation and is subject to the same criticisms.

**Example: Earnings yield method**

The earnings of Kickstart, a private company, were ₦450,000 last year.

Stock market companies in the same industry provide an earnings yield of about 9% to their shareholders.

**Required:**

Using the earnings yield method of valuation, suggest a suitable valuation for the equity shares in Kickstart.

**Solution**

If an appropriate earnings yield for Kickstart is 9%, the valuation of its equity would be:

₦450,000/9% = ₦5,000,000.

However, since Kickstart is a private company, a higher earnings yield should possibly be used for the valuation. If an appropriate earnings yield for Kickstart is 10%, say, the valuation of its equity would be:

₦450,000/10% = ₦4,500,000.

The valuation depends on arbitrary assumptions about a suitable earnings yield to apply, as well as assumptions about expected annual earnings.

### 18.4.3 Dividend Yield Method

With the dividend yield method of valuation, a company's shares are valued using its dividend for the year and a suitable dividend yield.

**Formula: Dividend yield**

$$\text{Dividend yield} = \frac{\text{Dividend per share}}{\text{Current market price per share}} \times 100$$

Using the dividend yield method of valuation, this formula is adapted as follows:

$$\text{Current market price per share} = \frac{\text{Dividend per share}}{\text{Dividend yield}}$$

A suitable dividend yield for a private company might be similar to the dividend yield on shares in similar quoted companies.

It might be more appropriate to select a dividend yield that is higher than the dividend yield for similar quoted companies, to allow for the higher risk of investing in private companies.

Dividend yield is used to value small shareholdings where the shareholder may have little say in the running of the business and is interested only in the income stream that it provides.

## 18.5 Dividend based Valuation methods

### 18.5.1 Dividend valuation model: constant annual dividends

The dividend valuation model is a more objective and cash-based approach to the valuation of shares. Like the P/E ratio method and earnings yield method, it is an income-based valuation method. However the valuation is based on expected future dividends rather than on total earnings.

The basic assumption with the dividend valuation models is that the value of shares to shareholders is the value of all the future dividends that they expect to receive from those shares in the future.

If the fair value of a share represents the value of all expected future dividends, this value can be estimated by discounting expected future dividends to a present value at the shareholders' cost of capital. All expected future dividends 'in perpetuity' are therefore discounted to a present value at the cost of equity capital.

Without going into the mathematics to prove the valuation model, it can be shown that if it is assumed that the company will pay a constant annual dividend every year into the foreseeable future, the present value of those dividends, and so the value of the shares, is:

### 18.5.2 Dividend valuation model [without growth] formula

$MV = D_1 / r_e$ [this is the present value of a perpetuity], $r_e$ is the shareholders required rate of return [cost of equity], d is the expected future annual dividend [starting at year 1] and MV is the share price ex-dividend.

This valuation model assumes that the dividend is paid annually, and that the current year's dividend has just been paid. This is the assumption that is commonly used in examination questions. For an 'exact' valuation using this model, it should be assumed the next dividend is payable in one year's time.

If the annual dividend in the current year has not yet been paid, but will soon be paid, the value of the share is its value 'cum dividend'. You might be asked to suggest a cum dividend valuation, where an annual dividend will be paid in the near future. If so, you should estimate the ex dividend price using the dividend valuation model, and then add the current dividend to arrive at a cum dividend valuation.

**Example DVM without growth**

A company is expected to pay an annual dividend of ₦48 per share into the foreseeable future and the shareholders' cost of capital is 12%. The most recent annual dividend has just been paid.

**Required**:

a. Using the dividend valuation model, suggest what the value of the shares should be.
b. Show how this valuation would change if the expected annual dividend in future years is ₦54.
c. Show how this valuation would change if the expected annual dividend in future years is ₦48 but the cost of equity capital is 12.5%

**Solution**

a. Using the dividend valuation model, the value of the share (ex dividend) ought to be ₦48/0.12 = ₦400.
b. If expectations about future annual dividends change from ₦48 per share to ₦54 per share, the valuation of the share will be ₦450 (₦54/0.12). This is a higher valuation than in (a) because the annual dividend is higher.
c. If future annual dividends are expected to be ₦48 per share, but the shareholders' cost of capital changes to 12.5%, the valuation of the share will fall to ₦384 (₦48/0.125). This is a lower valuation than in (a) because the cost of equity is higher.

The dividend valuation model therefore provides an explanation of how the value of shares will rise or fall when there are changes in either the expected annual dividend, or the shareholders' required rate of return (the equity cost of capital).

### 18.5.2 Dividend valuation method: constant rate of growth in annual dividends

An alternative assumption in the dividend valuation model is that the annual dividend will grow in the future. A simplifying assumption is that the dividends will grow at a constant annual percentage rate.

Again, without going into the mathematics to prove the valuation model, it can be shown that if it is assumed that the company will pay an annual dividend that grows by a constant percentage amount every year into the foreseeable future, the present value of those dividends, and so the value of the shares, is:

**Formula: Dividend valuation model (with growth)**

$$MV = \frac{d(1 + g)}{r_E - g}$$

Note: this formula gives the present value of any cash flow which starts in one year's time and grows at a constant rate in perpetuity

**Where:**

$r_E$ = the cost of equity

d = the annual dividend for the year that has just ended

g = the expected annual growth rate expressed as a proportion (4% = 0.04, 2.5% = 0.025 etc.)

Therefore, d(1 + g) = expected annual dividend next year or $d_1$

MV = the share price ex dividend.

This is the valuation of the share ex dividend. Note that this valuation formula is based on the assumptions that:

a. The dividend is paid annually; and
b. The dividend for the current year has just been paid.

**Example: DVM with growth**

A company has just paid an annual dividend of ₦48. Dividends are expected to grow by 4% each year into the foreseeable future. The shareholders' cost of capital is 12%.

**Required:**

Calculate the expected value of the share ex-dividend using DVM

**Solution**

Using the dividend valuation model, the expected value of the share (ex dividend) is:

MV = 48 (1.04) / 0.12 – 0.04 = ₦624

If there is no expected growth in annual dividends, and the company is expected to pay a constant annual dividend in the future, the share valuation would have been ₦400 (see the earlier example). Because the annual dividend is expected to increase every year, the valuation is much higher.

Using the dividend growth model, the valuation of shares changes with:

a. changes in expected future dividends (for example, changes in the expected annual growth rate in dividends); or
b. changes in the shareholders' required rate of return (the equity cost of capital).

**Example**:

The share price of ABC Company is currently ₦400. The cost of equity capital is 12%.

The annual dividend has just been paid. It is expected that the annual dividend next year will be ₦20 per share and that annual dividends will then grow at a constant annual rate into the foreseeable future.

**Required:**

(a)Calculate the expected annual growth rate in dividends from next year onwards.

(b)Suppose that the stock market now receives new and unexpected information about the company that makes investors re-assess the future annual dividends. Investors now expect that the annual dividend next year will be 10% lower than previously expected, and that annual growth in dividends in subsequent years will be only 4%.

Calculate the price that should now be expected for shares in ABC Company.

**Solution**

a. expected annual growth
   i. let the annual growth rate in dividend be g
   ii. 400 = 20 / 0.12 – g
   iii. 400 (0.12 – g) = 20
   iv. 48 – 400g = 20
   v. 48 – 20 = 400g
   vi. 28/400 = g
   vii. 0.07 = g , therefore g is 7%

b. The annual dividend next year is expected to be 10% lower than expected which is ₦18 [20 x 90%].
   - MV = 18 / 0.12 – 0.04
   - MV = ₦225

**Example**:

A company has just paid an annual dividend of ₦63. This dividend is expected to remain constant for two more years, but from Year 3 it is expected to grow by 3% each year into the foreseeable future. The cost of shareholders' funds is 10%.

**Required:**

What should be the current market value of the company's shares?

**Solution**

The dividend valuation model and the dividend growth model calculate the present value of all expected future dividends by discounting them at the cost of equity capital. A valuation can be obtained in this example using discount tables.

When dividend growth begins in Year 1, we can obtain a Year 0 valuation using the dividend growth model. In this example, we know that dividend growth is expected to begin in Year 3. We can therefore obtain a Year 2 valuation using the dividend valuation model.

The expected value of the share (ex dividend) at the end of Year 2 can be calculated using the dividend growth model as follows:

$P_2$ = 63(1.03) / 0.10 – 0.03 = 927

The expected current value of the share is this valuation at the end of Year 2 discounted to a Year 0 value, plus the present value of the expected dividends at the end of Year 1 and Year 2.

| Year | | Dividend | DCF@10% | Current value |
|---|---|---|---|---|
| | | | | |
| 1 | Dividend | 63 | 0.909 | 57 |
| 2 | Dividend | 63 | 0.826 | 52 |
| 2 | End of year 2 value | 927 | 0.826 | 766 |
| | **Share value** | | | **875** |

### 18.5.3 Retained earnings: the earnings retention valuation model

Dividend growth can be achieved by retaining some profits (retained earnings) for reinvestment in the business. Reinvested earnings should provide extra profits in the future, so that higher dividends can be paid. When a company retains a proportion of its earnings each year, the expected annual future growth rate in dividends can be estimated using the formula:

$$g = br$$

where g = annual growth rate in dividends in perpetuity,

b is proportion of earnings retained (for reinvestment in the business) and

r is the rate of return that the company will make on its investments.

**Example: Gordon's growth model**

A company has just achieved annual earnings per share of ₦50, of which 40% has been paid in dividends and 60% has been reinvested as retained earnings.

The company is expected to retain 60% of its earnings every year and pay out the rest as dividends.

The expected return on investments is 10% The cost of equity capital is 8%.

**Required:**

Calculate the market value using Gordon's growth model.

**Solution**

The current annual dividend is 40%  ₦50 = ₦20.

The anticipated annual growth in dividends = br = 60% × 10% = 6% or 0.06.

MV = 20(1.06) / 0.08 – 0.06 = ₦1,060

**18.5.4 Enterprise Value/EBITDA**

**Income based valuation: Enterprise value/EBIDA multiple method**

**Enterprise value**

**Definition**

Enterprise value (EV) is a measure of a company's total value, often used as an alternative to market capitalisation. It is the price you would pay for the entire business based on the current market price of the company's shares and net debt.

EV represents the total value of a business or enterprise to all providers of capital, including equity investors, preference share investors, debt investors and minority interests. It can be calculated by adding the company's market capitalisation and the market value of its gross borrowings, and deducting any cash balances.

EV = Market Capitalisation of equity + Preference shares + Debt + Minority interest – Cash and cash equivalents

**EV/EBITDA**

**Definition**

The Enterprise value/EBITDA multiple is the enterprise value of the company divided by earnings before interest, tax, depreciation and amortisation. It is a widely used valuation multiple.

EV/EBITDA is often used in conjunction with, or as an alternative to, the P/E ratio to determine the fair market value of a company.

**The formula for calculating the multiple is:**

Enterprise Value Multiple= (Enterprise Value)/EBITDA

The benefit of EBITDA multiples is that they strip out depreciation and amortisation, which may vary substantially between companies. EBITDA therefore provides a better basis for comparison.

One very important point to note about multiples is the connection between the numerator and denominator. Since enterprise value (EV) equals equity value plus net debt, EV multiples are calculated using denominators that are relevant for both equity and debt holders (that is, before the inclusion of interest expense and preference dividends). An advantage of this is that the multiple can be used to directly compare companies with different levels of debt.

**Example**

The following financial information is available for Aka Ltd.

All figures in ₦m

| | 2020 Historic ₦m | 2021 Forecast ₦m |
|---|---|---|
| Revenue | 39.60 | 42.1 |
| Operating profit | 8.70 | 9.2 |
| Depreciation | 0.50 | 0.6 |
| Amortisation | 0.30 | 0.3 |
| Net asset value | 24.40 | |
| Book value of bonds – currently trading at ₦80 | 16.25 | |

The closest comparable company to Aka Ltd has been identified as its competitor Kemi Plc, for which you have been able to ascertain the following data.

All figures in ₦m

| | 2020 Historic ₦m | 2021 Forecast ₦m |
|---|---|---|
| Revenue | 57.7 | 61.9 |
| Operating profit | 10.0 | 12.6 |
| Depreciation | 2.2 | 2.2 |
| Amortisation | - | - |
| Net asset value | 48.1 | |
| Book value of bonds – currently trading at ₦125 | 20.0 | |

Today's share price for Kemi Plc is 175k. Kemi has 27,300,000 shares in issue.

**Required:**

Use the information to derive an equity value for Aka Ltd, based on an EBITDA multiple.

**Solution**

**Step 1 - Calculate EBITDA multiple for Kemi Plc**

Equity value = ₦1.75 × 27.3m = ₦47.8m

Enterprise value (EV) = ₦47.8m + ₦25.0m = ₦72.8m

| | 2020 | 2021 |
|---|---|---|
| EBITDA multiples | 72.8/(10+2.2) = 6.0x | 72.8/(12.6+2.2)=4.9x |

**Step 2 – Apply multiple to value Aka Ltd**

Valuation based on:

| | 2020 | 2021 |
|---|---|---|
| EBITDA | 6.0x × ₦9.5m = ₦57.0m | 4.9x ×₦10.1m = ₦49.5m |

Suggested range for EV of Aka: ₦49.5m – ₦57m

From this, the market value of Aka's debt (₦13m) will need to be deducted to obtain an equity valuation, giving a range between ₦36.5m and ₦44m.

These figures are before any discount that might be made for the non-marketability of Aka's shares. If we were to apply say a 25% discount, this would give a range of values between ₦27.38m and ₦33m.

An enterprise value multiple indicates how long it would take for an acquisition to earn enough to pay off its cost. For example, an EV/EBITDA multiple of six indicates that the acquirer will pay six times the acquisition target's EBITDA. Offering an EV/EBITDA multiple that is substantially higher than that paid for a comparable acquisition is an indication that the acquirer is paying too much.

Often, an industry average EV/EBITDA multiple is calculated on a sample of listed companies to use as a benchmark.

Higher quality businesses deserve higher valuation multiples, but finding a company on either a high or low multiple relative to its sector does not necessarily indicate whether or not the company is a good buy.

An expensive company may be on a high multiple due to expectations of growth arising from its strategies in the market. A cheap company may be on a low multiple because it has no distinguishing characteristics. It can be misleading to think that a company is 'cheaper' because it trades at an EV/EBITDA multiple of four times when compared with its peers that trade at six times EV/EBITDA. It may be that the stock market has failed to value the company correctly.

The multiple can change with various factors: capital intensity, the nature of the business, competitive position of the firm, and the sustainability of cash flows.

| | 2020 Historic ₦m | 2021 Forecast ₦m |
|---|---|---|

| | | |
|---|---|---|
| Revenue | 57.0 | 75.0 |
| Operating profit | 6.0 | 7.5 |
| Depreciation | 2.5 | 2.0 |
| Amortisation | 1.0 | 1.0 |
| Book value of debt – currently trading at ₦125 | 16.0 | |
| | | |
| Share price | ₦2.95 | |
| Shares in issue | 27,500,000 | |
| Market share | 8% | 11% |

The average EBITDA multiple for the home furnishings sector is 9. Using the available information, calculate the EBITDA multiple for each company, and comment briefly on the results.

**Advantages of using the EV/EBITDA multiple**

a. It is unaffected by the capital structure of a company.
b. It takes net debt into account.
c. Ignoring capital expenditure and tax enables comparison of companies which have different levels of capex and tax planning.
d. Ignoring depreciation and amortisation enables more direct comparison between companies which might have different policies.
e. It is relevant – EBITDA multiples focus on the key statistics that are in common use by investors.

**Disadvantages of using the EV/EBITDA multiple**

a. It is simplistic – a lot of information from many value drivers is distilled into a single number.
b. Ignoring capex and tax could be a disadvantage in some circumstances – management, can for example, potentially add value through skilled tax management.
c. It is static – the multiple reflects a point in time which ignores the evolution of the business. The multiple is only meaningful if the profit figure used is representative of the future.
d. It can be difficult to compare – there are many reasons why multiples may differ between companies.

### 18.5.5 Dividend valuation model

A dividend valuation method is useful for the valuation of non-controlling interests (a small number of shares) in a company.

As we have seen, a future dividend stream can be valued using the following formula:

Value=($d_0$ (1+g))/((ke-g) )

where $d_0$ is the dividend at time 0

g is the expected annual growth rate in future dividends

Ke is the cost of equity

**Example**

Target paid a dividend of ₦250,000 this year. The current return to shareholders of companies in the same industry as Target is 12%, although it is expected that an additional risk premium of 2% will be applicable to Target, being a smaller and unquoted company.

**Required:**

Compute the expected valuation of Target, if:

a) The current level of dividend is expected to continue into the foreseeable future,

b) The dividend is expected to grow at a rate of 4% p.a. into the foreseeable future,

c) The dividend is expected to grow at 3% rate for three years and 2% afterwards.

**Solution**

Cost of equity (KE) = 12% + 2% = 14%

a) No growth in dividend:
VE = D/KE = ₦250,000/0.14 = ₦1,785,714

b) Constant growth to infinity
VE = D0(1 + g)/(KE - g)
= ₦250,000(1.04)/(0.14 – 0.04)
= ₦2,600,000

c) 2 – stage dividend growth model
**First 3 years, when g = 3%:**

| | | | | |
|---|---|---|---|---|
| | | | | ₦000 |
| Year 1 | $250(1.03) \times (1.14)^{-1}$ | = | | 226 |
| 2 | $250(1.03)^2 \times (1.14)^{-2}$ | = | | 204 |
| 3 | $250(1.03)^3 \times (1.14)^{-3}$ | = | | 184 |
| | | | | 614 |
| **Years 4 – infinity, when g = 2%:** | | | | |
| | $\frac{250(1.03)^3 \times (1.02)}{0.14-0.02} \times (1.14)^{-3}$ | = | | 1,567 |
| **Total value** | | | | **2,181** |

## 18.6 Valuation of debt securities: the basic principle

The valuation of debt capital is based on the same basic principle as the valuation of shares using the dividend valuation model or dividend growth model.

The value of debt securities (bonds) is the present value of all future interest payments and the repayment of the debt principal, discounted at the cost of the debt.

Taxation is ignored in the valuation, because the personal tax positions of investors differ. The valuation is obtained by discounting interest payments and the eventual redemption value of the bonds at the pre-tax cost of the bonds.

Since the future investment income from fixed-rate bonds (interest and repayment of the principal) are known amounts, not estimates, the valuation model for bonds is more exact than the dividend valuation model for shares.

For fixed rate bonds, the present value of all future interest payments and the repayment of the debt principal is therefore calculated using DCF to obtain a present value of future cash flows from the bond.

### 18.6.1 Cost of debt securities and the valuation of debt securities

The earlier chapter on cost of capital explained how the cost of debt capital can be calculated from the future cash flows from the bond and the market value of the bond.

Here we are calculating the market value of a bond from the future cash flows from the bond and the (before-tax) cost of capital.

### 18.6.2 Valuation of irredeemable fixed rate debt

The value of irredeemable fixed rate debt is the present value of interest payments in perpetuity. The valuation model for irredeemable debt is similar to the dividend valuation model with constant annual dividends.

**Formula: MV of irredeemable fixed rate debt**

| MV of debt using lender's required rate of return | MV of debt using borrower's cost |
|---|---|
| $MV = \dfrac{i}{r_d}$ | $MV = \dfrac{i\,(1-t)}{\text{Post tax } r_d}$ |

**Where:**

$r_D$ = the cost of the debt capital

i = the annual interest payable

t = rate of tax on company profits.

MV = Ex interest market value of the debt

Note that calculations are usually performed on a nominal amount of 100 or 1,000.

By convention, bonds are usually valued at an amount per ₦100 or ₦1,000 nominal value of the bonds.

**Example: MV of irredeemable fixed rate debt**

A 7% bond, denominated in naira, pays interest annually. The interest yield required by the bond investors is 8%.

The value of the bonds (ex-interest) is therefore (₦100 × 7%)/8%) = ₦87.50 per ₦100 nominal value of the bonds.

**Example: MV of irredeemable fixed rate debt**

A 10% irredeemable bond of ₦1,000 each, pays interest every six months.

The interest yield required by investors in the bonds is 8% per annum. What is the market value of these bonds?

**Solution**

**Answer**

If the annual cost of debt is 8%, the six-month cost of debt will be about 4%.

$$\text{Valuation} = \frac{\text{Six-monthly interest}}{\text{Six-monthly cost of debt}} = \frac{₦50}{0.04}$$

= ₦1,250

### 18.6.3 Valuation of redeemable fixed rate debt

The value of redeemable fixed rate debt is the present value of all future interest payments on the bond to maturity, plus the present value of the principal repayment at maturity, discounted at the interest yield on the bond.

**Example: Valuation of redeemable fixed rate debt**

A dollar-denominated 6% bond pays interest annually, and has three years remaining to maturity. It will be redeemed at par.

The interest yield required by the bond investors is 5% per annum. An annual interest payment has just been made.

The value of the bond is calculated as follows, for each ₦1,000 nominal value of the bonds.

| Year | | Amount | DCF@5% | Present value |
|---|---|---|---|---|
| | | | | |
| 1 | Interest | 60 | 0.952 | 57.10 |
| 2 | Interest | 60 | 0.907 | 54.40 |
| 3 | Interest + principal | 1,060 | 0.864 | 915.80 |
| | | | | **1,027.30** |

The bond will have a market value of 1,027.3 and at this price investors in the bonds will receive an average annual return of 5% if they hold the bonds until maturity.

### 18.6.4 Valuation of convertible bonds

The market value of a convertible bond is the higher of:

a. The value of the bond as a straight bond that will be redeemed at maturity, and
b. The present value of future interest payments up to the time that the bonds can be converted into shares, plus the present value of the expected market value of the shares into which the bonds can be converted.

A convertible should therefore be valued by each of these methods, and its value will be the higher of these two valuations.

**Example: Valuation of convertible bonds**

A company has issued some 4% dollar-denominated convertible bonds. These are convertible into shares of the company in four years' time at the rate of 25 shares for every ₦1,000 bonds. Interest on the bonds is payable annually, and the current year interest has just been paid.

The current market price of the company's shares is ₦46, and shareholders expect annual dividends to grow by 5% per year into the foreseeable future. The dividend is paid annually and a dividend for the current year has just been paid.

The convertible bondholders require an annual return of 6% per year on their investment.

What is the current price of the convertible bonds likely to be?

**Solution**

The current price of the convertible bond will be the higher of the value of the bond as a straight redeemable bond redeemable in four years' time and the value of a bond that will be converted into shares in four years' time.

The current share price is ₦46, but if dividends are expected to rise by 5% per year into the foreseeable future, the share price will also be expected to rise at the same rate. The expected share price in four years' time is therefore: ₦46 x (1.05)4 = ₦55.9.

Value of the convertible as a straight bond

| Year | | Amount | DCF @ 6% | PV |
|---|---|---|---|---|
| | | ₦ | | ₦ |
| 1 – 4 | Interest | 40 | 3.465 | 138.60 |
| 4 | Redemption value | 1,000 | 0.792 | 792.00 |
| | Value as straight bond | | | 930.6 |

Value of the convertible if shares are

| Year | | Amount | DCF @ 6% | PV |
|---|---|---|---|---|
| | | ₦ | | ₦ |
| 1 – 4 | Interest | 40 | 3.465 | 138.60 |
| 4 | Conversion value [25 x ₦55.90] | 1,397.5 | 0.792 | 1,106.80 |
| | | | | 1,245.40 |

The convertibles should have a current price of about ₦1,245.40.

(Note: In this example, by comparing the cash flows of the convertible as a straight bond and the convertible if the bonds are converted into shares, it should be obvious which has the higher present value. In this example, it should therefore be unnecessary to calculate the PV of the convertible as a straight bond.)

## 18.7 Efficient market hypothesis (EMH)

### 18.7.1 The efficiency of capital markets and fair prices

Investors in securities such as shares and convertible bonds want to be confident that the price they pay for their securities is a fair price. In order for market prices to be fair, it is important that the stock market should be able to process the relevant available information about companies and that investors should have immediate access to this information and act on it when making decisions about buying and selling shares.

The efficient markets hypothesis provides a rational explanation of how share prices change in organised stock markets. The hypothesis is based on the assumption that share prices change in a logical and consistent way, in response to new information that becomes available to investors. The speed with which share prices change depends on how quickly new information reaches investors, and this varies with the efficiency of the market.

### 18.7.2 The nature of capital market efficiency

a. There are four types of capital market efficiency:

b. **Operational efficiency** - A capital market is efficient operationally when transaction costs for buying and selling shares are low, and do not discourage investors from taking decisions to buy or sell.

c. **Informational efficiency** - A capital market is efficient 'informationally' when available information about companies is processed and made available to investors.

d. **Pricing efficiency** - A market has pricing efficiency when investors react quickly to new information that is made available in the market, so that current share prices are a fair reflection of all this information. For pricing efficiency to exist, a capital market must also be operationally and informationally efficient.

e. **Allocational efficiency** - When there is allocational efficiency in a capital market, available investment funds are allocated to their most productive use. Allocational efficiency arises from pricing efficiency.

Research into stock market efficiency focuses on pricing efficiency.

Efficiency therefore refers to the speed with which information is made available to the market, and the response of market prices to this information. In an efficient market, all investors are reasonably well informed at the same time about new developments that might affect market prices, so that some investors with 'insider knowledge' cannot exploit their knowledge to make profits at the expense of other investors.

If all relevant information is made available to all investors at the same time, all investors are able to make decisions at the same time about buying or selling investment, and about whether current prices are too high or too low.

Although the concept of market efficiency applies to all financial markets, it is probably most easily understood in the context of equity shares and the equity markets.

### 18.7.3 The purpose of the efficient market hypothesis (EMH)

The efficient market hypothesis (EMH) is a theory of market efficiency, based on research into share price behaviour in stock markets. The purpose of this research is to establish the extent to which capital markets show pricing efficiency.

According to this theory there are three possible levels or 'forms' of market efficiency:

a. Weak form efficiency
b. Semi-strong form efficiency, and
c. Strong form efficiency.

Each financial market can be categorised as being weak form, semi-strong form or strong form efficient.

In equities markets, the way in which share prices move in response to available information varies according to the efficiency of the market.

### 18.7.4 Weak form efficiency

The efficient markets hypothesis states that when a market has weak form efficiency, share prices respond to the publication of historical information, such as the previous year's financial statements.

When the market displays a weak form, it also means that the current share price embodies all the historical information that is known about the company and its shares, including information about share price movements in the past. Until the next publication of more historical information about the company, there is no other information about the company that will affect the share price in any obvious way.

The weak form suggests that the current price reflects all past prices and that past prices and upward or downward trends in the share price cannot be used to predict whether the price will go up or down in the future. Share prices do rise and fall, with supply and demand in the market, but the next price movement is equally likely to be up as down.

### 18.7.5 Random walk theory (versus Chartism)

A weak form of stock market efficiency is consistent with the random walk theory. This is the theory that share prices move up and down randomly over time, in response to the arrival of favourable or unfavourable information on the market.

Random walk theory is opposed to the view that future share price movements can be predicted from patterns of share price movements in the past, since patterns repeat themselves, and historical trends can be used to predict future trends. Some stock market analysts believe that they can predict future movements in share prices from recognisable patterns of share price movement. These analysts are sometimes called chartists, because recognisable patterns of share price movements can be illustrated by graphs or charts of share prices over a period of time. Chartism does not have a rational justification.

### 18.7.6 Semi-strong form efficiency

When a market has semi-strong form efficiency, current share prices reflect all publicly-available information about the company and its prospects, in addition to historical information. For example, share prices might respond to a new announcement by a company about its trading prospects for the remainder of the year. Similarly, the share price might also respond to an announcement that the company is seeking to make a new acquisition, or a major new investment.

If a market displays semi-strong form efficiency, share prices should move when new information becomes available to the public, but not before. For example, if a company is planning a major acquisition, the share price should not be affected by unconfirmed rumours in the market. However, the share price will react to the official announcement of a takeover bid by a company.

It also means that individuals who have access to information that has not yet been made public ('inside information') will be able to buy or sell the shares in advance of the information becoming public, and make a large personal profit. This is because the inside information will indicate whether the share price is likely to go up or down, and the individual can buy or sell accordingly.

Using inside information to make a personal profit from trading in shares is called insider dealing, which is illegal in countries with well-established stock markets.

### 18.7.7 Strong form efficiency

When a market has strong form efficiency, current share prices reflect all relevant information about the company as soon as it comes into existence, even if it has not been made publicly-available. In other words, the share price reflects all inside information as well as publicly-available information. The market is so efficient that all information is immediately transmitted throughout the market instantly, and all investors have access to this same information.

If the stock market has strong form efficiency, it is impossible for individuals to profit from insider trading, because there is no inside knowledge that the market has not already found out about.

In practice, research suggests that most markets have weak form efficiency, but some well-developed markets such as the New York Stock Exchange and London Stock Exchange are semi-strong form efficient.

**Example: Efficient markets hypothesis**

A company decides to undertake a major capital investment. The investment will be in a five-year project, and over the course of the five years, the company's directors believe that the net profits will add ₦125 million to the value of the company's shares.

The company made the decision to invest on 1st October Year 1, and the first year of profits from the investment will be Year 2. It announces the investment and the expected benefits to the stock market on 1st December. It is assumed that the stock market investors believe the company's estimate that the project will add ₦125 million to share values.

Strong form efficiency

If the stock market has strong form efficiency, the company's share price should go up on 1st October, as soon as the decision to invest is made. The total increase in share value should be ₦125 million.

Semi-strong form efficiency

If the stock market has semi-strong form efficiency, the share price should go up on 1st December, when the investment and its expected benefits are announced to the market and so become public information. (Between 1st October and 1st December, the information is 'inside information').

Weak form efficiency

If the stock market displays weak form efficiency, the share price will not be affected by the announcement on 1st December Year 1. The share price will eventually respond, after each of the next five years, when the actual historical profits of the company, including the profits from the new investment, are announced.

### 18.7.8 Implications of strong capital market efficiency

There are several theoretical implications of market efficiency. If a capital market has strong efficiency:

a. Share prices will be fair at all times and reflect all information about a company. This means that there is no 'good time' or 'bad time' to try issuing new shares or bonds.
b. Companies will gain no benefit from trying to manipulate their financial results and present their performance and financial position in a favourable light. In a market with strong-form efficiency, investors will see through the pretence and will understand the true financial position of the company.
c. For investors there will never be any 'bargains' in the stock market, where share prices are under-valued. Similarly there will be no over-priced shares that clever investors will sell before a share price fall.
d. If the capital market has strong form efficiency, if a company invests in any new capital project with a positive net present value, the share price should respond by going up to reflect the increase in the value of the company represented by the project NPV.

### 18.7.9 Factors that may have an impact on the market value of shares

In practice, research suggests that most markets have either weak form or semi-strong form efficiency. Factors which may impact on the efficiency of the market include:

a. The marketability and liquidity of shares. The greater the volume of shares traded the more opportunity there is to reflect new information in the share price.

b. Availability of information. Not all information can be available to all investors at the same time. Shares which are traded more by professional dealers are more likely to reflect full information as they can afford to pay for better monitoring systems and may have better access to early information.

c. Pricing anomalies. Share prices may be affected by investor behaviour at the end of the tax year.

## 18.8 Chapter review

At the end of this chapter, ensure that you can:

a. estimate the market value of a business using dividend yield;
b. estimate the market value of a business using price earnings ratio;
c. estimate the market value of a business using asset based valuations;
d. estimate the market value of a business using the dividend valuation model;
e. estimate the market value of debt and preference shares; and
f. explain the efficient market hypothesis.

**Skills Level**
**Financial Management**

CHAPTER 19

# RISK MANAGEMENT

**Contents**

# 19 Risk Management

## 19.0 Learning objective

This chapter discusses risk management.

## 19.1 Learning outcomes

**At the end of this chapter, readers should be able to:**

a. describe the different types of foreign exchange risk;
b. describe and apply purchasing power parity;
c. describe and apply interest rate power parity;
d. explain spot rates and what causes them to move;
e. adjust a spot rate to arrive at a forward rate;
f. explain and evaluate forward exchange contracts; and
g. explain and evaluate forward money market hedges.

## 19.2 Foreign exchange rate

### 19.2.1 The need for foreign exchange

Many companies enter into foreign exchange transactions (transactions in a foreign currency). The need for foreign exchange arises from international trade and international investment.

a. A company buying goods from another country might be required to pay in a foreign currency, such as the domestic currency of the supplier. It must therefore obtain the foreign currency to make the payment.
b. A company selling goods abroad might price the goods in the buyer's domestic currency, or in another currency such as US dollars. When the customer pays in the foreign currency, the company might sell the currency received in exchange for its own domestic currency
c. A company investing abroad might need to obtain foreign currency to acquire or to make the investment.

If a company in Australia wants to buy goods from a supplier in Germany, and the purchase price is in euros, the Australian company has to buy euros from its bank in order to make the payment to the supplier.

Similarly, if a company in Nigeria sells goods to a customer in the UK, and the price is paid in US dollars, the company will probably sell the dollars it has received to its bank, in exchange for naira. (Alternatively, the company could keep the dollars in a US dollar bank account, if it has one). The company in the UK would also need to buy dollars from a bank in order to pay its Nigerian supplier.

Many foreign currencies can be bought and sold freely in the foreign exchange markets (FX markets), which are operated world-wide by banks. On the other hand, some currencies do not have a liquid market, and foreign companies might be reluctant to accept payment in those currencies.

### 19.2.1 Spot rates

In the FX markets, banks trade currencies both spot and forward. A spot transaction is a transaction for the sale of one currency in exchange for another, for 'immediate' settlement. In practice, immediate' settlement usually means after two working days, so that if a company makes a spot transaction with a bank on a Monday, the actual exchange of currencies will happen two working days later on Wednesday. However, for the purpose of the examination, you can treat spot transactions as transactions for immediate settlement.

Currency can also be bought and sold at a pre-agreed future date at a pre- agreed rate. Such a rate is called a forward rate. Forward rate transactions are a useful means of reducing risk. Forward rates are explained in more detail in a later section of this chapter.

### 19.2.2 Quoting exchange rates

The exchange rate is the price of one currency in terms of another, that is, the number of units of one currency that could be bought with one unit of another currency. Please note that 'price' refers to the price of the foreign currency that is being sold.

There are two methods of quoting exchange rates. The method used varies from country to country and, in some countries from currency to currency. The two methods are direct quotes and indirect quotes.

### 19.2.3 Direct quotes

This is the number of units of the domestic currency that will be exchanged for one unit of a foreign currency.

An example of a direct quote is between naira and GBP, ₦250 can be exchanged for £1, usually expressed as ₦250/£1.

This ₦250 per £1 is a direct quote to a GBP.

Nigeria's foreign exchange system uses this method.

### 19.2.4 Indirect quotes

This is the number of units of foreign currency that will be traded for 1 unit of the domestic currency. For example, the indirect quote for ₦250/£1 would be £0.004 per ₦1. [1/250 = 0.004]

This means that £0.004 will exchange for ₦1. [£0.004 per ₦1]

This is an example of indirect quote and is also known as a reverse quote.

indirect quote = 1 / direct quote

**Comment**

Note that a direct quote of one currency is the indirect quote of another.

This is a useful thing to know as you will see later when forward rates are explained.

**Changing from direct quotes to indirect quotes and vice versa**

It is easy to change a direct quote to an indirect by taking its reciprocal.

**Example: Direct to indirect**

| Direct quote (in Nigeria) | Indirect quote (in Nigeria) |
|---|---|
| ₦260/£1 | Reciprocal is £1/260=0.000385 |
| ₦260 can be exchanged for £1 | ₦1 can be exchanged for £0.000385 |

This is only mentioned for completeness. It would be very unlikely that a Nigerian company would do this as quotes in Nigeria are direct.

### 19.2.4 Strong and weak rates

It is important to understand whether a currency is growing stronger or weaker against another.

As one currency strengthens then the other weakens. For example, if the naira is getting stronger against the dollar the dollar is weakening against the naira.

**Example: Strong and weak rates (direct quote)**

The naira/dollar exchange rate changes from ₦150/$1 to ₦160/$1.

In this case the naira is weakening against the dollar. It did take ₦150 to buy a dollar but now it takes ₦160.

Alternatively, this could be viewed as the dollar strengthening. Previously $1 could only buy ₦150 but now it can buy ₦160.

You need to be careful when deciding if the currency is weakening or strengthening. You may face a question involving currencies other than the naira.

**Example: Strong and weak rates (indirect quote)**

The GBP/dollar exchange rate changes from £1/$1.50 to £1/$1.60.

In this case the pound is strengthening against the dollar. Previously, £1 bought $1.50 but now it buys $1.60.

Alternatively, this could be viewed as the dollar weakening. Previously $1.50 could only buy £1 but now it takes $1.60.

### 19.2.5 Bid and offer prices

The above explanations assume that there is a single rate available between two currencies whether a contract is for a sale or purchase of the foreign currency.

This is not true.

In practice, banks quote two rates: a bid rate and an offer rate.

a. The bid rate is the rate at which the bank will buy the foreign currency (this will be the weaker rate for that currency).
b. The offer rate is the rate at which the bank will sell the foreign currency (this is the stronger rate for the currency).

Most exchange rates are quoted to four decimal places.

It is easy to get confused about which exchange rate should be applied to a particular transaction. The basic rule to remember is that the bank will use the rate that is more favourable to itself and less favourable to the customer.

a. A bank sells foreign currency at the stronger rate.
b. A bank buys foreign currency at the weaker rate.

**Example: Bid and offer prices (direct quotes)**

A Nigerian company needs $10,000 to pay a US supplier.

The bank's current rates for naira/US dollar are ₦150 – ₦160.

The company needs to buy US dollars in exchange for naira, in order to pay the US supplier.

The bank sells the foreign currency at its stronger rate. This is ₦160.

It will sell US dollars to the company at ₦160 with the company, because this rate gives it more naira.

The cost of buying the dollars is therefore ₦16,000,000 ($10,000 x ₦160).

**Check**

If the company immediately sold the $10,000 back to the bank, the bank would pay ₦150/$1. Thus the company would receive 15,000,000 ($10,000 x ₦150), losing ₦1,000,000.

If you perform this check and the company makes a gain then you have used the wrong rates. The bank always gains.

**Example: Bid and offer prices**

A UK company needs $10,000 to pay a US supplier. The bank's current rates for sterling/US dollar (US$/£1) are 1.50 – 1.60.

The bank sells the foreign currency at its stronger rate. This is $1.5.

It will sell the US dollars to the company at $1.5 because this rate gives it more pounds.

The cost of buying the dollars is therefore £6,667 ($10,000/1.5).

**Check**

If the company immediately sold the $10,000 back to the bank, the bank would pay only £6,250 ($10,000/1.6). Thus, the company would lose £417 (£6,667 -- £6,250).

## 19.3 Foreign exchange risk

### 19.3.1 Exchange rates and volatility

Banks quote exchange rates at which they are willing to buy and sell currencies in the FX markets.

Exchange rates are quoted as a number of units of one currency (the variable currency) in exchange for one unit of the other currency (the base currency). As described earlier, the quote might be a direct quote (as used in Nigeria and most other countries) or as an indirect quote (as used in the UK).

Exchange rates can be very volatile. This means that exchange rates can move up or down by large amounts, within a fairly short period of time.

For example, since the euro was created in 1999, when its value was about €1 = $1.20, the exchange rate has ranged between about €1 = $0.75 to about €1 = $1.35.

Exchange rate volatility creates foreign exchange risk for anyone involved in buying, selling, borrowing or investing foreign currency.

Foreign currency risk can be classified into three types. These are:

a. Translation risk;
b. Economic risk; and
c. Transaction risk

### 19.3.2 Translation risk

Translation risk arises in international companies with foreign subsidiaries. Income statements and statements of financial position (balance sheets) will be denominated in the local currency of the subsidiary and, on consolidation, will be translated into the currency of the holding company. On translation of financial statements from one currency to another, losses or gains arise due to exchange rate movements.

Translation risk is therefore the risk of losses (or gains) arising on the translation of the financial statements of a foreign subsidiary into the currency of the parent company, for the purpose of preparing consolidated accounts.

### 19.3.3 Economic risk

Economic risk refers to the long-term movement in exchange rates caused by changes in the competitiveness of a country.

For example, over the long term the euro might increase in value against the US dollar. If this happens, goods produced and paid for in US dollars will become cheaper relative to goods produced and paid for in euros. US companies will therefore become more competitive in terms of price, relative to companies in the Eurozone, because of the exchange rate movement.

Economic risk, in the context of foreign exchange, is therefore the risk that a company might choose to locate its operations in a country whose currency gains in value over time against the currencies of its competitors in world markets. The consequence of an increase in the value of the domestic currency is a loss of competitiveness.

### 19.3.4 Currency transaction exposures

Transaction risk is the foreign exchange risk that arises in transactions between two parties:

a. when the normal transaction currency of each party is different; and
b. when the transaction involves a future receipt/payment between the two parties.

Transaction risk is the risk that, for any future transaction in a foreign currency, the amount received or paid in domestic currency might be different from the amount originally expected because of movements in the exchange rate between the date of the initial transaction and the date of settlement (payment/receipt).

For example, transaction risk will arise when a UK company buys goods from a Chinese supplier when the price is in US dollars, and payment is required three months after the date of the purchase.

a. For the UK buyer, there is a risk that the US dollar will increase in value against the British pound in the three months before settlement is required. If the dollar strengthens in value, the cost in pounds of obtaining the dollars to pay the supplier will be higher than originally expected.
b. For the Chinese supplier, there is a risk that the US dollar will fall in value against the Chinese Renminbi in the three months before settlement. If the dollar falls in value, the dollar receipts will earn less in Renminbi that originally expected when the sale was made.

Volatile exchange rates increase transaction risk. Transaction risk can disrupt international trade, and make businesses more reluctant to trade internationally, because losses arising from adverse movements in an exchange rate reduce the profit on sales transactions, or increase costs of purchases. The transaction loss might even offset the amount of normal trading profit.

**Example: Transaction risk**

1 January

A Nigerian company sells sugar to a US buyer for US$100,000.

The exchange rate is ₦150/$1. Therefore, the Nigerian company expects to receive ₦15,000,000.

The US buyer is allowed three months' credit. 31 March

The Nigerian company receives $100,000 from the US buyer. The exchange rate is ₦140/$1.

Therefore, the Nigerian company receives ₦14,000,000.

This is ₦1,000,000 less than expected when the transaction was entered into. (The company has made an exchange loss of ₦1,000,000).

**This example illustrates several points about transaction risk.**

a. Currency risk arises from exposure to the consequences of a rise or fall in an exchange rate. Here, the Nigerian company was exposed to the risk of a fall in the value of the US dollar.
b. Transaction risk arises only when the settlement of the transaction (and receipt/payment) will occur at a future date.
c. Exchange difference only occurs in the above circumstances when there is a movement in the exchange rate (which almost always happens to a greater or lesser degree).
d. An exposure lasts for a period of time. Here, the exposure lasts from when the goods were sold on credit until the time that the customer eventually pays.

Currency risk is a two-way risk, and exposure to risk can lead to either losses or gains from movements in an exchange rate. In the above example, the exchange rate could have moved the other way.

**Example: Transaction risk**

1 January

A Nigerian company sells sugar to a US buyer for US$100,000.

The exchange rate is ₦150/$1. Therefore, the Nigerian company expects to receive ₦15,000,000.

The US buyer is allowed three months' credit. 31 March

The Nigerian company receives $100,000 from the US buyer. The exchange rate is ₦170/$1.

Therefore, the Nigerian company receives ₦17,000,000.

This is ₦2,000,000 more than expected when the transaction was entered into. (The company has made an exchange gain of ₦2,000,000).

Thus the exchange rate can have a big impact on the final outcome of the transaction. The Nigerian company above was presumably happy to sell its sugar for $100,000 or ₦15,000,000. However, the value of the transaction could fluctuate a great deal.

**Example: Transaction risk impact on final receipt based on the last question**

| | Transaction 1 | Transaction 2 |
|---|---|---|
| | ₦ | ₦ |
| Original sale value in naira | 15,000,000 | 15,000,000 |
| Exchange difference on settlement | | |
| Rate = ₦140/$1.: Exchange loss | [1,000,000] | |
| Rate = ₦170/$1.: Exchange loss | | 2,000,000 |
| **Final receipt** | **14,000,000** | **17,000,000** |

Trading profits for companies engaged in foreign trade can be significantly affected by currency movements. When exchange rates are volatile and unpredictable, the gain or loss on currency exchange could possibly be even bigger than the expected gross profit from the transaction.

**Example: Transaction risk impact on final margin based on the last question**

Suppose that the Nigerian company operated on a 10% margin.

| | Transaction 1 | Transaction 2 |
|---|---|---|
| | ₦ | ₦ |
| Original sale value in naira | 15,000,000 | 15,000,000 |
| 10% margin | 1,500,000 | 1,500,000 |
| Exchange difference on settlement | | |
| Rate = ₦140/$1.: Exchange loss | [1,000,000] | |
| Rate = ₦170/$1.: Exchange loss | | 2,000,000 |
| **Final profit** | **500,000** | **3,500,000** |

As illustrated, risk is two way. Transaction risk means that a company could be worse off (downside risk) or better off (upside risk) depending on the way the exchange rates move.

Companies often use methods to remove or reduce the volatility (risk). This is described as hedging. There are a variety of hedging techniques that can be used. These are very important and will be explained later.

Most hedging techniques result in the company missing out on exchange gains in order to protect themselves from exchange losses. Some people find this surprising at first but remember, a trading company exists to produce its goods and sell them at what it believes to be an acceptable margin. Hedging techniques protect the margin by locking out volatility.

### 19.3.5 Summary: currency risks

Translation risk does not affect the cash flows of a group of companies. It is a risk of non-cash ('paper') losses or gains in preparing consolidated financial statements.

Transaction risk does affect cash flows, because movements in exchange rates affect the amount of cash received in domestic currency, or the amount paid in domestic currency, for at least one of the two parties to the transaction.

Economic risk is a strategic risk, affecting the competitiveness of a business entity over the longer term

### 19.3.6 Government measures to stabilise exchange rates

A government may try to stabilise the exchange rate for its currency. The purpose of having an exchange rate policy would be to create stable economic conditions for international trade. A stable exchange rate, with relatively little exchange rate volatility, should help to promote growth in the country's economy.

In the past, some governments were able to manage the exchange rate by dealing on the foreign exchange markets, using their official reserves of foreign exchange to either buy or sell domestic currency. By creating demand or supply for its currency in the markets, the government would try to move the exchange rate up or down against major currencies such as the dollar. However, the foreign exchange markets are now so large that very few countries are in a position to manage the exchange rate effectively in this way. (Countries such as China may be an exception.)

The most effective way for a government to manage its exchange rate today, if it wished to do so, would be to increase or reduce domestic interest rates on its currency. Raising or reducing interest rates should affect the demand for the currency from investors. For example, raising the interest rate should attract more investment into the currency, and by increasing demand for the currency, the foreign exchange value of the currency should increase.

There are several exchange rate policies that a government might adopt. These include:

a. free floating ('benign neglect' of the exchange rate);
b. managed floating of the currency;
c. a fixed exchange rate policy, with the exchange rate fixed against a major currency or a basket of world currencies; and
d. a fixed exchange rate backed by a currency board system.

**Free floating**

With a policy of free floating, the government does not have a policy about the exchange rate. Instead, it allows the currency to find its own market value in the foreign exchange markets.

**Managed floating**

A policy of managed floating is to allow the currency to find its own level in the foreign exchange markets, but within target limits. (Targets may be set for the maximum and minimum exchange rate against, say, the US dollar or the euro.)

If the exchange rate threatens to go through the upper or lower target limit, the government will act to try to keep it within the policy limits, probably by raising or lowering interest rates.

Nigeria operates the managed float with a system known as the Dutch Auction System (DAS). The DAS is a public offering auction structure in which the price of the offering is set after taking in all bids and determining the highest price at which the total offering can be sold. The Wholesale DAS was introduced in Nigeria on February 20, 2006. It is a subset of the DAS whereby the CBN receives bids from Authorized Dealers for purchase of forex on behalf of Bureau De Change (BDCs) and other end users of forex (like companies and importers) during an auction.

In 2013, the WDAS was replaced with the Retail DAS which is a direct sale of forex by the CBN through the banks to the end users of forex. Unlike the WDAS, the RDAS is based solely on actual demand of forex by the end users. For example, if an Authorized Dealer has received only $1million of confirmed dollar requests from its BDC's and other end users it can only then bid for that $1million from the CBN auction unlike the WDAS where it can bid for more.

The CBN offers foreign currency twice a week to keep the naira within a range above or below the official exchange rate of say ₦306 per dollar.

**Fixed exchange rate policy**

A government might try to fix its exchange rate against:

a. Another currency, such as the US dollar, or
b. A basket of other world currencies, for example the US dollar, euro and yen.

The 'fixed rate' policy will normally permit some limited variations in the exchange rate.

For example, countries that wish to enter the eurozone in the European Community are expected to link their currency to the value of the euro for a period of time before they can be considered for 'eurozone membership'.

There are problems with fixing an exchange rate against another currency.

a. Economic conditions in the two countries must remain similar; otherwise there will be too much pressure on the exchange rate to change. For example, the rate of inflation in both countries must be similar over a long period of time.
b. The country's economy will be affected by any crisis in the economy of the other country, or by an increase in the volatility of the other country's currency.

**Fixed exchange rate backed by a currency Board**

A currency board system is another fixed exchange rate system. The government fixes its currency against the value of another currency (a 'hard' currency, such as the US dollar). Any new issues of domestic currency have to be backed by an amount of the 'hard currency' in the country's official reserves.

For example, a country with a currency board system might fix the exchange rate at 4 local currency units (LCUs) to the US dollar. If the country wants to increase its money supply (which will be necessary for economic growth), it will need to hold reserves of one US dollar for every increase of 4 LCUs in the money supply.

This 'backing' of a hard currency should help to stabilise the exchange rate for the country's own currency, which in turn should help the country to achieve economic stability.

A problem with a currency board system is that on occasions:

a. It might result in a shortage of domestic money supply, because of an insufficiency of the hard currency; or
b. It might push up domestic interest rates (in order to attract more hard currency).

If the problem becomes too serious, the currency board system may break down. A currency board system has worked well for Hong Kong (whose dollar has been linked to the US dollar), but has not been so successful in other cases (such as Argentina).

## 19.4 Causes of exchange rate fluctuations

There are several approaches to explaining the causes of exchange rate fluctuations:

a. supply and demand;
b. purchasing power parity theory; and
c. interest rate parity theory.

**Supply and demand**

Exchange rates are determined by supply and demand in the foreign exchange markets.

For example, the value of the British pound against other currencies is determined by supply and demand for the pound.

a. The demand for pounds comes from buyers of British exports, who are required to pay in pounds. Pounds are also bought by British exporters who receive payments in foreign currencies and want to exchange their currency receipts into pounds.
b. Demand for pounds is also created by flows of investment capital and savings. Foreign investors wishing to purchase investments in the UK must buy pounds to pay for their investments. UK investors selling their foreign investments might exchange their sale receipts (in a foreign currency) into pounds.

The supply of pounds comes from individuals and organisations who want to sell pounds in exchange for a foreign currency.

a. UK buyers of foreign goods who must pay in a foreign currency will sell pounds and buy the currency they need to make the payment.
b. Foreign investors who sell their UK investments and receive payment in sterling will want to sell the pounds in exchange for another currency. UK investors buying investments abroad must buy currency (and sell pounds) to pay for the investments.

A balance of trade deficit might affect the exchange rate. This is the difference between the value of a country's exports of goods and services and the cost of its imports. As a general rule if a country has a large balance of trade deficit, its currency is likely to depreciate in value because supply of its currency from international trading operations (e.g. from importers who need to pay in foreign currency) exceeds the demand (e.g. from foreign buyers of exported goods).

Supply and demand for currencies explain the continual fluctuations in currency values.

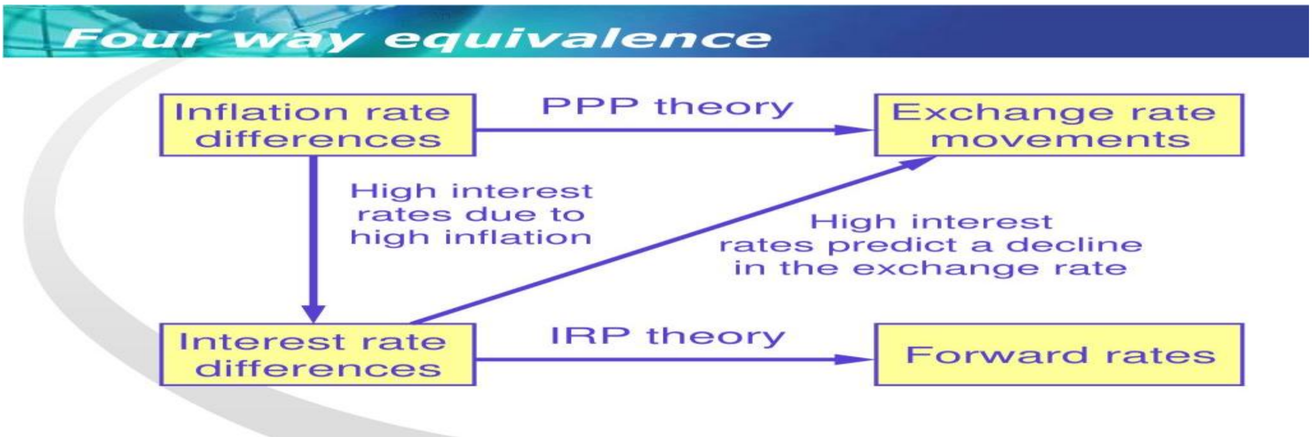
However, there are other theories that explain the underlying reasons for exchange rate movements, especially over the longer term, and an advantage of these other theories – purchasing power parity theory and interest rate parity theory – is that they can be used to make estimates of what exchange rates will be in the future.

## 19.5 Exchange rate relationships

### 19.5.1 Four-way equivalence

The term 'four-way equivalence refers to four concepts that together provide a consistent explanation of changes in foreign exchange rates, and a method of predicting future 'spot' exchange rates. These four concepts are:

a. purchasing power parity theory;
b. interest rate parity theory;
   the Fisher effect (which together with PPP theory makes the international Fisher effect); and
c. expectations theory.




The above relationships should exist when the foreign exchange market is in equilibrium.

The model gives insight into what would happen if a variable in the equilibrium position were to change.

In circumstances of capital market perfection the model would readjust instantly if any input variable were to change. For example, if an interest rate were increased in a country.

### 19.5.2 Purchasing power parity theory

Purchasing power parity theory (PPP theory) attempts to explain changes in an exchange rate due to the relative rate of price inflation in each country. The theory is based on the assumption that the exchange rate will adjust to enable the same amount of goods to be purchased in any country with a given amount of money.

PPP theory therefore predicts that if inflation is higher in one country than in another, its exchange rate value will fall so as to restore purchasing power parity.

In reality, an exchange rate does not change in the way predicted by PPP theory because other factors apart from price inflation affect the rate, especially in the short term. It might be argued, however, that PPP theory provides a useful guide to the likely direction and extent of exchange rate movements over a longer period of time.

**Example: Purchasing power parity**

At the start of a year a basket of goods cost ₦25,000 in Nigeria. The same basket of goods cost £100 in the UK.

This implies an exchange rate of ₦250/£1.

Annual inflation rates are expected to be 8% in Nigeria and 5% in the UK. Analysis

At the end of the year the basket of goods would cost ₦27,000 (25,000 x 1.08) in Nigeria and £105 [100 x 1.05] in the UK, but the same amount of goods could be purchased with equivalent amounts of each currency.

This means that the exchange rate must be ₦27,000 = £105

Therefore, the exchange rate will be ₦27,000/105 = £1 = ₦257.14/£1

**Forecasting exchange rates with purchasing power parity theory**

Purchasing power parity (PPP) theory states that the spot rates between two currencies will change over time in relation to the rate of inflation in the countries from which the currencies originate.

The following equations describe this relationship.

**Formulae for Purchasing Power Parity**

**If quotes are direct**

$S_t = S_0 \times 1 + I_d / 1 + I_f$

**If quotes are indirect**

$S_t = S_0 \times 1 + I_f / 1 + I_d$

Where $S_t$ = estimated spot rate at end of period.

$S_0$ = current spot rate

$I_f$ = period inflation rate in foreign currency

$I_d$ = period inflation rate in domestic currency

This might look a little difficult to remember but the inflation rate in the numerator (the top of the fraction) always relates to $S_t$.

**Example: Purchasing Power Parity**

Nigerian view: The current exchange rate for the naira and GBP is ₦250/£1. Forecast annual inflation in Nigeria is 8% and in the UK is 5%.

Calculate the estimated spot rate at the end of the period

a. Using Direct quote
b. Using indirect quote

**Solution**

**Using direct quote**

$I_d$ is inflation rate in domestic [Nigeria] of 8% and $I_f$ is inflation rate in foreign [UK] of 5%.

$S_t = S_0 \times 1 + I_d / 1 + I_f$

$S_t = 250 \times \{1.08 / 1.05\} =$ **₦257.14**

**Using indirect quote**

The indirect quote is 1/250 = 0.004, that is £0.004 for ₦1

$I_d$ is inflation rate in domestic [Nigeria] of 8% and $I_f$ is inflation rate in foreign [UK] of 5%

$S_t = S_0 \times 1 + I_f / 1 + I_d$

$S_t = 0.004 \times \{1.05 / 1.08\} =$ £0.003889

To check your result 1/0.003889 = **₦257.14**

**Example: Purchasing power parity (direct quote)**

The current exchange rate for the naira and the US dollar is ₦150 = $1.

It is expected that the rate of inflation in Nigeria will be 3% per year for the next few years, and in the US the rate of inflation will be 5% per year.

Purchasing power parity theory predicts the following movements in the exchange rate

| Year end | Spot rate at start | Adjustment factor | Predicted exchange rate |
|---|---|---|---|
| 1 | 150 | X $1.03^1 / 1.05^1$ | 147.13 |
| 2 | 150 | X $1.03^2 / 1.05^2$ | 144.34 |
| 3 | 150 | X $1.03^3 / 1.05^3$ | 141.59 |

An alternative approach would be to construct an annual adjustment factor and apply it periodically to each new spot rate.

**Example: Purchasing power parity (direct quote)**

**Facts as above:**

Purchasing power parity theory would predict that the following movements in the exchange rate:

| Year end | Spot rate at start | Adjustment factor | Predicted exchange rate |
|---|---|---|---|
| 1 | 150 | X 1.03 / 1.05 | 147.13 |
| 2 | 147.13 | X 1.03 / 1.05 | 144.34 |
| 3 | 144.34 | X 1.03 / 1.05 | 141.59 |

**Example: Purchasing power parity (indirect quote)**

The current exchange rate for the British pound and the US dollar is £1 = $2.

It is expected that the rate of inflation in the UK will be 3% per year for the next few years, and in the US the rate of inflation will be 2% per year.

Purchasing power parity theory would predict that the following movements in the exchange rate. Recall that indirect quote shows the number of units of foreign currency required for one unit of a local currency.

| Year end | Spot rate at start | Adjustment factor | Predicted exchange rate |
|---|---|---|---|
| 1 | 2.000 | X 1.02 / 1.03 | 1.9806 |
| 2 | 1.9806 | X 1.02 / 1.03 | 1.9614 |
| 3 | 1.9614 | X 1.02 / 1.03 | 1.9423 |

### 19.5.3 Interest rate parity theory

Interest rate parity theory is based on the assumption that exchange rates will adjust to eliminate differences in interest rates between countries.

The theory predicts that the currency of a country with a higher interest rate will depreciate in value over time against the currency of a country with a lower interest rate.

Like PPP theory, interest rate parity theory cannot explain all exchange rate movements, especially in the short term, but it might provide a useful guide to changes in the exchange rate over a longer period.

### 19.5.4 Forecasting exchange rates with interest rate parity theory

Interest rate parity theory states that changes in an exchange rate are caused by differences in interest rates between two currencies. If this is true, it should be possible to predict future spot exchange rates from differences in expected future interest rates between the currencies.

**Example: Interest rate parity**

The current exchange rate between the naira and the GBP is ₦250/£1. (Therefore ₦25,000 = £100).

Annual interest rates are forecast to be 8% in Nigeria and 5% in the UK. Analysis

An investor with 25,000 in Nigeria could also invest money for one year at 8% to receive interest and principal of 27,000 at the end of that time.

An investor with £100 in the UK could invest the money for one year to obtain principal plus interest of £105 after one year.

According to interest rate parity theory, the exchange rate after one year will be ₦27,000 = £105.

Therefore, the exchange rate will be ₦27,000/105 = £1 ₦257.14/£1

The theory predicts that the currency of a country with a higher interest rate will depreciate in value over time against the currency of a country with a lower interest rate.

**Formulae for Interest Rate Parity [IRP]**

**If quotes are direct**

$F = S_0 \text{ x } 1 + I_d / 1 + I_f$

**If quotes are indirect**

$F = S_0 \text{ x } 1 + I_f / 1 + I_d$

Where F = forward rate.

$S_0$ = current spot rate

$I_f$ = period interest rate in foreign currency

$I_d$ = period interest rate in domestic currency

This might look a little difficult to remember but the interest rate in the numerator (the top of the fraction) always relates to F.

This formula is similar to the PPP theory formula, except that the forecast annual interest rate is used instead of the annual forecast rate of inflation.

Once again the interest rate in the numerator always relates to S.

The equation constructs a forward rate (explained in more detail later) rather than a future spot rate. However, if the markets are in equilibrium the forward rate would be the same as the expected future spot rate.

In practice the forward rate is a poor predictor of actual spot rates in the future

**Example: Interest rate parity (direct quote)**

The current exchange rate for the South African Rand against the US dollar is 7.4000 Rand = $1.

The forecast annual interest rate for the Rand is 6% for the next 3 years and the forecast interest rate for the US dollar is 2%.

Calculate the forward rate.

**Solution**

**If quotes are direct**

$F = S_0$ x $1 + I_d / 1 + I_f$ [$I_d$ is 6% and $I_f$ is 2% based on direct quote]

Applying interest rate parity theory, we can predict the exchange rate at the end of the next three years as follows:

| Year end | Spot rate at start | Adjustment factor | Forward rate |
|---|---|---|---|
| 1 | 7.4000 | X 1.06 / 1.02 | 7.6901 |
| 2 | 7.6901 | X 1.06 / 1.02 | 7.9918 |
| 3 | 7.9918 | X 1.06 / 1.02 | 8.3052 |

**Example: Interest rate parity (indirect quote)**

The current exchange rate for British pound against the euro £1/€1.2115. The forecast annual interest rate for the British pound is 5%.

The forecast annual interest rate for the euro is 2.5%.

Calculate the forward rate.

**Solution**

**If quotes are indirect**

$F = S_0$ x $1 + I_f / 1 + I_d$ [$I_d$ is 5% and $I_f$ is 2.5% based on direct quote]

Applying interest rate parity theory, we can predict the exchange rate at the end of the next three years as follows:

| Year end | Spot rate at start | Adjustment factor | Forward rate |
|---|---|---|---|
| 1 | 1.2115 | X 1.025 / 1.05 | 1.1827 |
| 2 | 1.1827 | X 1.025 / 1.05 | 1.1601 |
| 3 | 1.1601 | X 1.025 / 1.05 | 1.1273 |

### 19.5.4 Other relationships

**Fisher effect**

The economist Irving Fisher gave his name to the so-called Fisher effect and international Fisher effect.

The Fisher effect is simply that the real rate of return on an investment is the nominal rate of return adjusted for the rate of inflation:

You have seen the equation in an earlier chapter used to link money cost of capital and real cost of capital.

**Formula: Fisher equation**

$1 + m = (1 + r)(1+i)$

Where:

m = money cost of capital (the nominal rate)

r = real cost of capital (the real rate)

I = inflation rate

**Example: Nominal rate to real rate**

The nominal rate of interest is 4% and inflation is 2.5% Therefore:

$(1 + m) = (1 + r) \times (1 + i)$

$(1 + 0.04) = (1 + r) \times (1 + 0.025)$ $(1 + r) = 1.04/1.025$

$r = 1.04/1.025 – 1 = 0.0146$ or 1.46%

Fisher argued that investors in all countries expect the same real rate of return, after allowing for inflation, and the difference in interest rates between two countries could be explained by differences in the rates of inflation in those countries. This is the so-called international Fisher effect.

**Expectations theory**

Expectations theory is the theory that all relevant information is reflected in the market rates of exchange. Therefore, the forward exchange rate between two currencies reflects market expectations about what the spot rate will be in the future.

**Example: Expectations theory**

The currency of Country X is the dollar and the currency of Country Y is the franc. The current spot exchange rate is $1 = 4.00 francs.

| | Country X | Country Y |
|---|---|---|
| Forecast nominal interest rate | 6% | 8.02% |
| Forecast inflation rate | 5% | 7% |

This information can be used with four-way equivalence to make the following predictions.

Purchasing power parity predicts that the spot rate in one year's time will be: 4.00 × (1.07/1.05) = 4.0762.

Interest rate parity predicts that the exchange rate in one year's time will be: 4.00 × (1.0802/1.06) = 4.0762.

The current one-year forward exchange rate is $1 = 4.0762 francs, and this is the expected spot rate in one year's time.

The real return on investment in Country X for the next year is: (1.06/1.05) – 1 = 0.95%.

The real return in investment in Country Y for the same period is: (1.0802/1.07) – 1 = 0.95%.

**19.5.5 Covered Interest Arbitrage**

It has been established that there is a close relationship between the interest rate of two countries and the exchange rate between the currencies of the two countries. Whenever the forward exchange rate does not align with the money market rates, investors will be able to make a risk-free gain by buying in one market and selling in the other in a process called arbitrage.

### Covered Interest Arbitrage

Covered interest arbitrage is a financial strategy that exploits interest rate differentials between two currencies while hedging against exchange rate risk using forward contracts.

### Key elements

a. Interest rate differential: Difference in interest rates between two currencies.
b. Forward contracts: Used to hedge against exchange rate risk.

### How it works

a. Borrow in a low-interest-rate currency at a fixed rate for a specified period.
b. Convert to a high-interest-rate currency.
c. Invest in the high-interest-rate currency. [deposit the funds is deposited for same period]
d. Use forward contracts to hedge against exchange rate risk. [The proceeds from the deposit/investment at the end of the investment period will be sold via the forward market for the specific period of the borrowing and investment].
e. The proceeds would be able to repay the borrowing plus interest and the profit is known as interest arbitrage profit.

### Goal

Risk-free profit: Earn a profit from interest rate differentials while minimising exchange rate risk.

When dealing with direct quote

a. Arbitrage opportunity does not exist if $1 + I_d = [1 + I_f] \times F/S_0$
b. Borrow the domestic currency if $[1 + I_d] < [1 + I_f] \times F/S_0$.
c. Borrow the foreign currency if $[1 + I_d] > [1 + I_f] \times F/S_0$.

Example on Interest Coverage Arbitrage

The spot rate of 1 Rand = ₦3.50 and the 1 year forward rate is 1 Rand = ₦3.36.

Money market rates

- Rand rate is 10% per annum
- Naira rate is 5% per annum

**Required:**

a. Are there arbitrage opportunities to be exploited?
b. If yes, compute the covered interest arbitrage profit, assuming a trader with ₦5,000,000.

**Solution**

Based on direct quote, ₦ is the domestic currency.

Using our test, $1 + I_d = [1 + I_f] \times F/S_0$

$1 + 0.05 = \{1 + 0.10] \ \times \ 3.36 / 3.50$

$1.05 \neq 1.056$

This implies that there are arbitrage opportunities to explore.

**B Part of the question**

Since 1.05 < 1.056, we borrow the domestic currency [Naira] taking the following steps:

a. Borrow ₦5,000,000 for 1 year at 5% p.a, which implies you have to pay back ₦5,250,000 {5,000,000 x 1.05} in 1 year's time.
b. Convert the ₦5,000,000 to Rand at the spot rate to get 5,000,000/3.50 = 1,428,571 Rands
c. Invest the 1,428,571 Rands at 10% for one year to get 1,571,429 Rands {1,428,571 x 1.10}
d. Sell the 1,571,429 Rands forward at 1 Rand = ₦3.36 which will yield ₦5,280,000 {5,000,000 x 3.36}
e. At the end of the year, collect the 1,571,429 Rands from your investment and use it to settle your obligation under the forward contract
f. Profit computation

| | ₦ |
|---|---|
| Proceeds of forward contract | 5,280,000 |
| Less repayment of the Rand loan and interest | 5,250,000 |
| Arbitrage profit | 30,000 |

Alternatively, the profit can be calculated as NP x $\{[1 + I_d] – \{[1 + I_f] \ F/S_0\}\}$

5,000,000 [1.05] – {1.10 x 3.36/3.50}

5,000,000 [1.05 – 1.056] = ₦30,000 [ignore the negative sign]

## 19.6 Forward fx contracts and forward rates

### 19.6.1 Forward rates

Banks trade in foreign currencies both for immediate delivery (either to or from the bank) at the spot rate or for future delivery (either to or from the bank) at a forward rate.

The forward rate is the rate at which a bank is willing to trade in foreign currency at a pre-agreed date.

Banks are able to quote forward exchange rates for currencies because of the money markets (short-term borrowing and lending markets). Forward exchange rates differ from spot rates because of the interest rate differences between the two currencies.

Forward rates are calculated by applying the interest rate differential to the spot rate using the interest rate parity equation. This was demonstrated earlier in this chapter.

A forward rate could be a stronger or weaker rate than the spot rate depending on whether the interest rate on the variable currency is higher or lower than the interest rate on the base currency.

a. When the forward rate is stronger than the spot rate the foreign currency is said to be trading at a premium to the spot rate.
b. When the forward rate is weaker than the spot rate the foreign currency is said to be trading at a discount to the spot rate.

Trading in foreign currency at the forward rate is through forward exchange contracts. These are a very powerful risk management tool as they allow companies to lock in future exchange rates.

For example, a Nigerian company can arrange a forward contract 'now' to sell a quantity of US dollars in exchange for naira in three months' time, at a rate of exchange that is agreed 'now'. This means that it knows exactly how many naira it will receive.

### 19.6.2 Forward contracts

A forward exchange contract is a contract entered into 'now' for settlement at an agreed future date (or at any time between two agreed future dates).

It is a contract between a customer and a bank for the purchase or sale of:

a. a specified amount of;
b. a specified foreign currency;
c. for delivery at a specified future date; and
d. at a specified rate.

The customer specifies the amount of foreign currency and the date and the bank specifies the rate at which it is willing to deal.

A bank will arrange a forward contract for settlement at any future date, but commonly-quoted forward rates are for settlement in one month, three months, six months and possibly one year.

Forward exchange transactions are available in all the major traded currencies of the world, although settlement dates of more than one year forward are very unusual in any currencies except the most heavily-traded currencies such as the dollar-euro.

### 19.6.3 Premiums and discounts

Forward rates are derived from current spot rates and interest rate differences between currencies, but it is common practice to quote forward rates as adjustments to the spot rate.

The adjustment might be:

a. a premium (designated pm) where the future rate is stronger than the spot rate; or
b. a discount (designated dis) where the future rate is weaker than the spot rate.

The nature of the adjustment to the spot rate to achieve the strengthening or weakening of the foreign currency depends on whether the quotes are direct or indirect.

| | **Forward rate at a premium** | **Forward rate at discount** |
|---|---|---|
| Direct quotes | Add premium | Deduct premium |
| Indirect quotes | Deduct a discount | Add discount |

**Example: Forward rate premiums and discounts (direct quote)**

The following examples show how the forward rate is calculated and then how it is presented as an adjustment to the spot rate.

The example shows the foreign currency trading at a discount and at a premium.

| | Foreign currency at a premium | Foreign currency at a discount |
|---|---|---|
| Spot rate | ₦150/$1 | ₦150/$1 |
| Nigerian interest rate | 10% | 5% |
| US interest rate | 5% | 10% |

Forward rate calculated as

| | | |
|---|---|---|
| F = S x {1 + $I_d$ / 1 + $I_f$} | 150 x [1.1 / 1.05] = | 150 x [1.05 / 1.1] = |
| | ₦157.14/$1 | ₦143.18/$1 |
| | ₦ | ₦ |
| Spot | 150.00 | 150.00 |
| Premium | 7.14 | |
| Discount | | (6.82) |
| Forward rate | 157.14 | 143.18 |

The next example shows the situation for a currency quoted indirectly and adds in further complications.

The first of these is that forward rates (shown as adjustment to spot) are quoted as spreads just like the spot rate. The correct rate to use depends on whether the foreign currency is being bought or sold.

The second complication is that the adjustments might be given in units which are a different order of magnitude for some quotes. For example, the adjustment to an indirect quote of dollars may be given in cents.

**Example:**

A UK company expects to receive US$75,000 in six months from a US customer and it wishes to hedge the exposure to currency risk by arranging a forward contract.

The following rates are available (US$/£1):

| | GBP/USD | | |
|---|---|---|---|
| Spot (£1=) | 1.7530 | - | 1.7540 |
| Six months forward | 240 | - | 231 pm |

The dollar is quoted forward at a premium. The premium is shown in 'points' of price, so that 240 – 231 means 0.0240 – 0.0231.

The bank will apply the rate that is more favourable to itself. (If you need to work out which rate is more favourable, use the spot rates to do this).

The company will be selling US dollars in exchange for pounds, and the higher rate will be used (the offer rate). For indirect quote, the premium should be deducted.

| | |
|---|---|
| Spot rate | 1.7540 |
| Forward points (deduct premium) | (0.0231) |
| Forward rate | 1.7309 |

The company can use a forward contract to fix its future income from the US dollars at £43,330.06 (75,000/1.7309).

### 19.6.4 Forward contracts and hedging exposure to FX risk

For companies, forward FX contracts can be used to hedge an exposure to currency risk (transaction risk). Currency risk will arise, for example, when a company expects to receive a quantity of a foreign currency in several months' time, which it will sell in exchange for its own domestic currency. If it plans to sell the foreign currency in a spot transaction, until it receives the currency, it is exposed to the risk that the exchange rate will move adversely and the currency will fall in value and be worth less than its current value.

For example, suppose that an Italian company expects to receive 5 million Japanese yen in three months' time, and the current exchange rate for euros against the yen (yen/€ 1) is 135.00. At this rate, the Italian company would be able to exchange the yen for €37,037 (5 million/135.0).

a. However, there is a risk that the yen will fall in value during the three months, during which the company has an FX risk exposure arising from its future yen income. If the yen fell in value and after three months the spot rate is 150.00, the yen income would be worth only €33,333.
b. On the other hand, if the yen strengthened in value, say to 120.00 spot after three months, the income would be worth €41,667.

Although foreign exchange rates can move favourably as well as adversely, companies engaged in international trade usually prefer to avoid exposure to currency risk. They can 'hedge' currency exposures by arranging forward contracts to buy or sell currency. By fixing the exchange rate 'now' for a future currency purchase or sale transaction, the uncertainty or risk in the exchange rate is eliminated.

### 19.6.5 Cross rates

The exchange rate for two currencies might be derived as a cross rate.

**Example: Cross rates (direct quote)**

The spot rate for the naira against the dollar is ₦150 = $1.

The spot rate for the US dollar against the Swiss franc is US$1 = SwFr1.2166. The spot rate for the naira against the Swiss franc is found as follows:

US$1 = SwFr 1.2166

₦150 = $1.

Therefore ₦150 = SwFr 1.2166

Therefore, the forward rate is ₦150/1.2166 = SwFr 1 = 123.29

**Example: Cross rates (indirect quote)**

The spot rate for the US dollar against the British pound is £1 = US$1.8610.

The spot rate for the US dollar against the Swiss franc is 1.2166 (US$1 = SwFr1.2166).

Calculate the spot rate of the GBP against the Swiss franc.

**Solution**

The spot rate of the GBP against the Swiss franc is found as follows: US$1 = SwFr 1.2166

£1 = 1.8610

Therefore £1 = 1.2166 × 1.8610 = **SwFr 2.2641**.

**Alternatively**

You can get the direct and indirect quotes for the exchange rates given and cross multiply to get the cross rate. To get pounds per swiss franc, you multiply the rate where the pounds is numerator and the swiss franc is denominator as shown below.

£/ US$ = 1.8610 Indirect quote US$/ £1 = 1 /1.8610

US$/ SwFr = 1.2166 Indirect quote SwFr / US$ = 1/1.2166

Therefore, the spot rate of the GBP against the Swiss franc is 1.8610 x 1.2166 =

**£ /SwFr 2.2641**

## 19.7 Hedging exposure to foreign exchange risk

### 19.7.1 The purpose of hedging risk

The purpose of hedging an exposure to risk is to eliminate or reduce the possibility that actual events will turn out worse than expected. The purpose of hedging an exposure to currency risk is to remove (or reduce) the possibility that a future transaction involving a foreign currency will have to be made at a less favourable exchange rate than expected.

Exchange rates can move up or down, and spot rates could move favourably as well as adversely. However, many companies prefer to hedge their currency risks by fixing an exchange rate now for a future transaction, even if this means that it will not be able to benefit from any favourable movement in the exchange rate.

### 19.7.2 Methods of hedging exposures to foreign exchange risk

The most important methods of hedging exposures to currency risk are:

a. leading and lagging;
b. netting receipts and expenditure (or netting assets and liabilities);
c. forward exchange contracts (described earlier);
d. creating a money market hedge;
e. currency futures;
f. currency options and
g. currency swaps.

### 19.7.3 Leading and lagging

Leading means making a payment early, before the end of the credit period allowed. Lagging means making a payment as late as possible, possible by taking longer credit than allowed.

Leading or lagging might be used by a company when it believes that the exchange rate between two currencies will change significantly up or down during a credit period.

a. The purpose of leading is to pay early in a currency that is expected to increase in value against the payer's own currency during the credit period.
b. The purpose of lagging is to delay payment as long as possible in a currency that is expected to fall in value

**Example: Leading and lagging**

A company in Nigeria purchases goods from a supplier in Ghana.

The Nigerian company is required to pay in Ghanaian cedis but has three months' credit from the supplier.

When the goods are delivered the exchange rate is ₦51/₵1.

The Nigerian company might believe that the naira will fall in value against the cedi over the next three months.

If so, delaying payment means that the eventual cost of the payment in naira will increase.

The Nigerian company might therefore decide to make the payment immediately, so that it is no longer exposed to the risk of a fall in the value of the naira against the cedi.

**Example: Leading and lagging**

A company in Japan has bought goods from a US supplier and payment in US dollars is required after two months.

The US dollar has recently been falling in value against the Japanese yen and the depreciation of the dollar against the yen is expected to continue for some time.

The Japanese company might therefore try to delay its payment to the US supplier as long as possible, perhaps by taking longer credit than the two months allowed, because if the dollar does fall in value, the eventual cost in yen of paying the US supplier in dollars will be lower.

### 19.7.4 Netting

Netting can be applied to cash flows in a foreign currency or to assets and liabilities denominated in a foreign currency.

**Netting cash flows**

When a company expects to have future cash receipts in a foreign currency and future cash payments in the same currency at about the same time, it can use the receipts to make some or all of the payments. To the extent that future receipts match future payments, the foreign exchange risk is eliminated.

Movements in the spot exchange rate will affect the netted receipts and payments equally. The loss from the adverse movement affecting the cash receipts or payments will be offset by the gain from the favourable movement affecting the cash payments or receipts.

**Example: Netting**

A Nigerian company expects to receive US$400,000 in two months' time and to make payments of $600,000, also in two months.

To hedge its currency exposures, the company can net $400,000 of receipts and payments, leaving a net exposure of just $200,000 in payments.

This exposure might be hedged with a forward exchange contract.

### 19.7.5 Money market hedge

#### Definition of a money market hedge

A money market hedge is another method of creating a hedge against an exposure to currency risk. Instead of hedging with a forward exchange contract, a company can create a hedge by borrowing or lending short-term in the international money markets, to fix an effective exchange rate 'now' for a future currency transaction.

#### Constructing a hedge for a future currency receipt

A company might expect to receive an amount of foreign currency at a future date, which it intends to exchange into its domestic currency. It wants to hedge its exposure to currency risk.

One way of hedging the risk is to make a forward exchange contract with a bank, in which it sells the future foreign currency receipts to the bank in exchange for domestic currency, at an exchange rate fixed 'now' by the forward contract.

Another way of hedging the risk is to establish a money market hedge. The money market hedge works by arranging a lending or borrowing transaction now, with a settlement date the same as the date when the future currency receipt or currency payment will occur. In the case of a hedge for a future receipt of foreign currency, it needs to borrow 'now' in the foreign currency, so that when the currency receipt actually occurs, it will be sufficient to pay the amount borrowed 'now' plus interest.

a. To create a money market hedge, the company should borrow an amount of the currency immediately, for repayment at the same time that the future currency income will be received. The income in the currency will be used to repay the loan with interest. The amount borrowed should therefore, together with the accumulated interest for the borrowing period, equal the amount of the future currency income.

b. Having borrowed the quantity of currency, the company should exchange it immediately (spot) for its domestic currency.

c. The domestic currency obtained in this way can be used in the company's business. However, for examination purposes, you might be expected to assume that the domestic currency will be invested or deposited for the same period as the currency loan.

d. At the end of the loan period, when the company uses its currency income to repay the currency loan, the deposit plus accumulated interest is an equivalent amount in domestic currency. This can be used to calculate an effective forward interest rate for the hedge of the currency exposure.

A numerical example might help to clarify this technique.

**Example: Money market hedge (future foreign currency receipt)**

A UK company expects to receive US$800,000 in three months' time. It wants to hedge this exposure to currency risk using a money market hedge.

Spot three-month interest rates currently available in the money markets are:

| | Deposits | Borrowing |
|---|---|---|
| US dollar | 4.125% | 4.250% |
| British pound | 6.500% | 6.625% |

The spot exchange rate (US/£1) is 1.7770 – 1.7780.

**Step 1**

The UK company will be receiving US dollars in three months' time. It should therefore borrow US dollars for three months. The borrowing rate will be 4.25% (the higher of the two quoted rates). This is an annual rate, and in answering an examination question, you should calculate the rate for the interest period as an appropriate fraction of the annual rate. Here, the interest for three months will be 4.25% × 3/12 = 1.0625% or 0.010625.

The borrowed dollars plus accumulated interest after three months needs to be $800,000, therefore the amount of dollars borrowed should be:

Final amount/ [1 + interest rate for the period] = $800,000/ 1.01625 = $791,589

**Step 2**

The company should sell the borrowed \$791,589 in exchange for British pounds. The appropriate spot rate is 1.7780. The company will receive £445,213.

We now assume that this will be placed on deposit for three months. The interest rate on deposits for sterling is 6.500%. This is an annual rate, and the interest for three months is assumed to be 6.5% × 3/12 = 1.625% or 0.01625.

After three months, the deposit plus accumulated interest will be £445,213 × 1.01625 = £452,448.

**Step 3**

At the end of three months, the company will receive US\$800,000. Its three- month loan will mature, and the \$800,000 is used to pay back the loan plus interest. The company has £452,448 from its deposit (its short-term investment in British pounds).

The money market hedge has therefore fixed an effective exchange rate for the dollar receipts, which is calculated as \$800,000/£452,448. This gives an effective three-month forward rate of £1 = \$1.7682.

**Constructing a hedge for a future currency payment**

To create a money market hedge for a future currency payment, a similar approach is required. To hedge a future payment in currency, a company should deposit an amount of the currency ‘now’ in the money market, so that the amount deposited plus interest will be sufficient to make the currency payment at the future date.

a. A company with an obligation to make a payment in foreign currency at a future date should therefore buy a quantity of the currency now and place it on deposit until the payment is due to be made. The amount of currency placed on deposit, plus the accumulated interest, should equal the amount of the future payment.
b. Buying the currency now spot will cost money. For the examination, it should usually be assumed that the company has to borrow in domestic currency to buy the foreign currency spot, and that the length of the loan period is the same as the deposit period for the foreign currency.
c. At the end of the deposit period, the foreign currency deposit plus interest is used to make the currency payment. The domestic currency loan has accumulated interest, and the total amount now payable to settle the loan can be used to calculate the effective interest rate for the currency transaction.

Again, an example might help to clarify the method.

**Example: Money market hedge (future foreign currency payment)**

Suppose that a UK company is expecting to pay a supplier US$500,000 in six months' time, and it wants to fix an effective exchange rate for this transaction with a money market hedge.

Spot six-month interest rates currently available in the money markets are as follows:

| | Deposits | Borrowing |
|---|---|---|
| US dollar | 4.125% | 4.250% |
| British pound | 6.500% | 6.625% |

The spot exchange rate (US$/£1) is 1.7770 – 1.7780. Step 1

The company should deposit US dollars for six months. The deposit rate will be 4.125% (the lower of the two quoted rates). This is an annual rate, and in an examination the rate for the interest period is calculated as an appropriate fraction of the annual rate. Here, the interest for six months will be 4.125% × 6/12 = 2.0625% or 0.020625.

The dollars placed on deposit plus accumulated interest after six months needs to be $500,000, therefore the amount of dollars placed on deposit for six months should be: final amount / 1 + interest rate for the period = $500,000 / 1.020625 = $489,896

**Step 2**

These dollars should be bought with British pounds. The appropriate spot rate is 1.7770. The company will therefore pay £275,687 to obtain the dollars.

We now assume that this money has to be borrowed for a six-month loan period. The interest rate on deposits for sterling is 6.625%. This is an annual rate, and the interest for six months will be 6.625% × 6/12 = 3.3125% or 0.033125.

After three months, the loan plus accumulated interest will be £275,687 × 1.033125 = £284,819.

**Step 3**

At the end of six months, the US deposit plus interest is used to make the payment of $500,000. The sterling loan is repayable with interest, and the amount payable can be used to calculate an effective exchange rate for the money market hedge.

The effective exchange rate is therefore £1 = $1.7555 ($500,000/£284,819).

**Conclusion: forward exchange contracts and money market hedges**

In practice, a money market hedge should result in an effective exchange rate similar to the forward exchange rate. In the examination, however, one method of hedging might well result in a more favourable exchange rate than the other.

An examination question might give you a set of exchange rates and interest rates for two currencies, and details of a transaction that creates a currency risk exposure. The question might then ask you to compare a forward exchange contract with a money market hedge, and recommend which method of hedging is better.

You might also be required to compare a money market hedge with other methods of currency hedging.

**Currency futures**

Currency futures are contracts that obligate the buyer and seller to exchange a specific amount of one currency for another at a predetermined exchange rate on a specific future date. A currency futures contract is an agreement between two parties to sell/buy a particular currency at a particular rate on a particular future date.

**Characteristics of futures contracts**

a. It is a standardized contract of a fixed amount of money.
b. It is available in a limited number of currencies.
c. It is available only at specified periods.

**How do currency futures work as a hedging method?**

Companies or investors can use currency futures to hedge against potential losses due to exchange rate fluctuations. By locking in a specific exchange rate, they can mitigate potential losses or gains from currency fluctuations.

**Example:**

A Nigerian company imports goods from the US and expects to pay $1 million in 3 months. To hedge against potential Naira depreciation, they buy a currency futures contract to sell Naira and buy USD at a fixed exchange rate (e.g., ₦400/USD). If the Naira depreciates to ₦450/USD, the company can still exchange at the fixed rate, saving on potential losses.

**Terminologies in futures contracts**

a. Tick is the smallest unit of price movement in a financial instrument such as a futures contract.
b. Tick size is the minimum price change for a futures contract.
c. Contract size refers to the quantity of the underlying assets that is represented by a single futures contract. It is the standardized unit of trading.
d. Futures price is the predetermined price at which a buyer and a seller agree to trade an underlying asset on a specific future date. The price at the start is called opening futures price and at the end is called the closing futures price.
e. Basis refers to the difference between the spot price of an asset and its futures price. [Basis = spot price – futures price]
f. Basis risk is the uncertainty associated with the basis, which can change over time due to various market and economic conditions. It is a risk that the general assumption of the basis reducing linearly may be incorrect.
g. Perfect hedge is a financial strategy that completely eliminates the exposure to the risk. In the context of futures, a hedge is said to be perfect if the number of contracts is a whole number [contract amount / contract size] but where it has decimals, it is an imperfect hedge.
h. Mark to market – is the process of calculating gains and losses on each trading day and adjusting the margin account accordingly.
i. Margin – is the collateral or deposit required to enter a futures position, meant to cover potential losses on the contract.
j. Initial margin – is the amount or deposit required to enter the futures contract.
k. Maintenance margin - is the minimum amount required to maintain a futures position.
l. Variation margin – is the minimum amount required to restore the margin account balance to the maintenance margin level.

**Steps in solving a currency future hedging calculations**

a. Determine the target income.
b. Determine the number of contracts needed.

c. Determine whether to buy or sell futures.
d. Determine which contract expiration date to use.
e. Close your position and evaluate the hedge.

| |
|---|
| ***Currency futures, currency options and currency swap would be comprehensively treated at the professional level [Strategic Financial Management].*** |

**Example on Currency Futures**

Downtime limited [a UK company] has invoiced a US customer $1,000,000 payable in August 2025. They have decided to hedge using futures contract to hedge the exposure. Today is May 2025

**Futures details**

**3-months Futures, Contract size $62,500 , Futures prices is $ per £**

May futures 1.5250

September futures 1.5900

The exchange rates are **$ per £**

Spot rate 1.5240 – 1.5260

August exchange rate 1.5875 – 1.5910

Required

Evaluate the relevant futures hedge.

**Solution**

**Target outcome** – Exposure amount / spot rate = $1,000,000 / $1.5260 = £655,308 [This refers to income that would be gotten if there was no fluctuation in exchange rate].

**Number of contracts** – Exposure amount / contract size [the exposure amount should be converted to the currency of the contract size using the current futures price or closing futures price in some cases, where it is in a different currency]. 1,000,000 / 1.5250 = **£** 655,738. 655,738/62,500 = 10.49 contracts. This will be rounded up to 10 contracts. [This is an imperfect hedge]

**Buy or sell futures** – since Downtime is entering a contract to receive $ which it would sell to buy **£** , it will enter a **futures contract to buy £.** The company will buy 10 futures contract,

**Which expiry date –** always choose a futures contract with an expiry date closest after the transaction date. A September contract would be recommended in this case.

**Profitability of the futures**

| | |
|---|---|
| Initially buy at | $1.5250 |
| Close out selling at | $1.5900 |
| Profit per $ | $0.0650 |
| Total profit = profit x number of contracts x contract size = 0.0650 x 10 x 62,500 | $40,625 |
| Cash market receipt | $1,000,000 |
| Total receipt | $1,040,625 |
| Closing exchange rate | 1.5910 |
| Net **£** receipt [$1,040,625 / 1.5910] | **£654,070** |
| Target receipt | **£**655,308 |

### 19.7.6 Currency Options

Currency options are financial derivatives that give the holder the right, but not the obligation, to buy or sell a specific currency at a predetermined exchange rate (strike price) on or before a certain date (expiration date).

Futures and Forward contracts are binding hedging instruments that is they are obligations that the parties must exercise but the currency option is a right and not an obligation which hedges against adverse exchange rate movements and simultaneously allows the company the ability to take advantage of any favourable exchange rate movements.

**Over-The-Counter [OTC] and Exchange traded options**

OTC options are customized option contracts traded directly between two parties without going through an exchange. They are flexible, confidential but carry a counter party risk.

Exchange traded options are standardized option contracts that are traded on a regulated exchange. They are standardized, transparent and reduce counter party risk but are rigid.

**How do currency options work as a hedging method**?

Companies or investors can use currency options to hedge against potential losses due to exchange rate fluctuations. Here's how:

a. Call option: Gives the holder the right to buy a currency at the strike price. Used to hedge against potential appreciation of a currency.
b. Put option: Gives the holder the right to sell a currency at the strike price. Used to hedge against potential depreciation of a currency.

**How to choose the option**

a. If the company has an exposure to pay a foreign currency, the company should enter an option to buy the foreign currency which is a call option.
b. If the company has exposure to receive foreign currency, the company should enter an option to sell the foreign currency which is a put option.

**Example:**

A Nigerian company expects to receive $1 million in 3 months and is concerned about potential Naira appreciation. To hedge, they buy a put option to sell USD and buy Naira at ₦400/USD. If the Naira appreciates to ₦350/USD, the company can exercise the option and sell USD at ₦400, mitigating potential losses.

**Steps in solving OTC options**

a. Determine the type of option required, call or put option.
b. Determine the net amount if the option is exercised.
c. Determine the net amount if the option is not exercised.
d. Choose the alternative that is better between your results in 2 and 3 above.
e. Deduct the premium from the alternative chosen in step 4 above to get the final result and amount.

**Example on OTC Option**

Majekobaje a Nigerian firm in the western part of the country is expecting to receive payments from its foreign customer of $L50 million on 31 December 2025.

The company wants to hedge the receipt using an OTC option and the following information has been provided:

| | |
|---|---|
| Spot rate [L$/ ₦] | 1.2335 – 1.2346 |
| 3-month OTC currency call option on L$50 – exercise price [L$/ ₦] | 1.1850 |
| 3-month OTC currency put option on L$50 – exercise price [L$/ ₦] | 1.1920 |
| Relevant option premium | ₦0.50 / L$100 |

Required

Show the outcome of hedging the above exposure using an OTC currency option if the exchange rate has moved to L$1.2065 – 1.2162 /₦

**Solution**

Majekobaje is a Nigerian firm and it is easier to work using direct quotes [number of ₦ required for 1 unit of a L$].

The question has given indirect quote to the naira and the first step would be to convert it to a direct quote. [direct quote is an inverse of the direct quote that is 1/quote given]

**Step 1- convert the indirect quote to Direct quotes**

| | | |
|---|---|---|
| Spot rate [₦/L$] | 1/1.2346 -- 1/1.2335 | 0.8100 – 0.8107 |
| 3-month OTC currency call option on L$50 – exercise price [₦/L$] | 1/1.1850 | 0.8439 |
| 3-month OTC currency put option on L$50 – exercise price [₦/L$] | 1/1.1920 | 0.8389 |
| Relevant option premium | ₦0.50 / L$100 | |
| The exchange rate has moved to | 1/1.2162 – 1/1.2065 | 0.8222 – 0.8288 |

**Step 2 – determine the type of option**

Since the exposure is a receipt of foreign currency, the company will enter an option to sell the foreign currency which is a put option.

**Step 3 – should the OTC option be exercised**

| | |
|---|---|
| December exchange rate [₦/L$] | 0.8222 |
| Put exercise rate [₦/L$] | 0.8389 |
| Should the company exercise? Yes if it gives higher receipt | yes |
| Gross receipt L$50m x 0.8389 | ₦41.95m |
| Less premium cost (50/100 x ₦0.50) | [₦0.25m] |
| Net naira receipt | ₦41.70m |

**Step 4 – Outcome if the option is not exercised**

If they don't hedge, it would have exercised at 0.8222 [₦/L$], which is the bank buying rate.

50m x 0.8222 = ₦41.11m

**Step 5 – choose the option that gives better results**

The option provides a better option as it gives a higher receipt.

### 19.7.7 Currency swaps

**The nature of currency swaps**

Interest rate swaps are swaps in the same currency, usually between a fixed rate and a floating rate of interest, with interest calculated on a notional amount of principal. Currency swaps are similar, but with some significant differences:

a. The swap is between two different currencies. One party pays interest on an amount of principal in one currency. The other party pays interest on an equivalent amount of principal in a different currency.
b. The interest rates that are swapped need not be a fixed rate in exchange for a floating rate. A currency swap can be between a fixed rate in one currency and a (different) fixed rate in the other currency.
c. There is an actual exchange of principal. There must be an exchange of principal at the end of the swap, at a rate of exchange that is fixed at the beginning of the swap. (There might also be an actual exchange of principal at the beginning of the swap, but this is not usual.)

## 19.8 Interest rate risk

The interest rate risk is the potential for investment losses that result from a change in the interest rate. It is the probability of a decline in the value of an asset resulting from unexpected fluctuation in interest rates.

Risk arises for businesses due to uncertainty in the future. Interest rate risk arises when businesses do not know

a. How much interest they might have to pay on borrowings either already made or planned to.
b. How much interest they might earn on deposits either already made or planned to.

The primary aim of interest rate risk management is to limit the uncertainty for the business, so that it can plan with greater confidence and not guarantee the business the best possible outcome.

### 19.8.1 The effect of a change in interest rates

Interest rates can move up or down, although economists are often able to predict the direction of future movements. A movement in interest rates can affect companies in either a positive or a negative way.

a. If a company has borrowed at a variable rate of interest, it will have to pay higher interest costs if the interest rate goes up, and lower interest costs if the rate goes down.
b. If a company has borrowed at a fixed rate of interest, for example by issuing bonds, it will continue to pay the same rate of interest even if market interest rates go down. However, competitors who have borrowed at a variable rate of interest, or competitors who decide to issue fixed rate bonds after the rate has fallen, will gain a competitive advantage.
c. An investor in fixed rate bonds who expects to sell the bonds before their maturity will also be affected by a change in interest rates. A rise in interest yields will result in a fall in the price of existing fixed rate bonds. A fall in the market interest rate will send bond prices up.

Changes in interest rates are particularly significant for organisations that deal in financial assets and liabilities, such as banks and investment institutions.

However, they can also be very important for other companies that borrow extensively and have fixed rate or floating rate debts totalling hundreds of millions of dollars.

For example, if a company has borrowed $500 million from a syndicate of banks at a variable rate of interest, an increase in the annual interest rate of just 0.25% will result in higher interest costs of $1,250,000 each year.

### 19.8.2 Interest rate volatility and interest rate risk

Interest rate risk is particularly high when:

a. Interest rate changes are frequent (and sometimes large); and
b. It is uncertain whether the next movement in rates will be up or down.

In other words, interest rate risk increases with interest rate volatility. Volatility is likely to be higher when expected inflation rates are high than when expected inflation rates are low.

### 19.8.3 Short-term and long-term interest rates

A distinction is made between:

a. short-term interest rates, which are money market interest rates; and
b. long-term interest rates, which are bond yields.

Volatility in short-term rates affects short-term lending and borrowing, and also all variable rate lending, such as bank loans. Volatility in longer-term rates affects bond investors.

Note that yields on a corporate bond are affected by:

a. Interest rates for risk-free bonds (domestic government bonds); and
b. Changes in the perceived credit risk of the bond issuer.

For example, suppose that a company's bonds which have been rated AA by a credit rating organisation are now downgraded to a rating of A+. The yield on the bond will increase to reflect the lower credit rating, and the market price of the bonds will fall. However, the increase in the bond yield is due to a credit risk factor rather than to interest rate risk.

### 19.8.4 Money market interest rates: LIBOR

Short-term interest rates for borrowers are set at a margin above the base rate or official rate of the lending bank, or at a margin above a money market rate. The money markets are markets for wholesale borrowing and lending short-term, for periods ranging from overnight up to about 12 months. ('Wholesale' means borrowing and lending in large amounts.)

Each major financial centre has a money market and a 'benchmark' rate that the participants in the market use. In London, the benchmark rate of interest is the London Interbank Offered Rate or LIBOR.

a. There are LIBOR rates for each maturity of lending, such as seven-day LIBOR, one-month LIBOR, three-month LIBOR and so on.
b. London is a major international money market centre, and there are LIBOR rates in the major currencies as well as in sterling. For example, there is a US dollar LIBOR and a Swiss franc LIBOR. There is also a euro LIBOR, but the commonly used benchmark rate for the euro is a rate called the euribor rate.
c. In Paris, there are PIBOR rates; in Frankfurt there are FIBOR rates; and so on.

The Nigerian equivalent of LIBOR is the Nigerian Inter-Bank Offered Rate (NIBOR).

A company borrowing British pounds from a bank at a floating rate of interest might pay interest at a margin above LIBOR. For example, if interest is payable every six months, a borrower might pay interest at 1.50% above the six-month sterling LIBOR rate.

(Basis points: 1% = 100 basis points, and in the money market, interest rates may be stated as a number of basis points above LIBOR. So LIBOR plus 1.50% might be stated as 150 basis points above LIBOR.)

When a company borrows at a variable rate of interest, it pays interest at the end of each interest period, which might be each month, or every three months, or every six months, and so on. The rate of interest payable for the period is decided by reference to the benchmark rate, such as three-month LIBOR, at the beginning of the interest period. The interest payable in each interest period is reset at the start of each period.

**Calculating the interest**

There are rules in the money markets about how interest should be calculated. The rules differ between currencies.

a. Interest on a sterling money market loan is calculated as:
   Loan principal × Annual interest rate × (Number of days in the loan period/365)
b. Interest on a US dollar money market loan is calculated as:

   Loan principal × Annual interest rate × (Number of days in the loan period/360)

For your examination, you will normally be able to make the assumption that interest is calculated as:

Loan principal × Annual interest rate × (Number of months in the loan period/12).

### 19.8.5 Hedging interest rate risk: FRAS

**Hedging methods**

Some organisations might wish to hedge their exposures to interest rate risk. They might also want to take advantage, if possible, from any favourable movements in interest rates. There are several ways in which risks can be hedged and opportunities to benefit from interest rate changes can be exploited.

Common methods include:

a. forward rate agreements or FRAS;
b. smoothing;
c. matching;
d. asset and liability management;
e. interest rate swaps;
f. interest rate options; and
g. interest rate futures.

All these methods can be used to deal with the possibility that 'spot' rates of money market interest will change, or current yields on bonds will change, and will be different at some time in the future.

### 19.8.6 Forward rate agreements (FRAs)

A forward rate agreement (FRA) is a forward contract for an interest rate. FRAs are negotiated 'over-the-counter' with a bank. In some respects, an FRA is similar to a forward exchange rate. It is a contract arranged 'now' that fixes the rate of interest for a future loan or deposit period starting at some time in the future. For example, an FRA can be used to fix the interest rate on a six-month loan starting in three months' time.

Banks are able to quote forward rates for interest rates because there is a large and active money market, and banks are able to borrow and deposit funds short-term. As a result, if a bank can borrow for nine months at one rate of interest and deposit funds for three months at another rate of interest, it can work out a rate to quote to a customer that wants to borrow between the end of month 3 and the end of month 9. A 'forward rate' can be fixed now that will guarantee the bank a profit on the transaction.

### Example: FRA

A bank can borrow dollars for nine months at 5% and can deposit dollar funds for three months at 4.75%. Suppose that it borrows $1 million for nine months and places them on deposit for three months.

After nine months, it will have to repay $1 million + ($1 million × 5% × 9/12) = $1,037,500. The interest payable is $37,500.

After three months, its dollar deposit will grow to $1 million + ($1 million × 4.75% × 3/12 = $1,011,875. The interest received is $11,875.

To break even by lending to a customer from the end of month 3 to the end of month 9 (six months), the bank would need to earn interest of $25,625 ($37,500 – $11,875).

The (annual) interest rate on the 6-month lending would therefore have to be:

25,625 / 1,011,875 x [12 / 6] x 100 = 5.06%

This is not what banks would do in practice, but the example is intended to show that banks are able to use spot money market rates (which are rates for borrowing or depositing funds 'now') to derive interest rates for a future interest period, knowing that they will make a suitable return.

### 19.8.7 The features of an FRA agreement

An FRA, like a forward exchange contract, is a binding agreement between a bank and a customer. It is an agreement that fixes an interest rate 'now' for a future interest period.

a. An FRA for an interest period starting at the end of month 3 and lasting until the end of month 9 is a 3v9 FRA or a 3/9 FRA.
b. Similarly, an FRA for a three-month period starting at the end of month 2 is a 2v5 FRA or a 2/5 FRA.

An FRA is an agreement that fixes a forward interest rate on a notional amount of money.

**Buying and selling FRAs**

FRAs are bought and sold.

a. If a company wishes to fix an interest rate (cost) for a future borrowing period, it buys an FRA. In other words, buying an FRA fixes a forward rate for short-term borrowing.
b. If a company wishes to fix an interest rate (income) for a future deposit period, it sells an FRA. Selling an FRA fixes a forward rate for a short- term deposit.

The counterparty bank sells an FRA to a buyer and buys an FRA from a seller.

### 19.8.8 Notional loans and deposits

A forward exchange contract for currency is an agreement to buy and sell currency at a future date when there will be an exchange of currencies between the two parties.

An FRA is different. It is not an actual agreement to take out a loan or to make a deposit. An FRA is an agreement on a notional loan or deposit, not an actual loan or deposit. The size of the notional amount of principal (the notional loan or deposit) is specified in the FRA agreement.

**How an FRA works**

An FRA works by comparing the fixed rate of interest in the FRA agreement with a benchmark rate of interest, such as LIBOR. The comparison takes place at the beginning of the notional interest period for the FRA.

a. If the FRA rate is higher than the benchmark rate (LIBOR), the buyer of the FRA must make a payment to the seller of the FRA, in settlement of the contract.
b. If the FRA rate is lower than the benchmark rate (LIBOR), the buyer of the FRA receives a payment from the seller of the FRA, in settlement of the contract.

The amount of the payment is calculated from the difference between the FRA rate and the benchmark rate (LIBOR rate), applied to the notional principal amount for the FRA and calculated for the length of the interest period in the agreement.

**Example:**

A company has forecast that due to an expected cash shortage, it will need to borrow $20 million for three months in two months' time. A bank quotes the following rates for FRAs:

2 v 3 3.61 – 3.59
2 v 5 3.67 – 3.63
3 v 5 3.68 – 3.65

**Required:**

What would be the FRA agreement with the bank, and what rate would apply to the agreement?

If the company can borrow at LIBOR + 50 basis points, what will be its effective rate of borrowing for the three months if US dollar LIBOR is 4.50% at the start of the notional interest period for the FRA?

**Solution**

The company needs a 2v5 FRA.

It needs to borrow, therefore, the bank will quote the higher rate, 3.67.

In three months' time on the fixing data, if US dollar LIBOR is 4.50% the bank will pay the equivalent of (4.50% - 3.67%) = 0.83%.

| | % |
|---|---|
| Three-month borrowing rate (4.50% + 50 basis points) | 5.00 |
| Less: settlement received in FRA agreement | (0.83) |
| Effective borrowing rate | 4.17 |

The effective borrowing rate is the same as the FRA rate of 3.67% plus the 50 basis points borrowing margin that the company is required to pay on the money it borrows: 3.67% + 0.50% = 4.17%.

### 19.8.9 Smoothing

This involves maintaining a balance between fixed and floating rate borrowing. In this method, the management of loans or deposits are simply divided so that some [loans and deposits] are on a fixed rate and some are on a variable rate.

### 19.8.10 Matching Assets and liability

This involves matching assets and liabilities to have a common interest rate. This method requires a business to have both assets and liabilities with the same kind of interest rate. The closer the two amounts, the better.

This is also related to the assets and liabilities management that relates to matching the periods over which the loans and deposits cover.

**Illustration**

Relevant Haven plc [RHP] has a deposit of $500,000 on which it expects an interest of LIBOR plus 1%. RHP also has a loan of $550,000 on which it is expected to pay an interest of LIBOR plus 2%. Show how the matching concept can be used to hedge the interest rate risk if LIBOR is currently 5% and expected to increase by 2% over the period

**Solution**

| | | |
|---|---|---|
| Deposit = $500,000 = 6% x 500,000 = | $30,000; | 8% x 500,000 = $40,000 |
| Loan = $550,000 = 7% x 550,000 = | $38,500; | 9% x 550,000 = $49,500 |
| Difference | $8,500 | $9,500 |

With the matching the exposure is reduced to barely $1,000 but without the matching, the interest rate payment exposure would be $11,000.

### 19.8.11 Interest rate futures

They are similar in effect to FRAs, except that the terms, amounts and periods are standardized having fixed sizes and gives the owners the right to earn interest or pay interest at a given rate. Interest rate futures can be bought and sold on exchanges such as intercontinental exchange futures Europe.

The price of the futures contracts depends on the prevailing interest rate and it is crucial to understand that as interest rates rise, the market price of the futures contracts falls. The price of the futures is 100% - interest rate. The basis risk is the risk that in practice, the futures price movements do not move perfectly with interest rates.

Selling a futures creates the obligation to borrow money and the obligation to pay interest while Buying a futures creates the obligation to deposit money and the right to receive interest.

Borrowers fear that the interest rates may increase [higher interest payments] and if this happens, the Futures price will fall in the future. To hedge this, the borrower would need to Sell futures now [at the high rate] and buy when it has fallen in the future to make a profit.

Lenders fear the interest rates may fall [reduced income] and if this happens, the Futures price will increase in the future. To hedge this, the lender would need to buy now [at the lower rate] and sell in the future when the Futures price has increased in the future to make a profit.

Short term interest rate futures contracts (STIRs) normally represent interest receivable or payable on notional lending or borrowing for a three month period beginning on a standard future date. The contract size depends on the currency in which the lending or borrowing takes place. Whole number of contracts should be used and maturity dates are March, June, September and December.

Profits and losses on futures are measured in ticks (one tick equals 0.0001 or 1% = 100 ticks). Tick = contract size x 3/12 x 0.0001

The pricing on an interest rate futures contract is determined by the interest rate (r) and is calculated as 100 – r. interest futures are usually quoted in the form of index and so a price at 82 means 18% (100-82).

**Interest rate options**

Interest rate options are financial derivatives that give the holder the right, but not the obligation, to borrow or lend at a specified interest rate (strike rate) on a specific date.

**Types of interest rate options:**

1. Interest Rate Caps: Protect against rising interest rates.

2. Interest Rate Floors: Protect against falling interest rates.

**How interest rate options work as a hedging method**

Companies or investors can use interest rate options to hedge against potential interest rate fluctuations. By buying an option, they can:

a. Limit exposure: Protect against adverse interest rate movements.
b. Benefit from favorable rates: If rates move favorably, the option can be allowed to expire, and the company can benefit from the favorable rates.

**Example**:

A company has a floating-rate loan and expects interest rates to rise. To hedge, they buy an interest rate cap, which gives them the right to borrow at a specified rate. If rates rise above the cap, the company can exercise the option and borrow at the lower rate.

## 19.9 Chapter review

**At the end of this chapter, readers should be able to:**

a. discuss the different types of foreign exchange risk;
b. discuss and apply purchasing power parity;
c. discuss and apply interest rate power parity;
d. explain spot rates and what causes them to move;
e. adjust a spot rate to arrive at a forward rate;
f. explain and evaluate forward exchange contracts; and
g. explain and evaluate forward money market hedges.

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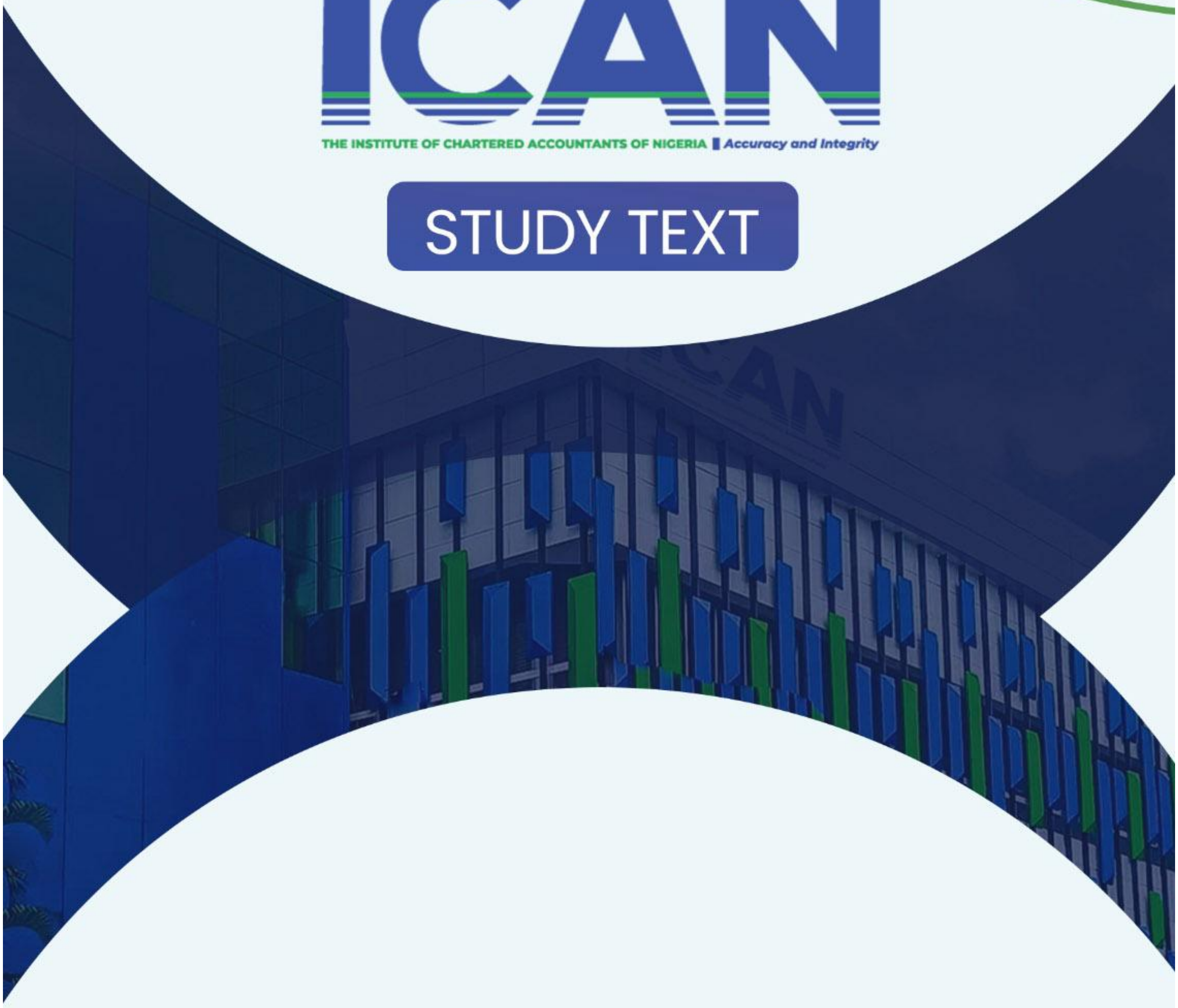


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