BUSINESS AND CORPORATE FINANCE

STUDY TEXT

C3

Final Level

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THE NATIONAL BOARD OF ACCOUNTANTS AND AUDITORS TANZANIA (NBAA)

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FOREWORD.

The National Board of Accountants and Auditors is a professional body in Tanzania, established under the Auditors and Accountancy Registration Act No 33 of 1972 (CAP 286 R.E.2002). The Board has been charged with among other things, the responsibility to promote, develop and regulate the accountancy profession in the country.

In fulfilling its statutory obligations, NBAA prepares National Accountancy Examination Scheme for students aspiring to sit for Accounting Technician and Professional Examinations. Further, for effective implementation of the examination scheme and improve examination results, the Board provides Study Guides for all subjects to assist both examination candidates and trainers in the course of learning and teaching.

The Study Guides have been prepared in the form of text books with examples and questions to enable the user to have comprehensive understanding of the topics. The Study Guides cover a wide range of topics in the NBAA syllabi and adequately cover the most comprehensive and complete knowledge base that is required by a leaner to pass the respective examination levels.

Furthermore, the Study Guides have been prepared to match with the Competency Based Syllabi to enable the learners to be exposed to practical understanding of issues rather than memorisation of concepts. In this case, the Study Guides are characterized by the following features:-

1. Focus on outcomes – The outcomes shown in every topic provides clear understanding on what to be learnt.

2. Greater workplace relevance – the guides emphasize on the importance of applying knowledge and skills necessary for effectively performance in a work place. This is different from the traditional training where much concern has been expressed in theoretical perspectives.

3. Assessments as judgments of competence – The assessment questions embedded in the Study Guides are adequate measures of understanding of the subject matter.

Study Guides are also useful to trainers specifically those who are teaching in the review classes preparing learners to sit for the professional examinations. They will make use of these Study Guides together with their additional learning materials from other sources in ensuring that the learners are getting sufficient knowledge and skills not only to enable them pass examinations but also make them competent enough to perform effectively in their respectively workplace.

NBAA believes that these standard Study Guides are about assisting candidates to acquire necessary skills and knowledge that will enable them to perform as professionals. The outcomes to be achieved are clearly stated so that learners may know exactly the skills and knowledge they are supposed to acquire in a particular topic.

NBAA wishes all the best to NBAA Examination candidates, trainers in their review classes, lecturers in the higher learning institutions and all other beneficiaries of these learning materials in making good use of the Study Guides towards promoting the accountancy profession in Tanzania.

CPA. Pius A. Maneno
EXECUTIVE DIRECTOR
JUNE, 2019

STUDY CONTENTS

C3 – Business and Corporate Finance

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Features of the book

'The book covers the entire syllabus split into various chapters (referred to as Study Guides in the book). Each chapter discusses the various Learning Outcomes as mentioned in the syllabus.

Contents of each Study Guide

'Get Through Intro': explains **why** the particular Study Guide is important through real life examples.

'Learning Outcomes': on completion of a Study Guide, students will be able to understand all the learning outcomes which are listed under this icon in the Study Guide.

The Learning Outcomes include:

'Definition': explains the meaning of important terminologies discussed in the learning Outcome.

'Example': makes easy complex concepts.

'Tip': helps to understand how to deal with complicated portions.

'Important': highlights important concepts, formats, Acts, sections, standards, etc.

'Summary': highlights the key points of the Learning Outcomes.

'Diagram': facilitates memory retention.

'Test Yourself': contains questions on the Learning Outcome. It enables students to check whether they have assimilated a particular Learning Outcome.

Self-Examination Questions': exam standard questions relating to the learning outcomes given at the end of each Study Guide.

EXAMINATION STRUCTURE

The syllabus is assessed by a three-hour paper-based examination.

The examination will consist of two sections.

Section A	One compulsory question (covering a range of syllabus content)	40 marks
Section B	Three questions out of Five	60 marks

SECTION A

GLOBAL BUSINESS ENVIRONMENT

A1

STUDY GUIDE A1: INTERNATIONAL BUSINESS ENVIRONMENT AND FOREIGN DIRECT INVESTMENT (FDI)

Get Through Intro

The modern economy is globally connected and growing more so every day. Smaller, and even the large self-contained economies are significantly affected by the global economy. Virtually all sectors are being internationalised with the motives of global concentration, global synergies, and other strategic global motivations. An individual or a firm in one country can invest into business interests located in another country. The understanding of issues concerning evaluation, implementation and implications of Foreign Direct Investment (FDI) in a current globalised economy are therefore important to this end.

Regardless of business domain, a private firm, government owned or an NGO could operate a cross border business with a variety of objectives. Various fast food chains like KFC, McDonald's and several manufacturers like Toyota, i-phone and designers such as Gucci, operates within number of countries including Tanzania. Some Tanzanian firms such as METL are also crossing the borders in terms of their operations. Despite the observed internationalisation and modernisation, each country or region has its own unique operating environment and own rules on import and export making investment and financing operations differ across countries. This chapter therefore introduces the regulations, theories and practices governing global direct investments and possible reactions from host countries. Highlighted below are the learning outcomes for this indicative topic.

Learning Outcomes

a) Evaluate based on a given scenario the impact of external factors and financial market issues upon business and financial strategy.
b) Evaluate global business environment and financial management decisions related to multinational companies by analysing;

   i. Shareholders and Corporate wealth maximisation concepts for Multinational firms.
   ii. Factors for the growth of global business and multinational Corporations;
   iii. Risks and Opportunities associated with global business.
   iv. Factors for consideration before going global.

c) Evaluate the determinants, usefulness, implications and host country's restrictions on Foreign Direct Investment (FDI) by assessing:

   i. Assessing foreign direct investments modes of involvement
   ii. Analysing reasons, strategic and economic motives behind FDI
   iii. Alternative global business entry strategies (methods).
   iv. Legal and Institutional framework governing Foreign Direct Investment with specific emphasis to Tanzania.
   v. Advantages and drawbacks of FDI to host country
   vi. The role of Foreign Direct Investment in abusive transfer pricing.
   vii. Theories governing Foreign Direct Investment (FDI).

1. Identify and evaluate based on a given scenario the impact of external factors and financial market issues upon business and financial strategy.

[Learning Outcome, a]

Business and Corporate as an area of finance is concerned with actions taken by managers to increase value of the firm by acquiring an appropriate amount and mix of funds procured at competitive prices and then allocating these funds in various assets which basing on sound analysis, are expected to generate returns greater than the cost of acquired funds. With an international aspect, cross border financing and or investment decisions can be made, and this necessitates a broader understanding of investment and financing activities. It is therefore important to understand the impact of external factors and financial market issues upon business and financial strategy. Let us start by examining the external factors which leads to opportunities and threats/challenges to the firm.

External factors

Business firms within an economy do not exist in a vacuum. Their operations, decisions and actions take place in a dynamic and often turbulent environment, within which many different external factors impact upon their performance. The global economic environment provides both **opportunities** and **threats** to an organisation. This pervasive growth in foreign market interpenetration makes it increasingly difficult for any country business organisation to avoid substantial external impacts on various aspects. External factors likely to impact operations of the business can easily be identified using **PEST model.**

1. Political- A country's political system and government policy affects the economic, social and political environment e.g. the government's economic policies, such as fiscal policies and monetary policies, have an impact on the market conditions, the funding environment etc. which, in turn, have a bearing on the organisation. One should consider these factors while assessing the performance of an organisation. Remember these factors: stability of the government, political formation of the government, involvement of the government in trade agreements such as EU, EAC etc., attitude of the government towards globalisation, privatisation etc.

2. Economic- Economic factors refer to the **macroeconomic factors** that will shape the broader economic environment within which the firm operates. They represent **the financial condition** of the external environment within which the organisation must operate. These factors include GDP, taxes, exchange rates, unemployment, trade factors and tariffs as well as Monopolistic practices

3. Social- Social factors refer to factors such as changing demographic patterns, changing consumer tastes and preferences and overall societal trends. They represent the **tastes and demands** of the external environment within which the organisation must operate. Population growth, Population profile and education levels, Age and health of the population, Disposable income levels and Social trends

4. Technological- Technological factors take into account the **effect that technology has** on the way an organisation makes and delivers its goods and services. In addition to looking at present technology, organisations also need to look at upcoming technology and how it will affect the current way of business. Technical factors affecting an organization include Rate of change and new developments in technology, Patents granted and Diffusion of technology

With internationalization of companies, various opportunities and threats are brought by above factors leading to different financial and business strategies by the firm.

Relevant **financial market issues impacting business and financial strategy.**

i. **Deregulation of financial markets**- reduction or elimination of strict rules prior raising funds in the capital market has simplified possibilities of raising funds from different economies. It has vastly increased the ability of the **financial markets** to allocate international capital efficiently. Having many rules and regulations reduces investment opportunity and eventually a slow economic growth. Deregulation has increased growth in financial transactions and resulted in a restructured, more competitive, and less costly financial services industry.

ii. **Cross listing**- This refers to the process of listing of a company's common shares on a different exchange market than its primary and original stock exchange market. With numerous times zones and multiple currencies, cross listing results to increased liquidity, access to more investors and it enhances corporate governance practices. Cross listed companies are will abide by the corporate governance rules adopted by the well-developed stock market.

iii. **Access to capital** refers to the need that small businesses have for loans or investment money, so they can grow. With internationalization, it is now easy for companies to access capital from different parties of the world. Not only in form of debt, but also in form of equity as explained under cross listing in ii above.

iv. **Minimization of transaction cost**- Access to information- with the growth in technology, investors can easily know what is happening in other economies and make timely decisions

v. **Economic integration**- when countries located in a particular geographic area agree to reduce and or remove trade barriers, there will be a free flow of goods or services and factors of production among each other. This will stimulate financial market as well as economic growth among member countries.

Major effects in developing countries that have resulted from the globalization of financial markets

- Increased competition
- Expansion of product base
- Expansion of customer base
- Increase of market efficiency
- Increased usage of IT
- Increased unemployment
- Increased employment capital mobility.

Generally, the emergence of corporate entities in the world economy is based on contemporary technological development, which has led to globalization of production. international production has resulted to the following:

- co-operation among global productive units
- the large-scale capital exports,
- the export of production that is production abroad has come into prominence as against commodity export

All in all, global corporations consider the whole of the world their production place, as well as their market and move factors of production to wherever they can optimally be combined.

In deciding whether to invest abroad, Management must first determine whether the firm has sustainable competitive advantage that enables it to compete effectively.

Required:

Discuss financial market issues relevant to multinational companies willing to invest in less developed countries.

2. Evaluate global business environment and financial management decisions related to multinational companies by analysing;
i. Shareholders and Corporate wealth maximisation concepts for Multinational firms.

[Learning Outcome b.i]

Multinational corporations (MNCs) are defined as business entities that engage in some form of international business. Their managers conduct international financial management, which involves international investing and international financing decisions that are intended to maximize the value of the MNC.

Central goal of MNCs

Successful financial decision making in a globalised business environment requires an understanding of the goal(s) of the firm. A firm can have one or more goals such as achieving a target market Share, keeping employee turnover at minimum, survival, maximization of profit, creating an over expanding empire etc. Despite all these goals, there is a need for a single financial objective as it leads to clear decisions and harmonizes several roles to unified objective.

The most widely accepted financial objective of the firm whether **operating in local or foreign environment is to maximize the value of the firm for its owners**, that is, to maximize shareholder wealth. Shareholders are the owners of a corporation, and they purchase stocks because they are looking for a financial return whether firms' operations are global or local.

Wealth maximization is taken as a central financial goal of the firm in finance for the following reasons:

i. Wealth maximization is based on cash flows and not profits. In contrast to profits, cash flows are exact and explicit and therefore avoid any ambiguity associated with accounting profits which is subjected to judgment and estimates
ii. Wealth maximization presents a longer-term view relative to other goals such as profit. Accounting profit tends to be shorter oriented and can be achieved by the managers at the cost of long-term sustainability of the business.
iii. Risk- variability of returns is not displayed in profit figures but wealth maximization considers the element of risk. Wealth-maximization principle considers the risk and uncertainty factor while considering the discounting rate. The discounting reflects both time and risk. The higher the uncertainty, the higher the discounting rate and vice-versa. Two firms with identical profits may be exposed to different risk scenarios and hence different value before the eyes of shareholders.

Example

Consider two firms, firm A and firm B. If both firm A and firm B have accounting profit as a percentage of sales of 18%, with this information, an investor will be indifferent on whether to invest in A or B. If additional information that communicates their level of risk is provided; say, firm A is in transportation industry managing a fleet of motorcycles, commonly known as boda-bodas while firm B is a mutual trust fund that is professionally managed and invests in a well-diversified portfolio. In this regard, an investor is likely to invest in firm B since it has low risk as compared to firm A although both firms have identical profits.

iv. Wealth maximization considers future prospects. Profit is a historical figure and although recent profit figures may be used to project future growth, they fail to display the growth potential. Two firms with identical profits may be valued differently by shareholders due to their growth potential. With wealth maximization, expected future cash flows are discounted to obtain their present value, a basis that is use to value the company.
v. Wealth maximization considers the time value of money. It is important as we all know that a shilling today worth more than a shilling in future. In wealth maximization, the future cash flows are discounted at an appropriate discount rate to represent their present value.

MNCs and agency problem

As it is the case with domestic corporations, agency problem for MNCs is also caused by separation of ownership and control. Managers of MNCs may make decisions that are contrary to the maximization of long-term shareholders wealth which is the central goal of the firm. With MNCs, managers are having more room to pursue their own interests rather than interests of the shareholders

Example

- An MNC's manager may decide to establish a subsidiary in a location based on the location's appeal to a particular manager rather than on its potential benefits to its shareholders.
- A decision to expand a subsidiary may be motivated by a manager's desire to receive more compensation rather than to enhance the value of the MNC.

These situations result to conflict of interests between managers of MNCs and the central goal of MNCs and hence amounting to agency problem

Agency costs for an MNC are usually larger than agency costs for a purely domestic corporation. It should be remembered that agency cost is the costs suffered by owners (shareholders or principals) in ensuring that managers (agents) maximize shareholder wealth. Below are the reasons as to why agent costs for MNCs with subsidiaries scattered around the world is likely to be larger than agency costs for a purely domestic corporation.

- Monitoring managers of distant subsidiaries in foreign countries is more difficult.
- Foreign subsidiary managers raised in different cultures may not follow uniform goal.
- The sheer size of the larger MNCs can also create large agency problems.
- Managers of MNCs located abroad tend to downplay the short-term effects of decisions, which may result in decisions for foreign subsidiaries to be inconsistent with maximizing shareholder wealth.
- Going concern assurance provided by operations in other countries may induce some managers to pursue own interests rather than maximizing shareholders wealth.

Test Yourself 2

It is claimed that agency costs for an MNC are larger than agency costs for a purely domestic firm. Justify this claim by explaining possible agency costs which may be incurred by MNCs.

2. Evaluate global business environment and financial management decisions related to multinational companies by analysing;
ii. Factors for the growth of global business and multinational Corporations.

[Learning Outcome b.ii]

The growth of any business is the function of various factors which can be generalised into suitable strategies and conducive global business environment. Below are the factors for the growth of global business and multinational Corporations;

(a) Comparative advantage

The increase in multinational business can generally be linked to the classical theory of comperative advantage. This theory argues that countries should specialise in producing products which results to comperative advantage. When a country specializes in the production of some products, it will not produce other products, making trade between countries is unavoidable. Comparative advantages allow firms to penetrate foreign markets.

According to Porter, a nation attains a competitive advantage only when its firms are competitive. He further believes that firms become competitive through innovation. Innovation means modernisation and it includes technical improvements to the product or to the production process. In his Diamond model, Potters puts forward four factors explaining why a country is likely to have comperative advantage over the other in the production of a particular product. These four factors are memorized as **P**eter, **F**irst **D**o **R**eading **F**ast.

i. **Firm strategy, structure and rivalry** (i.e. conditions for organisations and the nature of domestic rivalry) The first factor refers to the **local competitive structure** for a country's industries. Companies that can operate and survive in a highly competitive local environment can be prepared to compete in the global environment. These companies are forced to become, efficient and innovative in order to succeed in a global environment. This factor refers to how the firms manage to cope with the competition.

ii. **Demand conditions** (i.e. sophisticated customers in home market) Demand conditions refer to the **sophistication of local consumers**. The more demanding and discerning a country's customers, the more demanding they will be on suppliers of their local goods and services.

iii. **Related and supporting industries-** the term **"related and supporting industries"** refers to the existence of organisations that serve similar industries and can collaborate. This usually means they are part of the industry supply chain. This increases the possibility of an **ongoing exchange of ideas**. If there is success in one industry, it is advantageous for the success of the other industry. In the case of related industries, an organisation would prefer home suppliers rather than foreign suppliers because home suppliers can provide co-operation and timely availability of resources

iv. **Factor conditions** (i.e. the nation's position in factors of production, such as skilled labour and infrastructure) Factor conditions are production for inputs such as:
   - human resources such as skilled labour
   - money market (Bond market, repo market) / capital market (debt market, equity market)
   - physical resources such as availability of good quality raw materials
   - intellectual resources such as computer
   - infrastructural resources such as transport system

(b) Market Imperfections Theory

Market imperfection brings about immobility of factors of production such as labour, rationalizes international trade and investment. MNCs often capitalize on a foreign country's resources. Imperfect markets provide an incentive for firms to seek out foreign opportunities. Had markets been perfect, factors of production would flow to any economy wherever they are demanded. The unrestricted mobility would have made international trade irrelevant since each country would have incurred the same cost and returns in producing a product.

(c) Product cycle Theory

At the heart of product cycle theory, is the argument that as a firm matures, it may recognize additional opportunities outside its home country. According to this theory, corporations become established in the domestic market because of some perceived advantage over existing competitors. As competitors become informed at home, a firm is likely to establish itself first in its home country. At this stage, firms foreign demand will be accommodated through exportation. With time, foreign competitors will be informed, and foreign competition will increase. The firm may feel the only way to retain its advantage over competition in foreign countries is to produce

the product in foreign markets. This is done to reduce transportation and other operational costs. As foreign competition increases, the firm will become more established by differentiating its product.

(d) Deregulations:

Strict regulations within an economy makes it difficult for growth of global business and MNCs. Relaxations of these regulations attracts foreign investors. As discussed in the preceding section, the central financial objective of a corporation is to maximise wealth and therefore, corporations are likely to go global if they will find a jurisdiction whose regulations will cause the to maximise their wealth.

METL Group, Tanzanian home-grown company with a presence in eleven countries in Africa appoints highly qualified and technically trained managers. The group decided to expand its operation after realizing that Tanzanian market has matured. It is group's policy to invest in its people and infrastructure. It also takes advantage of availability of cheap raw materials and other factors of production.

Although there is a strong domestic competition from other giants such as Azam group, MELT has focused on producing the products which it can do better than its rivals. The market segment chosen by MELT does not necessitate sophistication of products given the nature of customers it serves.

Required:

Using MELT as a case study discuss factors for the growth of global business and multinational Corporations

2. Evaluate global business environment and financial management decisions related to multinational companies by analysing;
iii. Risks and Opportunities associated with global business
[**Learning Outcome b.iii]**

Opportunities associated with global business

Global companies have some significant advantages over local businesses. Below are opportunities associated with global business:

- Opportunities for market growth- going international results to a widened customer base. This results to growth of business due to increased sales which eventually results to maximisation of long-term shareholders wealth.
- Opportunity for risk minimisation through diversification. A multinational corporation can offset a negative growth in one country by a success in the other country.
- Access to new talent – international labour can offer a company unique advantages in terms of increased productivity, advanced language skills as well as diverse educational backgrounds
- Enhanced competitive advantages- Companies which starts operating i other countries attain a first move advantage and hence in a position to build brand awareness before competitors.
- Widened access to human resources- Talented human workforce results to unique advantages in terms of increased productivity, advanced language skills as well as diverse educational backgrounds
- More attractive investment opportunities- companies with multinational operations have an additional investment opportunity offered by foreign market. External partnership drives innovation.
- Quickening diffusion of technology. If say a Tanzanian company starts operations in China, it is likely that the company will advance its operations in terms of technology due to experiences obtained from both countries.
- Reducing production and redistribution costs – allocating factory closer to the market and sources of inputs results to a reduced operational cost. This makes a company gaining more competitive advantage relative to its competitors.

Despite all these opportunities, global business is exposed to several risks. Ideally, value of a corporation depends on its expected future cash flows. Uncertainties surrounding MNC's future cash flows amounts to risks facing multinational companies. These risks can be categorized into three groups as discussed below:

1. **Foreign exchange risks**
If the foreign currencies to be received by an MNC suddenly weaken against the its operating currency, the MNC will receive a lower amount of cash flows than was expected. This may reduce the value of the MNC. To protect its self against this risk, a MNCs may adopt different techniques which include internal hedging techniques and

external hedging techniques. Internal hedging techniques include measures such as invoicing in hard currency, exposure netting as well as leading and lagging payments. External hedging techniques include measures such as money market hedge, forward contract, future contracts, options as well as swaps. These techniques will be covered in detail in the later chapters.

2. Political Risks

These include the risk of interference (law, restrictions on convertibility of currently of currencies etc.) and sometimes complete confiscation of company's assets. Several measure can be employed by a multinational organization to avoid political risks.

Measures before locating Production facilities overseas

- Assess the political environment of the host government
- Enter into binding agreements with the host government

Measures after locating production facilities overseas

- Invite influential Political leaders to form part of the Board of Directors of a Multinational firm
- Provide employment to indigenous people
- Support infrastructure activities
- Buy raw materials from local suppliers
- Support social activities e.g. sponsoring sport clubs
- Own communication facilities
- Borrow from local sources to finance your firms' operations.

3. Economic Risks

If economic conditions weaken, the income of consumers becomes relatively low, consumer purchases of products decline, and an MNC's sales in that country. This is because the amount of consumption in any country is influenced by the income earned by consumers in that country. All in all, economic risk involves changes in expected future cash flows, and hence economic value, caused by a change in exchange rate. Economic exposure can be separated into two components: transaction exposure and operating exposure. Operating exposure arises because currency fluctuations can alter a company's future revenues and costs, i.e. its operating cash flows.

Possible restrictions on Foreign Direct Investment by the host country

- **Local contents requirements (LCRs)**: MNCs are required to use a certain amount of local inputs in production. This is done with a view to promote development of local ancillary industries (TV, automobiles etc).
- **Domestic Sales requirements:** MNCs are required to sell a certain proportion of their production in the domestic markets (i.e. exports are restricted).
- **Remittance restrictions:** restrict the right of a foreign investor to repatriate from an investment (several countries in Africa impose these restrictions owing to balance of payments problems).
- **Local employment restrictions:** specify that a certain percentage of the TNS's employment be reserved for host countries nationals and
- **Product Mandating:** Places obligations on a TNC to supply certain markets with a designated product or product manufactured form a specific facility or operation.

3. Evaluate the determinants, usefulness and implications of host country's restrictions on Foreign Direct Investment (FDI) by

i. Assessing foreign direct investments modes of involvement

[Learning Outcome b.i]

Corporations are increasingly attracted to do business beyond their domestic markets. The main reason for this is said to be the growth of the international trade and the increase of the word economic independence. As such, Foreign Direct Investment (FDI) has become important source of private capital for developing countries. FDI leads to private international capital flows; and therefore, important because it represents additional investment and provides employment. This is good from the host government point of view.

The International Monetary Fund defines foreign direct investment as "an investment that is made to acquire a lasting interest in an enterprise operating in an economy other than that of the investor, the investor's purpose being to have an effective voice in the management of an enterprise". The term FDI is used to denote the

acquisition abroad of physical assets, such as plant and equipment, with operational control ultimately residing with the parent company in the home country.

FDI may take number of different forms including

- Establishment of new enterprises in foreign country (either as a branch or a subsidiary)
- Expansion of overseas branch or subsidiary,
- Acquisition of an overseas business enterprise or its assets.

Stages for FDI (Modes of Involvement)

There are various ways/methods on how the company can go global, but all in all safety of the capital to be involved should be a priority.

1. Exportation
This involves selling good and/or services abroad.

Advantages
- less risk and less cost method
- political risks are minimal
- agency cost is avoided such monitoring and evaluation costs

Disadvantages
- Host country's citizens denied employment chances
- Inputs not obtained from host country
- Host country not participating in the entire value chain activities

2. Management contracts
This is a contract that involves provision of management services to a foreign firm. It is an agreement by which company will provide its organizational and management expertise in the form of services to a foreign company.

Advantages
- Minimum investments
- Minimum political risk (no nationalization)
- Host country's company may become more innovative and productive

Disadvantages
- Involves payment of high cost to foreign experts
- May result to significant outflow of funds from host country

3. Licensing a foreign firm
This involves granting rights and provision of technology to a foreign entity to produce particular product(s) in exchange for fees or some other benefits. It obligates a firm to provide its technology (copyrights, patents, trademarks) or trade names in exchange of fees/ some specified benefit. The right is always granted for a specified period.

Advantages
- Requirement of minimum capital investment
- Faster way of foreign market entry
- Fewer risks especially political risks
- Helps to escape high tariffs and act as ban of importation to host country
- Gives a room for the host country to participate in value chain activities
- Employment to citizens of host country

Disadvantages
- Cannot be applied for some goods or services
- Cash flow is relatively low- license fee is likely to be lower than FDI profits
- Possible loss of quality control- (Product quality standards may compromised/affected).
- Competition from the licensee after the expiry the contracted period
- Difficult to control the transfer of technology to competitors (risk that the technology will be stolen).
- High agency costs

4. Joint venture/strategic alliance with local partner
Joint Venture is defined as shared ownership in a foreign business. A foreign business unit that is owned partially by the parent company is termed a foreign affiliate i.e. sharing ownership and risk with a local partner. Joint venture

is a venture that is owned and operated by two or more firms. Many firms enter foreign markets by engaging in a joint venture that resides in those markets. A foreign unit that is 50% or more owned and therefore controlled by the parent is typically designated a foreign subsidiary. A Joint Venture is therefore a foreign affiliate but no a subsidiary.

Advantages
- The local partner understands the customs moves of the local environment
- The local partner can provide competent management, not only top but at the middle as well
- Local partner`s contacts and reputation enhance access to the host country`s capital
- The public image of a firm that is partially local owned may improve its sales
- Shared risks and shared profit

Disadvantages
- Political risk is increased rather than reduced if the wrong partner is chosen,
- Local and foreign partner may have divergent views about the cash dividends or about desirability of growth financed by retained earnings

5. Acquisition of Existing business

Firms frequently acquire other firms in foreign countries as means of penetrating foreign market.

Advantages
- Allow firms to have full control over their business
- Enables the firm quickly to obtain large portion of foreign market share

Disadvantages
- Expose the company at risk,
- It requires a substantial capital for investment, a
- High agency costs and,
- If it is performing poorly it may be difficult to sell operation at reasonable price.

6. Establish a wholly-owned locally incorporated branch

To produce and sell their products, this method requires high investment, and it takes long for the company to get reward.

Note: At times, a company may use combination of various methods.

3. Evaluate the determinants, usefulness and implications of host country's restrictions on Foreign Direct Investment (FDI) by
ii. Analysing reasons, strategic and economic motives behind FDI
[Learning Outcome b.iii]

Reasons for foreign direct investment

Some of the key factors that are important in firm's decision to invest overseas include:

i. Overcoming trade Barriers
Governments may impose tariffs, quotas, and other restrictions on exports and imports of goods and services, hindering the free flow of these products and services across national boundaries. Facing barriers to exporting its products to foreign markets, a firm may decide to move production to foreign countries as a means of circumventing the trade barriers. Trade barriers can also arise naturally from transportation costs. Such products as minerals ore or cement that are bulky relative to their economic values may not be suitable for exporting because high transportation costs will substantially reduce profit margins. In these cases, FDI can be made in the foreign markets to reduce transportation costs.

ii. Imperfect Labor Markets
Labor services in a country can be severely underpriced relative to its productivity because workers are not allowed to move freely across national boundaries to seek higher wages. Among all factor markets, the labor market is the most imperfect. Severe imperfections in the labor market lead to persistent wage differentials among countries. When workers are not mobile because of immigration barriers, firms themselves should move to the workers to benefit from the underpriced labor services. This is one of the main reasons MNCs are making FDIs in less developed countries, where labor services are underpriced relative to their productivity.

iii. Comparative advantages

MNCs often enjoy comparative advantages due to special intangible assets they possess. Examples include technological, managerial and marketing knowhow, superior R & D capabilities, and brand names. These intangible assets are often not hard to package and sell to foreigners. In addition, the property rights in intangible assets are difficult to establish and protect, especially in foreign countries where legal recourse may not be readily available. As a result, firms may find it more profitable to establish foreign subsidiaries and capture returns directly by internalizing transactions in these assets.

iv. Vertical Integration

MNCs may undertake FDI in countries where inputs are available to secure supply of inputs at a stable price. Furthermore, if MNCs have monopolistic/oligopolistic control over the input market, this can serve as a barrier to entry to the industry. Many MNCs involved in extractive/natural resources industries tend to directly own oil fields, mine deposits, and forests for these reasons. Although the majority of vertical FDI are backward in that FDI involves an industry abroad that produces inputs for the MNCs, foreign investments can take the form of forward vertical FDI when they involve an industry abroad that sells MNC's output.

v. Product Life Cycle

Firms undertake FDI at a particular stage in the life cycle of the products that they initially introduced. When firms first introduce new products, they choose to keep production facilities at home, close to customers. In the early stage of the product life cycle, the demand for the new product is relatively insensitive to the price and thus the pioneering firm can charge a relatively high price. As the product becomes standardized and mature, it becomes important to cut the cost of production to stay competitive. In this case the firm may be induced to start production in foreign countries. Thus, FDI takes place when the product reaches maturity and the cost becomes an important consideration. FDI can thus be interpreted as a defensive move to maintain the firm's competitive position against its domestic and foreign rivals.

vi. Shareholder Diversification Services

If investors cannot effectively diversify their portfolio holdings internationally because of barriers to cross-border capital flows, firms may be able to provide their shareholders with indirect diversification services by making direct investments in foreign countries. When a firm holds assets in many countries, the firm's cash flows are internationally diversified. Thus, shareholders of the firm can indirectly benefit from international diversification even if they are not directly holding foreign shares.

Foreign Direct Investment Motives

Motives for FDI can be categorized into two groups, strategic Motives and economic Motives.

Strategic Motives behind FDI

a) *Market Seekers* - Imperfections and barriers to entry exist in many foreign countries, which may mean that companies have to locate their production facilities abroad to access new markets. The market motive is often defensive, as are other strategic motives, with companies concentrating on overall survival rather profitability. Market seekers produce in foreign markets either to satisfy local demand or to export to markets other than their own home market.
b) *Raw Material Seekers* - Raw material seekers extract raw materials whenever they can be found, either for export of for further processing and sale in the host country. Firms in the oil, mining, plantation, and forest industries fall into this category. By having direct control over raw materials, a more certain supply at an acceptable cost can be maintained
c) *Production Efficiency Seekers*- Because of imperfections in the international factor market, especially labor, companies often locate their production facilities abroad in regions of cheap labour to cut production costs, thereby increase competitiveness. Thus, production efficiency seekers produce in countries where one or more of the factors of production are underpriced relative to their productivity.
d) *Knowledge Seekers*- Knowledge seekers operate in foreign countries to gain access to technology or managerial expertise.
e) *Political Safety Seekers*- To avoid interference from governments, companies often locate their production facilities in regions free from government influence. Political safety seekers acquire or establish new operations in countries that are considered unlikely to expropriate or with private enterprises. Two corporate policies result from this motive:
   - Safe Plant: Safe plants involves locating production facilities in politically stable countries to secure supply in case of government intervention in alternative source countries.
   - Multiple Sourcing: This occurs when companies locate their production facilities in several locations and produce similar products in each.

Economic Motives behind FDI

Economic motives relate primarily to the competitive advantages of the multinational over companies located in foreign markets. The competitive advantages must be firm specific, transferable, and powerful enough to compensate the firm for the potential advantages of operating abroad. Based on observations of firms that have successfully invested abroad, some of the competitive advantages enjoyed by multinational firms are:

a) *Economies of Scale and Scope* - Economies of scale can arise in production, marketing, R&D, transport, finance and purchasing. Production economies can come from the use of large-scale automated plant and equipment or from an ability to rationalize production through worldwide specialization. Marketing economies occur when firms are large enough to use the most efficient media to create worldwide brand identification, as well as to establish worldwide distribution, warehousing and servicing systems. Financial economies derive from access to the full range of financial instruments and sources of funds. In-house research and development programs are typically restricted to large firms. Transportation economies accrue to firms that can ship in carload or shipload lots. Purchasing economies come from quantity discounts and market power.

b) *Managerial and Marketing Expertise*- Managerial expertise includes skills in managing large industrial organizations from both a human and technical viewpoint. It also encompasses knowledge of modern analytical techniques and their application in functional areas of business. Managerial expertise can be developed through prior experience in foreign markets.

c) *Superior Technology*- Technology includes both scientific and engineering skills. It is not limited to multinational, but firms in the most industrialized countries have had advantage in terms of access to continuing new technology spin-offs from the military and space programs.

d) *Financial Strength* - Financial strength includes not only economies of scale but also the ability to reduce risk through diversification of operations and borrowing sources. Typically, multinationals have had both lower cost and better availability of capital than foreign and domestic competitors.

e) *Differentiated Products* - Differentiated products originate from research-based innovations or heavy marketing expenditures to gain brand identification. It is difficult and costly for competitors to copy such products, and they always face a time lag if they try. Having developed differentiated products for the domestic market, the firm may decide to market them worldwide, a decision consistent with the desire to maximize return on heavy research and marketing expenditures.

f) *Competitiveness of the Home Market*- A strongly competitive home market can sharpen a firm's competitive advantage relative to firms located in less competitive home markets. Firms facing sophisticated and demanding customers in the home market can hone their marketing, production and quality control skills. A competitive home market obliges firms to fine-tune their operational and control strategies. They are forced to customize these strategies for their specific industry and country environment.

Various researches on "Investment in Tanzania" have indicated that tax holidays and exemptions offered by the government of Tanzania to attract foreign direct investment are not the only reason behind many investors' decision to come and invest in Tanzania.

Required:

Using examples, discuss any four (4) other determinants that you think may be an attraction to foreign investments to a country like Tanzania

3. Evaluate the determinants, usefulness and implications of host country's restrictions on Foreign Direct Investment (FDI) by assessing:
iii. Alternative global business entry strategies (methods).

[Learning Outcome c. iii]

A company can go global through various ways as discussed below:

i. **A Joint Venture**
This is a legal entity formed between two or more parties to undertake an economic activity together. The JV parties agree to create, for a finite time, a new entity and new assets by contributing equity. They then share in the revenues, expenses and assets and "control" of the enterprise. A MNC may create joint venture with the local company as an entry strategy to global market.

Advantages of Joint Venture
- The local coy have full knowledge of market environment which would take a substantial period for the foreign company to acquire
- The local coy will provide competent managers especially for the middle level.
- In some countries 100% of ownership is not possible thus joint venture is the only alternative

Disadvantages of Joint Venture
- Financing decision could be monopolized by the local company
- Political risk will increase if wrong partner is chosen
- Disclosure requirements may be interfered by host country

ii. **Mergers and Acquisition**

Although they are often uttered in the same breath and used as though they were synonymous, the terms merger and acquisition mean slightly different things. When one company takes over another and clearly established itself as the new owner, the purchase is called an acquisition. From a legal point of view, the target company ceases to exist, the buyer "swallows" the business and the buyer's stock continues to be traded. In the pure sense of the term, a merger happens when two firms, often of about the same size, agree to go forward as a single new company rather than remain separately owned and operated. This kind of action is more precisely referred to as a "merger of equals." Both companies' stocks are surrendered, and new company stock is issued in its place.

Advantages

- It is cost effective way to capture advance technology rather than developing it internally
- It is an easy and quicker way to establish an operating presence in the host country
- Economies of scale can be achieved in a merger or acquisition
- Foreign exchange exposure is reduced

Disadvantages

- Cultural differences may prevent the joining of the two companies with different customer values and nationality
- The price paid by the foreign coy to acquire the local company may be too higher

iii. **Licensing**

This is the method by which the foreign company grants license to the local company to manufacture the company's product in return of royalties.

Advantages

- Transportation costs are avoided because exporting is not required
- Direct foreign investment is not required as the locally company handle Production

Disadvantages

- License fees are generally low.
- It is difficult to control quality of the product.
- The possibility of technology secrecy provided to the local company to leak out to the competitive firms of the host countries.

iv. **Franchising**

Franchising is the practice of using another firm's successful business model. In this case multinational company allow an individual to sell its product in specific country and the company receives fees plus a periodical royalties and return. Good examples of companies which use the franchising strategy are McDonald's Corporation and Kentucky Fried Chicken (KFC) American fast food chains.

Advantages

- Independence of small start-up business supported by big business network.
- Training provided by the franchisor compensates for the need of experience.
- Already established reputation and image.
- Easiness of securing finance due to brand awareness.

Disadvantages

- Binding agreement.
- Little room for creativity.
- Failure of one franchise may cost other franchises.
- Sharing profit with the franchisor.

3. Evaluate the determinants, usefulness and implications of host country's restrictions on Foreign Direct Investment (FDI) by assessing:
iv. Legal and Institutional framework governing Foreign Direct Investment in Tanzania.
[**Learning Outcome c. iv]**

The trend of FDI inflow in Tanzania has tremendously increased in the past decade. In the 1990s, Tanzania's FDI was negligible but it grew tremendously in the past decade. This can be attributed to the increasing awareness of investors about the attractiveness of Tanzania as investment destination including Tanzania's; high growth potential, strategic location, peace and political stability, attractive investment regimes and incentives, abundance of natural resources, membership of bilateral trade agreement and warm and hospitable social attitude towards investors. Some of the leading countries investing in Tanzania includes; South Africa, United Kingdom, Kenya,

Canada, and China. Prioritized sectors of investment include; agriculture and livestock development, natural resources, tourism, manufacturing, petroleum and mining, real estate, transportation services, ICT, financial institutions, telecommunications, energy, human resources, and broadcasting.

Quality institution contributes to economic growth by harnessing the enforcement of contracts and protection of property which create an enabling environment for people and businesses to grow. FDI has proven useful in the past to advance economic development and foster structural change in emerging economies for which Tanzania is not an exception. In particular, FDI plays important role in emerging economies development efforts by; supplementing domestic savings, generating employment, integrating local businesses into the global economy, transfer of modern technologies, increasing productivity and raising skills of local manpower. Despite the FDI growth, the country faces the following institutional challenges of which if addressed will attract more growth are:

- Inadequate power supply,
- Less improved infrastructure
- lack of designated land for investment projects

Laws governing FDI in Tanzania

- Tanzania Investment Act, 1997
- Zanzibar Investment Promotion Act, 1986
- Private Partnership Act, 2010
- The Land Act, 1999
- The Tourist Industry Licensing Act, 1969
- The Value Added Tax Act, 1997 (Amended in 2014)
- Capital markets and Securities Act, 1994
- Banking and Financial Institution Act, 1991
- Export Processing Zones Act, 2002
- Special Economic Zones Act, 2002
- The Hotels Act, 1963
- Foreign exchange Act, 1992
- Immigration Act 1995

Various organisations and actors facilitate FDI in Tanzania by adhering to their sartorial regulations as well as other relevant principal acts identified above. These organizations and their influence have been discussed below:

i. **Tanzania Investment Centre (TIC)** Created by Tanzanian Investment Act of 1997 as “the primary agency of the government to coordinate, encourage, promote, and facilitate investment in Tanzania”. The agency helps investors to obtain permit, licenses, visas, and land and play the role of guide to the applicable acts and regulations that an investor may need to understand.

ii. **Business Registration and Licensing Agency (BRELA)** gives license to investors wishing to operate their businesses in Tanzania. It is under the Ministry of Industry and Trade. The agency has the mandate to register certain kinds of businesses. But in Zanzibar, FDI registration is handled directly by Zanzibar Investment Promotion Agency and may liaise with relevant ministries if necessary. These agencies have made licensing procedure and documentation requirements fairly straightforward t overly onerous as previous.

iii. **National Investment Steering Committee (NISC)** is a committee set up to ensure coordination and consistency among the different government ministries, sectors, agencies and their respective institutions with respect to investment including FDI. A committee was a recommendation from United Nations Industrial Development and Organisations’ (UNIDO) on investment regulations for the development of Tanzania institutions influencing investment and trade.

iv. **Tanzanian National Business Council (TNBC)** is a committee established under Presidential order and chaired by the President. Its aim is to provide the private sector, including foreign investors, the access to the President in order to discuss barriers to efficient business operations.

v. **Commercial Court:** The High Court of Tanzania oversees all commercial cases. There are three specialized divisions Commercial, Labour, and Land. The Labour and Land divisions have exclusive jurisdiction over their respective matters, while the Commercial division is without exclusive jurisdiction. Subject to financial limitations, the District and Resident Magistrate Courts also have original jurisdiction in certain commercial cases. The Tax Appeal Act and the Fair Competition Act, 2003 of Tanzania established the Tax Revenue Tribunal and the Fair Competition Act as other quasi-judicial bodies for related commercial cases.

vi. **Ministries:**
- Ministry of Land, the Land Act and the Village Land Act 1999 empowers the Land Ministry to make land available to private sector investors on a leasehold basis.

- The Ministry of Mining and Energy have the sole responsibility of granting mineral rights to investors.
- Ministry of Energy and Minerals - According to the Mining Act 1998 and the Petroleum Act 1980 of Tanzania, all firms investing in the mining or petroleum sectors are required to obtain registration and approval administered by this ministry. The ministry asses and issue certificate separately from the once issued by BRELA under the Ministry of Trade and Industry.
- Ministry of Tourism and Natural Recourses and TIC gives licences to investors in tourism business.
- The Ministry of Labour and Employment manages and administers expatriate employment and basic legislation covering immigration to Tanzania purposely for investment.
- Ministry of Industry and Trade have wide- It harnesses foreign investment by providing and enforcing; intellectual property rights, sectoral developments and competition policies and general regulation on external trade.

Test Yourself 5

Various laws governing FDI in Tanzania have been for enacted. These laws include but not limited to Tanzania Investment Act, 1997; Zanzibar Investment Promotion Act, 1986; Private Partnership Act, 2010 and The Land Act, 1999. The formulation of such laws gave mandate and existence of various organisations and actors to support FDI.

Required:

Discuss the actors and their respective roles

3. Evaluate the determinants, usefulness and implications of host country's restrictions on Foreign Direct Investment (FDI) by assessing:
v. Advantages and drawbacks of FDI to host country

[Learning Outcome c. iv]

Advantages of FDI for the Overseas Country

1. In the short-run FDI may lead to improvement in the balance of payments.
2. FDI may bring about of new technology, particularly for LDCs.
3. FDI may assist in the development of the skills of the indigenous work force.
4. FDI may assist in the creation of additional employment.
5. Introduction of new management practices.

Disadvantages of FDI for Overseas Country

1. In the long term there will be negative impact on the balance of payments as the multinational company seeks to remit funds earned out of the country.
2. In the long term, the economy may be more unstable, since in times of economic pressure it is the operations that are furthest from the head office that tend to be closed first.
3. Loss of control over key resources may occur if a multinational company comes to own strategic resources in the country, such as mineral deposits.
4. Introduction of different value systems and lifestyles that undermine the traditional culture.

3. Evaluate the determinants, usefulness and implications of host country's restrictions on Foreign Direct Investment (FDI) by assessing:
vi. The role of Foreign Direct Investment in abusive transfer pricing.

[Learning Outcome c.vi]

A transfer price is the compensation paid for intra-group services to related units of MNCs. It is the price at which goods or services are transferred from one process or department to another or from one member of the group to another. For the case of MNCs, transfer pricing entails a price a price at which goods and services are transferred from one operation to another operation within the same country or across the borders. MNCs adjusting their arm's length prices to obscure the extent of their transfer price manipulations.

International transfer pricing is regarded as an important mechanism for multinational corporations (MNCs) to manoeuvre funds internationally and to choose the countries in which they wish profits to be reported. In pursuing global profit maximisation by employing transfer pricing mechanisms, an MNC is constrained by counter-measures introduced by governments.

Transfer pricing techniques used under FDI Arrangements

FDI through MNCs use four transfer pricing techniques namely Market-based transfer pricing, Cost-based transfer pricing, negotiated transfer prices and central management-based transfer prices

- **The market-based transfer price** is a price that a selling division can get for its product in the external market or the price at which the buying division can get the product in the market place. The use of market-based transfer prices allows each division to be evaluated on a stand-alone basis
- **The cost-based transfer pricing** includes the full cost method, the full cost-plus method and the marginal cost transfer price. Under the full cost method, the full cost including fixed overheads absorbed that have been incurred by the supplying division in making the intermediate product is charged to the receiving division. The full cost-plus method on the other hand ensures that the supplying divisions do not make any profits on the products or services transferred a mark-up is added to enable the supplying division to earn a profit on interdivisional transfers. The marginal cost transfer price method on the other hand involves charging the variable cost that has been incurred by the supplying division to the receiving division.
- **The negotiated transfer pricing** method involves negotiations between two managers of the selling and receiving departments/divisions. The selling manager quotes the price and delivery conditions which may or may not be accepted by the receiving manager based on alternative sources (Hirshleifer, 2006).
- **The central management-based transfer pricing**, the central management may determine the transfer price and communicate this to the divisional managers. In most cases the basis of this is to promote goal congruency and to allow for a standard performance evaluation criteria.

Likely abusive transfer price practice in FDI arrangement

When related companies transact with each other, their commercial and financial relations may not be directly affected by external market forces in the same way. As a result, the prices charged for intra firm transfers of goods, for instance, between a foreign subsidiary of a multinational and its parent, may differ from those charged to independent companies for the transfer of comparable goods.

Transfer price is not a bad practice. What makes it bad is the motive behind instituting it. If applied internally for motives such as allocating resources optimally, measuring performance or enhancing divisional autonomy, then it is not an abusive practice. The main abusive issue by MNC is **adjusting the price of cross-border transactions to reduce taxable profits.** This is done intentionally by shifting profit to tax haven countries to minimize taxable profit. This practice leaves the host country operations with inadequate taxable profit.

Due to inadequacies institutional infrastructure and weak legal structure, MNCs are likely to maneuver some transactions to suit tax minimization objective. MNC may therefore charge a price less than or higher that arm's length price for transactions for their own motive. Typical international transactions that are usually subject to transfer pricing rules include:

- Purchase of raw-material
- Sale of finished goods
- Software development services
- IT enabled services
- Support services
- Technical service fees
- Royalty fee
- Management fees
- Corporate guarantee fees
- Loan received or paid
- Purchase of fixed assets
- Reimbursement of expenses paid/received
- Sale or purchase of machinery

Counter measures introduced by governments to overcome abusive TP

- Enactment of laws which require that transfer prices for imports and exports of goods and services be set equal to arm's length prices. Tax regulations of home and host countries needs to capture this notion in their regulations.
- Enforcement of transfer pricing regulations to protect revenue for the growth of the host country. This will help protecting revenue share of the host country.
- Transfer pricing audit by taxation authority- used to check the abuse of transfer pricing by MNCs industries and detect whether price or profit has been understated.
- Pressure from lobbyists on scrutinisation of MNCs suspected of profit shifting and transfer mispricing.
- Aligning and rationalizing business supply chains, tax, and legal operating models to deliver sustainable financial benefits as well as defining sustainable transfer pricing strategies is a key towards overcoming abusive TP practices.

Answers to Test Yourself Questions

Answer to TY 1

i. **Deregulation of financial markets**- reduction or elimination of strict rules prior raising funds in the capital market has simplified possibilities of raising funds from different economies. It has vastly increased the ability of the **financial markets** to allocate international capital efficiently. Having many rules and regulations reduces investment opportunity and eventually a slow economic growth. Deregulation has increased growth in financial transactions and resulted in a restructured, more competitive, and less costly financial services industry.

ii. **Cross listing**- This refers to the process of listing of a company's common shares on a different exchange market than its primary and original stock exchange market. With numerous times zones and multiple currencies, cross listing results to increased liquidity, access to more investors and it enhances corporate governance practices. Cross listed companies are will abide by the corporate governance rules adopted by the well-developed stock market.

iii. **Access to capital** refers to the need that small businesses have for loans or investment money, so they can grow. With internationalization, it is now easy for companies to access capital from different parties of the world. Not only in form of debt, but also in form of equity as explained under cross listing in ii above.

iv. **Minimization of transaction cost**- Access to information- with the growth in technology, investors can easily know what is happening in other economies and make timely decisions

v. **Economic integration**- when countries located in a particular geographic area agree to reduce and or remove trade barriers, there will be a free flow of goods or services and factors of production among each other. This will stimulate financial market as well as economic growth among member countries.

vi. **Financial Strength**
Firms demonstrate financial strength by achieving and maintaining global cost and availability of capital. This is a crucial competitive cost variable that enables them to fund FDI and other foreign activities. Multinationals that are resident in liquid and unsegmented capital markets are normally blessed with this attribute.

Answer to TY 2

- Monitoring managers of distant subsidiaries in foreign countries is more difficult.
- Foreign subsidiary managers raised in different cultures may not follow uniform goal.
- The sheer size of the larger MNCs can also create large agency problems.
- Managers of MNCs located abroad tend to downplay the short-term effects of decisions, which may result in decisions for foreign subsidiaries to be inconsistent with maximizing shareholder wealth.
- Going concern assurance provided by operations in other countries may induce some managers to pursue own interests rather than maximizing shareholders wealth.

Answer to TY 3

1. In terms of **Comparative advantage,** MELT has specialised in producing products which results to comperative advantage.

    i. **Firm strategy, structure and rivalry.** MELT is facing domestic competitions from other companies such as Azam group of companies
    ii. **Demand conditions**-market segment chosen by MELT does not necessitate sophistication of products given the nature of customers it serves.
    iii. **Related and supporting industries-** various domestic suppliers sell their inputs to MELT Co.
    iv. **Factor conditions** – recruiting highly trained managers

2. **In terms of Market Imperfections Theory-** immobility of factors of production such as labour, rationalizes international trade and investment.

3. Regarding **Product cycle Theory** since MELT operations matured in Tanzania, it recognized opportunities outside its home country.

Answer to TY 4

(a) determinants of foreign direct investments:

- Motive of MNC Vs Economic Determinant: which include the Raw material availability and cost, Productivity and availability of skilled and unskilled labour infrastructure (roads, ports, power, telecom etc).
- Efficiency-seeking which is based on labour productivity; Availability of scientifically trained manpower; Transport costs (from host country to export destinations) and membership of the host country in regional trading agreement with a view to the possibility of tie-ups with other corporate in the region.
- Policy Framework- Several dimensions of the policy environment could be important such as economic and political stability, rules regarding entry and exist and privatization policy.7
- Business Facilitation - This essentially refers to the ease with which business can be conducted in the host country. The most important of these business practices include corruption and administrative efficiency, investment incentives for special sectors and areas and development of financial institutions, especially banks and the capital market.
- Monetary and financial system – stability of forex, convertibility of TSHS, Possibility of financing the investments internally and
- Political risk: Civil unrests, democratic change and its impact on investments and other policies.

Answer to TY 5

FDI Actors and their respective roles in Tanzania

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- Ministry of Industry and Trade have wide- It harnesses foreign investment by providing and enforcing; intellectual property rights, sectoral developments and competition policies and general regulation on external trade.

Indicative Examination Questions (IEQs)

IEQ 1

(a) Discuss any two conditions that a company needs to fulfil before embarking on foreign direct investment.

(b) Discuss any two reasons behind the growth of foreign direct investments in Africa.

(c) Mbonden City Plc is a manufacturer company of multimedia computer system based in Dar es Salaam.

In the multinational sense, companies try to create, transfer and preserve their competitive advantages abroad. Mbonden's customers are all Tanzanian firms and majority of them purchase highly customized computer systems. Mbonden City Plc is considering whether to switch from domestic production to offshore production, possibly in Kenya.

Mr. Jaman Nyoni, the Chairman of Mbonden City's board of directors believes that since the company has sound engineering and marketing capacity, shifting to offshore manufacturing will enable it to increase production as well as take full advantage of low-wage labour, cheaper materials, tax concessions, low interest on loans and government subsidies. The Chief Finance Officer has prepared a conversional discounted cash-flow statement, which indicated that switching to offshore production would give a positive Net Present Value (NPV) investment.

The board of directors has established that the Kenyan Government is willing to provide a loan of Kshs900 million at 9 percent fixed interest to Mbonden to allow it to build a factory there. The loan would be repaid in six annual-equal instalments. The projected annual income before tax from the proposed Kenya Plant is Kshs.9,000,000, beginning at the end of the first year. Kenya's corporate tax (CT) rate is 25 percent and there is a 20 percent dividend withholding tax. However, Kenya will exempt the plant's income from CT (but not the withholding tax) for the first six years. Mbonden plans to remit all income as dividends back to Tanzania where Tanzania Corporate Tax is 35 percent.

Another option being considered by Mbonden City Plc is to shut down all domestic production and arrange a manufacturing contract with a firm operating in Japan. However, the board of directors of Mbonden City Plc is concerned that the change from domestic to foreign operations could entail a loss of some intangible strategic benefits associated with domestic production.

Required:

Assume you work for FDI Consulting firm and you have been asked to advise the board of directors of Mbonden City Plc on their foreign investment strategy:

(i) Calculate the value of tax exemptions, which the Kenyan Government is willing to allow on the basis that Mbonden City Plc's wish to remit all income as dividend back to Tanzania.
(ii) Calculate the before tax value of the interest subsidy, based on the information above, if the market interest rate for such an investment is 20 percent.
(iii) Comment on what you consider to be the key advantages and disadvantages for Mbonden City Plc if it were to shut down all domestic production and arrange a subcontract with a Japan based company, to manufacture all its production.

Answer to IEQ 1

(a) Conditions to be fulfilled before a company decide to undergo an FDI:
(i) The expectation that the net benefits of FDI will be greater than that for either licensing or exporting. FDI will be preferred to export or licensing where:
- International diversification of product lines by FDI reduce risk.
- Benefits exist from interrelationships in the production of several parts of the multinational's product range.
- The reputation or brand name of the company is considered as important by consumers, and
- An after-sales service is very important. In this case multinational firm will be unwilling to entrust after-sales service to a third party through licensing or other agreement.

(ii) The multinational's foreign activities must be competitive when compared with local companies in the foreign country.
(iii) The optimal location for FDI can be identified via the analysis of the costs of materials, labour, transportation etc.
(iv) The optimal timing of FDI can be established.

(b) Reasons for the recent growth of foreign direct investment (FDI) in developing markets:

(i) To enjoy tax incentives and other incentives.
(ii) To take advantages of tariff exemptions.
(iii) Remittance guarantees.
(iv) Privatization.
(v) Positive attitude towards foreign investment.
(vi) Relaxation of the state controls.

(c) (i) **The value of tax exemptions**

The Tax exemption calculation if Mbonden City Plc remits all income as dividend to Tanzania.

	IN KENYA	
	Without Tax Holiday	**With Tax Holiday**
	Kshs.	**Kshs.**
Profit Before tax	9,000,000	9,000,000
Corporate Tax (@ 25%)	2,250,000	----------
Profit after tax (dividend)	6,750,000	9,000,000
Withholding Tax (20%)	1,350,000	1,800,000
Net Company Dividend	5,400,000	7,200,000
	IN TANZANIA	
Tanzania tax owed (35%)	3,150,000	3,150,000
Less: Indirect FCT	1,350,000	1,800,000
Direct FCT	2,250,000	----------
Net Tanzania Tax Owed	(450,000)	1,350,000
The value of net dividend	**5,400,000**	**5,850,000**

Net benefit = 5,850,000 – 5,400,000 = Kshs. 450,000

Assuming Mbonden City Plc has no use for the Kshs. 450,000 excess foreign tax credits; the calculations indicate that the value of the tax holiday to it is about Kshs. 450,000 annually.

STUDY GUIDE A2: MERGERS AND ACQUISITIONS

Get Through Intro

As we have studied in earlier stage, the central goal of the firm in finance is to maximise shareholders wealth. To achieve this goal, companies cannot do without growth. Mergers and acquisitions have constantly been a common external growth strategy. Moreover, it adds to the various ways through which a firm can go multinational through branches, subsidiaries, joint ventures, franchise or turn key projects. Mergers and acquisition have been mentioned as a quickest way of entering a new market and overcoming competition. When two companies to form a new company, or one purchase the other, it becomes easy to obtain the earlier mentioned advantages.

Business combination, acquisition and formation of synergies have for long been considered amongst efficient ways for quick growth and expansion to foreign markets by companies around the globe. However, a successful merger and acquisition strategy requires critical analysis, realistic valuation and application of appropriate principles to that end. Nonetheless, this can only be possible when business firms have practitioners with right understanding and skills on this issue. It is therefore imperative for professional accountant to be enlightened on theories, principles and practices on mergers and acquisition.

In this Study Guide, we will introduce the concept mergers and acquisitions, assess alternative valuation techniques for mergers and acquisitions as well as assessing alternative financing techniques for mergers and acquisitions.

Learning Outcomes

a) Assess and plan mergers and acquisitions as an alternative growth strategy by analysing:

   i. Alternative types of mergers and acquisitions.
   ii. Alternative mergers and growth strategies available to a firm.
   iii. Merits and demerits of mergers and acquisitions as expansion strategy.
   iv. Qualities of an appropriate acquisition strategy.
   v. Factors that determine the success of a merger or acquisition.

b) Assess alternative valuation techniques for mergers and acquisitions by analysing:

   i. Corporate and Competitive nature of an acquisition proposal.
   ii. Existence of synergies through mergers.
   iii. The problem of overvaluation of the target firm.
   iv. The impact of acquisition or mergers upon the risk profile of the acquirer.
   v. Growth levels of the target firm's earnings.
   vi. Valuation of Type I, II, and III acquisitions.
   vii. Valuation of Intangible Assets.

c) Assess alternative financing techniques for mergers and acquisitions by analysing:

   i. Alternative approaches to financing mergers and acquisitions.
   ii. An offer for Acquisition.
   iii. Effect of an offer on financial position and performance.

1. Assess and plan mergers and acquisitions as an alternative growth strategy by analysing:
i. Alternative types of mergers and acquisitions

[Learning outcomes a. i]

Definition

Mergers ad acquisitions (M&A) refer to the combination of business firms. Although every merger has its own unique reasons, the underlying principle behind mergers and acquisitions (M&A) is the creation of additional value which we called "synergy" that takes three forms including revenue, expenses and cost of capital. On the revenue side, merging companies is likely to result to higher revenue than it was realized before. On the side of expenses, business combinations usually result to cost saving due to economies of scale and economies of scope. It is cheaper for the combined business to raise capital than when these businesses raise capital alone.

On the other hand, M&As are also driven by strategic reasons such as positioning that is taking an advantage of future opportunities created by the combined company, filling strategic gaps which are essential for long term survival, enhancing organizational competencies as well as widening market access. M&A are at times driven by the wish to acquire assets at the price less than market value. For instance, an oil extraction company may need to develop oil refining equipment while on the other hand, there is a company that has excess capacity in terms of refining oil. These companies might combine the efforts for the success of one new company. The need to diversify and smooth income is another reason for diversification. Given the significance of mergers and acquisitions, such transactions must be approved by those charged with governance of the firm as well as shareholders.

In summary, the drivers for mergers and acquisitions are:

- Market share
- Economies of scale
- Government policy
- Deregulation
- Economies of scope
- Imitation
- Buying out competitors
- Potential business synergies e.g. expanding product lines
- Having a succession pool
- Acquiring specific competence
- Globalisation/market access
- Access to closed markets
- Access to distribution channels

Test Yourself 1

Why is it likely that a M&A will result to lower cost of capital to the company?

Forms of Mergers and Acquisitions

For whatever a reason, M&As may take various forms including mergers, acquisitions, consolidations, purchase of assets, tender offers as well as management acquisitions.

- **Merger**: refers to the combination of two existing firms into one new firm. With mergers, companies which combines are usually of comparable size to create a new firm that will theoretically be equally owned by both partners
- **Acquisition:** under this arrangement, one firm retains its legal structure and obtains the majority ownership in the acquired firm, which does not change its name or legal structure. One firm therefore dissolves after being acquired by the other. It is simply a purchase of a small firm by a large one and the small firm ceases to exist, and its assets becomes part of a larger firm
- **Consolidation:** the unification of two or more corporations by dissolution of existing ones and creation of a single new corporation.
- **Tender Offer:** under this arrangement, one firm offers to buy the outstanding shares of the other firm at a specific price. The firm that wants to purchase the other firm communicates the offer directly to the shareholders bypassing management of the firm that is to be purchased.
- **Acquisition of Assets:** This normally occurs during bankruptcy proceedings where other firms bid to purchase the assets of the firm being liquidated. The firm whose assets are being purchased must get approval of its owners. Therefore, acquisition of assets occurs when one firm purchase assets of the other.

- **Management buyout (MBO) or management acquisitions.** Here, the management of the company purchases enough shares that makes them controllers of the company and makes the firm a private one. It has an impact of unifying ownership and control, an act that minimizes agency costs.

All in all, the terms merger and acquisition are too broad to refer to mergers and acquisitions only. The real difference between these transactions lies on how the purchase is communicated to and received by the target company's board of directors, employees and shareholders.

1. Assess and plan mergers and acquisitions as an alternative growth strategy by analysing:
ii. Alternative mergers and growth strategies available to a firm.

[Learning outcomes a. ii]

a) **Horizontal:** Two firms are merged across similar products or services. this is integration in **complementary activities** in a value system. It results in the production of substitute products. Horizontal integration is **useful** in the following ways
   - economies of scope
   - reduction in competition
   - fulfilment of customer expectations
   - availability of substitutes
   - economies of scale

   Horizontal mergers are often used as a way for a company to increase its market share by merging with a competing company. For example, the merger between oil and gas companies operating in upstream will allow both companies a larger share of the oil and gas market.

b) **Vertical:** Occurs when two firms with **adjacent activities** in a value system combines. For example, when a manufacturer is merging with a supplier. Vertical mergers are often used to gain a competitive advantage within the marketplace. If Jaydee Pharmaceuticals, a large manufacturer of pharmaceuticals, merged with, a large distributor of pharmaceuticals, to gain an advantage in distributing its products.

Example

Shell is a worldwide group of oil, gas and petrochemical companies. The company's main business is the exploration for and the production and trading in a range of energy resources. The company has extensive vertical integration. It conducts exploration, production, transportation, refining, retail distribution and sale of fuel. The vertically integrated business model gave significant economies of scale to Shell and provided it with the opportunity to establish barriers to entry both geographically and on a more global scale.

Vertical integration may be of two types:

i. **Forward integration-** is expansion into activities which are related with the organisation's outputs. This type of integration extends control over downstream **distribution operations**; those areas of the value system which are closer to end users.
ii. **Backward integration-** is expansion into activities related with the inputs into the organisation's existing business. This type of integration involves extending control over **upstream operations**; those areas of the value system which are further from the end user.

Example Hi Tech Ltd is a computer manufacturer in the UK. It decided to acquire Superb Ltd, a spare parts manufacturer. This is backward integration because Hi Tech is producing outputs and it intends to acquire a business which is its raw material manufacturer i.e. which produces inputs.

c) Conglomerate-. It involves merging with a firm that offers products or services **beyond the current capabilities or value.** Firms which have united are in entirely different fields

Example

Virgin is one of the world's most recognised and respected brands. Conceived in 1970 by Sir Richard Branson, the Virgin Group has gone on to grow very successful businesses in sectors ranging from mobile telephony, to transportation, travel, financial services, leisure, music, holidays, publishing and retailing. The businesses owned by Virgin are as follows:

- Virgin Travel (& Virgin Holidays)
- Virgin Retail (Music & Entertainment)
- Virgin Investments (computer products, promotional blimps, property development)
- Virgin Hotels Group (clubs & hotels in UK, Spain & Virgin Islands)
- Virgin Communications (Virgin Interactive Entertainment, Publishing, Radio, TV)

Advantages of unrelated diversification

- The financial resources of the organisation can fully be utilised in the industry where higher profits can be earned.
- There is the opportunity to maximise the utilisation of underutilised resources or competencies.
- The risk involved in business is spread over different industries.

Related business combination is argued to be superior to unrelated diversification because it usually creates economies of scope. However, there are some problems associated with related diversification such as:

- It is time-consuming.
- It is expensive.
- Difficulties may arise in sharing resources.

3. Assess and plan mergers and acquisitions as an alternative growth strategy by analysing:
iii. Merits and demerits of mergers and acquisitions as expansion strategy.
[Learning outcomes a. iii]

Merits of mergers and acquisitions

- Firms enter into merger and acquisition to increase their market share. The combination of firms into one will not only bring the existing customers together, but also likely to attract other customers
- The benefits of synergy refer to the benefits arising out of working together of two or more parts. The benefits. arise because the result is greater than the sum of their individual effects or capabilities. synergy brings about returns enrichment and cost savings.
- **Economies of scope in contrast to economies of scale**. An organisation may achieve economies of scope by increasing its number of SBUs so that its total costs are spread over a greater number of business units. The cost per business unit therefore falls. In this manner, diversification takes place
- Realization of economies of scale. Uniting companies makes it possible to operate in large scale resulting to quantity discount and other cost savings.
- Ability to raise capital at cheaper cost
- Acquisition by another firm is one way that shareholders can remove managers with whom they are unhappy.

Demerits of mergers and acquisitions

- It is hard to estimate synergies using discounted cashflow techniques
- Synergies projected for M & A's are not achieved in most cases.
- A small percentage of all M & A's will earn their predetermined cost of capital.
- In the first six months of a merger, productivity may fall by as much as 50%.
- The average financial performance of a newly merged company is graded as C - by the respective Managers.
- In acquired companies, there is likely to be a high chance of employees' turnover for the first years of operations.
- There are complex accounting, tax, and legal effects when one firm is acquired by another.

1. Assess and plan mergers and acquisitions as an alternative growth strategy by analysing:
iv. Qualities of an appropriate acquisition strategy
[Learning outcomes a. iv]

The acquisition of one firm by another is, of course, an investment made under un- certainty.

A clear M&A strategy- A structured approach to M&As is key to its success, both the predator and the target should have a structured strategy to go about uniting. All too often strategies are incomplete, focusing on the requirements of the purchaser, without integrating the different market demands on the acquisition Incomplete strategies.

Decision on type and level of integration- There should be a perfect match between the level of integration required for the specific purpose of a merger or acquisition.

Managing cultural and system integration- An integration strategy has as its goal to create synergies or to establish a third company and managing. Integration of organisational cultures and systems is therefore seen as critical.

Conflict resolution and team building should have high priority.

Focusing on key priorities

Carrying out a proper due diligence- Due diligence should be carried out to validate the value of the deal, to identify potential risks and opportunities. both parties identify any legal risks associated with the mergerby carrying legal due diligence.

Regulators considerations-There are several regulatory considerations when performing M&A. In some cases, there is a need to obtain specific approvals from an M&A transaction from government regulatory bodies, especially when the company is part of core economic activities of the country like banking, insurance, electricity or water supply. government agencies exist that ensure industries stay competitive. M&A transactions usually present a possibility of collusion between firms, to raise price and create a monopoly situation. Some countries have stringent labour laws, which need to be taken into account before M&A transaction take place.

1. Assess and plan mergers and acquisitions as an alternative growth strategy by analysing:
v. Factors that determine the success of a merger or acquisition
[Learning outcomes a. v]

For M&A strategy to be successful it has to results to merits of M&A such a as to increase market share, ensure synergies etc as discussed in learning outcomes a. iii. The following factors determines the success of Mergers and acquisitions

- **Industry relatedness**. One of the aims of the M&A is to minimise competition and to increase market share. To easily achieve this, M&A deal has between companies operating in the same industry. This will make the new company to have an extensive previous experience in M&As in the same industry.
- **Common marketing strategy-** Merging companies is one factor but creating a common marketing strategy among the merged companies is very important to ensure strategic adjustment and brand name recognition on the market. This will make it easy for the newly developed products to penetrate the market.
- **Corporate culture convergence**. the difficulties, the costs and the risks associated with the cross-cultural contact should be managed and harmonised to bring about success of M&A. The cultures of the merging companies should be compatible to be successfully integrated.
- **Managed employees' resistance and**
- **Integrated technological processes.** Compatibility of IT system determines success of M&A strategy. A well-integrated IT system will result to goal harmonisation and eventually goal congruence for the newly formed company.
- Efficiency in managing synergy. Related to the strategic adjustment, synergy takes place when two separate entities can be managed more efficiently together than separately.
- Portfolio diversification. of the key goal of M&A is to minimise risk in order create competitive advantage. When properly diversified, M&A strategy is likely to result to this goal.
- Strategic similarities
- **Retaining key executives post M&A stage**. Executive departures post-M&A stage has a negative impact on the performance of acquired firms.
- **Timing of M&A**- Early positioning, that is companies that react earlier in the M&A wave have an advantage to their competitors because they can benefit from information asymmetry
- Mode of financing – Financing M&A from cheaper sources is likely to make it a success than using expensive sources. On the other hand, using external sources such as raising new equity may have a signalling impact on how management perceive position of the company.
- Governmental participation. According to the economic theory, the transfer of capital on the market and the market competition should improve the financial performance if environmental conditions rather than ownership affect more the performance. When a government participates in M&A through say privatization, it brings about the transfer of capital on the market and hence a success of M&A

2. **Assess alternative valuation techniques for mergers and acquisitions by analysing:**
i. Corporate and Competitive nature of an acquisition proposal.
[Learning outcomes b. i]

Usually, when an acquisition proposal is tabled, different regulations on takeovers will become active within a corporation. These regulations vary from jurisdiction to jurisdiction, but their main aim is to secure the interests of shareholders through controlling the directors. Such regulations may include:

- All shareholders to be equally treated
- Shareholders must be given an access to relevant information so that they can make informed decisions
- Any action taken by the board must be approved by shareholders
- Directors should act to the best interests of the shareholders and ignore thei personal interest once to the company is put under takeover bid
- An independent valuer should support valuation of assets
- The assumptions on which prospective financial information has been prepared should be verified by accountants

Generally, a company could either adopt shareholder or stakeholder models of regulations during M&A. A shareholder model is mainly focusing at protecting the rights of shareholders. A stakeholder model considers the interests of all stakeholders including employees, government, community suppliers, customers etc.

The issue of which model is better than the other is still debatable. While shareholders model appears to be more economically efficient, stakeholder's model appears to be more successful in dealing with agency problem and managerial abuse of power.

2. Assess alternative valuation techniques for mergers and acquisitions by analysing:
ii. Existence of synergies through mergers.

[Learning outcomes b. ii]

Consider two firms which are about to merge, firm A and firm B in order to form a combined firm, firm AB. In this scenario, synergy will be the excess of value of combined firm (value of firm AB) over the sum of value of individual firms (value of firm A + Value of firm B). A well strategized M&A is likely to result to synergies in many ways. It is important to understand these synergies in order to be able to determine the NPV of an acquisition candidate (target). It should be noted that one approach of finding the NPV of an acquisition candidate is the difference between the synergy from the merger and the premium to be paid. The following types of synergies are normally considered.

Discounted cash flow model is used to value synergies from acquisition whereby the value of synergy is determined as the present value of future cash flows expected from synergy. The future CF expected form synergy is found by taking the difference between CFs of the combined firms and the sum of CFs of two separate firms. These cash flows should be discounted by the required rate of return on the equity of the target.

i. Revenue enhancement
Merging companies is sought to enhance revenue through market power, market gains and strategic gains.
Enhancement of revenue through **market power** can be realised in the following ways
- Monopolistic power that eliminates competition
- Innovation
- Quick access to new market
- Acquisition of valuable, rare and scarce resource.

Market gains can be realized through
- Activating previously ineffective media programming and advertising efforts
- Strengthening channel of distribution
- Balancing the product mix

Strategic gains refer to the potentiality of taking advantage of the competitive environment if certain situations materialize.

ii. Cost reduction
This can be attained through
- Economies of scale – ability to lower production cost due producing in large volume.
- Economies of scope - ability to lower cost due to complementary resources

iii. Lower taxes,
Some acquisitions are aimed at lowering taxes though the following ways
- Net operating loss from say a target can offset net operating income of say a predator resulting to low taxable income for the combined.
- The use of unused debt capacity- it should be noted that interest on debt is a tax allowable expense. This is to say, it reduces taxable income for a particular firm.

- **Tax advantages on capital gain as opposed to dividend**. The use of surplus funds to acquire shares of another firm is likely to lower taxability because in many jurisdictions, capital gain is taxed at lower rate relative to dividends

iv. Lower cost of capital- This is because issuing cost of securities becomes smaller as many securities are issued due to economies of scale. It is relatively cheaper to issue many shares than issuing few shares.

2. Assess alternative valuation techniques for mergers and acquisitions by analysing:
iii. The problem of overvaluation of the target firm.

[Learning outcomes b. iii]

Over valuation problem

This situation occurs when the computed value of a target or any other firm higher than the real value of the firm. The said problem is normally influenced by market inefficiency. Despite the fact that capital markets are generally considered to be semi strongly efficient, i.e. prices reflect all publicly available information, yet the market does not fully understand the information available and hence a tendency of overestimating potential returns and overpricing equity. A Target firms are often overvalued because of:

- Over optimism with regard to economies of scale
- Anticipation of gains due synergies
- The target share price may involve open auction and highest bidder being the purchaser

It is expected that the price of overvalued firm will eventually be corrected by the market however such corrections may not happen if:

- There is a collusion between company managers, commercial banks, auditors and law firms
- Managers provide data that deliberately misleading

When managers are reluctant to correct an overvaluation problem, the situation may force them to

- Use aggressive accounting practices so as to produce desired results
- Making poor business decisions so as to portray success
- Use equity that is unrealistically overvalued to finance repurchase and hence poor acquisition decisions

Since there are chances that financial information provided by managers might be deliberately misstated in order to give a desired impression, there is a need to analyze and adjust such information appropriately before relying on them.

2. Assess alternative valuation techniques for mergers and acquisitions by analysing:
iv. The impact of acquisition or mergers upon the risk profile of the acquirer.

[Learning outcomes b. iv]

These impacts could be positive or negative

Positive impacts of acquisitions

- The company's overall cost of capital may decrease as a result of improvement of credit rating after M & A
- Bankruptcy risk may decrease as well. When companies get combined, the expected synergies and a match between their assets may enhance its value and hence a decrease in the possibilities of bankruptcy

Negative impacts upon risk profile of the acquirer

- Over optimistic assessment of economies of scale causes synergetic gains to be lower than expected.
- Acquiring company usually pays a premium over the market value of the company being acquired

Reasons for the failure of combinations

- Over optimistic assessment of economies of scale
- In ability to implement amalgamation efficiency
- In adequate preliminary investigation
- Focusing at next target soon after combination instead of focusing at realising expected synergies
- Challenges in valuation
- Winners curse- when there is competition between two acquires, the winner has to pay extra price (premium) in order to secure the deal.

2. Assess alternative valuation techniques for mergers and acquisitions by analysing:
v. Growth levels of the target firm's earnings

[Learning outcomes b. v]

Estimating growth levels of target firm's earnings:

Prior valuing a target for an acquisition, it is important hen valuing a company, it important to determine growth rate. Various approaches can be used to estimate the growth rate of a target firm. These approaches include

- estimation of growth rate through extrapolation of past values,
- Using earnings retention model to estimate growth rate

1. Growth rate through extrapolation of past values

This involves the computation of compounded annualized growth rate in company's revenues, earnings, and dividends. Previous trend is analyzed and used to extrapolate future growth. It assumes that the past patterns of growth in dividend is likely to continue in the future.

$$g = \left(\frac{most\ recent\ dividend}{original\ dividend}\right)^{1/n} - 1$$

Note: n stands for number of growths and not years

Example

Given below is the trend of CRDB's Bank plc for the past 6 years. You are required to extrapolate growth rate in earnings.

Year	EPS in TSHS
20X7	530
20X6	430
20X5	370
20X4	260
20X3	250
20X2	180

Solution

$$g = \left(\frac{most\ recent\ dividend}{original\ dividend}\right)^{1/n} - 1$$

$$g = \left(\frac{530}{180}\right)^{1/5} - 1$$

$$g = \left(\frac{most\ recent\ dividend}{original\ dividend}\right)^{1/n} - 1$$

This approach is however challenged on the following grounds

- With historical estimates, there is a need to decide on how far can someone go back to trace earnings of the earliest period? The more someone goes back, the higher the possibilities of including conditions which are no longer relevant for the future.
- If growth in earnings is volatile, it becomes challenging to predict long term growth rate even if the past conditions will prevail in the future.

2. Estimation of growth rate using retention model

Long-term growth rate

This approach uses earnings retention model together with cost of equity (K_e). K_e derived using CAPM is regarded to be a fair estimation of long-term growth. Using this approach, growth will be determined as follows

g = b x r

Where,

- g = growth rate
- b = retention rate, i.e. (1 – dividend pay-out rate)
- r = rate of returns, in this case Ke

Short term growth rate

Short term growth can also be estimated using earnings retention model together with accounting rate of return (ARR). ARR is regarded to be a fair estimation of returns in the short run. Using this approach, growth will be determined as follows

g = b x r

Where,

- g = growth rate
- b = retention rate, i.e. (1 – dividend pay-out rate)
- r = rate of returns, in this case AR

Example

1. Post tax rate of return is 10% and capital invested is Tshs 100m.
   Growth = Capital invested x Post tax rate of return
   = Tshs 100 million x 10%
   = Tshs s10 million
2. Rate of return is 10% and capital invested in Tshs 200 million.
   Growth = Tshs 200 million x 10%
   =Tshs 20 million
3. Rate of return is 15% and capital invested is Tshs 200 million.
   Growth = Tshs 200 million x 15%
   = Tshs 30 million

From the above example we can conclude that the net earnings of a company depend upon the capital invested and the post-tax rate of return obtained by the company. Any increase in either of the capital invested or post tax rate of return will increase the earnings of the company. Dividend is paid out of net earnings of the company. Hence, we can assume that the dividend growth depends upon the post-tax return on equity and the proportion of profits reinvested i.e. retained earnings in the company.

Tip

Higher the retention ratio, higher will be the growth rate.

3. Assess alternative valuation techniques for mergers and acquisitions by analysing:
vi. Valuation of Type I, II, and III acquisitions.

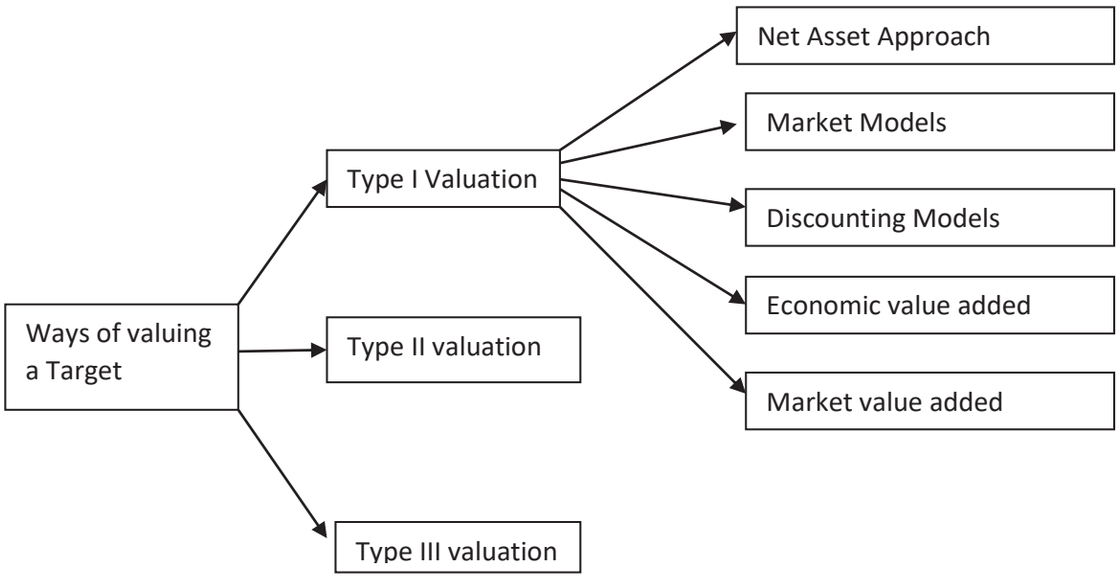
[Learning outcomes b. vi]

Valuation techniques are important part of M&A since they have to do with shareholders wealth maximisation. To maximise shareholders wealth, acquisition price should not be more than value of the target. Once a takeover is initiated, a valuation of target firm will be the next move in order to know offering price.

If target is a listed company, the acquirer will bid, and takeover will be successful if the bid is accepted by target's shareholders. However, if target is not a listed company, the acquirer will bid and for takeover price to be successful, it must be negotiated with the existing shareholders. Target's valuation therefore becomes a critical part of M&A process since it has an implication on the price to be paid by acquirer and in case this price is higher than benefits of a target firm, then the wealth of acquiring firm's shareholders will not be maximised.

For the purpose of target's valuation, there are three types of acquisitions and each has its own implication on value of the target. These classifications depend on the effect that M&A transaction has on business and financial risk.

- **Type I valuation**- with this type of valuation, target firm's exposure to both business and financial risk is not affected.
- **Type II valuation**- with this type of valuation, target firm's exposure to business risk is not affected but financial risk exposure is affected.
- **Type III valuation**- with this type of valuation, target firm's exposure to both business and financial risk is affected.



1. **Type I valuation**

There are several techniques to value business and having a single value in near to impossible. His is because each valuation model is based on different assumptions and inputs. As a result, value of a firm is usually given as a range of values as opposed to one single value. The following models can be applied to value a type I firm

- Book value or Net Asset Approach
- Market relative models (P/E Ratio model,
- Dividend Valuation Models and Free cash flow models
- Economic value added (EVA)
- Market value added approach (MVA)

i. **Net asset approach- (Type I valuation)**

With this approach, value of the firm is obtained as the excess of company's assets over liabilities

VF = Total Assets – Total Liabilities

Assets values can be

- Book values, usually for monetary assets
- Replacement cost, usually for non-monetary assets and/or
- Net realisable value for non-monetary assets as well.

NAV model works well where

- Firm being valued is small
- Most of its assets are tangible
- Goodwill is not significant

- Discounted cash flows are difficult to be applied
- Resource based companies
- Investment companies

Challenges with net asset valuation model are

- it does not consider the true value of intangibles
- Replacement cost cannot be easily found in practice
- The firm is more than sum of its constituent parts. To take care of this, the acquirer and the target will agree on the multiplier which will be multiplied with annual profit or turnover and added to the value of assets.

ii. Market relative models

a. Price earnings ratio method

With P/E ratio method, target firm's value is determined by multiplying company's most recent earnings by industry's average price earnings ratio.

$$\frac{P}{E}\text{Ratio} = \frac{MPS}{EPS}$$

$$\text{Value per share} = \frac{MPS}{EPS}\ X\ EPS$$

$$\text{Value of the firm} = \frac{MPS}{EPS}\ X\ \text{Total earnings}$$

b. Market to book ratio /Tobin's Q ratio

This method involves computation of target company's book value and then multiplying such a book value to market to book ratio of the industry's average or market to book ratio of any chosen benchmark.

Value of the company = target company's book value X market to book ratio of the benchmark

iii. Dividend Valuation Models and Cash flow models

a. Dividend Valuation model DVM

The DVM are based on the premise that the market value of ordinary shares represents the sum of the expected future dividend flows, to infinity, discounted to present value. The only cash flows that investors ever receive from a company are dividends and capital gains.

- If a shareholder intends to hold a share for one year. A single dividend will be paid at the end of the holding period, d_1. To Derive the value of a share at time 0 to this investor (P_0), the future cash flows, d_1 and P_1, have to be discounted at a rate which includes an allowance for the risk class of the share, k_e. then
  $P_0 = [d_1/ (1 + k_e)] + [P_1/(1 + k_e)]$
- If the shareholder intends to hold the share to infinity and the firm is assumed to pay dividend to infinity, then $Po = \frac{d1}{Ke}$
- If dividends are expected to grow at the constant rate, then $P_0 = [d_1/ (k_e – g)]$

In any other situation, just observe cash flow characteristics and find the PV in order to get value of the share and eventually value of the firm after multiplying with number of shares.

b. Free cash flow approach

Free CFs involves working backwards from earnings before interest and tax. A negative free CF is not bad because it could be an indicator that the company is investing more in capital expenditure and therefore an indication of future growth. There are two ways of valuing a target firm using free CF approach

- **Approach 1:** Discounting free CFs **before interest** using **WACC** to obtain NPV and then subtracting value of the debt to obtain value of target firm.
- **Approach 2:** Discounting free CFs **after interest** using **cost of equity (ke)** to obtain value of target firm. There is no need of subtracting the value of debt under approach 2 since FCF excludes interest on debt

Example

Dodo co. Ltd is a firm whose CFs after tax but before interest are specified below

Year	After tax (before interest CFs) TSHS million
20X6	530
20X7	620
20X8 onwards	710

Dodo co. has received a bid to be acquired by Sarwart Co at TSHS 2800 million. Both companies have a gearing level of 20%. Currently, Dodo co has 8% irredeemable bond of TSHS 410 million trading at per i.e. TSHS 100 per bond. Tax rate is at 30%

Dodo company's risk premium is 7% and the company's equity beta is 2.0 while risk free rate is standing at 5%.

Required:

a. Find value of Dodo co basing on free CFs before interest
b. Find value of Dodo basing on free CFs after interest
c. What is the significance of values computed above given the bid received from Sarwart?

Solution

a. **Approach 1:** Discounting free CFs **before interest** using **WACC** to obtain NPV and then subtracting value of the debt to obtain value of target firm.

K_e (using CAPM) = 5% + 2 × (7%) = 19%

$$K_d = \frac{i \times (1-T)}{P_0} = \frac{8\% \times (1-0.3)}{100} = 5.6\%$$

WACC = 19% × 0.80 + 5.6% × 0.20 = 16.32%

Year	After tax (before interest CFs) TSHS million	DF at 19.32%	PVs
20X6	530	0.8381	444.2
20X7	620	0.7024	435.5
20X8 onwards	710		
PV as at Y3 20X8	3674.948	0.5887	2,163.3
Value of the firm before debt			**3,042.9**
Less: debt value			410.0
Value of the firm			**2,632.9**

b. **Approach 2:** Discounting free CFs **after interest** using **cost of equity (ke)** to obtain value of target firm. There is no need of subtracting the value of debt under approach 2 since FCF excludes interest on debt

Year	After tax (before interest CFs) TSHS million	DF at 19%	PVs
20X6	530	0.8403	445.4
20X7	620	0.7062	437.8
20X8 onwards	710		
PV as at Y3 20X8	3736.842	0.5934	2,217.5
Value of the firm before debt			**3,100.7**

c. As it has been noted from a and b above,

- If Dodo will be valued basing on approach one i.e Discounting free CFs **before interest** using **WACC** to obtain NPV and then subtracting value of the debt to obtain value of target firm, then the company's value will be 2,632.9 million which is lower than the asking price of TSHS 2800 million. **The target will therefore be said to be overvalued**
- On the other hand, using approach 2, the target company **is undervalued by 300.7 million** (i.e. TSHS 3,100.7million vs. TSHS 2,800 million)

iv. Economic value added (EVA)

This is an estimate of economic profit that is derived by taking net operating income less cost of capital employed

EVA = Net operating profit after tax (NOPAT) – (WACC × book value of capital employed)

Various adjustments may be made on NOPAT such as

- Adding the value of **intangibles**
- Adding back **goodwill written off** and **accounting depreciation** but instead deducting **economic depreciation**. Economic depreciation is a measure of the actual decline in the market value of the assets.
- **Net interest on debt capital** – debt is included in capital employed and the cost of debt is included in the WACC.

v. Market value added approach (MVA)

MVA is the excess of market value of debt and equity over book value of Debt and equity

MVA = Market value of debt + Market value of equity – Book value of equity – Book value of debt

MVA shows how much management of the company has added to the value initially provided by capital holders. MVA of the company is also related to EVA such that the present value of company's EVA. If the market and book value of debt is the same, then MVA measures the difference between market value of a common stock and the equity capital of the firm.

2. Type II Valuation

Recall: Type II acquisitions affects only the financial risk, but business risk remains unaltered. When the level of gearing changes, levered beta changes resulting to a change in ke basing on CAPM model.

Therefore, adjusted present value model is used to compute value of target firm under type II approach. The target firm's value is obtained by discounting its free cash flows by unlevered cost of equity and then adding the present value of the tax shield.

3. Valuation of type III acquisitions

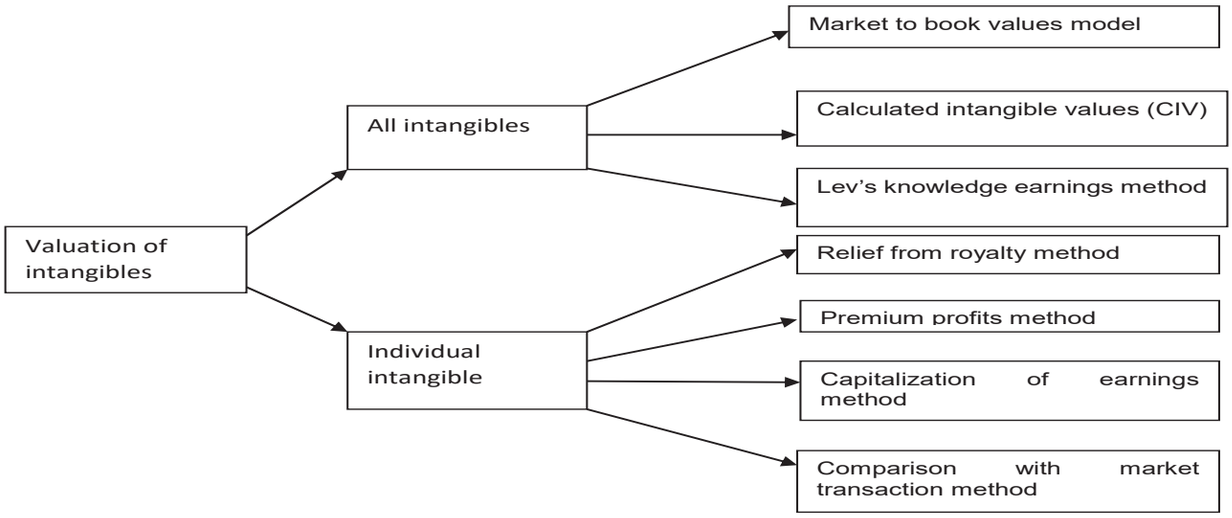
Recall: Type II acquisitions affects both financial risk and business risk

- Step 1: Calculate the asset beta of both companies.
- Step 2: Calculate the average asset beta for the new combined company after the acquisition.
- Step 3: Repeat this beta to reflect the post-acquisition gearing of the new combined company.
- Step 4: Calculate the combined company's WACC.
- Step 5: Discount the post-acquisition free cash flows using the WACC.
- Step 6: Calculate the NPV and discount the value of debt to give the combined company's value of equity

2. Assess alternative valuation techniques for mergers and acquisitions by analysing:
vii. Valuation of Intangible Assets.

[Learning outcomes b. vii]

The valuation of intangible assets and intellectual capital is one of the trickiest parts. This is because it is difficult to clearly establish net gains brought by the intangibles to the firm. Valuation of intangibles can be looked at from two perspectives. Valuation of all Intangible assets of an entity or valuation of individual intangible assets.



A. Valuation of all Intangible assets of an entity

Three common models can be used to value all intangible assets of an entity:

- Market to book values model
- Calculated intangible values (CIV)
- Lev's knowledge earnings method

1. Market to book values model

Here, the difference between the book value of tangible assets and the market value of the firm is regarded as value of intangibles.

Example

If Tangwing plc has a market value of TSHS 12,000 million and its book value is TSHS 9,000 million, then the value of intangibles in this case will be TSHS 3,000 million

2. Calculated intangible values (CIV)

CIV model is based on the argument that the extra profit generated by a company with intangibles is due to the existence of those intangibles. Therefore, there is a need to identify a benchmark. In practice, identification of a benchmark is difficult. Again, for the method to result to a more precise value, a competitor/ benchmark should have no intangibles but in practice it is impossible to find such a competitor.

Applying this model involves several steps:

- Identify a suitable competitor/industry average for benchmarking the rate of return on assets (ROA)
- Find competitors or industry's average rate of return
- Compute company's value of spread. Obtained as a difference between company's operating profit and the value obtained by taking company's assets base multiplied by competitors ROA
- Find the predicted post tax value of spread at T_1
- Find CIV by calculating the PV of all spreads expected to infinity, assuming that the company will operate to infinity, otherwise as specified in the scenario.
- Firms value will then be asset base plus CIV

Example

Leteraha co Ltd is a company specialised in information research and development for on line marketing. The company is rich in intangible assets and the owners are keen to establish the value of such intangibles using CIV method.

Leteraha's income statement for the previous year shows an operating profit of TSHS 687Million and the company's statement of financial position showed an asset base of TSHS 1,560 Million. Short-term growth in earnings is expected to be at the rate of 4% and the firm's weighted average cost of capital is 7%.

Sweetners co Ltd has been identified as an appropriate competitor for Leteraha Co Ltd. Sweetners had a profit of TSHS 1,250million for the past year and an asset base of TSHS 7,800million. Corporate tax is at 30%.

Find,

a. Value of intangible assets
b. Total value of assets

Solution

a) Applying the steps identified earlier on

- Sweeteners' co Ltd is a suitable competitor
- Competitor's average rate of return

$$\text{ROA} = \frac{1250}{7800}$$

= 16%

- Compute company's value of spread.

= operating profit – (company's assets base X competitors ROA)

= TSHS 687Million- (1,560 Million X 16%)

= TSHS 109.92 million

- Find the predicted post tax value of spread at T_1

= TSHS 109.92 X (1-0.3) X (1 + 0.04)

= TSHS 80.02 million

- Find CIV by calculating the PV of all spreads expected to infinity, assuming that the company will operate to infinity, otherwise as specified in the scenario.

$$\text{PV} = \frac{\text{CF1}}{\text{WACC}}$$

$$= \frac{\text{TZS 80.02 millions}}{0.07}$$

= TSHS 1,143.2 million

Therefore, basing on the calculated intangible value (CIV) model, the value of intangible assets is estimated to be TSHS 1,143.2 million

b) Total value of assets

= TSHS 1,560 Million + TSHS 1,143.2 million

= TSHS 2703.2 Million

Problems with the CIV approach

- It uses average industry ROA as a basis for computing excess returns, which may be distorted by extreme values.
- The choice of discount rate to apply to the excess returns to value the intangible asset needs to be made with care. To ensure comparability between companies and industries, some sort of average cost of capital should perhaps be applied. This again has the potential problems of distortion.

2. Lev's knowledge earnings method

An alternative method of valuing intangible assets involves **isolating the earnings deemed to be related to intangible assets and capitalizing them**. However, it is more complex than the CIV model in how it determines the return to intangibles and the future growth assumptions made.

In practice, this model does produce results that are close to the actual traded share price, suggesting that is a good valuation technique.

However, it is often criticized as over complex given that valuations are in the end dependent on negotiation between the parties. To apply this model, steps below are adopted

- Step 1: Computation of normalised earnings
- Step 2: Separate earnings driven by other assets so as to remain with earnings driven by the intangibles
- Step 3: Capitalise the value of intangible earnings

Example

Hope plc is an exploration company based in Mtwara region. Currently the company incurs heavy spending in exploring oil and gas reserve in the region. The company has normalised earnings of TSHS 700 million.

Hope plc's monetary assets value has been established as TSHS 50 million while the firm's tangible assets amounts to TSHS 1850 million. The company's cost of capital and growth rate is currently standing at 12% and 10% respectively. The growth rate is expected to fall to 5% from year six onwards. The current risk-free rate is 4% and the industry's average returns for the firms trading on the basis of their intangible assets are currently at 7%.

Calculate the value of Hope plc's intangible assets using Lev's knowledge earning method.

Solution:

- Step 1: Computation of normalised earnings

  Given in the question as TSHS 700 million

- Step 2: Separate earnings driven by other assets so as to remain with earnings driven by the intangibles

	TSHS million
Normalised earnings	700
Less: Return on financial/monetary assets (50 x 4%)	(2)
Returns on tangible assets (1,850m x 7%)	(129.5)
Earnings driven by intangible assets	**568.5**

- Step 3: Capitalise the value of intangible earnings

  In order to capitalise the earnings o TSHS 568.5, there is a need to establish growth for each year

  g (Y_1 to Y_5) = 10%

  g (Y_1 to infinity) = 5%

	CF, g=10% Y1-Y5 and 5% Y6 onwards	*Discount factor at 10%*	*PVs*
Now	568.5		
Year1	625.4	0.8929	558.35
Year2	687.9	0.7972	548.38
Year3	756.7	0.7118	538.59
Year4	832.3	0.6355	528.97
Year5	915.6	0.5674	519.52
Year6 onwards*	970.51		
Y6 to infinity* PV = CF/r	9,705.09	0.5066	4,916.90
Capitalised value of intangible earnings			**7,610.70**

B. Valuation of individual intangible assets

Here, the following methods can be applied

- Relief from royalty method
- Premium profits method
- Capitalization of earnings method
- Comparison with market transaction method

1. Relief from royalty's method

With this method, value of the intangible asset will simply be given as

- Value obtainable from licensing out the right to intangible asset to the third party

- Royalties that the owner of intangible asset is relieved from paying just by being the owner rather than the licensee
- A **notional royalty rate** is estimated as a percentage of revenue expected to be generated by the intangible asset. The **estimated royalty stream can then be capitalized**, for example by discounting at a risk-free market rate, to find an estimated market value.
- This relatively simple valuation method is **easiest to apply if the intangible asset is already subject to licensing agreements**. If they are **not**, the valuer might **reach an appropriate figure from other comparable licensing arrangement**.

2. Premium profits method

- The premium profits method is often used for **brands**. It bases the valuation on **capitalization of the extra profits generated by the brand** or other intangible asset in excess of profits made by businesses lacking the intangible asset or brand.
- The premium profits specifically attributable to the brand or other intangible asset may be **estimated** (for example) **by comparing the price of branded products and unbranded products**. The **estimated premium profits** can then be **capitalised by discounting at a risk-adjusted market rate**.

3. Capitalization of earnings method

With the capitalised earnings method, the **maintainable earnings accruing to the intangible asset are estimated**. An **earnings multiple is then applied to the earnings**, **taking account of expected risks and rewards**, including the prospects for future earnings growth and the risks involved. This method of valuation is often used to value **publishing titles**.

4. Comparison with market transaction method

- This method looks at **actual market transactions in similar intangible assets**. A multiple of revenue or earnings from the intangible asset might then be derived from a similar market transaction.
- A **problem** with this method is that **many intangible assets are unique,** and it may therefore be difficult to identify 'similar' market transactions, although this might be done by examining acquisitions and disposals of businesses that include similar intangible assets.

3. Assess alternative financing techniques for mergers and acquisitions by analysing:
i. Alternative approaches to financing mergers and acquisitions.
[Learning outcomes c. i]

An acquirer may finance an acquisition through the following ways.

- **Financing through Exchanging Stocks:** In case a company wants to acquire another, it is to be assumed the firm has abundant stock and a statement of financial position. This is to say, the acquiring firm exchanges its stock for shares of the target firm. This financing option is relatively safe as the parties share risks equally. This financing method works to acquirer's advantage in case a target is undervalued, and it works to the target's advantage in case the target is overpriced.
- **Financing through debt Acquisition:** In some circumstances, the target company may be struggling to meet its outstanding debt commitments. This situation may be the driving force behind a sale because and the seller's priority in this case is to reduce the risk of additional losses by entering into a merger or acquisition with a company that can pay the debt. From the acquirer's point of view, sale value is reduced or eliminated, and it becomes an incentive to bargain a lower sales value.
- **Paying in Cash:** While cash may be perceived to be the most convenient and instantaneous financing approach, the price of a target may be very significant making it difficult to raise the required cash amount. This option requires an acquirer to maintain sufficient liquidity in order to finance the acquisition.
- **Initial Public Offerings:** Prospects from M&A might bring about investor's excitement on an initial public offering, making IPO an excellent way for a company to raise funds at that time. The prospects may result to an increase in share price and therefore possibilities of raising more funds. However, this method Is riskier in the sense that market volatility may cause the price to drop.
- **Issuance of Bonds:** An acquirer may issue time-definite bonds with a predetermined interest rate or any other bond that seems convenient at the time of acquisition. In this regard, the acquirer may issue Redeemable, Irredeemable or convertible bond. This option becomes suitable to the acquirer if the market does not want high interest and is willing to buy bonds at premium.
- **Loans:** Due to high expectations, borrowing money during M&A may be costly. An acquirer normally seeks the cheapest loan option to supplement the need for funds.

3. Assess alternative financing techniques for mergers and acquisitions by analysing:
ii. An offer for acquisitions.

[Learning outcomes c. ii]

Attractiveness of an acquisition offer depends on potentials of future growth. An acquirer prefers companies with growth potential after a merger. An acquirer will see the possibilities of merging with low end performers or high-end performers rather than average performing companies. Below are determinants of attractiveness of an acquisition offer.

Growth: Companies with much higher or much lower growth than the average are the most likely to become acquisition targets. Companies growing at a rate that is on average similar to industry growth are less likely to be a target of an acquisition.

Profitability: Private companies with much higher or much lower profitability than the average are the most likely to become acquisition targets. Public companies with much lower profitability than the average are most likely to become targets.

Leverage: Private companies with much higher leverage than the average are the most likely to become acquisition targets. Public companies with much lower leverage than the average are the most likely to become acquisition targets.

Size: Private companies that are much larger or smaller than the average are the most likely to become acquisition targets. Public companies that are much smaller than the average are more likely to become acquisition targets.

Liquidity: Lower levels of liquidity indicates difficulties in running a company. Target companies have lower levels of liquidity than non-target companies.

Valuation: Public companies with lower valuation multiples than the average are the most likely to become acquisition targets.

3. Assess alternative financing techniques for mergers and acquisitions by analysing:
iii. Effect of an offer on financial position and performance.

[Learning outcomes c. i]

An acquisition offer, and the process tend to affect both financial position and performance of both acquirer and the target in different ways as discussed below. In M&A transactions, financial position of the acquirer tends to have long-term effects as compared to the target's effects.

Financial position effect to the acquiring company

For the acquirer, the impact of an M&A transaction depends on the deal size relative to the company's size. The larger the potential target, the bigger the risk to the acquirer. A company may be able to withstand the failure of a small-sized acquisition, but the failure of a huge purchase may severely jeopardize its long-term success. The acquirer's capital structure will change, depending on how the M&A deal was financed. If entirely financed by debt, then percentage of debt to equity will increase. If financed by cash, then company's cash position will be affected.

Financial position effect to the acquiring company

M&A transaction gives target company's shareholders an opportunity to cash out at a significant premium, especially if the transaction is an all-cash deal. If the acquirer pays partly in cash and partly in its own stock, the target company's shareholders get a stake in the acquirer, and thus have a vested interest in its long-term success. In most cases, depending on market reaction, the target company's shares will rise to a level close to that of the acquirer's offer.

Performance effect on the acquirer

Ideally, an acquirer's future growth prospects and profitability should ideally be enhanced by the acquisitions it makes. Empirical evidence suggests that experience and frequency of acquisitions by acquirer is relevant in determining performance of the acquirer. Post-acquisition financial performance of an acquirer is said to improve significantly for organizations that had **previous acquisition experience**, acquired **a higher percentage of a target, or were older**. Post-acquisition performance decreased significantly for acquiring firms when target firms contested an acquisition.

Performance effect on the target

In cases where the acquirer has made a hostile bid for a target company, target's management may recommend that its shareholders reject the deal. One of the most common reasons cited for such rejection is that the target's management believes the acquirer's offer substantially undervalues it. But such rejection of an unsolicited offer can sometimes backfire, as it was the case for Yahoo who rejected Microsoft offer of $31 per share in 2008 but due to credit crisis Yahoo shares were trading below $10 and it took almost 6 years for the company to beat Microsoft's offer.

Indicative Examination Questions

IEQ 1

TWIGA International, a company quoted on the Dar es Salaam stock exchange, has decided to diversify into a new sector in order to reduce its risk. However, the company has not decided whether to diversify through acquisition of an existing business in the new sector or to establish a new company (organic growth). TWIGA International has cash balances of K240 million which are currently invested in short-term money market deposits.

The company has identified a possible acquisition target, SERENGETI Ltd, a smaller quoted company in the new sector. Even though SERENGETI Ltd is quoted, approximately 60% of its shares are still owned by four directors. These directors have stated that they might be prepared to recommend the sale of SERENGETI Ltd, but they consider the total value of its shares to be worth K235 million. As a Finance Manager of TWIGA International, you have been asked to establish if the value given by the directors is reasonable. The following financial information has been provided:

Summarised financial data: Figures in TSHS million

Details	**TWIGA**	**SERENGETI**
Turnover	530	88
Pre-tax operating cash flow	101	55
Taxation (30%)	30.3	16.5
Post- tax operating cash flow	70.7	38.5
Dividend	12	10.03
Retained earnings	58.7	28.47
Statement of financial position		
Non-current assets (net)	218	58
Current assets	185	54
Current liabilities	149	51
Liabilities and owners' equity		
Ordinary shares (TSHS 50 par for Twiga) and TSHS15 par for target	60	4.5
Reserves	139	52.1
12% Debentures 20X7	40	0
10% Bank term loan	15	0
Recent 11% bank loan	0	4.4
Current share price	TSHS 885	TSHS 460
Average dividend growth during the last five years	8% p.a.	10% p.a.
Equity beta	0.85	1.01
Industry data:		
Average P/E ratio	9	7
Average P/E of companies recently taken over, based upon the offer price	10	5

The risk-free rate of return is 7% per annum and the market return 15% per annum.

Other information:

1. After the acquisition some land and buildings of SERENGETI would be sold for K8 million (after tax).
2. Following the acquisition, it's expected that 145 employees of SERENGETI would immediately be made redundant at an after-tax cost of K10 million. Pre-tax annual wage savings are expected to be K1 million. Pre-tax advertising and distribution savings are expected to be K750, 000 per year.
3. The four existing directors of SERENGETI would each be paid an after-tax consultancy fee of
4. K500,000 per year for four years for consultancy services if the acquisition succeeds. This amount would not increase with inflation.

Ignore inflation

Required:

a. Estimate the value of SERENGETI Ltd using the following valuation methods:
   (i) The comparative P/E
   (ii) The dividend valuation model
   (iii) The present value of relevant operating cash flows over a fifteen (15) year period.
b. Advise whether, TWIGA International should proceed with the acquisition of SERENGETI Ltd shares.
c. Explain whether diversification through mergers and acquisitions is an effective means of reducing risk and securing future growth for TWIGA International.

Answer to IEQ 1

a. (i) P/E ratios

Since SERENGETI Ltd operates in a different sector, the comparative P/E ratio valuation must be based upon the average P/E ratios in that sector. The P/E ratio of 5 will therefore be used.

Value of SERENGETI Ltd is **K192.5 million** (5 x 38.5m)

ii) Dividend valuation model

$$Po = \frac{Do\,(1+g)}{Ke - g}$$

ke = Rf + β(E(Rm) – Rf)
Ke = 7% + 1.01 (15% - 7%)
= 15.08%
Po = 10.03 (1.10)/0.1508 – 0.10

= TSHS 219.19 million

iii) Cash flow valuation method	TSHS million
Current pre-tax operating cash flow	55
Post -acquisition adjustments:	
Annual wage savings	1
Advertising/distribution savings	0.75
	56.75
Taxation (30%)	17.02
Annual post tax cash flow	39.73

The other post tax cash flows to be taken into account are:

	TSHS million
1. Redundancy costs	10
2. Sale of land and buildings	8
3. Consultancy service (0.5m x 4)	2

Cost of capital

Market value (30 x 4.6)	=TSHS 138.0
Market value of debt	=TSHS 4.4
Total	TSHS 142.4

Cost of debt = 11% x (1-0.3) = 7.7%
WACC = 15.08% x 138/142.4 + 7.7% x 4.4/142.4
= 14.61 + 0.24
=14.85% Say 15%

Discounted cash flows using 15% as discount rate:

	TSHS million
Annual post tax cash flow (39.73 x 5.847)	= 232.3
Redundancy costs (10 x 1.000)	= (10)
Sale of land & buildings (8 x 1.000)	= 8
Consultancy services (2 x 2.855)	= (5.71)
Present value of cash flows	= 224.59

Value of the company TSHS 224.59 million

b. Advice:

The three valuation methods have produced the price range of TSHS184.51million to TSHS197.44 million which is below the proposed offer price of TSHS 235million. This may indicate that the company is over- priced by the directors. The present value of the operating cash flows (which is possibly the best of the three approaches) gives the lowest valuation of TSHS 184.51million suggesting further that SERENGETI Ltd could be overpriced.

TWIGA international can make a counter offer at this price and if the acquisition of SERENGETI Ltd would be in line with TWIGA's long-term strategic objectives, then it is recommended that the acquisition should proceed. However, it's worth to note that the valuations methods used have limitations. For example, the present value method has ignored any **likely changes** in the **pattern of the cash flows** following the acquisition as well as any strategic plans that the company may have for such a long-time frame.

c. Explanation

A strategy of diversification does not always provide a sound rationale for merger or an acquisition. One problem is that the synergies identified are often more difficult to achieve when two businesses, which are quite different in nature are combined. Such differences may, for example, prevent TWIGA from benefiting from economies of scale or the use of complementary resources. Similarly, although the management team of TWIGA may be highly efficient and highly motivated, it may not have the necessary skills to replace the management team of the Acquired business.

There may also be problems in trying to integrate the operations of two different kinds of business because of differences in market need, business culture and so on. TWIGA has always been in the manufacturing industry and the management team may therefore have a number of challenges adapting to the management of a company in a completely new sector.

Diversification is a useful way of dealing with risk and it is therefore intuitively appealing to see mergers and takeovers as a useful means to achieve this end. The question that must be asked however is whether the directors of the company should diversify, or the shareholders should diversify individually. It is usually easier and cheaper for the shareholders to diversify, by acquiring a diversified portfolio of shares than for the directors to diversify. When the directors of a company diversify, by taking over another company, a significant premium is often paid to the shareholders of the target company. This evidence by what the Directors of SERENGETI Ltd are offering compared to the estimated value.

STUDY GUIDE A3: FOREIGN EXCHANGE MARKET

Get Through Intro

Foreign exchange market brings key players of international business and global investments together, by facilitating the transfer of capital and purchasing power globally. Foreign exchange market supports imports and exports, foreign investment and facilitates allocation of scarce recourses worldwide. The market provides a forum where multinational firms, international companies, commercial banks, traders and the public can convert their domestic currencies to currencies of their demand and beyond that they can possibly transact assorted currencies for profit. The globally operating companies can use the market for the purpose of hedging risks affecting their foreign currency denominated transactions and balances. Further arbitrageurs, speculators and other business men can actively engage in foreign currency transactions and record some financial benefits. Therefore, it would not be treated a crime to contend that without the ability to trade in different currencies, companies' prospects will be limited and global economic growth will suffer.

Foreign exchange market is the largest, highly liquid and efficient market but without physical geographical location. The market operates all over the world and conducts business round the clock due to timing differences of major regions of the world. It operates electronically, and it is regarded as the most efficient market because the prices reflect all information available to participants. In this course the traders cannot make supernormal profit in the long run because the prices adjustment takes place instantly. The market is critically needed for international trade and investments. It enables movement of major currencies of the world globally. Through this market prices of different currencies can be determined and transfer of purchasing power between countries simplified. The prices of different currencies can be determined through a number of systems, technically referred as to the exchange rate regimes. Consequent to that the exchange rate can freely be determined by market forces or rigidly fixed by country's central bank. Some countries or blocks such as European Union (EU) have adopted single currency system where the euro is used by member states. This is also the future for East Africa Community (EAC). However, in practice the dirt float system is widely applicable where the exchange rate is established by market forces of demand and supply, with untimely central bank intervention especially where excessive volatility of domestic currency is experienced.

In this chapter of the study guide learners will gain an in-depth understanding of the nature, mode of operation, functions and participants of the market and the roles played by each of the participants. The mechanics of exchange rate quotations, how to determine and exploit the misalignments in the exchange rates to benefit from arbitration transactions, theory and practices of exchange rate systems is of paramount importance and will be explored, discussed and its application demonstrated.

Learning Outcomes

a) Assess the nature, system of operation, characteristics and functions of foreign exchange market.
b) Evaluate roles and activities of different players in a foreign exchange market and apply relevant information to determine different exchange rate quotations.
c) Apply relevant data and information to determine opportunities for bilateral and triangular arbitrage profit in the foreign exchange transactions.
d) Evaluate exchange Rate Regimes and analyse Tanzanian Exchange rate policy and practices.

1. Assess the nature, system of operation, characteristics and functions of the foreign exchange market

[Learning outcome a]

The foreign exchange market (Forex) is a global over the counter or online network market where traders buy and sell currencies of different countries. In this market participants such as central banks, commercial banks, hedge funds, brokers and traders, multinational corporations and international firms can ably buy, sell, speculate and hedge on different currencies. The trading of currencies takes place without necessarily visiting physical geographical located market. This implies that the foreign exchange transactions are mainly executed electronically. The market operates 24 hours a day, seven days a week. It sets the exchange rates for currencies with floating rates. It is considered the largest and most liquid market in the world. *In the words of Francisco Javier Fernández (2018):*

> "Foreign exchange market is a "decentralized worldwide market in which currencies are traded. It was created in order to facilitate the flow of money derived from international trade. Today, it is the world's largest financial market, with an average daily volume of about $5 trillion, and is undergoing an important and growing "electronification."

Like any other commodities, currencies traded in a foreign exchange market have a price. The price at which currencies are exchanged for other currencies is called exchange rate. Exchange rate or currency rate is the central concept in the foreign exchange market and is defined as the price of one country's currency expressed in terms of another country's currency. The exchange rate is crucially important for the operation of the foreign exchange market. It plays an important role in international trade because it facilitates the transfer of purchasing power necessary to purchase goods and services across countries.

Nature and operations of foreign exchange market

The foreign exchange market is not located in one place rather it is the framework of individuals, firms, banks and brokers who buy and sell foreign currencies through electronic communication systems around the world. This market has been growing at a rapid pace, reflecting a general growth in the volume of the cross-border trade and investment. Foreign exchange markets tend to be located in nationals' financial and business centres near the local financial markets. The most important foreign exchange markets are found in London, New York, Tokyo, Frankfurt, Amsterdam, Paris, Zurich, Toronto, Brussels, Milan, Singapore and Hong Kong. The aforementioned financial market centres are termed as deep market given the huge volume of foreign exchange transaction done per day while foreign exchange markets in most of the developing country including Tanzania are termed as shallow market due to lower volume of foreign exchange transaction done over a given period of time.

There are four main foreign exchange operations undertaken in the foreign exchange markets: spot transaction, forward deals, future transactions and currency options. In the spot market currencies are bought and sold for immediate delivery. In the forward market, currencies are bought and sold at prices agreed now but for future delivery at an agreed date. Not only delivery is made on the future date but also payment made at the agreed future date. A detailed discussion on each of these operations is later provided in this study guide chapter.

Functions and characteristics of foreign exchange market

Foreign exchange market is the world's largest financial market which provides a number of benefits and advantages to various participants. The benefits of foreign exchange market include liquidity and leverage compared to stocks and futures markets. The foreign exchange market is arguably the best financial investment in the currency market. It performs the following functions and offers several benefits as follows (i) facilitates payments for goods and services internationally (ii) facilitates lending and borrowing across countries (iii) Provides hedging facilitate for multinational firms and international traders (iv) facilitate reduction in transaction costs in the process of exchange of goods and services among countries (v) facilitate efficient allocation of physical and financial resources worldwide, and (vi) facilitate transformation of the risks of international assets and investments abroad.

In order to perform these functions, the foreign exchange markets possess the following featured characteristics:

(i) Lower trading costs - investors dealing in stocks usually spend large amount of money before finally holding an investment in a given company. This is not the case with the foreign exchange market whereby with just a few amounts of currency (say Euro 250 or less); one can open a mini foreign exchange account and start trading. The lower trading costs in the foreign market have made it possible for even small, individual investors to make decent

profits from foreign exchange trading. With lower costs, the possible losses are also much lower. Foreign exchange trading usually has no commission fees unlike in other investments. The costs of foreign exchange trading are limited to the spread or the difference between the selling and buying prices for a particular currency pair.]

(ii) Excellent transparency - transparency means the free access to trading information. Foreign exchange trading is a transparent process because the trader has full access to market data and information that are necessary to perform successful transactions. The excellent transparency of the foreign exchange market means that foreign exchange traders have more control over their investments and can decide what to do base on the information available.

(iii) Superior liquidity - in a foreign exchange market, traders are free to buy and sell currencies of their own choice. The superior liquidity of the foreign exchange market enables traders to easily exchange currencies without affecting the prices of the currencies being traded. So whether you trade a few thousand dollars or several million, you can be assured of the same currency prices during the time an order was placed and then executed. The foreign exchange market's superior liquidity allows you to get the profits you expect at the time you made the trade.

(iv) Strong market trends - foreign exchange traders make money by getting accurate market data and then analysing the direction the market takes. The foreign exchange traders do this by relying heavily on trends and trending in an attempt to predict the direction of the foreign exchange market. Most traders use technical analysis to analyze past and present foreign exchange market data and then search for trends. Other financial markets use trends and trending, but this characteristic is much stronger in the foreign exchange market. Due to strong trending, foreign exchange markets are much easier to analyze and identify possible entry and exit positions during trading.

Test Yourself 1

Explain the meaning of foreign exchange market and discuss its main functions.

The operation of foreign exchange market in Tanzania

The officially regulated foreign exchange market in Tanzania is the Interbank Foreign Exchange Market (IFEM). The exchange rate between the Tanzania shilling and any of the foreign currencies are determined by the market forces in the IFEM and the Bank of Tanzania (BOT) participates in the market primarily to meet its monetary policy objectives. The Bank of Tanzania in its pursuit of monetary policy objectives structures its sales of foreign exchange to smoothen transitory fluctuations in the exchange rate while continuing to meet government external obligations as well as maintaining an adequate level of gross official reserves. In Tanzania, the recognized dealing time in the IFEM runs from 9:00 hours to 15:00 hours from Monday to Friday except for Public Holidays or unless otherwise communicated by the Bank.

Quotation of prices

- Prices quoted by a dealer in the IFEM are deemed as firm unless they are expressed to be indicative prior to quoting.
- All members are obliged to present a binding two-way quote during trading hours while maintaining a maximum spread of TSHS. 10.00 all the time. i.e., providing both bid and ask rates through Reuters.
- The quoted price is good for amount of USD 250,000 (U.S Dollars two hundred fifty thousand). For amounts above USD 250,000 the price maker can qualify the amount.
- All members are obliged to regularly update their indicative two-way quote on Reuters's screen during trading hours and the Bank may intervene at those prices for an amount of up to USD 250,000.

Concluding a deal

- When a dealer calls another dealer by displaying quotes price (bid/ask) without specifying the amount, the USD 250,000 rule for a given quote price applies. Where a dealer calls for a firm quote, he/she will be required to specify the amount but need not state whether the intention is to buy or sell.
- In the IFEM, a transaction should be deemed concluded when one shows a firm price and the other deals at that price.

2. Evaluate roles and activities of different players in a foreign exchange market and apply relevant information to determine different exchange rate quotations

[Learning outcome b]

The main participants in a foreign exchange market can be categorised into four levels. The first-level are the customers who includes tourists, importers, investors, individuals and so on. These are the immediate users and suppliers of foreign currencies. The second-level are the commercial banks, which act as clearing houses between users and earners of foreign currencies. The third-level are foreign exchange brokers through whom the nation's commercial banks even out their foreign exchange inflows and outflows among themselves. Finally, at

the fourth and the highest level is the nation's central bank, which acts as the lender or buyer of last resort when the nation's total foreign exchange earnings and expenditure are unequal. The central bank then either draws down its foreign reserves or adds to them.

Roles and activities of different players in the foreign exchange market

(a) Customers - the individuals and international firms engaging in foreign trade participate in foreign exchange markets through availability of the services of banks. Exporters require converting the foreign currencies into Tanzania shillings and importers require converting Tanzania shillings into the foreign currencies denominating the receipts and payments for their exports and imports respectively. Similar types of services may be required for settling any international obligation i.e., payment of technical know-how fees or repayment of foreign debt, etc. The customers can even need foreign currencies for overseas family trips and vacations.

(b) Commercial banks – These are the most active players and the market makers. Commercial banks engage in the market for trading purposes and in facilitating international transactions and dealings, of different customers especially those involved in international trade. Literally commercial banks have wide network of branches and act as intermediary between exporter and importer situated in different countries. The banks buy foreign currencies from exporters and sells foreign exchange to the importers of the goods and services and the general public engage in international transactions not on the account of trade. The foreign exchange bought may not necessarily be equal to the amount sold by banks at every point in time. In this case the banks are left with the overbought or oversold position. If a bank buys more foreign exchange than what it sells, it is said to be in 'overbought/plus/long position'. In case bank sells more foreign exchange than what it buys, it is said to be in 'oversold/minus/short position'. If the bank is having oversold position it will buy from the market and if it has overbought position it will sell in the market. In general terms commercial banks have following objectives for their active involvement in the foreign exchange market:

- They render better service by offering competitive rates to their customers engaged in international trade.
- They are in a better position to manage risks arising out of exchange rate fluctuations.
- Foreign exchange business is a profitable activity and thus such banks are in a position to generate more profits for themselves.
- They can manage their integrated treasury in a more efficient manner.

(c) Central banks – The country's central bank is charged with the responsibility of maintaining the external value of the domestic currency. The central banks participate in the foreign exchange to ensure stability of economic policies and therefore that domestic currency's value. The level and timing for engagement depends on the exchange rate regime in use. If the country follows a fixed exchange rate system, the central bank has to take necessary steps to maintain the parity. Even under floating exchange rate system, the central bank has to ensure orderliness in the movement of exchange rates. Generally, this is achieved by the intervention of the bank. Sometimes this becomes a concerted effort of central banks of more than one country.

In specific terms the central banks participate in the foreign exchange market for two main purposes:

- Exchange rate management – in this case the central bank intervenes in the market in order to maintain the external rate of domestic currency at a particular level or in a band so fixed. If a country, as a matter of policy, follows fixed exchange rate system, the central bank is required to maintain exchange rate generally within a well-defined narrow band. Whenever the value of the domestic currency approaches upper or lower limit of such a band, the central bank intervenes to counteract the forces of demand and supply through intervention. For floating exchange rate system, the intervention necessarily happens when there is excessive devaluation of domestic currency. This why it argued that there is no a purely flexible exchange rate system because the central banks sometimes will need to influence the supply of the foreign currencies to regulates her country's currency value.
- Reserve management in this regard the central bank is concerned with the investment of the country's foreign exchange reserve in stable proportions in a range of currencies and in a range of assets in each currency. The central banks do this to ensure the nation has a right proportion of foreign currencies for exportation and for meeting other foreign transactions.

(d) Exchange brokers - Foreign exchange brokers play a very important role in the foreign exchange markets. However, the extent to which services of foreign exchange brokers are utilized depends on the tradition and practice prevailing at a particular foreign exchange market centre. Brokers works as follows in the foreign exchange market: Banks seeking to trade display their bid and offer rates on their respective pages of Reuters screen, but these prices are indicative only. On inquiry from brokers they quote firm prices on telephone. In this way, the brokers can locate the most competitive buying and selling prices, and these prices are immediately broadcast to a large number of banks by means of hotlines/loudspeakers in the banks dealing room/contacts many dealing banks through calling assistants employed by the broking firm. If any bank wants to respond to these prices thus made available, the counter party bank does this by clinching the deal. Brokers do not disclose counter party bank's name until the buying and selling banks have concluded the deal. Once the deal is struck the broker

exchange the names of the bank who has bought and who has sold. The brokers charge commission for the services rendered.

(e) Speculators, Arbitrageurs and Hedgers - These are major participants in the foreign exchange but with different motives. Arbitrageurs, traders and hedgers seek to reduce (or eliminate, if possible) the exchange risks by "locking in" the exchange rate on future trade or financial operations.

Speculators participate in the market with a view of making profit on account of favourable movement in exchange rate, take position i.e., if they feel the rate of particular currency is likely to go up in short term. They buy that currency and sell it as soon as they are able to make a quick profit. The speculators will only benefit if their expectations meets reality. If the expected rate is different from the actual rate, the speculators suffer loss. Similarly, Companies mainly Multinational Corporations have trading activities beyond their national borders in relation to their cash flows exposure. Given the large nature of these companies and being involved in multi-currencies dealing, they get into foreign exchange exposures. With a view to take advantage of foreign rate movement in their favour they either delay covering exposures or does not cover until cash flow materialize. Sometimes they take position so as to take advantage of the exchange rate movement in their favour and for undertaking this activity, they have state of the art dealing rooms.

Hedgers on the other hand engage in the foreign exchange for hedging purposes. The multinational corporations and international firms have their transactions denominated in different currencies of the world, and therefore are exposed to currency risks. They then participate in the foreign exchange market in order to take a hedging position. For example, the multinational firms, engage in forward contracts to protect the home currency value of various foreign currencies dominated assets and liabilities.

Arbitrageurs seek to earn risk free profits by taking advantages of differences in exchange rate between one location and another. The arbitrageurs will pursue a particular action if they notice inconsistency of exchange rate between places. Contrary to speculators, arbitrageurs make a risk-free profit because they only take a particular action when it is profitable to do so.

Exchange rate quotations

Exchange rate represents a price of one currency expressed in terms of another currency. It therefore provides amount of one currency required to purchase a unit of another currency. Exchanged rate can further be defined as the amount of one currency that can be exchanged per unit of another currency. The quotation TSHS 2350/US$ represents number of Tanzanian Shillings (TSHS 2350) need to exchange for one United States dollar (US$1).

The exchange rate could be quoted as to represent the amount of domestic currency needed or required to acquire a unit of a foreign currency or the amount of the foreign currency required for a unit of a local (domestic) currency. This is defined as direct and indirect exchange rate quotation in that order. So therefore, the direct quotation dictates the amount of local or domestic currency required for a unit of foreign currency. On the other hand, if the quotation offers units of foreign country required for purchasing a unit of domestic currency, it is referred as indirect quote. Most countries around the world use direct quotation when quoting the spot price of foreign currency.

In Dar es Salaam US dollar is quoted at TSHS.2250/1$. This is a direct quotation of US dollar against the TSHS because it shows amount of local currency (TSHS) required for a unit of a foreign currency (US$). Now, if this quote in Dar es Salaam is quoted at $0.00045/1TSHS, this is an indirect quotation of TSHS against the US dollar.

The bid - ask spread

Exchange rates are usually quoted in pairs, bid rate and ask rate. A bid is the rate at which a dealer is willing to buy another currency. Therefore, it is the dealers' buying rate. Ask rate is the price at which the dealer is willing to sell a quoted currency. In this regard the quoted exchange rates consider the point of view of dealers (banks) and customers are presumably price takers, except in cases of agreed rates. The difference between the ask rate and bid price represent dealers' transactions costs and profit, technically referred the bid-ask spread. The bid-ask spread is defined as the difference between the two exchange rates (bid and ask rates) for a currency and is regarded as the potential sources of profit for dealers (commercial banks) and brokers.

The spread represents the difference between a bank/dealer`s buying (bid) and selling (offer or ask) rates in an exchange quotation. The spread is used to cover the market markers' costs and provide for their profits and therefore its size will reflect the degree of risk associated with holding the currency in question. The level of the spread is influenced or determined by the level of stability in the market; the Volume of business and degree of volatility in exchange rate. Whether using the direct or indirect quote the smaller rate is the bid and the higher rate is the offer. This spread is usually stated as a percentage cost of transacting in the foreign exchange market, which is completed as follows:

Percent spread/ Transaction cost = (Ask price – Bid price)/Ask price x 100%

Example

Pound sterling quoted at $1.6050 to $1.6060, and then the percentage spread will be:
Percent spread = (1.6060 – 1.6050)/1.6060 x 100% = ***0.06%***

The foreign exchange transactions

The foreign exchange dealers do not only engage in spot currency transactions, they also engage in forward foreign exchange transactions. In addition to offering customers the services necessary for immediate delivery transactions the spot market, banks in the foreign exchange market quote for and handles deals where currency is to be delivered at a specified future date. I.e. the foreign exchange transactions could be for immediate delivery or for future delivery of stated amount of a particular currency. It follows that we can have a spot transaction and hence spot market and forward transactions hence forward market. In the spot market one buys a spot contact for the exchange of one currency for another for immediate delivery. It is the market where exchange rate transaction's settlement is designed to be within two business days (excluding public holidays in the countries of both currencies). The date of the actual payment of funds is called the value date. The exchange rate used for the spot transaction is spot exchange rate as opposed to forward rate which is agreed on the date of contract but will be used in the future specified period.

A forward exchange transaction involves agreement of the amount to be delivered and the rate to be used in a specified future rate, agreed today. In the outright forward contract, an agreement is made at time zero (t=0) for sale or buy of a currency at an agreed price for delivery to be made in the future ($t=t_1$). The exchange rate applicable in forward transaction is called forward rate, which is agreed today for the exchange of stated amount of a particular currency in a future period. Forward rate is fixed in the forward contract which is a binding contract between a customer and a dealer for the purchase or sale of a specific quantity of stated foreign currency, at a rate of exchange fixed at the time of making the contract, which could be for a month, two months, three month or 12 months to suit the needs of the parties to that contract. It follows that the forward transactions can be either for speculative purposes or for hedging reasons. The multinational corporations and other business men often insure their future payable or receivables denominated in foreign currencies by buying or selling the currencies of payables and receivables forward, in that order. The main purpose of the forward market is to enable importers or exporters to fix, at the time of a contract, a price for the purchase or sale of a fixed amount of foreign currency for delivery and payment at a specified future time. This eliminates foreign exchange risk due to future exchange rate fluctuations – the precise home currency amount to be paid or received is fixed.

Example

If you have a payable denominated in Botswana Pula (BWP) 5,000 due in three months, you can enter into a three-month forward contract, which is a forward transaction. The forward contract allows traders (parties) to agree (fix) the rate that will be used to buy the foreign currency in question at maturity. This rate is referred as to forward rate, which is the price you agree to pay in three months when the BWP 5,000 is supposedly delivered. The forward contract therefore locks in the amount payable in domestic currency irrespective of changes in exchange rate. If you agree a forward rate of TSHS 227.35/BWP to buy the BWP 5,000in three month, the amount payable in domestic currency (TSHS) shall be TSHS 1,136,750 (i.e. TSHS 227.35/BWP* BWP 5,000), regardless of the existing spot rate at that date.

Example

In a typical forward transaction, for example a US company buys textiles from England with payment of t1 million due in 90 days. The importer thus is short pounds that is, it owes pounds for future delivery. Suppose the pound is $1.71 over the next 90 days, however pound might rise against the dollar, raising the dollar cost of the textiles. The importer can guard against this exchange risk by immediately negotiating a 90 day forward contract with bank at a

price of say £ = $1.72. According to the forward contract, in 90 days the bank will give the importer t1 million (which it will use to pay for its textiles order) and the importer will give the bank $1.72 million which is the dollar equivalent to £1 million at the forward rate of $1.72/£.In technical terms, the importer is offsetting a short position in pounds by going long in the forward market that is buying pounds future delivery.

The forward rate premium or discount [%]

It is defined elsewhere in this study guide that the rate quoted today for the settlement at some future date. It denotes the rate of exchange at which a stated amount of a contracted currency (foreign or domestic currency) will be exchangeable at a specific future date. Forward exchange rates are in most cases quoted as a two way price in "forward swap points". These points are the adjustments to be made to the spot price to achieve the applicable forward exchange rate. These prices differentials are termed and could be either premium (pm) or discount (disc). This helps to identifying whether the quoted currency s more expensive (at premium) or cheaper (at a discount) to purchase on the forward date than on the spot value.

A foreign currency is said to be trading at a forward discount if the forward rate expressed in domestic currency terms is less that the spot rate, whereas forward premium exists if the forward rate is above the spot rate. It follows that the forward premium or discount is simply the amount by which the forward rate differs from the spot rate and the size of the premium or discount depends on the differences in interest rates between the two currencies. In simplistic terms, when a currency is more expensive in the forward market than it is now in the spot market in terms of the base currency, the quoted currency is said to stand at a premium in the forward market relative to the base currency. Conversely, the base currency is said to stand at a discount relative to the quoted currency.

Example

If the spot exchange rate between South African Rand (ZAR) and Tanzanian Shillings (TSHS) is TSHS 177.81/ZAR, and the 1 month and 2months forward rates are TSHS 175/ZAR and TSHS 180.67/ZAR respectively; it implies that the ZAR is trading at one-month discount because it is less expensive in the forward market that it is, in the spot market. Accordingly, the ZAR is trading at 2 months forward premium because the spot rate is less than the 2months forward rate.

The forward premium or discount can as well be expressed percentage wise. The % per annum cost of forward cover is the annualised forward premium, which can be expressed as an annualised % deviation from the spot rate.

The annualised forward premium (prem.) or discount (disc) is the percentage difference between the spot and forward exchange rate, stated in annual percentage terms as.

$$\frac{FR - SR}{SR} \times \frac{360}{n} \times 100$$

Where: n is the maturity day in months

FR is the forward rate

SR is the spot rate.

If the resulting percentage value is positive it means the traded currency is at forward premium and the negative value implies the traded currency is at forward discount.

Example

The following information is given by Mapesatele a dealer in foreign currencies who operates from the Tanzanian main business city, Dar es Salaam. The spot rate of exchange between Burundi Franc (BIF) is given at TSHS 1.75/BIF. The 90-day forward rate is given at TSHS 1.35/BIF. Required: determine whether the Burundi Franc is trading at premium or discount and calculate the annualised premium/discount.

Solution

The given spot rate (TSHS 1.75/BIF) is greater than the 90-day forward rate (TSHS 1.69.BIF). The implication is that the Burundi Franc (BIF) is less expensive in the forward market than it is the spot market. It is therefore trading at a forward discount.

The annualised forward discount in percentage will be calculated as follows:

$$\frac{TZS1.69/BIF - TZS1.75/BIF}{TZS1.75} \times \frac{360}{90} * 100$$

= - 13.71%

The annualised value is -13.71%. The negative sign means that the Burundi Franc (BIF) is selling at forward discount which means that it takes 13.71% fewer Tanzanian shillings (TSHS) to get a Burundi Franc (BIF) at the 90 –day forward contract rate.

Test Yourself 2

(a) Explain the concept of "points" and how it is used in quoting forward exchange rates.

(b) The following exchange rates were observed in Dar es Salaam on 30th October 2010.

	TSHS/US$	TSHS/£
Spot	1450 – 1510	2550 – 2670
1 Year Forward	1550 - 1570	2675 - 2700

Further, it is assumed that cross rate quotations for US$ and £ are available.

Required:

(i) With supporting computations, indicate whether the £ is trading at a forward discount or premium relative to the US$. Use mid-prices to determine the one year forward premium or discount on the £ relative to the US$.
(ii) Suppose you have to purchase US$10,000 one year forward. What will be the cost of this transaction in £?.
(iii) Compute the percentage bid-ask spread on the spot £.

The cross exchange rates

In certain circumstances currencies related to particular transactions may not have been quoted in either of the currency that is the exchange rate between targeted currencies may be missing. This requires the use of the relationship of exchange rate of the currencies for which the exchange rates are given to obtain the missing required exchange rate. The exchange rate calculated from two (or more) other exchange rates is called the cross rate. The exchange rate is therefore defined as the rate implied and calculated from two or more exchange rates. It is the exchange rate implied by two or more other exchange rates. The cross rate can be useful for two purposes (i) to determine the exchange rates between currencies; when that currency is not given and (ii) to check if the opportunities for inter market arbitrage exist.

The cross rates can be used to detect existence of opportunities for inter market arbitrage. Exchange traders are continually altered to the possibility of taking advantage, through currency arbitrage transactions of exchange inconsistencies in different money centres. These transactions involve buying a currency in one market and selling it in another. Such activities tend to keep exchange rates uniform in the various markets.

Example

Given the spot exchange rate between Ugandan Shillings (UGX) and Tanzanian Shilling (TSHS) is TSHS 0.585/UGX, and the exchange rate between Tanzanian Shillings (TSHS) and Kenyan Shillings (KES) is TSHS 20.76/KES.

Required:

Calculate the spot cross rate between Ugandan Shillings (UGX) and Kenyan Shillings (KES), UGX/KES.

Solution

The spot cross rate can be calculated by considering the relationships of the given spot exchange rates, i.e. TSHS/UGX and TSHS/KES. It follows that the spot rate between UGX and KES, $\frac{UGX}{KES}$ is given by the $\frac{TZS}{KES}\ 20.76 \div \frac{TZS}{UGX}\ 0.585$

$$= \frac{\text{TZS}}{\text{KES}}\ 20.76\ \times \frac{\text{UGX}}{\text{TZS } 0.585}$$

$$= \text{UGX}/\text{KES}\ 35.50.$$

The calculated cross rate is expected to be the same as the actual exchange rate of the currencies in consideration. If there is inconsistency between the calculated cross rate and the actual cross rate, then opportunities for arbitrage profit exist. The triangular arbitrage opportunity exists when the computed cross rate is inconsistent with the market cross rate. The determination of triangular arbitrage opportunity and computation of arbitrage profit is covered in subsequent sections of this study guide chapter.

Forward cross rate

The forward cross rate represents the rate implied between two or more given forward exchange rates. The forward cross rates are determined in the same as the spot cross rates.

Example

Consider the following spot and three - month forward quotations for a U.S Dollar ($),

	Spot	3-month-forward
€ /$	0.81070 – 0.81103	0.81170 – 0.81243
¥ /$	107.490 – 107.541	107.347 – 107.442

Required:

Based on these rates, calculate the 3 month-forward cross-rate for yen in terms of Euros.

Solution

Like spot cross rate, the forward cross exchange rate for€ €/¥ can be calculated based on the relationship of given 3months forward exchange rates of € /$ and ¥ /$. From these two given 3months forward exchange rates the € /¥ shall be equal to € /$ divided by ¥ /$. Such that the buying rate € /¥ is found as The Buying cross rate will be given as € /¥ = €/$ 0.81170 /107.442 $/¥ =0.00755, whereas the selling forward cross rate will be calculated as € /¥ = €/$ 0.81243/107.347 $/¥= 0.00757. The 3 months cross forward rate for Yen (¥) in terms of Euros is € 0.00755 - 0.00757.

Test Yourself 3

The following are exchange rates observed in the local foreign currency market.

TSHS/Euro (€)	Spot	1,890.00 – 1,892.00
TSHS/Euro (€)	One month forward	1,894.025 – 1,897.05
Canadian Dollar/Euro	Spot	3.4582 – 3.4600
Canadian Dollar/Euro	One month forward	3.4530 – 3.4553

Required:

i. Compute the one month forward cross rate for buying and selling the Tanzanian shillings (TSHS) against the Canadian dollar.

ii. Determine whether the forward selling of TSHS against the Canadian dollar is a premium or discount and by how much.

3. Apply relevant data and information to determine opportunities for bilateral and triangular arbitrage profit [Learning outcome c]

It has been considered and discussed in section two of this chapter that amongst main participants who play an active role in the foreign exchange market are arbitrageurs. The arbitrageurs are the group of participants who exploit inconsistencies in exchange rates of different currencies to determine opportunities to make risk free arbitrage profit. The inconsistencies in exchange rate occur when the foreign exchange arbitrage efficiency does not exist. The efficient foreign market is experienced when where existing foreign exchange market rates are fully reflective of information available to market participants such that they cannot make abnormal profits. This implies that any information available to a particular participant will immediately be available to other participants and be

reflected in the market rates. While it is true that it may be difficult for arbitrageurs to consistently make abnormal profit from foreign arbitrage transaction. It is possible to make arbitrage profit from currency arbitrage transaction at least in the short term.

Foreign exchange arbitrage Transactions

Currency arbitrage transaction involves the purchasing of a stated amount of a selected currency in one place and re-selling the same in another location, in order to take advantage of exchange rate differences between two distinct markets. This is possible where market participants observe inconsistencies between the buying rate and selling rate of a particular currency at the same time. In this case traders can buy certain amount of a currency exhibiting low price in price in one market and resell where same currency can be sold at higher prices. This could be the inconsistent bid-ask exchange rates between different locations. The arbitrage transaction normally involves simultaneous purchase and sale of an asset (currency) in order to profit from a difference in the price (exchange rate). If inconsistencies exist between exchange rates exhibited in different locations or places, the arbitrageurs can exploit the exchange rate differentials to make a risk less profit. This will continue until the market is fully informed of the price differences and the equilibrium restored. There are two types of arbitrage transactions possible in foreign exchange market. The bilateral arbitrage and triangular arbitrage. These are discussed below.

Bilateral arbitrage transaction

This also referred as geographical arbitrage. The bilateral arbitrage exists due to miss-alignment or lack of alignment between the bid rate and ask rate displayed by two distinct foreign exchange markets. The bilateral arbitrage exists when the dealers buying rate in one location is observed to be higher than another dealers' selling price for the same currency at the same time. In this situation a trader can take this opportunity by buying the currency where the ask rate displayed is low and resell the same where the dealers buying rate is displayed high. This can be made possible by taking long and short position in foreign exchange market simultaneously. It is worth noting that, foreign exchange market operates electronically and therefore simultaneous buy and sell transaction is possible.

Example

The exchange rate between the Tanzanian Shilling (TSHS) and Malawian Kwacha (MKW) at Mlimani City is displayed as: TSHS/MKW 2.90-3.20. At the same time the exchange rate of Malawian Kwacha (MKW) at Uhuru Street City Centre is observed to stand at TSHS/MKW 2.60 – 2.85. There is a misalignment of the bid rate and selling rate displayed by the dealers in these two places. The Mlimani City's dealer selling prices (TSHS 2.85/MKW) is observed to be low compared to Uhuru Street's dealer buying rate (TSHS 2.90/MKW). Because of inconsistency between MKW buying and selling rate in these two locations, the bilateral arbitrage opportunity exists. The trader can exploit the opportunity by buying the Malawian Kwacha (MKW) from Mlimani City at TSHS 2.85 and concurrently sell the same to a dealer at Uhuru Street at TSHS 2.90. The trader can thereby make a risk less arbitrage profit of TSHS 0.4 per unit of Malawian Kwacha (MKW). Therefore, with the ability to transact a large amount of Malawian Kwacha (MKW), a trader can make huge sums of arbitrage profit.

Test Yourself 4

Razaq observed the following exchange information regarding the SINGAPORE DOLLAR (SGD) and Tanzania Shillings (TSHS) in 2018. The exchange information was displayed by two different banks at around 13.00 hrs in the afternoon in Tanzanian touristic city of Arusha.

Waqwetu Bank Limited: Spot rate	TSHS/SGD 1750 - 1780
Wakuhenga Bank Plc. Limited	TSHS/SGD 1850 - 1905

Required:

(a) Define geographical arbitrage
(b) Determine the opportunity for bilateral profit.
(c) If your answer in (b) above is affirmative and given that Razaq can transact up to SGD 2,000,000; illustrate how Razaq the arbitrageur can benefit from the above information.

Triangular arbitrage transaction

The triangular arbitrage opportunity exists when there is misalignment between the exchange rate of two or more currencies and the exchange rate implied between them, i.e. cross exchange rate. Similar to other kinds of arbitrage it occurs when the foreign exchange market is less efficiency and lasts for every short period. The traders exploit the triangular arbitrage through a triangle shaped steps, whereby one currency is converted to another currency and that currency converted into third currency, and finally converting the third currency back to the

original currency within a short period. The original cost is then compared with the last proceeds and the difference is the profit.

The triangular arbitrage process involves the trader (1) acquiring, the common currency (2) exchanging the common currency for the overvalued currency (3) Sell the overvalued currency into the second currency (undervalued currency), and (4) finally convert the units of the second currency (undervalued) into the domestic currency (original currency). The difference between the amount in (1) and the proceeds in (4) is the triangular arbitrage profit.

Example

Mr. Kibolu, a Tanzanian trader has observed the following exchange rates: the US dollar is bid at Tanzanian Shillings TSHS 2190/US$ in Dar es Salaam; and the Kenyan Shillings (KES) is bid at TSHS 20.50/KES. At the same time the Commercial banks at Nairobi are selling US dollar spot at KES 121/US$.

Required:

(a) Is there any opportunity for triangular arbitration?
(b) How can Mr. Kibolu a Tanzanian trader with TSHS 100, 000,000 use that amount to benefit from the inter market arbitration? Show all the procedures and compute arbitrage profit (if any).

Solution:

a) The existence of arbitrage opportunity can be done by finding a cross rate of Kenyan Shilling (KES) against US Dollar (US$) and compare it with the actual (given) cross quotation. If the calculated cross exchange rate is not the same as actual quotation, then the arbitrage opportunity exists: If the cross rate <actual quotation = opportunity for profit.

   The starting point is to calculate the cross rate between KES and US$, which can be obtained by considering the relationship between the two other exchange rates, i.e. TSHS 2190/US$ and TSHS 20.50/KES. This is given by $\frac{\text{TZS}}{\text{US\$}}\ 2190/20.50\ \times\ \frac{\text{KES}}{\text{TZS}}$

   = KES 106.83/US$

   The calculated cross rate (KES 106.83/$) is inconsistent with the actual (market) cross rate (KES 121/$). Therefore, the opportunity for triangular arbitrage opportunity exists. The comparison further show that the US dollar is overvalued by the market relative to KES, since more units of KES are needed to acquire a unit of dollar (KES 121) as compared with KES 106.82 implied exchange rate.

b) Mr. Kibolu, a Tanzanian trader can exploit the triangular arbitrage opportunity by taking the following steps:

   - Sell the common currency TSHS 100,000,000 and buy the overvalued currency, i.e. US $, at spot market at TSHS 2190/US$, (i.e. TSHS 100,000,000/TSHS 2190/TSHS), you obtain US $ 45,662.10.
   - Simultaneously sell the proceeds of US $ 45,662.10 to acquire the undervalued currency at spot KES 121/$ (i.e. KES 121/$ * $ 45,662.10) and get KES 5,525,114.16.
   - Resell the KES 5,525,114.16 at spot TSHS 20.50 /KES , hence obtain TSHS 113,264,840.18

   The arbitrage profit will be TSHS 13,264,840.18 (i.e. TSHS 113,264,840.18- 100,000,000).

Test Yourself 5

Assume you are a trader with Deutsche Bank. From the quote screen on your computer terminal, you notice that Dresdner Bank is quoting £1.0242/$1.00 and Credit Sisses is offering SF I.5030/$1.00. You learn that UBS Bank is making a direct market between the Swiss franc and the Euro, with a current £/SF quote of 0.6750.

Required:

(i) Does triangular arbitrage opportunity exist given the above information? Give reason for your answer .
(ii) Show how you can make a triangular arbitrage profit by trading at these prices (ignore bid-ask spreads for this problem). Assume you have $5,000,000 with which to conduct the arbitrage.
(iii) What £/SF spot price will eliminate triangular arbitrage?

4. Evaluate exchange rate regimes and analyse Tanzanian exchange rate policy and practices [Learning outcome d]

The exchange rate can be determined in assorted ways referred as exchange rate regimes. The exchange rate regime represents the system or methods through which the exchange rates are determined or established around countries of the world. Exchange rate has been defined elsewhere in this section as amount of one currency required for the acquisition of a unit of another currency. Different countries of the world apply and implement different approaches in determining the value (price) of their currency relative foreign currencies. The countries are supposedly required to decide on the suitable exchange rate system. This is because the exchange rate system can substantially influence international trade volume, flow of foreign investment and capital. In prior periods the exchange rate was being determined or fixed according to agreed units of gold or any other valuable items or another currency. There are several approaches, but flexible exchange rate system is common and simplistic since the market determines the exchange rate. The description of these regimes is provided below:

Free floating rate regime

The flexible exchange regime allows the exchange rate to be determined by market forces of demand and supply of currencies, such that the increased demand for a particular currency, other things remaining constant, will lead to its appreciation and increase in its price relative to other currencies. Under this system the government intervention is avoided, and therefore exchange rates freely fluctuates in response to changes in macro-economic variables such inflation rate, interest rate, economic policies and prices of goods and services of other countries which are influential on the demand of a country's currency. Under this system any misalignments in the balance of payments are automatically corrected. However, the purely floating exchange rate raises possibilities for currency risks and can therefore discourage international trade due increased costs of hedging.

If the prices of goods and services increases in Tanzania relative to prices of goods and services in Uganda, this will lead to increased importation from Uganda by Tanzanian firms which will consequently increase the demand for Ugandan Shillings (UGS) to cater for payment of increased imports. The increased demand for Ugandan Shillings will lead to its appreciation and the amount of TSHS need per unit of UGS will increase. The opposite process will lead to appreciation of TSHS and decreasing amount of TSHS required for acquisition of a Ugandan Shillings.

Managed floating regime

This is also referred as dirty float or hybrid exchange rate system. Under this system the exchange rate is allowed to fluctuate according to market forces but with irregular and untimely interventions by countries' authorities. The whole process involves the central bank involvement to stabilise the exchange rate especially where excessive fluctuation of domestic currency's value is observed. Depending on the objective, the central bank can intervene in the market indirectly by instructing commercial banks to increase or decrease statutory reserves of their foreign currencies. In this case the commercial banks will be forced to either sell or buy the foreign currencies from the market and therefore affect the market supply of foreign currencies. This can also be through adjusting the interest rate of the country. Occasionally, the monetary authorities directly influence the demand and supply by selling (injecting) the foreign currency (increased supply) and or buying the foreign currencies from the market (decreased supply) and accordingly influence the exchange rate. The system requires the central banks to keep sufficient reserve of foreign currencies to be used when the market becomes excessively volatile and makes the value of domestic currency undesirable.

If Tanzania practices managed exchange rate system, this would mean the central bank will set the range of exchange rate within which the exchange rate should flow. Any excessive volatility beyond that level will encourage the government interference. Such situation can be were desirable exchange rate is TSHS/US$ 1780-1950. This implies that any change to say TSHS/$ 1951 would compel the action of the central bank to regulate it within acceptable ranges.

Fixed exchange rate system

It is possible for the government to maintain fixed exchange rate at which it desires its currency to be exchanged against foreign currencies. Under this approach the central bank of the country sets a fixed value at which its domestic currency will be traded against the rest of the currencies. In this case foreign exchange market forces of demand and supply are supposedly determinants of exchanges rate had the system been freely floating are

defeated. Under this system the exchange rate is dictated by the central banks of the country. The central bank maintains and fixes the exchange at a particular point for at which the domestic currency shall be traded and/ or allows fluctuation of such fixed rate within desired levels. Because the exchange rate is fixed or allowed to move within desirable boundaries, the currency risk is therefore reduced, and it may encourage international trade and reduce costs of hedging foreign currency denominated transactions. The operation of this system requires government authority's intervention from time to time to in order to correct imbalances in the balance of payments and monetary policies because no automatic adjustments are possible.

Pegged currency

In some cases where a particular country has regular transactions denominated in particular foreign currency (ies), that country may decide to peg or fix the value of its currency against the selected foreign currencies. This is called the pegged exchange rate arrangement where the value of the country is attached or fixed to another foreign currency or to a basket of foreign currencies. Most countries peg their currencies with major currencies such as US dollar which a highly traded currency in order to maintain the moderate stability of domestic currency with that currency. This is often referred as to the dollarization where the country pegs the value of its currency to dollar.

Parallel exchange rates

Some countries set different exchange rates for different types of transactions e.g. trade and tourism. Official exchange rate may be set without regard to market forces and this will lead to individual setting up non-official markets. This may be tolerated by the government or legal penalties may be imposed on so-called black-market operations.

The Exchange rate system applicable in Tanzania

As most of developing countries in the world, Tanzania operates under the freely floating exchange system which was adopted around 1990's. The exchange rate between Tanzanian Shillings (TSHS) and foreign currencies is therefore determined by the domestic inter-bank currency transactions, that is demand for and supply of the TSHS in the foreign exchange market. It was discussed before that it is almost impossible to operate under a purely freely floating exchange rate system and therefore most of countries use hybrid system. For that reason, although Tanzania follows the flexible exchange rate system where exchange rate is determined by forces of demand and supply of domestic currency, the central bank do sometimes interfere the market to bring about stability especially where there is excessive depreciation of domestic currency (TSHS). Therefore, the exchange rate is market determined but with irregular foreign exchange intervention aiming at moderating the rate of volatility and undue fluctuations in domestic currency's value.

The depreciation of the value of Tanzanian shillings (TSHS) against major currencies of the world such as US dollar ($), Euro (€), Sterling pound (£), have continuously witnessed over the recent past. This depreciation could substantially be associated (i) high reliance on imports and low volumes of exports (balance of payments deficit) (ii) decreasing level of exports of agricultural products such as sisal, cotton, cashew nuts, and the fall in world prices of agricultural commodities. For example, the weight average exchange rate between Tanzanian Shillings and US dollar have changed from TSHS 1280.30 (January, 2009) to TSHS 2241.66 (January, 2018).

(a) Discuss the cases for and against a country using fixed exchange rate system.
(b) Why might a government wish to see a depreciation in the exchange rate of its currency?
(c) Discuss any two ways in which a country can achieve a depreciation of its currency.

Answers to Test Yourself Questions (TYQ)

Answer to TY 1

Foreign Exchange market is the market where one country`s currency can be exchanged for another country`s; it is not a physical place; rather it is electronically linked network of banks, foreign exchange dealers and brokers whose function is to bring together buyers and sellers of foreign exchange. The main participants are large commercial banks, commercial customers, foreign exchange brokers, primary Multinational corporations, hedgers, speculators and arbitrageurs and central banks.

The main functions of the market are:

- Money transfer i.e. transferring the purchasing power from one country to another through foreign bills or remittance made through telegraphic transfers
- Credit function i.e. providing credit for international trade, foreign investments and financing MNCs.

- Provision of hedging facilities such as forward contracts, future contracts and options
- Price discovery (information0 i.e. the determination of values of different currencies.

Answer to TY 2

(a) A point is the smallest unit of "price" change quoted given a conventional number of digits in which a quotation is stated. In the international financial markets, exchange rates for major currencies are quoted to four decimal places. A fifty-point change will mean 0.0050 change in exchange rate. In Tanzania exchange rates quoted by the central bank are in two decimal places meaning a point is equivalent to a cent of shilling. "Points" quotation in forward rates is when a forward quotation is expressed only as a number of decimal points it differs from the spot quotation. The difference is stated as a premium or a discount.

(b)

(i) The Forward premium or discount on £

Given:

Spot Mid-Rates:	TSHS1480/US$	=	US$0.00067/TSHS
	TSHS2610/£	=	£0.00038/TSHS
Forward Mid-Rates:	TSHS1560/US$	=	US$0.00064/TSHS
	TSHS2687.5/£	=	£0.00037/TSHS

The mid-exchange rates US/£ will therefore be:

Spot: [US$0.00067/TSHS]/[£0.00038/TSHS] = US$1.7632/£

Forward: US$0.00064/TSHS]/[= £0.00037/TSHS] = US$1.7297/£

Therefore the £ is trading at a forward discount relative to the US$.

One Year Forward discount on £ =

$$\frac{US\$1.7297 - US\$1.7632}{US\$1.7632} x \frac{12}{12} x100\% = -1.9\%$$

(ii) The cost of US$10,000

The forward rate US$/£ is:

Bid Rate = [US$0.00063/TSHS]/£0.000374/TSHS]

= US$1.6845/£

Ask Rate = [US$0.00064/TSHS]/£0.00037/TSHS]

= US$1.7297/£

The cost of US$10,000 will therefore be US$10,000/US$1.6845/£ = £5936.48

(iii) The Percentage Bid-Ask Spread

= [Ask-Bid]/Ask x 100%

= [US$1.8649 – US$1.6923]/US$1.8649 X 100%

= 9.25%

ANSWER TY 3

(i) Cross-rate for selling Euro against Canadian $ is found as follows:

Forward Euro are sold for US $: US $ are bought at the Euro forward selling price of € 1,897.05 = US$ 1 and are simultaneously sold for one – month forward Canadian $ at a rate of Canadian $ 3.4530. Thus, €1,897.05 = Canadian $ 3.4530.

Therefore, Forward selling price for Euro VS Canadian $ = 1,897.05/3.4530
= 549.39

Similarly, the forward buying rate = 1,894.025/3.4553
= 548.15

(ii) Determine whether the forward selling of Euro against Canadian $ is in premium or discount and show of how much.

It is at discount

The spot selling rate of Euro against Canadian $ = 1,892.00/3.4582
= € 547.11

Forward discount = [(549.39 – 547.11)/547.11] x 12/1
= 0.0500
= 5%

Answer to TY3

(a) Geographical/ Bilateral arbitrage it is the process involving purchase of underlying currency in the market where is cheap and selling it where is expensive. It becomes viable due to lack of alignment between bid-ask spread in two different market places.

(b) It is observed that the bid price for Singapore Dollar (SGD) at Wakuhenga Bank Plc. Limited is observably higher (TSHS 1850) than the ask rate displayed by Waqwetu Bank Limited (TSHS 1780). There is a misalignment of the bid rate and selling rate displayed by the two banks, and therefore opportunity for geographical arbitrage profit do exist.

(c) To benefit from the possible geographical arbitrage the arbitrage should take the following steps:
- Purchase SGD 2,000,000 from Waqwetu Bank Limited at TSHS 1780 per Singapore dollar. This transaction will cost Razaq a total of TSHS 3,560,000,000 [i.e. SGD 2000, 000*TSHS/SGD1780].
- Sell the SGD 2,000,000 spot in Wakuhenga Bank Plc. Limited at the rate of TSHS 1850/SGD. This transaction will yield TSHS 3,700,000,000 [i.e. SGD 2,000,000*TSHS 1850/SGD].
- The bilateral arbitrage profit will be = TSHS 140,000,000 [TSHS 3,700,000,000-TSHS 3,560,000,000]

Answer TY4

(b)

i. Market Cross rate is given as $\frac{€}{SF}$ 0.6750

The calculation cross will be obtained by taking

$\frac{€1.0242}{\$1.00}$ divided by SF $\frac{1.5030}{\$1.00}$

This result to £/SF 0.6814 since dollar cancels out; the calculated cross therefore will be £/*SF* 0.6814 which is inconsistent with market cross rate of (£/*SF* 0.6750). Triangular arbitrage opportunity does exist due lack of alignment between the market and implied across rate.

ii. To make a triangular arbitrage profit the Deutsche Bank trader would sell $5,000,000 to Dresdner Deutsche Bank trader would then sell the Euros for Swiss francs to Union Bank of Switzerland at a price of £1.0242/$1.00. This trade would yield £5,121,000= $ 5,000,000 x 1.0242. The Deutsche Bank trade would then sell the Euros for Swiss francs to Union Bank of Switzerland at a price of £0.6750/SF1.00, yielding SF7,586,667 = £5,121,000/6750. The Deutsche Bank trader would then sell the Euros for Swiss France to Union Bank of Switzerland at a price of €0.6750/SF1.00, yielding *SF* 7, 586,667 = £5,121,000/6750. The Deutsche Bank trader will resell the Swiss francs to Credit Suisse for $5,047,683 = SF7, 586,667/1.5030, yielding a triangular arbitrage profit of $47,683.

(ii) The s(£/*SF*) cross exchange rate should be £/*SF*0.6814. This is an equilibrium rate at which a triangular arbitrage profit will not exist.

Answer to TY 5

(a) **The Case for and against fixed system of exchange rate**

- The Case for Fixed System of Exchange Rate

The great advantage of fixed rates is stability. Firms which engaged in international trade know within certain narrow limits how much they will be paying for their imports and receiving for their exports, and they are thus able to operate with much more certainty and to plan their budgets accordingly, without running the risk of losing if the exchange rate goes against them.

Secondly, fixed exchange rates impose discipline on governments to take action when their currencies are consistently too high or too low; that is, a currency with a low exchange rate probably reflects an unfavorable position on the country's balance of payments, which may in turn be caused by high inflation. The need to keep the currency's valued from falling further will oblige the government not only to support the currency in the short run, but also to take more radical action to solve the underlying problem.

Thirdly under fixed exchange rate system there is little room for speculation, which is an advantage as this only, distorts currency values without representing trade in real goods and services.

- The Case against (Disadvantages) of Fixed System of Exchange Rate

Firstly, that they can lead to currencies being kept unrealistically high or low before a revaluation or devaluation occurs.

Secondly, they presuppose that central banks have enough foreign currency reserves to support their own currencies in the short run.

Thirdly, they take away from governments independence of economic policy-making and the same time require them to give priority to balance of payment problems over domestic problems; i.e. the central bank may be force into raising interest rates to support its currency when the government may want to decrease them to combat unemployment.

(b) **Government and rise in exchange rate for its currency**

If exchange rate of a country's currency rises it has the joint effect of making imports cheaper in terms of home currency and exports more expensive to foreign buyers. The essence this will have a deflationary effect on the home economy which might be welcomed for the following reasons:

- If aggregate demand in the economy is too high relative to supply this will lead inflationary pressure. The firming of the exchange rate will lower the demand for domestically produced exports and increase the demand for imported substitutes for home produced and consumed goods, both of which should lead to a reduction in aggregate demand and hence reduce the inflationary pressure.
- A further reason for a government to desire a currency appreciation is if the country is running a balance of payments surplus. In such circumstances it may wish to export capital and the firmer exchange rate should encourage this.

(c) For government to achieve a rise in the exchange rate of its currency it must enter the foreign exchange market. Such intervention can take several forms. Either it can enter the market directly by using its gold and currency reserves to buy its own currency, thus driving up the price of the currency by increasing demand. Alternatively, the government can raise domestic interest rates encouraging capital flows into the country thereby rising demand for the domestic currency on the foreign exchange market, thus raining its price.

Indicative Examination Questions (IEQs)

IEQ 1

(a) Explain the meaning of the term "arbitrage" in the finance context and its application in the foreign currency markets.

(b) You are provided with the following spot exchange rates as they appear today in the foreign currency market desks of three local banks in Arusha:

Kisongo Commercial Bank	€ 0.7650 – 0.7745/US$
Moshono Savings Bank	TSHS.1,395 – 1,420/US$
Sanawari Wakulima Bank	TSHS.1,860 – 1,905/ €

Required:

(i) With supporting computations, show whether there exists arbitrage opportunity.
(ii) If there exist arbitrage opportunity, and assuming that you have TSHS.10 million to invest, show how you can exploit the opportunity and the amount of profit (in TSHS) that you will make.

IEQ 2

(a) Explain main types of foreign exchange rate systems and discuss how such systems might affect the ability of Financial Managers to forecast exchange rates.

(b) The following are exchange rates observed in the local foreign currency market.

TSHS/Euro (€)	Spot	1,890.00 – 1,892.00
TSHS/Euro (€)	One month forward	1,894.025 – 1,897.05
Canadian Dollar/Euro	Spot	3.4582 – 3.4600
Canadian Dollar/Euro	One month forward	3.4530 – 3.4553

Required:

(i) Compute the one month forward cross rate for buying and selling the Tanzanian shillings (TSHS) against the Canadian dollar.
(ii) Determine whether the forward selling of TSHS against the Canadian dollar is a premium or discount and by how much.

IEQ 3

(a) A number of economic blocks in Africa, including the East African Community, are now considering having a single currency in the future.

Required:

(i) Using examples, briefly discuss the importance of a "single currency" for African economies.

(ii) Highlight key factors that must be considered before embarking on a single currency.

(b) The international monetary system refers primarily to the set of policies, institution, practices, regulations and mechanisms that determine the rate at which one currency is exchanged for another.

Required:

Briefly explain the different types of exchange rate regimes including variations of flexible exchange rate setting mechanisms.

Answer to IEQs

IEQ 1

(a) Arbitrage is the act of simultaneously buying and selling the same or equivalent assets or commodities for the purpose of making certain, guaranteed (risk less) profits.

(b) (i) Cross-rates: $\frac{1{,}420}{0.7650€} = TZS.1{,}856.21/€$

$$\frac{1{,}395 TZS.}{0.7745€} = TZS.1{,}801.16/€$$

By comparison:

Cross-rate TSHS.1, 801.16 – 1,856.21/€ with

Sanawari Wakulima Bank TSHS.1, 850 – 1,905/€.

Cross rate differs from actual market rate. Arbitrage opportunities exist.

(ii) Arbitrage approach:

(a) Buy US$ in Moshono Savings Bank
(b) Sell the US$ in Kisongo Commercial Bank to buy €
(c) Sell the € in Sanawari to buy back TSHS.

$$\frac{TZS.10.000{,}000}{TZS.1{,}420/US\$} = US\$7{,}042.25$$

US$ 7,042.25 * $\frac{€0.7650}{US\$} = €5{,}387.32$

$$€5{,}387.32 * \frac{TZS.1{,}860}{€} = TZS.10{,}020{,}415.20$$

Less: TSHS.10, 000,000.00

Arbitrage profit **20,415.20**

Alternative Solution:

(a) **Arbitrage**:

Arbitrage is the act of simultaneously buying and selling the same or equivalent assets or commodities for the purpose of making certain (guaranteed) riskless profits. In relation to the foreign exchange market, we may distinguish between:

(i) Triangular (or inter-market arbitrage)

(ii) Commodity arbitrage

(iii) Interest arbitrage

The principal objective of any arbitrage process is to benefit from possible market imperfections, (i.e. get arbitrage profit). The gain is risk free.

(b) (i) **Checking on opportunities for profit**.

The mid-cross rate between the TSHS and € is:

$$\frac{\text{TZS } 1{,}408/\text{US\$}}{€\,0.7698/\text{US\$}} = \text{TSHS } 1829 / €.$$

The actual mid-rate is TSHS 1883 / €. As the two rates differ, opportunities for profits from triangular arbitrage exist.

(ii) **The arbitrage process: Illustration**.

- Exchange the TSHS 10m spot for US$ at TSHS 1,408 / US$ to have US$ 7,102.
- Convert the US$ 7,102 into € spot at € 0.7650 / US$ to obtain € 5461.
- Exchange the € 5461 for TSHS spot at TSHS 1883 / € to obtain TSHS 10,283,063.

Thus, the arbitrage profit will be: TSHS 10,283,063 – TSHS 10,000,000 = **TSHS 20,415.20**

IEQ 2

(a) (i) **Free Floating Exchange Rate**

- Value of the currency is determined solely by market demand foe and supply of the currency in the foreign exchange market
  - Trade and capital flows are the main factors affecting the exchange rate
  - In the long run, it is the macro economic performance of the economy (including trends in competitiveness) that drives the value of the currency)
  - No pre-determined official target for the exchange rate is set by the government. The government and/or monetary authorities can set interest rates for domestic economic purposes rather than to achieve a given exchange rate target
  - It is rare for pure free-floating exchange rates to exists – most governments at one time or another seek to “manage” the value of their currency through changes in interest rates and other controls

(ii) **Semi-Fixed Exchange Rate**

- Exchange rate is given a specific target
- Currency can move between permitted bands of fluctuation
- Exchange rate is dominant target of economic policy-making (interest rates are set to meet the target)
- Central Bank may have to intervene to maintain the value of the currency within the targets

- Re-valuations are possible but seen as a last resort

(iii) **Fully-Fixed Exchange Rate**

- Commitment to a single fixed exchange rate
- No permitted fluctuations from the central rate
- Achieves exchange rate stability put perhaps at the expense of domestic economic stability
- Bretton-woods system when currencies were tied to the US Dollar
- Gold standard in the inter-war year – currencies linked with gold

The fixed exchange rates systems are easy to forecast since they remain generally unchanged. The freely floating exchange rate system is however, complicated in forecasting which may require statistical techniques to be used.

(b) (i) Cross-rate for selling Euro against Canadian $ is found as follows:

Forward Euro are sold for US $: US $ are bought at the Euro forward selling price of € 1,897.05 = US$ 1 and are simultaneously sold for one – month forward Canadian $ at a rate of Canadian $ 3.4530. Thus, €1,897.05 = Canadian $ 3.4530.

Therefore, Forward selling price for Euro VS Canadian $ = 1,897.05/3.4530

= 549.39

Similarly, the forward buying rate = 1,894.025/3.4553

= 548.15

(ii) Determine whether the forward selling of Euro against Canadian $ is in premium or discount and show of how much.

It is at discount

The spot selling rate of Euro against Canadian $ = 1,892.00/3.4582

= € 547.11

Forward discount = [(549.39 – 547.11)/547.11] x 12/1

= 0.0500

= 5%

IEQ 3

(a) (i) **Advantages (importance of single currency**):

- Minimization of foreign exchange risk within the region
- Reduction of uncertainties between investors
- Currency becomes stronger
- Movement of goods and services is facilitated
- Transaction costs minimizations
- Single interest rates
- Developing of financial markets
- Price parity across the region.

(ii) **Critical issues to be considered (Any of the following)**:

- State of economies of east Africa should be at par
- Political stability in all countries involved
- Regulatory Body to regulate the system and provide the forum discussion
- Inflation control
- Integrated capital market
- Harmonization of monetary policies

(b) **Market mechanisms for establishing exchange rates are:**

(i) Free float (Freely fluctuating exchange rate)

Under purely freely fluctuating exchange regime currencies are allowed to float (i.e. move upward and downward) freely without government interaction in the market or restrictions on who may change money. The exchange rates are determined by the interaction currency supply and demand. The supply-and-demand schedules, in turn are influenced by prices level changes, interest differentiations, and economic growth. Generally, the exchange rate will fluctuate randomly as market participants assess and react to new information, much as security and commodity prices in other financial markets responds to news. This will actually shift the supply-and-demand schedules which in turn will lead to new equilibrium positions.

(ii) Managed float

In this case the exchange rates are allowed to float in response to demand and supply forces but not as frees and complete as it would be under pure freely fluctuating rate regime. The government (through central bank) intervenes actively in the foreign exchange market in order to reduce the economic uncertainty associated with a clean float. The government interaction is due to the fact that there is a fear that too abrupt in a change in the value of a nation's currency could imperil its export industries (if the currency appreciates) or lead to a higher rate of inflation (if the currency depreciates).

The practical experience with floating rates has not been encouraging since instead of reducing economic volatility, as they were supposed to do, floating exchange rates appear have increased it. Managed floats fall into three distinct categories of central bank interventions; these are: Smoothing out daily fluctuations; Leaving against the wind and unofficial pegging.

(iii) Target-zone Arrangement (or Pegged currency)

Under the target-zone arrangement, the currency is linked to a major trading currency or a basket of currencies (currency blocs) and keeps that relationship fixed. Under this system, countries adjust their national economic policies to maintain their exchange rates within a specific margin around agreed-upon fixed central exchange rates.

Many economists and policy makers have argued that the industrialized countries could minimize exchange rate volatility and enhance economic stability if the United States, German, and Japan linked their currencies in a target-zone system.

(iv) Fixed rate system

Under fixed rate system, governments are committed to maintain target exchange rates through its central banks or treasury agencies. Each central bank actively buys or sells its currency in the foreign market whenever its exchange rate threatens to deviate from its stated *par value* by more than an agreed-on percentage. The resulting coordination of monetary policy ensures that all members' nations have the same inflation rate. In this case, each member must accept the group's joint inflation rate as its own.

(v) Controlled rate Regime (or the current hybrid system)

In such a regime, national governments directly affect exchange rates by imposing and enforcing legal controls on private dealings in FOREX. The national government uses their sovereign power to control the overall demand for, and/or supply of FOREX. Some forms in which governments may exercise their powers include:

- Licensing requirement where residents have to apply to the exchange control authorities for licensing to import goods and to acquire the exchange needed for those goods.
- Residents may be required to obtain FOREX from specified sources only that have been designed to operate as part of the exchange control mechanism.
- Similarly, residents are required by the law to sell all the FOREX to these official agencies.

STUDY GUIDE A4: INTERNATIONAL PARITY RELATIONSHIP AND EXCHANGE RATE FORECASTING

Get Through Intro

The exchange rate and exchange rate forecasting are at the heart of multinational financial management. The multinational corporations, international firms, commercial banks, international business community and general public continuously apply exchange rate for personal and business purposes. The listed participants require exchange rate forecasting for different reasons. The motives for forecasting exchange rate could be – to appraise and evaluation of international projects, formulating international financial policies, speculating and arbitraging in foreign exchange market, hedging and mitigating currency risks, and for trading purposes. The concept of exchange rate has been discussed in *A2: Foreign Exchange Market* of this study guide. Subsequent to that, it is important to understand the reasons, determinants for exchange rate fluctuations, evaluate different techniques that can be used in exchange rate forecasting and to assess the impact of balance of payment in domestic currency's value relative to the currencies of the rest of the world.

The fluctuation of exchange rate is associated with a number of other economic factors. The relationship and the link between these economic factors and exchange rate are explained by international parity or equilibrium theories. The theories, for example explains how exchange rate can be influenced by inflation rate, interest rate, changes in economic growth, change in international trade volumes and balance of payments. The parity theories are further important tools for exchange rate forecasting. It has been suggested that these are equilibrium theories such that if they are holding there is no possibilities for arbitrage opportunities. In other words any disparities in these theories suggest possibility of arbitrage opportunities. Accordingly, the understanding of the concepts and practices behind exchange rate forecasting and mechanics of international parity theories is critical

In this study guide chapter, the concept and practices of parity theories and its role in exchange rate forecasting is introduced, Determinants of exchange rate explored and evaluated and opportunities for commodity and interest rate arbitrage profit exploited and determined. The influence of the balance of payment on domestic currency's value when compared with other foreign currencies is also discussed and examined.

Learning Outcomes

a) Examine International Parity Relationship by analysing the relationship of exchange rate and other economic variables through;
   i. Supply and Demand theory, Purchasing Power Parity (PPP), Fisher Effect (FE), International Fisher Effect (IFE), Interest Rate Parity (IRP) and Forward Rate as Unbiased predictor of Future Spot Rate.
b) Apply PPP and IRP to determine commodity and interest rate arbitrage opportunities.
c) Evaluate the need for exchange rate forecasting and Apply different techniques to forecast exchange rates.
d) Evaluate the implication of balance of payments on exchange rate determination.

1. Examine International Parity Relationship by analysing the relationship of exchange rate and other economic variables through;

Supply and Demand theory, Purchasing Power Parity (PPP), Fisher Effect (FE), International Fisher Effect (IFE), Interest Rate Parity (IRP) and Forward Rate as Unbiased predictor of Future Spot Rate.

[Learning outcome, a]

Exchange rate has been defined elsewhere in this book as "a price of one currency expressed in terms of another currency". Like prices of other commodities exchange rate is not self-standing. It is at the possible influence of other factors. These factors explain fluctuation or volatility of exchange rate. The main economic variables which influence the exchange rate are inflation (price levels in different countries), interest rate (opportunity cost of money across countries), relative changes in economic growth and development, changes in international trade volumes and movements of balance of payments. The description of relationship between exchange rate and most of the determinants of exchange rate is provided by the international parity relationship, which are equilibrium conditions of exchange rate.

(1) Supply and Demand Theory

According to this theory, the exchange rate is determined by the forces of demand and supply. **Therefore, the point of intersection of the two curves will be the equilibrium rate**. If, for any reason, the demand for a foreign currency increases, then the price will rise further, assuming the supply remains the same. On the contrary, if the supply is increased by a shift of the supply curve downwards, the price will decline from, provided the demand remains the same. Any excess demand, below the equilibrium point or excess supply, above the equilibrium point decreases or increases the foreign currency reserves of a country temporarily. This disequilibrium condition is rectified by market forces over time.

(2) Purchasing Power Parity (PPP)

Purchasing power parity (PPP) is an equilibrium theory which provides that exchange rates between currencies are in equilibrium when their purchasing power is the same in each of the two countries. This means that the exchange rate between two countries should equal the ratio of the two countries' price level of a fixed basket of goods and services. When a country's domestic price level is increasing (i.e. country experiences inflation), that country's exchange rate depreciates in order to return to PPP. The process of equilibrium continues until prices of goods of two countries reach the same level. There are two forms of Purchasing Power Parity (PPP), the absolute and relative version.

(i) The Absolute Version of PPP Theory

The absolute version of PPP theory is based on the law of one price. The theory states that in a freemarket identical commodities will be priced similarly across borders, such that if the price in Tanzanian shillings of a product is multiplied by the exchange rate, say, the US Dollar, it will yield the price of the same product in US dollars. If we assume that the exchange rate between the TSHS and US $ is 1600: 1, then a product that costs $1 in the United States should cost TSHS 1600 in Tanzania. Otherwise, arbitrage profits will occur. Ultimately, however, the market, through the forces of demand and supply, will bring about equilibrium between the Tanzanian shillings and US dollar prices. Thus, the law of one price will be reinstated and as a result, the purchase power parity between the TSHS and the US $. The differences in the rates of inflation between the countries will also be nullified because the PPP adjusts to equal the ratio of their price levels. The implication of the theory is that the exchange will be determined in some way by the relationship between prices of similar product in two countries.

Absolute version of PPP theory is based on following assumptions

- The law of one price assumes that there are no transportation costs and no differential taxes applied between the two markets.
- There must be competitive markets for the goods and services in both countries.
- The law of one price only applies to tradable goods; immobile goods such as houses, and many services that are local, are of course not traded between countries.

Let P_XTZ be the price of commodity X in Tanzania, and P_XKE = the price of similar commodity in Kenya. The expected exchange rate of Tanzanian Shillings (TSHS) against Kenyan Shillings (KES) is then expressed as $E_t = \frac{TZS}{KES}$.

The law of one price is given as:

PTSHS $= \frac{TZS}{KES} \times PKE$ ..... *(1)*

Rearrange as $E_t \times \frac{TZS}{KES} = \frac{PTZ}{PKE}$..... *(2)*

That is the ratio of relative inflation rates. If inflation falls in Kenya the right-hand side of equation (2) above will become smaller, thus the exchange rate of Kenya shillings against Tanzania shillings will fall by a proportional amount (lower inflation increases value of the KES in terms of the exchange rate).

Example

Suppose a kilo of salt is sold for Tanzanian Shillings (TSHS) 2,000 in Pwani, Tanzania while the same kilo of salt is sold for Kenyan Shillings (KES) 120 in Nakuru, Kenya.

Required:

Calculate the exchange rate between the TSHS and KES implied by Law of one price.

Solution

Let the price of a kilo of salt in Tanzania be denoted as, P_sTZ= TSHS 2,000, Price of kilo of salt in Kenya P_sKE = KES 120.

It follows that, the exchange rate implied by Law of One Price (LOP) will be determined as follows $E_t \times \frac{TZS}{KES} = \frac{PTZ}{PKE}$, Therefore, $E_t\left(\frac{TZS}{KES}\right) = \frac{TZS\ 2{,}000}{KES\ \ 120} =$ **16.67**

The exchange rate implied by the Law of One Price is the equilibrium exchange rate and that any deviation of market (actual) exchange rate from the rate implied in the law of one price, suggests the existence of commodity arbitrage opportunity.

In practice it would take a long time to reach price equilibrium according to PPP. In the short run, exchange rates are news driven i.e. announcements about interest rate changes, changes in perception of the growth prospects of economies and the like are all factors that drive exchange rates in the short run. The Purchasing Power Parity further suggests that the purchasing power of a consumer will be similar when purchasing goods in a foreign country or in the home country. If inflation in the foreign country differs from inflation in the home country, the exchange rate will adjust itself to maintain equal purchasing power.

The Purchasing Power Parity model (absolute version) has shown some weaknesses and could be a poor predictor of short-term changes in exchange rates because:

- It ignores the effects of capital movement on the exchange rate-trade and therefore exchange rates will only reflect the prices of goods which enter into international trade and not the general price level since this include non-tradable goods.
- It ignores the fact that government may manage exchange rates, e.g. through interest rate policy such that the assumption of free market defeated.
- The transaction cost of trading the commodities such as shipping, insurance, storage cost do exit.
- It assumes that identical commodities in the two countries (homogeneous) and that there is no product differentiation which is unrealistic.

(ii) The relative form of purchasing power parity (PPP)

This version of PPP state that the exchange rate between the domestic currency and any foreign currency will always adjust to reflect change in inflation/price level in the two countries. The relative form of PPP is an alternative version that accounts for the possibility of market imperfections such as transportation costs, tariffs and quotas. This version acknowledges that, because of these market imperfections, prices of similar products of

different countries will not necessary be the same when measured in a common currency. Under this version of PPP 'the exchange rate between the domestic currency and any foreign currency will adjust to reflect changes in prices levels of the two countries. Subsequent to that, the currency of the country experiencing a higher rate of inflation will depreciate against the other currency by approximately the inflation differential. The higher the rate of inflation in one county relative to another will signify that the purchasing power of that country's currency is weak and accordingly its value depreciates compared to the other country's currency.

Given, the inflation levels for two countries, and the spot rate, the expected exchange rate can be determined as follows using the purchasing power parity model:

Single period version (t = 1)

$\frac{e_t}{e_0} = \frac{1+i_h}{1+i_f}$, This can be rewritten as $\frac{e_t - e_0}{e_0} = i_h + i_f$, whereas $\frac{e_t - e_0}{e_0}$ is exchange rate differential, and $i_h + i_f$ is inflation rate differentials.

This is to say, generally that the PPP theory states that the exchange rate differentials should be equal to the inflation rate differentials in the short run.

Multi period version (t>1)

$\frac{(1+i_h)^t}{(1+ir_f)^t} = \frac{\bar{e}_t}{e_0}$, this can be rearranged as $e_t = e_0 \left(\frac{(1+i_h)^t}{(1+i_f)^t}\right)$

Where

e_t = The domestic currency value of the foreign currency at time t
e_0 = The domestic currency value of the foreign currency at time O
i_h = The periodic domestic inflation rate
i_f = The periodic foreign inflation rate

Therefore, according to Purchasing power parity, the exchange rate change during a given period should be equal to the inflation rate differential in that same time period. According to PPP a currency with high rate of inflation should devalue relative to the currency of the country with low rates of inflation. The theory is however, likely to be more useful for predicting long run changes in exchange rates since these are more likely to be determined by the underlying competitiveness of economies as measured by the model. The clear prediction of the purchasing power parity model of exchange rate determination is that, if a country experiences a faster rate of inflation than its trading partners, it will experience depreciation.

Example

It is given that the current or spot exchange rate between Tanzania and Kenya is TSHS 20/KES and respective annual rates of inflation are 15% and 10%.

Required:

Assuming that purchasing power, parity theory holds, calculate the rate of foreign exchange expected in 12 months' time.

Solution

According to purchasing power parity the exchange rate differentials equals the inflation rate differentials $\frac{e_t}{e_0} = \frac{1+i_h}{1+i_f}$. Accordingly, the expected spot rate would be determined as $e_t = e_0 \left(\frac{(1+i_h)^t}{(1+i_f)^t}\right)$,

$e_t = \frac{TZS}{KES} 20 \left(\frac{1+0.15}{1+0.1}\right)$,

$e_t = \frac{TZS}{KES} 20 \left(\frac{1.15}{1.1}\right)$

$$e_t = \frac{TZS}{KES} \quad 20.91$$

The exchange rate in 12 months (one year) will be TSHS/KES 20.91. When the calculated exchange rate is compared with spot rate of TSHS/KES 20 which was prevailing 12 months ago, it can be noted that the Tanzanian Shillings has depreciated against Kenyan Shillings during the period of one year. This is because more TSHS (20.91) are needed to purchase 1 Kenya shilling compared to only TSHS (20) required before. The Kenyan shillings have therefore appreciated. This is in line with the purchasing power parity which state that the country with relative higher rate of inflation, in this case Tanzania (15%) will experience depreciation or fall in value of its currency relative to a country experiencing lower rate of inflation, in this case Kenya (10%).

(3) The Fisher effect [FE] theory

The Fisher Effect (FE) theory was initially developed by the US economist Irving Fisher. The theory describes the relationship that exists between inflation rate and interest rate. It states that investors all over the world expect the same real rate of return on their investments after the effects of inflation are eliminated. Therefore, while nominal interest rates may differ between countries this is only because of different inflation expectations. The FE holds that, in equilibrium, an increase (decrease) in the expected rate of inflation in a country will cause a proportionate increase (decrease) in the interest rate in that country. That is nominal interest rate in each country are equal to the required real rate of return plus compensation for expected inflation.

The theory states that the nominal interest rate (r) is made up of two components: A real required rate of return "a" and inflation premium equal to the expected amount of inflation "i". Hence, FE is given 1+ Nominal interest rate = (1+real required rate of return) (1+expcted inflation rate).

$$(1 + r) = (1 + a)(1 + i)$$

Where, r = nominal rate; a= real rate; i = inflation rate

The expected inflation rate is the expected rate of inflation over the period of time for which funds are to be lent. $r_h + r_f = i_h + i_f$; Where r_h and r_f are nominal home and foreign currency interest rates, and i_h and i_f are home and foreign country inflation rates respectively. The exact form is:

$$\frac{1 + r_h}{1 + r_f} = \frac{1 + i_h}{1 + i_f}$$

Where,

r_h Interest rate in home country

r_f Interest rate in foreign country

i_f Inflation rate in foreign country

i_h Inflation rate in foreign country

The Fisher effect helps to explain the difference in the interest rates in two countries. This difference can be correlated with the difference in the inflation rates in those countries. Accordingly, the generalized version of Fisher theory insists that currencies with high rates of inflation should bear higher interest rates than currencies with lower rates of inflation.

If the required real return is 3% and expected inflation is 10%, then the nominal interest rate will be about 13% (13.3% to be exact). The logic behind this result is that $1 next year will have the purchasing power of $0.9 in terms of today's dollar. Thus, the borrower must pay the lender $ 0.103 to compensate for the erosion in the purchasing power of the $ 1.03 in principal and interest payments, in addition to the $ 0.03 necessary to provide a 3 real return.

Assume that the nominal interest rate in Germany is 5%, the rate of inflation is 3% and the expected rate of inflation in the US is 4%. In this case, the nominal interest rate in the US can be calculated using the Fisher theory as follows:

$\frac{1+r_h}{1+r_f} = \frac{1+i_h}{1+i_f}$,

Therefore, $1 + i_{\$} = 1 + i_{€} \times \frac{1+r_{\$}}{1+r_{€}}$

$= 1 + 0.05 \times \frac{1+0.04}{1+0.03} = \mathbf{1.06}$

Therefore, the nominal rate of interest in the US is 0.06 or 6%.
It can be observed that the real rate of return after eliminating the rate of inflation is the same in both Germany and the US, i.e. 2% (5% - 3%) in Germany and (6% - 4%) in the US.

It is worth to note that, if the capital markets are highly integrated the real interest rate differentials around the world will not be much. This is because under capital market integration the real interest rates are determined by the global supply and demand for funds and investments, unlike where capital market are segmented in which real interest rates are determined by local credit condition. However, total elimination of real interest differentials is impossible due to currency exposure and existence of different political risks levels in different countries.

(4) The International Fisher effect [IFE]

This theory describes the precise relationship between the relative nominal interest rates of two countries and exchange rates. It suggests that an investor who periodically invests in foreign interest-bearing securities will on average achieve a return similar to what is possible domestically. The key point of understanding the impact of relative changes in nominal interest rates among countries on the foreign exchange value of a nation's currency is to recall the implication of PPP and the generalized Fisher Effect. PPP implies that exchange rates will move to offset changes in inflation rate differential. Thus, a rise in the Tanzania inflation rate relative to those of other countries will be associated with a fall in the Tanzanian Shillings (TSHS)'s value. It will also be associated with a rise in the Tanzanian interest rate relative to foreign interest rates. This implies that the exchange rate of the country with higher interest rates will depreciate to offset the interest rate advantage achieved by foreign investments.

In specific terms, the IFE suggests that currencies with low interest rates are expected to appreciate relative to currencies with high interest rates. Essentially what the international fisher effect says is that arbitrage between financial markets in the form of international capital flows should ensure that the interest differential between any two countries is an Unbiased Predictor of the future change in the spot rate of exchange. This condition does not mean, however, that the interest differential is an especially accurate predictor; it just means that prediction errors tend to cancel out over time.

Give the interest rates of two countries and spot rate of one country IFE can be applied to determine the expected (future) exchange rate as follows.

$\frac{(1+r_h)^t}{(1+r_f)^t} = \frac{\bar{e}_t}{e_0}$, this can be rearranged as $\bar{e}_t = e_0 \left(\frac{(1+r_h)^t}{(1+r_f)^t}\right)$

Where ēt is the expected exchange rate in period t.

(5) The interest rate parity [IRP] theory

Interest rates can be used as a tool for demand management in monetary policy therefore interest rates in different countries will vary depending on the economic condition of the economy. Another factor influencing exchange rates is the interest rates. If interest rates are high in one country compared to another, this will have the effect of attracting capital inflows as investors try to take advantage of the higher rate of interest. Consequently, the demand for domestic currency increases, pushing up its price. The ultimate effect is a depreciation of the domestic country's currency as it becomes more expensive.

The Interest Rate Parity (IRP) theorem examines the impact of nominal interest rate differentials between two countries on the future/forward rate of the foreign currency. This theory states that premium or discount of one currency against another should reflect the interest rate differential between the two currencies. The theory specifically, offers that in a perfect market situation and where there are no restrictions on the flow of money one should be able to gain the same real value on one monetary asset irrespective of country where they are held.

The theory states that: The difference in the national interest rates for securities of similar risk and maturity

should be equal to, but opposite sign to the forward rate discount or premium for the foreign currency, except for transaction costs. IRP is an equilibrium condition – a 'parity relationship' and holds that exchange rates are determined by interest rate differentials. It states that the **premium** or **discount** of one currency in relation to the other should reflect the interest rate differentials between the two currencies. Thus, interest rates play an important role in determining exchange rates.

The IRP equation is $r_h - r_f = p$

Where, r_h =Home Interest Rate

r_f = Foreign Interest Rate

p = Forward Premium or discount of the foreign currency.

IRP is often approximated as $\frac{r_h - r_f}{1+r_f} = \frac{F - S_0}{S_0}$,

Alternatively, $\frac{F}{S_0} = \frac{1+r_h}{1+r_f}$

such that $F = S_0 \left(\frac{1+r_h}{1+r_f}\right) t$

Where, *F* and S_0 are Forward and Spot rates respectively, and r_h and r_f are domestic country and foreign interest rates respectively.

The IRP holds where forward premium or discount (the difference between the spot and forward rates) equals interest rate differential between the two countries. It follows that, the IRP is an equilibrium condition that should hold in the absence of barriers to international capital flows i.e. it assumes that money is internationally mobile. If IRP do not hold then it would be possible for arbitrageurs to make unlimited amounts of money exploiting the arbitrage opportunity. Since we do not typically observe persistent arbitrage conditions, we can safely assume that IRP holds on the whole. But in some cases the inconsistency or disparity in the interest rate theory can be observed which suggest the existence of interest arbitrage opportunity.

In case of disparity in the IRP the investor may take advantages for the interest rates differences by doing the following (i) Say choose to invest at foreign currency money market instrument of identical risk and maturity for the same period. (ii) This would require that the investor exchange the home currency for foreign currency at the spot rate of exchange, (iii) invests foreign currency in a money market instrument, (iv) Sell the foreign currency forward (in order to avoid any risk that the exchange rate would change), and (v) at the end of the period convert the resulting proceeds back to home currency. The different between the amount invested in chosen currency and the final proceeds will be the investor's interest arbitrage profit.

Example

Assume we have £1m to invest and S$1.6800/£ and F360$1.6066/£; Also UK fixed interest rate is 13.00%pa while US fixed interest rate is 8.0625%pa. We could invest £1m in UK at 13.00% for 12 months. OR we could convert £1m to $ at $1.68/£, invest $ at 8.0625% for 12 months and sell the pre-calculated proceeds forward 12 months at $1.6066/£; both investments would yield the same amount £1.13m then Equilibrium holds.

Test Yourself 1

Zen Pharma Inc. exports a special pharmaceutical product, Zenfar, from its headquarters in Atlanta, USA to a major Tanzanian importer. The current exchange rate is $1= TSHS 1,600. Exports to Tanzania are currently 200,000 units of Zenfar at $50 each. Direct costs are $30 per unit. There is an expectation that the Tanzanian currency will be devalued by 15 percent by the Tanzanian government. Zen is now faced with a pricing decision problem that must be decided before the anticipated any actual devaluation takes place. Zen is considering two options before it.

Option 1

Maintain the same Tanzanian price as prevailing today (i.e. sell for a lower dollar price such that the cost to the importer in Tanzanian shillings is the same as at present). In such a case, the sales volume to Tanzania will not be affected, or,

Option 2

Maintain the same dollar price, and therefore the Tanzanian shilling price is increased to compensate for the devaluation. This will result in a 10 percent decrease in volume.

Required:

(a) What is the short-run implication of pricing strategy under Option 1
(b) What is the short-run implication of pricing strategy under Option 2
(c) Which strategy do you recommend?

6. The rational expectations theory

According to this theory forward rate is regarded as unbiased predictor of the future spot rate. It suggests that, when the current level of risk is ignored, the equilibrium is achieved when the forward differential equals the expected changes in the exchange rate. Some forecasters believe that foreign exchange markets for the major floating currencies are efficient and forward exchange rates are unbiased predictors of future spot exchange rates, such that the forward rate agreed today for future use will be approximately equal the spot rate at that date. A formal statement of the unbiased forward rate (UFR) condition is that the forward rate should reflect the expected future spot rate on the date of settlement of the forward contract such that incentives to buy or sell the currency forward.

$f_t = \bar{e}_t$, Where $\bar{e}_t$ is the expected future exchange rate at time t (unit of home currency per unit of foreign currency) and f_t is the forward rate for settlement at time t.

Unbiased predictor simply means that the forward rate will, on average, overestimate and underestimate the actual future spot rate in equal frequency and degree. It therefore "misses the mark" in a regular and orderly manner and sum of the errors equals to zero. The fact that it is unbiased predictor, however, does not mean that the future spot rate will actually be equal to what the forward rate predicts.

Forward rate speculations

Speculation is the process of seeking to profit from anticipated exchange rate fluctuations. Forward speculation on the other hand is the process which involves purchasing the underlying currency expected to appreciate forward and selling it on the date of settlement of the forward contract.

Example

Given the followings information

Spot rate:	£: TSHS 2350- 2500
1 Month Forward rate	£: TSHS 2400- 2550
1 Month Forecast rate	£: TSHS 2600-2700
The amount for trading is given to be	£1,000,000

Required: Illustrate how the speculator can benefit from forward speculation and determine the amount of profit in £.

Solution

The speculation profit can be obtained by taking the following steps:

- The Speculator can buy the pounds 1,000,000 I month forward at TSHS/£ 2550 (Fix the price to buy the pounds in 1-month period). Total cost payable in 1-month **TSHS 2,550,000,000.**
- On the settlement date of the forward contract deliver TSHS **2,550,000,000** to the counterparty (bank) and obtain 1,000,000 pounds.
- Then **s**ell the 1,000,000 pounds spot at the forecast rate of TSHS 2600.
- **The speculator obtains TSHS 2,600,000,000.** The Expected profit shall be: TSHS (2,600,000,000 – 2,550,000,000) = **TSHS 50,000,000.**

Test Yourself 2

The current spot exchange rate is TSHS 189.58/ZAR and the three-month forward rate is TSHS 175.50/ZAR. Based on the financial expert analysis of the exchange rate, you are pretty confident that the spot exchange rate will be TSHS 186.58/ZAR in three months. Assume that you would like to buy or sell South African Rand (ZAR)

1,000,000.

Required:

(i) What actions does the speculator need to take to speculate in the forward market? What is the expected Tanzanian Shillings (TSHS) profit from speculation?
(ii) What would be your speculative profit in dollar terms if the spot exchange rate actually turns out to be TSHS 167.46/ZAR.

2. Apply Purchasing Power Parity and Interest Rate Parity to determine opportunity for commodity and interest arbitrage profit respectively [Learning outcome b].

The Purchasing Power Parity (PPP) and Interest Rate Parity (IRP) like the rest of the theories are equilibrium conditions. It follows that when these theories hold (i.e. they are operating at equilibrium) there is no opportunity for arbitrage profit. Contrary, any disequilibrium (disparities) would entail that the opportunity for arbitrage profit exist and one can benefit from such exchange rate disparity. While, disequilibrium in interest rate parity theory amounts to interest rate arbitrage, similar condition under purchasing power parity leads to commodity arbitrage opportunity under law of one price.

4.2.1 Purchasing power parity disequilibrium and commodity arbitrage opportunity

The PPP absolute version the LOP is formally represented by the equation: E_t= pd (t)/pf ($_t$), it provides that the exchange rate between two countries is simply the ratio of prices of a particular product in the countries. Commodity arbitrage exists if the Law of Price does not hold. It occurs when the exchange rate implied by Purchasing Power Parity is different from the actual/ given exchange rate. It involves the purchase of a particular product/ commodity in the country where it is cheaper (undervalued currency) and sell in the country where it is expensive and make arbitrage profit.

Example

A kilo of salt is sold for TSHS 2,000 in Tanzania while the same kilo of salt is sold for KZS 125 in Kenya. Assume the actual exchange rate (Market rate) is provided to be TSZ 17/KZS and that no transportation costs. **Required:** Is commodity arbitrage possible given the above information? Calculate the arbitrage profit if a trader can purchase up to 100,000 kilograms of salt from either country.

The commodity arbitrage exists if the actual/provided exchange rate differs/is inconsistent with exchange rate implied by the law of one price of Purchasing Power Parity (PPP). The Implied exchange rate between TSHS/KZS is given by a ratio between PsTZ (Price of Kilo of salt in Tanzania) and PsKES (Price of kilo of salt in Kenya). Thus E_t (TSHS/KZS) = PsTZ/PsKES. Therefore: E_t (TSHS/KES) = TSHS 2,000/KES 125 = TSHS/KZS 16, which differ with Actual rate of **TSHS/KZS 17**. Hence the commodity arbitrage exists.

Solution

Computation of commodity arbitrage profit:

From the above result it is observed that the Tanzanian shillings is undervalued by the market/ actual rate hence, the procedures/steps to realize the commodity arbitrage profit would be as follows:

(i) Purchase 100,000kgs of salt from Tanzania; total cost would be TSHS 200,000,000 [100,000Kgs * TSHS 2000.]
(ii) Ship/transport the 100,000kgs of salt to Kenya to be sold at KZS 125 each kilo. Total revenue amounts to KZS 12,500,000.
(iii) The KZS 12,500,000 Will then is converted into TSHS at the actual rate of TSHS/KZS 17.
You obtain TSHS 212,500,000 i.e [TSHS 17/KZS *KZS 12,500,000]
The arbitrage profit is therefore TSHS 12,500,000. [i.e. TSHS 212,500,000-200,000,000]

Arbitrage profit per kilo would be TSHS 12,500,000/Kgs 100,000, Profit per kilo = TSHS 125.

It should be noted that the direction of commodity movements and benefit from commodity arbitrage will depend on the currency which is undervalued in relation to another. The rule is the trader should always purchase the commodity from the country whose currency is undervalued (cheap) and sell it in the country whose currency is overvalued (expensive).

Test Yourself 3

Test Yourself 3

Kisukuru Int. Company limited an international firm based in Tanzania has recently observed that a product called magadi is also obtained in Kenya. A ton of magadi is sold for TSHS 2,000,000 in Meru Tanzania while the same ton is sold for KZS 125,000 in Nakuru Kenya.

Given that the current average market rate between TSHS/KZS is 17 and that transportation costs between Meru and Nakuru is TSHS 500,000 or (KZS 55,000) per trip; and that the exchange rates are expected to be stable for the foreseeable future.

Required:

a. Is commodity arbitrage viable given the above information? Why? (Support your answer with necessary computations).
b. Calculate total arbitrage profit and profit per tonne (if any) that Kisukuru Int. Company can make, if it can purchase 100,000 tons of magadi at any given period from either country.

4.2.2 Interest rate parity disequilibrium and interest arbitrage opportunity

Interest rate arbitrage exists if the IRP is not holding, that is the interest rate differentials are inconsistent with the forward premium or discount at a given period of time. The process will involve borrowing and lending currencies. The arbitrageur will borrow from the country whose currency is undervalued and invest in the country whose currency is overvalued and convert the investment proceeds into the first currency borrowered and repay the loan, the difference is arbitrage profit.

(a) Covered interest arbitrage (CIA)

The spot and forward exchange markets are not, however constantly in the state of equilibrium described by interest rate parity. When the market is not in equilibrium, the potential for "riskless" arbitrage profit exists. The arbitrager who recognizes such an imbalance will move to take advantage of the disequilibrium by investing in whichever currency offers the higher return on a covered basis. The process whereby an investor earns a risk-free profit by (1) borrowing funds in one currency, (2) exchanging those funds in the spot market for a foreign currency, (3) investing the foreign currency at interest rates in a foreign country, (4) selling forward, at the time of original investment, the investment proceeds to be received at maturity, (5) using the proceeds of the forward sale to repay the original loan, and (6) having a remaining profit balance.

(b) Uncovered interest arbitrage

Investors borrow in countries and currencies exhibiting relatively low interest rates and convert the proceeds into currencies that offer much higher interest rates. The transaction is "uncovered" because the investor does not sell the higher yielding currency proceeds forward.

Example

You are given the following information:

Exchange rates: Spot rate $(S_0) =$ TSHS 2500/£

1 year forward rate F_1 = TSHS 2700/£

Interest rates: Tanzania 20% per annum
United Kingdom 4% per annum.

The amounts available for borrowing is 1,000,000, from either country.

Required:

(a) Does the IRP Hold? Justify your answer.
(b) If arbitrage opportunities exist determine the covered interest arbitrage profit.

Solution to example

(a) Test whether the arbitrage holds. It holds if the interest rate differentials equals from forward premium or discount.

Forward differentials:

$r_{TZ=20\%=0.2}$, $r_{US=4\%=0.04}$

$$r_{US} - r_{TZ} = 20\% - 4\% = 16\%$$

1 year Forward premium or discount on £

$$= \frac{F_1 - S_0}{S_0} \times \frac{n}{12} * 100$$

$$= \frac{TZS\ 2{,}700 - 2{,}500}{2{,}500} \times \frac{12}{12} * 100 = 7\%$$

The interest rate differentials 16% is inconsistent with the forward premium on £ 7%. Therefore, arbitrage opportunity does exist.

(b) Calculation of interest rate arbitrage profit

In order to determine the direction of the fund, i.e. where one should borrow and invest in order to realise arbitrage profit identified in (a) above compute the covered Yield. This is achieved by adding forward premium to nominal interest rate for the currency trading at forward premium and deducting forward discount to nominal interest rate for the currency trading at forward discount [note that if one currency is trading at forward premium the other one must trading on forward discount. Since pound is trading at a premium of 7% the Covered yield on Pounds (£) – United Kingdom $= 4\% + 7\% = 11\%$, and the Covered yield on the TSHS – Tanzania $= 20\% - 7\% = 13\%$.

The rule: Borrow from the country with low covered yield and invest in a currency with high covered interest yield. Hence the interest arbitrage is in favour of Tanzania. Borrow pounds and invest in TSHS.

Covered Interest Arbitrage computation

(i) Borrow £ 1000,000 at 4%, after a year you repay 1,000,000* 1.04= £1,040,000
(ii) Covert the borrowed amount of £ 1,000,000 into Tanzanians shilling at spot rate of TSHS 2,500/£. You obtain TSHS 2,500,000,000.
(iii) Invest the TSHS 2,500,000,000 at 20% for a year, investment proceeds will be TSHS 2,500,000,000 × 1.2= TSHS 3,000,000,000.
(iv) Sell the investments proceeds of TSHS 3,000,000,000 one year forward at TSHS 2700/£; you obtain [TSHS 3,000,000,000/ TSHS 2700/£] = £1,111,111.1
The covered interest arbitrage profit = £ 71,111 [i.e. £1,111,111.1- £1,040,000].

Test Yourself 4

The following exchange rate and interest rate quotes for the UK pound and the euro are available**:**

Currency	Spot rate	3month- forward rate	3 month -Interest rate (annualized)
UK pound	€1.5523-35/£	€1.5288-337/£	8.00%
Euro			3.96%

Required:

(a) Demonstrate the validity of the Interest Rate Parity condition and discuss your result..
(b) Show how to realize a profitable opportunity via covered interest rate arbitrage and calculate the profit per £1,000,000 arbitraged.
(c) Discuss the implications of Interest Rate Parity for the determination of exchange rates.

Test Yourself 5

Currently, the spot exchange rate is TSHS 1500/$ and the three-month forward exchange rate is TSHS 1520/$. The three-month interest rate is 8.0% per annum in the Tanzania and 5.8% per annum in the US. Assume that you can borrow as much as TSHS 3,000,000 or $ 2,000,000 [NBAA, MAY 2012]

Required:

(i) Determine whether the interest rate parity is currently holding

(ii) If the IRP is not holding, how would you carry out covered interest arbitrage? Show all the steps and determine the arbitrage profit.
(iii) Explain how the IRP will be restored as a result of covered arbitrage activities.

Kwelea-Kwelea Co is a Tanzanian- based company which has the following expected transactions. Two months expected receipt of $3,400,000 and expected payment of $2,400,000 due in two months' time. The company is also due to receive $3,000,000 in three months' time. The finance manager has collected the following information:

Spot rate [TSHS/$]: 1620 ± 20
Two months forward rate [TSHS / $]: 1629 ± 30
Three months forward rate ($ per £): 1646 ± 40

Money market rates for Kwelea-Kwelea Co:

	Borrowing	Deposit
One-year Tanzania interest rate:	15%	10%
One-year dollar interest rate:	5.5%	5%

Required:

(a) Calculate the expected TSHS receipts/payments in two months by Kwelea-Kwelea co Ltd using forward market hedge.
(b) Calculate the expected TSHS receipts in two months using a money-market hedge and recommend whether a forward market hedge or a money market hedge should be used.
(c) Comment on the parity implication on your results in (a) and (b) above.

3. Evaluate the Need for Exchange Rate Forecasting and Apply Different Techniques to Forecast Exchange Rates Learning outcome c]

Decisions regarding international business transactions and activities require consideration of multiple currencies and the impact of changes of their values on such activities, business events and transactions. In order to be able to make precise decision on whether and when to mitigate the impact of exchange rate volatility on their undertakings, the multinational corporations, international firms and business men operating in a global context are inevitably in need for exchange rate forecasting. This becomes even more critical under the floating exchange rate regime where exchange rate is dependent on market forces. It follows that the global firms, traders, arbitrageurs, speculators and public in general need to proactively forecast state of exchange rate and incorporate the output of such forecasting in their decision-making equations. These decisions could be as informal as travelling overseas to as formal as capital budgeting, global financing, and speculation decisions by business firms and traders. Exchange rate forecasting is thus critical as it enables managers to avoid making currency risk unconscious decisions. Although forecasting could not be taken as accurate as to the level of eliminating the currency risk, it can play a great deal in minimizing that risk.

3.1 The need for exchange rate forecasting

It is stated earlier in this study guide chapter that the exchange rates a significant part of long-term decisions likely to be interrupted by change in value of currencies denominating transactions and activities of such decisions. The exchange rate forecasting is therefore a pre-requisite in implementing different decisions especially, those which involve the use of multiple currencies. Exchange rate forecasting can be described as a formal and a proactive process of generating expectations about value of domestic currency relative to other currencies. The exchange forecasting is needed for various reasons. The reasons and motives for exchange rate forecasting are as discussed in this section.

(i) Speculating purposes

Speculation involves making decisions to buy, sell or hold a certain amount of a currency/derivative instrument in anticipation of making profit out of exchange rate fluctuations. Speculators therefore buy currency or derivatives today if it is expected that the currency/derivative will appreciate in value so that to sell it in future and vice - versa. The speculators make decisions regarding their activities in spot market, forward market, option and futures markets with the help of exchange rate forecasting.

(ii) Hedging purposes

The global firms or individuals engage in hedging activities in order to minimise or eliminate altogether the risk arising from exchange rate volatility. Since hedging is not by itself a cost free activity, the firm or individual will only hedge when necessary and when the benefits of hedging exceed involved costs. The decision whether to hedge a transaction (payable or receivable) involving foreign currency but due in future date or otherwise will depend on whether the spot rate prevailing at the date of settlement is favorable or not. To know the expected spot rate at the date of settlement require forecasting. Hedging decision is therefore influenced by the results from exchange rate forecasting.

(iii) Pricing decisions

The forecasting of exchange rate is important for international business firms and multinational corporations in setting prices of products that are necessarily produced in one country, from imported raw material, and consequently sold in difference foreign countries. Pricing decision for a product requires the understanding of whether the currency denominating its sale or purchase of raw materials is strong or weak relative to the domestic currency. We need the forecasting of exchange rate to achieve that.

(iv) Financing decisions

In addition to information regarding interest rates business firms will prefer its debts (financing source) to be denominated in a currency expected to depreciate over the loan period. This will make the company use fewer domestic currencies in the repayment of principal and interest amount (cheaper). This calls for exchange rate forecasting.

(v) Investment and capital budgeting decisions

More importantly the exchange rate forecasting is required in making long-term foreign investment decisions. The international business firms will need to invest in a currency expected to appreciate over the investment period such that the fewer foreign currencies will yield substantial amount in domestic currency. In addition to that the international capital budgeting process requires estimation of cash flows expressed in a currency of investment. This equally calls for the forecasting of the expected spot exchange rates through which the estimated foreign cash flows will be converted into domestic currency. The equilibrium theories such as the International Fisher Effect (IFE) and Purchasing Power Parity (PPP) are commonly used for this purpose.

(vi) Strategic planning

The multinational firms require exchange rate forecasting for strategic planning such as the choice of the production location, foreign markets and source of materials. These multinational firms will normally need to incur costs in countries where currencies are expected to depreciate and earn revenue in countries where currencies are expected to appreciate. The exchange rate forecasting is therefore crucial to facilitate the strategic decision making process by global firms and international business enterprises.

(vii) Arbitrage decisions

Amongst the participants in the foreign exchange market is arbitrageurs. The arbitrageurs engage in arbitrage activities by buying currencies from where they are considered cheaper and resell them where they are expensive. The arbitrage opportunities could be exploited where two markets are involved, literary called bilateral arbitrage, or triangular arbitrage in which the prices of three currencies are involved, referred as triangular arbitrage. The types of arbitrage opportunities, how to check for the same and calculation of risk free arbitrage profit have been adequately covered in this study guide under *A2: Foreign Exchange Market*. It follows that in determining opportunities for arbitrage profit the traders requires forecasting of exchange rate otherwise they will not be able to make a guaranteed arbitrage profit.

(viii) Central bank intervention

The Central Bank of any country plays an important role in exchange control and in ensuring the stability of her country's currency. Under the floating exchange system particularly central banks infrequently interferes foreign exchange markets in order to regulate exchange rates especially where excessive unfavorable volatility of domestic currency is anticipated. In order to know whether and when to intervene the central banks require exchange rate forecasting. This is why there is no a purely flexible exchange rate system but rather the dirty float system where market forces are allowed to determine the exchange with regular interferences in the foreign exchange markets.

3.2 Different techniques (approaches) for forecasting exchange rates

The importance of exchange rate forecasting in a global business environment has well been articulated in the previous section. From that point it becomes necessary to understanding the main methods or techniques which can be available for this purpose. While the forecasters use a wide variety of forecasting techniques or approaches, the most can be classified into three. The distinctive approaches popularly being used for exchange rate forecasting are efficient market approach, fundamental approach and technical approach.

(i) The efficient market approach

The market is said to be efficient if the prices of the commodities (currencies) in the market reflects all available information such that it is not possible to make abnormal profit. The efficient market hypothesis has strong implications for forecasting if the foreign exchange market is efficient. It suggests that the current exchange rate has already reflected all relevant publicly available information such as money supplies, inflation rates, trade balances, and output growth. The exchange rate will then change only when the market receives new information. Since news by definition is unpredictable the exchange rate will therefore change randomly over time. In this regard, under the efficient market approach, if the exchange rate indeed, follow the random walk pattern, the future exchange rate is expected to be the same as the current exchange rate. To be precise, in a sense that random walk hypothesis it is suggested that today's exchange rate is the best predictor of tomorrow exchange rate.

(ii) The fundamental approach

This is a frequently used approach to forecasting future exchange rates and applies the fundamental relationships between economic variables and exchange rates. It examines macroeconomic variables such as inflation, interest rates, national income growth and changes in monetary policies that are likely to influence currency's projections. The simplest form of fundamental analysis involves the of parity conditions such as Purchasing Power Parity (PPP) and International Fisher Effect (IFE). The PPP for example indicates that in the long run exchange rates reflect the relative purchasing power of the currencies. In this approach a multiple regression models can be developed to incorporate selected fundamental variables in the equation. As such in this approach the exchange rate is expressed as a function of other economic variables (dependent variable).

(iii) Technical approach

Technical analysis focuses exclusively on past prices and volume patterns and movements while totally ignoring fundamental economic and political factors to forecast currency prospects. The approach first analyses the past behaviour of the exchange rates for the purpose of identifying patterns and then projects them into the future to generate forecast. Clearly, the technical approach is based on the premise that history repeats itself, the technical approach differs from the fundamental approach in that it does not use the key economic variables such as money supply or trade balance for the purpose of forecasting. There are two primary methods of technical analyst: charting and trend analysis. Chartists examine bar charts or use more sophisticated computer-based extrapolation techniques to find recurring price patterns. Trend-following systems seek to identify price trends via various mathematical computations.

A large number of forecasting methods are now available ranging from the most naïve method, using the most recent observation as the forecast for the next period, to highly complex approaches, such as the use of structural econometric models and state-of the – art time series methods or combination of methods.

Discuss any four reasons as to why Multinational Corporation may need exchange rate forecasting.

4.4 Evaluate the implication of balance of payments on exchange rate determination [Learning outcome d]

The country's balance of payments is commonly defined as the record of transactions of its import and export over a specified period. It represents accounting records of all monetary transactions between a country and the rest of the world including payments for the country's exports and imports of goods, services, and financial capital, as well as financial transfers. If the level of imports exceeds the level of exports, there is said to be a deficit on the balance of payments which equates to a net payment in a foreign currency. For simplicity, assume that the UK has a balance of payments deficit which must be funded through US$; in such a case the demand for US$ would rise and the supply of sterling would increase as attempts are made to acquire US currency. Basic laws of supply and demand dictate that when the demand for a commodity increases, its price increases as well and when the supply goes up the price goes down. As a result, sterling would depreciate relative to the US$.

To be specific, on the question of the implications of balance of payment on domestic currency value, the discussion is interesting and very much linked with other macro-economic variables. It is clearly put that the

balance of payments comprises of payments for imported goods and services and receipts from the exportation of goods and services to the rest of the world. The more we import the more we as a country pay and the less we receive from the rest of the world. This amounts to deficit balance of payments. The need to import more creates demand for foreign currencies by an importing country and could as a result lead to fall in value of the domestic currency. Low productivity locally, makes the general price level (inflation) for local goods and services high relative to those of foreign countries. This encourages importation and discourages exportation. Consequent to that demand for foreign currencies to pay for imported goods and services increases, while that of domestic currency diminishes. As a result the amount of domestic currency required to acquire a unit of foreign currency in question increases. This implies a depreciation of domestic currency value. It follows that, an increased export, raises the demand for local currency by the rest of the world and boosts its value relative to other currencies, and vice-versa.

Example

Exchange rate at time 1: TSHS 2,000 = USD 1;

Exchange rate at time 2: TSHS 2,500 = USD 1.

The implication of the exchange rates above is that the TSHS has depreciated in relation to the USD. The USD has appreciated in relation to the TSHS. Under exchange rate 1, one USD would have cost TSHS 2,000. However, under exchange rate 2, USD 1 now costs TSHS 2,500. This may have been due to a deficit in the balance of payments for the country that uses TSHS. The demand for USD would have increased causing its price to inflate.

In the context of a country like Tanzania a fall in Tanzanian Shillings is continually experienced against major currencies. Specifically, the value of TSHS against US dollar, Sterling Pound and Euro is noted to be unstable year after year. This can indeed be associated with payment for massive importation to cater for deficit supply of various goods and services in the country. This creates a deficit in the balance of payment which is equal to the net payment in the stated foreign currencies, hence depreciation of TSHS against those currencies. The focus and move towards industrial economy could partly address this issue in future. As such deliberate efforts need to be exerted to promote local production. This could be possible for the Government creating enabling environment such as infrastructure, predictable power supply, and improved quality of locally made products, stable and predictable policies and a changed mindset of the population regarding international trade.

The following is an example show how depreciation of depreciation Tanzania shilling against the EUR (or appreciation of EUR against the TSHS) will occur due to changes in balance of payments:

If there is excess supply of goods and service in Europe, the prices for such products will tend to decrease. The decrease in the prices of European products will lead to an increased demand for goods, services and investment for let say in Tanzania. The increased demand for European products in Tanzania will increase demand for EUR (increase supply of TSHS), as a result the price of EUR rises (TSHS falls):

- The Tanzania begins to import more goods from the Europe (i.e. services, gifts, investments etc. Demand for EUR increases (supply of TSHS increases.).
- Effect – TSHS price of the Euro rises (Euro price of the TSHS falls.) and the TSHS depreciates.
  Alternatively, a surplus balance of payments would lead to an appreciation of a TSHS relative to EUR.

Answers to Test Yourself Questions

Answer to TY 1

(1a) Maintain the same Tanzanian shilling price:

The new exchange rate, post devaluation will be

TSHS 1,600 x 1.15 = TSHS 1,840
The current price in TSHS = $50 x TSHS 1,600
= TSHS 80,000.
Sales revenues at the post devaluation rate
(TSHS 80,000 x 200,000)/ (TSHS 1,840) = $8,695,652.
Direct cost = ($30 x 200,000) = $6,000,000.
Contribution margin = $8,695,652 - $6,000,000 = $2,695,652

(1b) Maintain the same dollar price:

The new sales volume will be 200,000 unitsx0.9	= 180,000 units.
The new price in TSHS =$50 x the real price = $200* R$4.00/$	= R$ 800
Sales revenues = 180,000 x $50	= $9,000,000
Direct cost = ($30 x 189,000)	= $5,400,000
Contribution margin = $9,000,000 - $5,400,000	= **$3,600,000.**

In the short run, choose alternative b, as the contribution by maintaining the USD price is higher by $904,348 than if the price were to be reduced.

Answer to TY 2

2(a): If you believe the spot exchange rate will be TSHS 186.58/ZAR in three months. The speculator should buy ZAR 1,000,000 three months forward for TSHS 175.50/ZAR, thus the speculator locks in the amount payable in three months of TSHS 175,500,000 (TSHS/ZAR 175.50* ZAR 1,000,000) in forward contract. At maturity, i.e. after three months the speculator will receive ZAR 1000,000 and sell those rands, i.e. ZAR 1,000,000 spot at TSHS 186.58. He/ obtains TSHS 186,580,000 (TSHS 186.58 *ZAR 1,000,000).

The expected speculative profit will be: TSHS 11,080,000 = ZAR 1,000,000 x (TSHS/ZAR 186.58 –175.50). This will only be materialized if the expert analysis on expected spot rate turns to be true after three months, and when the speculator locks the amount payable in Tanzanian Shillings (TSHS) for South African Rand (ZAR) 1,000,000 in forward contract.

2 (b): If the spot exchange rate actually turns out to be TSHS 167.46/ZAR in three months. The speculator will record a loss from the long position of **TSHS 8,040,000** = ZAR 1,000,000 x (TSHS/ZAR 167.46 -175.50). This is because the speculator will be required to paying the amount promised in the forward contract and otherwise compelled to sell the ZAR 1.000,000 at spot rate (TSHS 167.46/ZAR) which is unfavourable.

Answer to TY 3

(3a): The commodity arbitrage exists if the actual/provided exchange rate differs/is inconsistent with exchange rate implied by the law of one price of PPP. The Implied exchange rate between TSHS/KZS is given by a ratio between PmTZ (Price of a ton of magadi in Tanzania) and PmKE (Price of a ton of magadi in Kenya).

Therefore

$$s\left(\frac{TZS}{KES}\right) = \frac{PmTZ}{PmKE}$$

$$S\left(\frac{TZS}{KES}\right) = \frac{2{,}000{,}000TZS}{125{,}000KES}$$

$$S\left(\frac{TZS}{KES}\right) = 16$$

The exchange rate implied by law of price under PPP differs with Actual (market) rate of TSHS/KZS 17. Hence the commodity arbitrage exists.

(3b) Commodity arbitrage profit: From the above result it is observed that the Tanzanian shillings is undervalued by the market/ actual rate hence, the procedures/steps to realize the commodity arbitrage profit would be as follows:

(i) Purchase 100,000tons of salt from Tanzania; Total cost would be TSHS 200,000,000 [100,000tons * TSHS 2000.]
(ii) Ship/transport the 100,000kgs of salt to Kenya to be sold at KZS 125 each kilo. Total revenue amounts to KZS 12,500,000.
(iii) The KZS 12,500,000 Will then is converted into TSHS at the actual rate of TSHS/KZS 17.
You obtain TSHS 212,500,000 i.e. [TSHS 17/KZS *KZS 12,500,000]
The arbitrage profit is therefore =TSHS 12,000,000 [i.e. TSHS [212,500,000 - (200,000,000+500,000)]

The arbitrage profit per kilo would be TSHS 12,000,000/Tons 100,000. Profit per ton of Magadi shall be TSHS 120.

Answer TY 4

(4a) Demonstration of the validity of the interest rate parity condition

The validity of interest rate parity is observed when and if the interest rate differentials equals from forward premium or discount. In this case, we determine the validity of interest parity using the given information.

The 90-day forward discount is: (1.5288-1.5523)/1.5523=- 0.015
The effective 90-day interest rate differential is:

[(3.96% x (90/360) - 8% x (90/360)]/(1+8% x (90/360)) =-0.029

Interest Rate Parity does not hold, as the forward discount does not equal the interest rate differential. The results show the existence of the covered interest rate arbitrage opportunity.

(4b) The calculation covered interest arbitrage profit implied in (a) above will be as follows;

- Borrow £1,000,000
- Repayments will be £1,020,000.
- Buy the €1,552,350 spot using £1,000,000 and invest €1,552,350 at the euro interest rate of 0.92%.
- At maturity value will be €1,566,632. The €1,566,632 forward for £1,024,746.

Arbitrage profit per £1,000,000 will be £4,746.

(4c) Discussion of the implications of interest rate parity for the determination of exchange rates

Assuming that the forward exchange rate is an unbiased predictor of the future spot rate, IRP can be written as: St= [(1+i$)/ (1+i£)] E(St+1).

The exchange rate is thus determined by the relative interest rates and the expected future spot rate. Since expectations are continuously revised as news hit the market, the exchange rate will exhibit highly dynamic, random behaviour.

Answer to TY 5

Data and information given:

5 (i): Determining whether the interest rate parity holds:

Spot Rate = TSHS 1500/$; FR 3months = TSHS 152O/$;
3 months interest rate: rTSHS = 2.0%; $r_{\$}$ = 1.45%
Credit = TSHS 3,000,000 or $ 2,000
$(1+r_{TSHS})$ = 1.02

The forward rate implied by the interest parity theory is determined as $F = S_0 \left(\frac{1+r_h}{1+r_f}\right)t$

F = 1,500 (1.02/1.045)
F = TSHS/$ 1464.12.

The actual forward rate (TSHS 1500/$) differs with the forward rate implied by the Interest Rate Parity (TSHS 1464.12). Thus, IRP is not holding exactly and accordingly, covered interest arbitrage exists.

5 (ii): Arbitrage profit will be:

- Borrow TSHS 3,000,000; repayment will be TSHS 3,060,000.
- Convert the TSHS 3,000,000 at spot TSHS 1500/$ [Buy $ 2,000 spot using TSHS 3,000,000], you obtain $ 2,000.
- Invest $ 2,000 at the pound interest rate of 1.45%; Maturity value will be $ 2029
- Sell $ 2029 forward for TSHS 1520/$ = TSHS 3,084,080

Arbitrage profit will be TSHS 24,080 [i.e. TSHS 3,084,080-3,060,000].

5 (iii): Following the arbitrage transactions described above: The Tanzanian interest rate will rise; The US interest rate will fall; the spot exchange rate will rise; the forward exchange rate will fall. These adjustments will continue until IRP holds.

Answer to TY 6

The relevant information and data given for Kwelea-Kwelea Co Ltd

Two Months Expected Receipts $3,400,000
Two months Expected payment ($2,400,000)
Net Exposed Amount $1,000,000
Therefore, the exposed amount is receivable which is to be hedged against currency risk.

Expected Receipts in the 2 months: Net Amount Receipts US$ 1,000,000

2 months forward Rate: Bid (1629 – 30) = $TZS/\$1599$
Ask (1629 + 30) = $TZS/\$1659$
Two months forward Rate = $TZS/\$1659$

(6a): The forward market hedge on the net receipts of US$ 1,000,000 in TSHS shall be:

Sell the US$ 1,000,000 forward at = $TZS/\$1599$
Receipts in TSHS = US$ 1,000,000 x $TZS/\$1599$
= TSHS 1,599,000,000.

(6b): The money market hedge on US$ 1,000,000.

Net Receipts Exposed amount US$1,000,000. In order to hedge in the money market follows the Kwelea- kwelea shall follow the following steps;
Borrow the amount in dollars at the r$ borrowing rate for 2 months [5.5% x 2/12**] = 0.92%)**
Amount to be borrowed:

Borrow X (1 + 0.92%) = $1,000,000
X = $\$1,000,000/1.0092$
X = US$ 990,884.
Convert the US$ 990,884 at spot bid (1620 – 20)
= $TZS/\$1600$
You obtain: $ 990,884 x $\frac{TZS}{\$1600}$ **= TSHS 1,585,414,400**

Invest the TSHS 1,585,414,400 at Tanzania Lending rate for 2 months (10% x 2/12) = 1.67%,
Investment Proceeds: after 2 months:

= TSHS 1,585,414,400 (1 + 1.67%)
= TSHS 1,585,414,400 x 1.0167
= TSHS1,611,890,820.

Comparison and advice
Forward market Hedge (Receipts in TSHS) = TSHS 1,599,000,000
Money Market Hedge (Receipts in TSHS) = TSHS 1,611,890,820
The Company should use the money market hedge strategy as it maximizes receipt in TSHS as compared to Forward market hedge.

(6c): The money market hedge receipts in Tanzanian Shillings (TSHS) do not equal to the forward market hedge receipt in Tanzanian Shillings (TSHS). So therefore, the implication of the results is that the interest rate party does not hold. It should be recalled that the IRP holds if forward rate differentials [forward market] equals to interest rate differentials (money market).

Answer TY 7

A Multinational Corporation is a company engaged in producing and selling goods or services in more than one country. It ordinarily consists of a parent company located in the home country and at least five or six foreign subsidiaries, typically with a high degree of strategic interaction among the units.

Reasons for multinational corporations need for exchange rate forecasting- discussion on any four (4) of the of the following reasons.

- Hedging decision.
- Short-term financing decision.
- Short-term investment decision.
- Capital budgeting decision.
- Long-term financing decision.
- Earnings assessment.

Indicative Examination Questions (IEQs)

IEQ 1

One year ago, the exchange rate between the Bongoland's shilling (BS) and the Northland dollar (N$) was BS 1900/N$. Since then the shilling has fallen 8 percent against the dollar. Price levels in Northland have gone up

Required:

(a) Determine the current nominal exchange rate between the two currencies.
(b) Determine what should be the current nominal exchange rate based on the purchasing power parity and assuming last year was "normal".
(c) Compute and explain the percentage real term depreciation or appreciation of the Bongoland shilling relative to the Northland dollar and explain any two possible causes.

IEQ 2

Currently, the spot exchange rate is TSHS.1500/$ and the three-month forward exchange rate is TSHS.1520/$. The three-month interest rate is 8.0% per annum in Tanzania and 5.8% per annum in the USA. Assume that you can borrow as much as TSHS.3,000,000 or $ 2,000.

Required:

(i) Determine whether the Interest Rate Parity (IRP) is currently holding.
(ii) Show how would you carry out covered interest arbitrage if the IRP is not holding. (Show all the steps and determine the arbitrage profit).
(iii) Explain how the IRP will be restored as a result of covered arbitrage activities.

IEQ 3

(a) "Parity theories link exchange rate and other economic variables. Indeed, these variables influence the value of the currency in question".
Required:
Discuss four factors that cause nation's currency to appreciate or depreciate.
(b) Kasri Ltd, a Tanzanian import-export firm, learned that a particular type of rice grown in Tanzania, commonly known as "Super Rice" is also grown in Songaland. A ton of super rice is sold for Songaland Wan 50,000 while the same ton of rice is sold for TSHS 1,200,000 in Tanzania. Shipping costs (Dar es Salaam to Songaland and vice versa) amount to US$ 90 per ton. Current exchange rates (mid-rates) among the three currencies are as follows:

TSHS/US$	TSHS 1560/US$
TSHS/Wan	TSHS 52/Wan
Wan/US$	Wan 45/US$

The exchange rates are expected to be stable for the foreseeable future and the firm can import or export 100 tons of super rice at any given time.

Required:

(i) With supporting computations, show if the given information presents Kasri Ltd with arbitrage opportunity.
(ii) If there is a commodity arbitrage opportunity, show how Kasri Ltd can exploit it and the profit that it will make.

IEQ 4

(a) Latang'amwaki is a well-known and successful currency speculator who relies on forecasting exchange rates. Latang'amwaki has just seen the current spot exchange rate is TSHS.1550/$ and the six-month forward rate is TSHS.1500/$. Based on his analysis and forecast of the exchange rate, he is pretty confident that the spot exchange rate will be TSHS.1520/$ in six-months. Assume that he would like to buy or sell $10,000,000.
Required:

(i) What actions should Latang'amwaki take to speculate in the forward market?
(ii) What is the expected TSHS profit from speculation if his forecast turns out to be accurate?
(iii) What would be his speculative profit in dollar terms if the spot exchange rate actually turns out to be TSHS.1460/$.

(b) Briefly explain the main activities involved in fundamental forecasting of exchange rates.
(c) What are the major limitations of fundamental forecasting?

Answers to IEQs

Answer to IEQ 1

(a) If the BS has fallen by 8% then its value is now 92% of its value one year ago. This gives nominal exchange rate of BS2065.22/N$ (i.e. 1900/0.92).

(b) The purchasing power parity effect posits that exchange rate move to equalize prices when there is inflation in the respective economies. Thus $\frac{1+\pi_d}{1+\pi_f} = 1+e$ where π_d and π_f are domestic and foreign inflation rates respectively. Substituting the above information into the expression we get the expected depreciation to be 6.93 percent and nominal rate as BS 2041.47/$.

(c) If the nominal rate had changed from 1900 to 2031.68 there would not have been any real depreciation as the purchasing power of the BS would have been maintained. However, since the nominal rate is BS 2065, 22/N$ then there is a real depreciation of about 1.62% (i.e. [2031.68/2065.22]-1).

In general, the main reason for this depreciation is that exchange rate is determined by other factors than relative inflation rate. The other factors include:

- Decrease in the supply of the foreign currency (including due to low exports, etc).
- Increase in demand for the foreign currency.

Answer to IEQ 2

Data given:
Spot Rate = TSHS 1500/$; FR 3months = TSHS 1520/$; 3 months interest rate;
rTSHS = 2.0%; r$ = 1.45%
Credit = TSHS3,000,000 or $2,000

(i) (1 + rTSHS) = 1.02
(1 + r$)(F/S) = (1.0145) (1520/1500)
= 1.0280;
Thus, IRP is not holding exactly. Hence covered interest arbitrage exists.

(ii) Arbitrage profit will be:

(1) Borrow TSHS3,000,000at 8% for 3 months repayment will be TSHS3,060,000.
(2) Convert the TSHS3,000,000 at spot TSHS1500/$ [Buy $2,000 spot using TSHS3,000,000], you obtain $2,000.
(3) Invest $2,000 at the pound interest rate of 5.8% p.a. for 3 months maturity value will be $2029.
(4) Sell $2029 forward for TSHS1520/$ = TSHS3,084,080.
Arbitrage profit will be TSHS24,080 [TSHS3,084,080 – 3,060,000]

Following the arbitrage transactions described above: The Tanzanian interest rate will rise; The US interest rate will fall; the spot exchange rate will rise; the forward exchange rate will fall. These adjustments will continue until IRP holds.

Answer to IEQ 3

(a) Any Four factors cause nation's currency to appreciate or depreciate

- Difference in national inflation rates – A Country's import and export depend on the relative prices of foreign produced and domestically produced goods. A rise in prices of domestically produced goods (goods inflation) that is not matched abroad leads to depreciation of domestic currency.
- Changes in real interest rates – the real interest rate is the difference between the interest rate and expected inflation. If a country's real interest increases, it will lead to appreciation of its currency. If it decreases, it will lead to a depreciation of its currency.
- Difference in economic performance – Financial flows are attracted by higher expected return. For equity, investors search for high performance of individual firms and of the economy as a whole. So good news on the prospect for growth of a nation should attract more international equity capital, the nation's currency should appreciate.
- Change in investments climate – such as a political system, a rigorous but fair legal system, protecting the rights of all investors, A tax system that is fair to foreign investors, free movements of capital and monetary authorities that favour price stability.
- Government policies, that is monetary and fiscal policy will also cause depreciation or appreciation of the nation's currency.

(b) Kasri Ltd

(i) Exchange rate implied by the LOP can be used to check on opportunities for commodity arbitrage. The exchange rate implied by the LOP is: TSHS 1,200,000/Yuan50,000 = TSHS24/Yuan. This rate differs from the actual rate of TSHS52/Yuan. Thus, opportunities for commodity arbitrage exist.

(ii) The Yuan is overvalued. The product is therefore expensive in China and cheaper in Tanzania. To benefit from the possible commodity arbitrage Kasri Ltd. Should take the following steps:
Purchase 100 tons of super rice in Tanzania at TSHS1,200,000 per ton. Total purchase cost will be TSHS1,200,000 x 100 = TSHS120M. Ship the 100 tons to Beijing at US$90 per ton costing in total US$9,000. At TSHS1,560/US$ the shipping costs will amount to TSHS14,040,000. The 100 tons can be sold for Yuan50,000 per ton realizing Yuan5,000,000. The Yuan5,000,000 will then be converted into TSHS at TSHS52/Yuan to give TSHS260M. Thus, we have:

Sales Revenue……. TSHS 260,000,000
Less: Purchase Cost……(TSHS120,000,000)
Shipping Costs……(TSHS 14, 040,000)
Net Profit…….....……TSHS 125,960,000

Answer to IEQ 4

(a) Actions expected profit by the speculator

(i) Action: If Latang'amaki believe the sport exchange rate will be TSHS 1520$ in six months, he should buy $ 10, 000,000 forward for ZS 1500$.
(ii) The expected profit will be TSHS 200,000,000/=. That is $ 10,000,000 x (TSHS1520– TSHS 1500).
(iii) If the spot exchange rate turns out to be TSHS 1460/$ in three months, Latang'amwaki will get a loss amounting to TSHS 400,000,000/= that is $ 10,000,000 x (TSHS 1460 – TSHS 1500).

(b) Activities involved in Fundamental forecasting of exchange rates

Fundamental forecasting is based on fundamental relationship between economic variables and exchange rates. Given current values of these variables along with their historical impact on a currency's value, dealers or other participants in FOREX markets can develop exchange rate projections using some models. The main activities are:

- To select Exchange Rate Forecasting Model
- To identify the fundamental factors that determine exchange rates;
- To predict the future values of these factors to be used in forecasting the exchanges rates.
- To forecast exchange rate using the selected model.

(c) Limitations of fundamental forecasting are as follows:

- Forecasts needed for factors with instantaneous impact might be difficult to obtain;
- Uncertain timing of impact of these factors on future exchange rates;
- Omission of other relevant factors from model used in forecasting.
- Change in sensitivity of currency movements to each factor overtime.

SECTION B

INTERNATIONAL INVESTMENT ANALYSIS ASSIGNMENTS

B1

STUDY GUIDE B1: INTERNATIONAL INVESTMENT APPRAISAL

Get Through Intro

Investment decision is one of the key decisions in financial management. Funds acquired from financing decisions should be allocated in assets which generate returns greater than the cost of acquired funds. As introduced in the earlier course, Investment appraisal entails techniques used to select investment projects which attain the central objective of the firm in finance i.e. maximization of long-term shareholders wealth. The earlier discussion was however focused on domestic perspective.

With the growing rate of globalization and internationalization of markets, both investors and financial advisors need to be in a position of evaluating projects located in different countries. On the other hand, foreign investment appraisal involves complexities such as forecasting future exchange rates, double taxation, intercompany flows as well as remittance restrictions. The understanding of international investment appraisal at this end is of great importance as it will enable professionals to be in the position of making informed foreign investment decisions. This guide aims at exposing a student on evaluating potential international investment decisions and assessing their financial and strategic consequences as well as adjusting present values.

Learning Outcomes

a) Evaluate potential international investment decisions and assessing their financial and strategic consequences internationally by analysing alternative international investment appraisal techniques.
b) Evaluate impact of financing on international investment decisions and adjusted present values by analysing:
   i. The impact of alternative project financing sources on international project economic viability.
   ii. The impact of political and foreign exchange risk on international investment decisions

1. Evaluate potential international investment decisions and assessing their financial and strategic consequences internationally by analysing alternative international investment appraisal techniques. [Learning outcome 1]

Investment appraisal is a process of identifying, analysing and selecting investment projects whose returns (cash flow) are expected to lengthen further than one year. Foreign investment appraisal is also called capital budgeting. Objectives of capital budgeting are to determine whether a proposed capital investment will be a profitable one over the specified time period and to select between investment alternatives.

Investment appraisal for international firm's uses the same framework as the domestic capital budgeting. Examples of a foreign investment decision range from purchase of new equipment to replace existing equipment, to an investment in an entirely new business venture in a country where, typically, manufacturing or assembly has not previously been done. The activities involved in international capital budgeting is similar to those in domestic capital budgeting except the fact that foreign investment appraisal involves the following complexities.

- **Foreign Exchange Risks -** cash flow from a foreign project are in foreign currency and therefore subject to exchange risk from the parent's point of view.
- Foreign exchange risk is that the currency will depreciate or appreciate over the period of time
- International financing arrangement of capital and related to cost of capital,
- **Remittance restrictions-** where there are restrictions on the repatriation of income, substantial differences exist between projects cash flow and cash flows received by the parent firm. Only cash flows that are remittable to the parent company are relevant from the firm's perspective
- **International Taxation -**both in domestic and international capital budgeting, only after-tax cash flows are relevant for project evaluation. However, in international capital budgeting tax issue is complicated by existence of two taxing jurisdictions plus a number of other factors including form of remittance to the parent firm, tax withholding provision in the host country
- **Political or Country Risk -** assets located abroad are subject to the risk of appropriation or nationalization by the host government, also there are may be changes in applicable withholding taxes, restrictions on remittances by the subsidiary to the parent

Due to these complexities, some difficulties in international capital budgeting arises. These difficulties include:

i. Parent cash flows are different form project cash flows.
ii. All cash flows from the foreign projects must be converted into the currency of the parent firm.
iii. Profits remitted to the parent are subject to two taxing jurisdictions i.e. the parent country and the host country.
iv. Anticipate the differences in the rate of national inflation as they can result in changes in competitive position and thus in cash flows over a period of time
v. The possibility of foreign exchange risk and its effect on the parent's cash flow.
vi. If the host country provides some concessionary financing arrangements and/or other benefits, the profitability of the foreign project may go up.
vii. Initial investment in the host country may benefit from a partial or total release of blocked funds.
viii. The host country may impose restrictions on the distribution of cash flows generated form the foreign projects.
ix. Political risk must be evaluated thoroughly as changes in political events can drastically reduce the availability of cash flows.
x. It is more difficult to estimate the terminal value in the multinational capital budgeting because potential buyers in the host or parent company may have widely different views on the value to them of acquiring the project.

Test Yourself 1

Lake Manyara Ltd is a Company based in Tanzania and having its offices in Arusha. The firm is thinking of establishing a branch in South Africa or Mbeya. The CEO of Lake Manyara company is well informed about difficulties when appraising domestic projects but he is unsure of difficulties involved in international capital budgeting. In this light, you are **required** to explain the complexities to the CEO.

Alternative international investment appraisal techniques

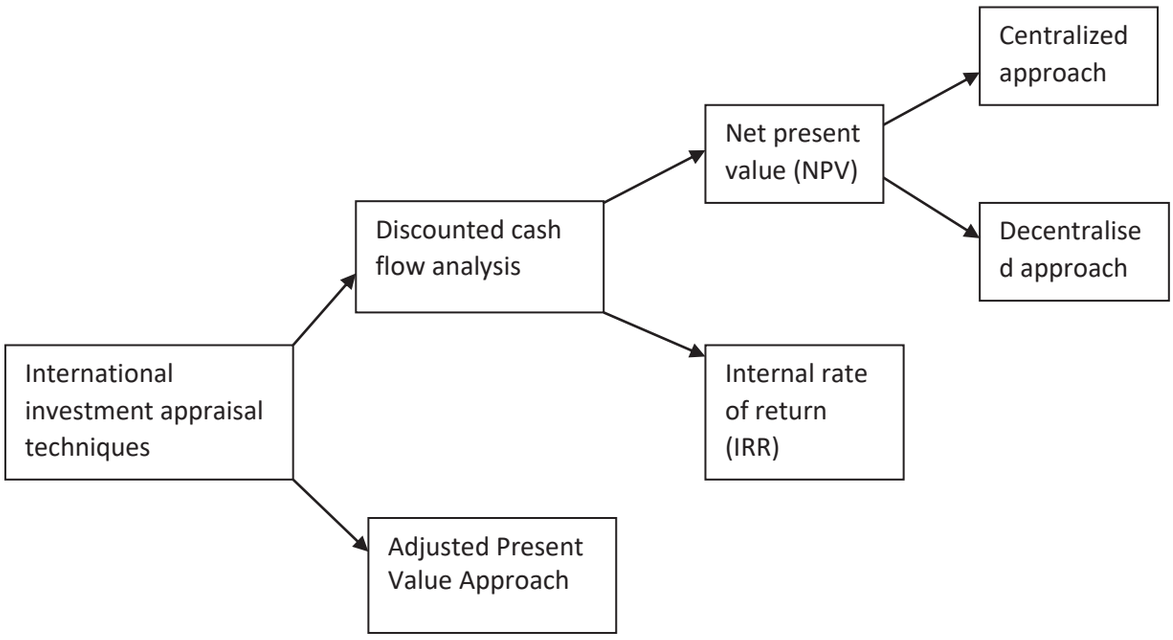
In international capital budgeting two approaches are commonly applied:

1. Discounted cash flow analysis (DCF)
2. The adjusted present value approach

Approach 1: The Discounted Cash Flow Analysis

DCF technique involves the use of the time value of money principle to project evaluation. The two most widely used criteria of the DCF technique are the

- The net present value (NPV)
- The internal rate of return (IRR)



The net present value (NPV)

In domestic capital budgeting there is no need of converting currencies since the project is within the home country, but for international capital budgeting there is need of converting currencies from foreign to home currency especially during repatriation of the profits at the end of the project.

The evaluation of the international capital budgeting projects should take this issue into consideration; two techniques have been designed on how and when the currency should be converted. These techniques are:

- Centralized capital budgeting technique
- Decentralized capital budgeting technique

A. Centralized international capital budgeting technique

Under a centralized international capital budgeting, a project is evaluated from the domestic country point of view. Domestic country in this context means the home country in which head office operates and centralization takes place in that office. With a centralized approach, cash flows to be discounted should be denominated in domestic currency i.e. there is a need to convert the currency prior discounting them. A simple way is that the cash flow should follow the currency of the cost of capital. With centralized capital budgeting technique, forecast the cash flows in foreign currency first, then convert these cash flows into domestic currency using the relevant forward exchange rates and finally discount the cash flows in domestic currency and the discount rate appropriate for domestic projects.

A strong theoretical argument exists in favour of analysing any foreign project from the view point of the parent. Cash flows to the parent are ultimately the basis for dividends to stakeholders, reinvestment elsewhere in the world, repayment of corporate-wide debt, and other purposes that affect the firm's many interest groups.

Example

If Exim bank has its head office in South Africa and all operations takes place in South Africa, South Africa will then be a domestic country for capital budgeting purposes.

The technique involves the following steps

1. Estimate the relevant cash flow of the project in local currency(foreign currency) terms
2. Forecast the exchange rate over the project life, parity relationship are used, specifically International Fisher Effect.

In this case home and foreign country will be determined by forecaster's point of view, or in other words use exchange rate quotation.

3. Convert the local currency denominated cash flow into domestic currency values using the forecast exchange rate (relevant forward rates)
4. Decide on appropriate discount rate or required rate of return between domestic cost of capital and domestic cost of the project, both calculated from the domestic country point of view.

   The domestic cost of project can be calculated by using CAPM or any other relevant technique covered under cost of capital especially when the project is perpetual.

5. Discount the cash flows to the present values using the selected discount rate
6. Calculate the NPV in domestic currency terms , then make decision if NPV is greater or equal to zero accept the project otherwise reject

Note: Centralized means **domestic** appraisal so in discounting cash flows the **domestic** cost of capital or **domestic** cost of project should be used. When both are given in the question the domestic cost of project should be preferred

Example

The Management of I Kid`s International Co., Tanzania based firm is reviewing the Company's capital investment options for the coming year and is considering investing in Malawi. The investment would involve a current outlay of MKW 8,800,000,000 on capital equipment and MKW 2,000,000,000 on working capital. The corporate tax rate in Tanzania is 30% and that of Malawi is 40%, no withholding tax for amount repatriated from Malawi to Tanzania.

The project is expected to last for three years 20X6- 20X8; and all in investments including the working capital requirements will be incurred and paid for in December, 20X5. The revenues and cost for the projects are as provided in the table below [Figures in "000" Malawi kwacha].

Year	Revenue	Variable Costs	Fixed Costs
2013	47,500,000	15,000,000	11,000,000
2014	49,000,000	16,000,000	11,000,000
2015	34,200,000	12,800,000	11,000,000

Fixed costs include an annual charge of MKW 6,000,000,000 for depreciation. At the end of the year 3 the working capital investment would be recovered and the net realizable value of the equipment MKW 9,000,000,000. Annual inflation rate in Tanzania is 6% while in the Malawi inflation is running at 7%. The current spot rate is MKW20/TSHS. The company requires a 10% return on any foreign investment. **Required:** Appraise and comment on the viability of the project using the NPV method.

Suggested Solution:

Given:

Initial costs: Capital equipment MKW 8,800,000,000
Working capital requirement MKW 2,000,000,000

Spot rate: MKW 20/TSHS
TSHS Inflation rate = 6% = 0.06; MKW inflation rate= 7% = 0.07
Recall: The Purchasing Power Party (PPP)

$$\ell t = \ell o \left(\frac{1+ih}{1+i^{f}} \right)_{t}$$

$$\ell 20X6 = 20 \left(\frac{1.07}{1.06} \right)^{1}$$

= MKW/TSHS 20.20

ℓ20X7 $= 20.20 \left(\frac{1.07}{1.06}\right)^1$
= MKW/TSHS 20.40

ℓ20X8 $= 20.40 \left(\frac{1.07}{1.06}\right)^1$
= MKW/TSHS 20.40

IKid`s international Company
Malawi Project Appraisal
Net Present Value methods (MKW 000,000)

Initial Costs	**20X5**	**20X6**	**20X7**	**20X8**
Capital equipment	(8,800)	-	-	-
Working capital	(2,000)	-	-	-
Revenue	-	47,500	49,000	34,200
Variable costs	-	(15,000)	(16,000)	(12,800)
Contribution margin	-	32,500	33,000	21,400
Fixed costs	-	(11,000)	(11,000)	(11,000)
Profit before tax	-	21,500	22,000	10,400
Tax (40%)	-	(8,600)	(8,800)	(4,160)
Profit after tax	(10,800)	12,900	13,200	6,240
Add back: Dep.	-	6,000	6,000	6,000
Net cash flows in WKW	(10,800)	18,900	19,200	12,240
Salvage value	-	-	-	9000
Recovery of Working capital	-	-	-	2000
Cash for remittance	(10,800)	18,900	19,200	23,240
Exchange rate	20	20	20	20.6
Remittance in TSHS	(540)	936	941	1,128
Tax (30%)	-	(281)	(282)	(338)
Net remittance in TSHS	(540)	655	659	790
Discount rate (10%) DF	1	1	1	0.7513
PV	**(540)**	**595**	**544**	**593**

NPV $= \sum PVs$ of EFCs $- Io.$

= TSHS (595 + 544 + 593.) - 540
= TSHS 1733 – 540
= TSHS 1,193 x 1,000,000
NPV = TSHS. 1,193,000,000

Comment: Since the project has positive NPV the project is financially valuable and should be established.

B. Decentralized international capital budgeting technique

Project is evaluated from the host country's point of view and NPV initially is calculated in the currency of the host country. Evaluation of a project from the local viewpoint serves some useful purposes, but it should be subordinated to evaluation from parent's viewpoint. Almost any project should at least be able to earn a cash return equal to the yield available on the host government bond with similar maturity to the project, if a free market exists for that bond. With decentralized capital budgeting technique, a project analyst should forecast the cash flows in foreign (local) currency, discount these cash flows at the discount rate appropriate for the foreign market to get an NPV in terms of foreign currency and convert the NPV in foreign currency into domestic values at the spot exchange rate.

Decentralized international capital budgeting technique involves the following steps:

1. Estimate the relevant cash flows in local currency (foreign currency) terms

2. Decide on appropriate discount rate or required rate of return between foreign cost of capital and foreign cost of projects both calculated from the foreign point of view

   The foreign cost of capital can be deduced from the domestic cost of capital as follows:

$$\text{Foreign cost of capital} = [(1 + \text{rf})(1 + \text{Risk premium on foreign investment})] - 1$$

$$\text{Premium on foreign investment} = \frac{1 + \text{Domestic cost of capital}}{1 + \text{rh}} - 1$$

   Where: r_f is the nominal interest rate (risk free rate) of the foreign country
   r_h is the nominal interest rate (risk free rate) of the domestic country

   In this case home and foreign country/currency will be determined by the investors point of view, this means that the investor's home will be home currency and the where he/she invest will be foreign country

3. Discount the cash flow using the selected discount rate
4. Calculate NPV in local currency terms
5. Convert the NPV to domestic currency value using the current spot exchange rate
6. Make decision if NPV is greater than zero or zero accept the project otherwise reject

   Note:

- Decentralized means **foreign** appraisal so in discounting cash flows the **foreign** cost of capital or **foreign** cost of project should be used
- When both are given in the question the foreign cost of project should be preferred
- Decentralized means, before discounting cash flow they should be in foreign currency, simple way is that the cash flow should follow the currency of the cost of capital, since the cash flows are already in foreign currency thus there is no need to convert cash flow

Recall: Nominal cash flows should be discounted by using nominal discount rate and real cash flows should be discounted by real discount rate most MNCs tend to evaluate projects from both the parent and project view point. The parent's viewpoint gives results closer to the traditional meaning of net present value in capital budgeting. Project valuation provides a closer approximation of the effect on consolidated earnings per share, which is a major concern to practicing managers. However, the truth is the CFS from the two perspectives may differ because the \net after tax cash flows to the subsidiary may differ substantially with that to the parent.

Example

A US firm is considering an investment in Tanzania, which will cost Tshs 200million and is expected to produce an income of Tshs 30million in real terms in each of the next seven year. The firm estimate that the appropriate cost of capital or the project in the US is 8%. Nominal interest rates are 9% in Tanzania and 7% in the US, the spot exchange rate is Tshs 1354.50 per USD. At the end of the seventh year the US Firm expects to sell the Tanzanian investment to a local firm for Tshs 50million.

Required

Evaluate and comment on the economic viability of the proposed project. Use Decentralized capital budgeting.

Solution

Computation of foreign (TZ) CoC:

The foreign cost of capital can be deduced from the domestic cost of capital as follows:

$$\text{Foreign cost of capital} = [(1 + \text{rf})(1 + \text{Risk premium on foreign investment})]$$

$$\text{Premium on foreign investment} = \frac{1 + \text{Domestic cost of capital}}{1 + \text{rh}} - 1$$

$$\text{Premium on foreign investment} = \frac{1 + 8\%}{1 + 7\%} - 1 \Rightarrow 0.0093$$

$$\text{Foreign cost of capital} = [(1 + 9\%)(1 + 0.0093)]$$

$$= 10.01\%$$

All figures in TSHS "000,000"

Details	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Initial cost	-200							
Intermediate CFs		30	30	30	30	30	30	30
Disposal of investment/ Terminal CFs								50
Cashflows	-200	30	30	30	30	30	30	80
Discount factors at 10.01%	1	0.9090	0.8263	0.7511	0.6828	0.6206	0.5642	0.5128
Present value	-200	27.270	24.789	22.533	20.483	18.619	16.925	41.026
NPV	**-28.35**							

Basing on monetary grounds alone, the project is not feasible because NPV is negative.

Test Yourself 2

Multidrop Inc. is a Kenyan based company. The company is contemplating a foreign direct investment in Arusha, Tanzania. The investment is estimated to cost a total of KES 400,000,000; Divided as for non-current assets KES 350,000,000 and working capital requirements of KES 50,000,000.

The project is expected to last for four years, and all initial investment costs will be incurred and paid for, in the year 2013. The investment is expected to produce the following after tax cash flows in real terms:

YEAR	Net Cash inflows in Real terms TSHS
2014	6,000,000,000
2015	8,000,000,000
2016	11,000,000,000
2017	10,000,000,000

The firm estimates that the appropriate (nominal) cost of capital for the project is 8%. Annual interest rates are 9% in Tanzania, 7% in Kenya. The spot exchange rate is TSHS.18.50/KES. And inflation in Tanzania is expected to average 10% per year for the next four years.

At the end of the fourth year, the Multidrop Inc. expects to sell the Tanzanian investments to local firm for TSHS.10,000,000,000. The corporate tax rate in Tanzania is 30% and 35% in Kenya. However, the Kenyan government does not charge tax on the remittance from Tanzania, nor does Tanzania charge repatriation tax for transfers to Kenya.

Required:

Evaluate and comment on the economic viability of the proposed project.

The internal rate of return (IRR)
Principle of IRR remains the same in international capital budgeting only that care should be taken in computing NPV as explained in the preceding section. Recall that IRR is the rate that equates NPV to zero. This study guide has therefore focused more on NPV.

Approach two: adjusted present value method (APV)
The APV format allows different components of the project's cash flow to be discounted separately. This allows the required flexibility, to be accommodated in the analysis of the foreign project. The method uses different discount rates for different segments of the total cash flow depending upon the degree of certainty attached with each cash flow. In addition, the APV format helps the analyst to test the basic viability of the foreign project before accounting for all the complexities. The APV framework is a useful technique because international projects frequently have cash flows not encountered in domestic projects, the APV technique easily allows the analyst to add terms to the model that represent the special cash flows.

The APV model is a value additive approach to capital budgeting. The cash flows are logically discounted at different rates, a function of their different risk. Operating cash flows are viewed as being more risky. They are therefore discounted at the cost of equity. The adjusted present value of a project is given by:

$APV = \sum OCF_t/(1+k^*)^t + \sum k_d DT_c/(1+k_d)^t$ - Initial Cash Investment

Where:
OCF_t = The after-tax operating cash flows in period t
k*= The required rate of return in the absence of leverage (all equity financing)
D = Value of debt financing sustainable by the project
k_d = Cost of Debt Financing

2. Evaluate impact of financing on international investment decisions and adjusted present values by analysing:

i. The impact of alternative project financing sources on international project economic viability.

[Learning outcome b.i]

In multinational investment projects, the type of financing package is often critical in making otherwise unattractive projects attractive to the parent company. Thus, cash may flow back to the parent because the project is structured to generate such flows via royalties, licensing fees, dividends, and so on. Unlike in domestic capital budgeting, operating cash flows cannot be kept separate from financing decisions.

Implications of source of financing on foreign investment appraisal

- If an MNC is financed from expensive sources, then a number of attractive investment decreases as it becomes difficult to find an investment that brings returns greater than the cost of acquired funds.
- If a project has been financed through loan from domestic country, a lender (foreign country or country of investment) should ideally be paid solely or almost exclusively out of the money generated from foreign project. This brings about the issues of transfer price, income repatriation
- On the other hand, financing a foreign project though a foreign loan may bring about simplicity in repayment of interests and administering the loan
- An MNC has an advantage of raising funds from both domestic and foreign capital markets.

Be it that funds are sourced domestically of from foreign sources, shareholders wealth has to be maximised. Managers should therefore adopt the most convenient and cheaper option of raising funds. Raising funds from expensive sources will cause WACC to increase and hence a decrease in the value of the firm.

3. Evaluate impact of financing on international investment decisions and adjusted present values by analysing:

ii. The impact of political and foreign exchange risk on international investment decisions

[Learning outcome b.i]

Political Risk Must Be Considered. The host government may change its attitude towards foreign influence or control over some segments of the local economy. This may be through sudden revolution, or it may result from a gradual evolution in the political objectives of the host government. Political risk is also important in determining the terminal value, because politics may impose a specific ending date which negates use of an infinite horizon for valuation purposes. If a specific ending date is mandated, the value received on that date may be extremely difficult to anticipate. In the context of premiums for political risk, diversification among countries may create a portfolio effect such that no single country need bear the higher return that would otherwise be imposed if that country were the only location of a foreign investment.

Political risk: This is another factor that can significantly impact the viability and profitability of foreign projects. Whether it be through democratic elections or as a result of sudden developments such as revolutions or military coups, changes in a country's government can affect the attitude in that country towards foreign investors and investments. This can affect the future cash flows of a project in that country in a variety of ways. Political developments may also affect the life and the terminal value of foreign investments.

Political risks should be incorporated into foreign investment analysis by adjusting the expected cash flows of a project, rather than its required rate of return. Establishing certainty equivalents of the expected cash flows of that particular project can do this.

An important thing to notice is that there is an important source of risk (exchange rate risk) that isn't incorporated firm's local cost of capital.

Answers to test yourself

Answer to TY 1

- Parent cash flows are different form project cash flows.
- All cash flows from the foreign projects must be converted into the currency of the parent firm.
- Profits remitted to the parent are subject to two taxing jurisdictions i.e. the parent country and the host country.
- Anticipate the differences in the rate of national inflation as they can result in changes in competitive position and thus in cash flows over a period of time.
- The possibility of foreign exchange risk and its effect on the parent's cash flow.
- If the host country provides some concessionary financing arrangements and/or other benefits, the profitability of the foreign project may go up.
- Initial investment in the host country may benefit from a partial or total release of blocked funds.
- The host country may impose restrictions on the distribution of cash flows generated form the foreign projects.
- Political risk must be evaluated thoroughly as changes in political events can drastically reduce the availability of cash flows.
- It is more difficult to estimate the terminal value in the multinational capital budgeting because potential buyers in the host or parent company may have widely different views on the value to them of acquiring the project.

Answer to TY 2

Given data:

- Discount rate = 8% = 0.08
- Annual inflation rate 10% per annum
- Interest rate in Tanzania (Rtz) = 9% = 0.09
- Interest rate in Kenya (Rke) = 7% = 0.07

Working 1: Nominal cash flows in TSHS:

- Normal cash flows = Real cash flows * (1+ inflation)^t

Year	Real cash flows	Inflation factors [10%]	Nominal cash flows
2014	6,000,000,000.00	1.1	6,600,000,000.00
2015	8,000,000,000.00	1.21	9,080,000,000.00
2016	11,000,000,000.00	1.331	14,641,000,000.00
2017	10,000,000,000.00	1.4641	14,641,000,000.00

Working 2: Exchange rate forecasting:

- Spot rate TSHS/KES 18.5
- Recall the International Fisher Effect
- Et=E0(1+Rtz/1+rKE)^t
- E. rate year 2014 = TSHS 18.5(1.09/07)
  = TSHS/KES 18.85
- E. rate year 2015 = TSHS 18.85(1.09/1.07)
  = TSHS/KES 19.20
- E. rate year 2016 = TSHS 19.20(1.09/1.07)
  = TSHS/KES 19.56
- E rate year 2017 = TSHS 19.56(1.09/1.07)
  = TSHS/KES 19.92

Multidrop Inc. company

Tanzania project appraisal, NPV method

YEAR	**2,013**	**2,014**	**2,015**	**2,016**	**2,017**
Initial costs:					
Non- current assets	(6,475,000,000)				
Working capital	(925,000,000)				
Net cash flows in TSHS		6,600,000,000	9,680,000,000	14,641,000,000	14,641,000,000
Liquidation value					10,000,000,000

Networking capital					925,000,000
NET CASH FLOW in TSHS	(7,400,000,000)	6,600,000,000	9,680,000,000	14,641,000,000	25,566,000,000
Exchange rate	19	19	19	20	20
Net cash flows remittance in KES	(400,000,000)	350,132,626	504,166,667	748,517,382	1,283,433,735
Discount Factors (8%)	1.000	0.926	0.857	0.794	0.735
PRESENT VALUES IN KES	**(400,000,000)**	**324,222,812**	**432,070,833**	**594,322,802**	**943,523,795**

NPV (KES) = ∑ Present values – Initial Costs

NPV(KES) = [2,293,940,242.00 +432,070,833+594,322,802+942,850,477]-KES400,000,000

NPV= KES [1,893,940,842.00-400,000,000]

NPV=KES 1,893,466,923.31

Comment: Since the NPV is positive, then Tanzania project is economically viable, Multidrop should establish the project.

Indicative Examination Questions (IEQs)

IEQ 1

Excurb Co. is a Japanese based manufacturer of TV sets. The firm is reviewing the Company's capital investment options for the coming year and is considering investing in Tanzania. The company wishes to set up a manufacturing subsidiary in Tanzania. The Tanzanian subsidiary would undertake the construction of a new factory in Arusha. The initial project cash investment is estimated at Japanese Yen 100,000,000. Of the total amount, Yen 50,000,000 will be used to finance the acquisition of fixed assets and the remaining amount will be used to meet working capital needs.

The project duration is four years. The expected net operating income and depreciation expense over the four-year period is as given below:

End of Year	**1**	**2**	**3**	**4**
Net operating income (TSHS million)	300	500	200	300
Depreciation expense	50	50	50	50

Depreciation is a tax allowable expense. The sport exchange rate is TSHS10/¥ and an annual appreciation of 5% of the Japanese Yen against the TSHS is predicted over the next four years. Corporate tax rates are 40% and 50% in Tanzania and Japan respectively. Tanzania imposes a withholding tax of 10% on earnings remitted by subsidiaries of foreign companies. The after-tax realizable value of the investment in four years' time is expected to be approximately TSHS 200 million.

Required:

Evaluate whether Excurb Co. should establish the Tanzanian Subsidiary if the company requires a 14% return on any foreign investment.

Answer to IEQ 1

Excurb Co. Tanzania Investment Appraisal

Details	**0**	**1**	**2**	**3**	**4**
Initial cash investment (TSHS m)					
Fixed assets	(500)	-	-	-	-
Working capital requirement	(500)	-	-	-	-
Net operating Income	-	300	500	200	300
Taxes (at 40%)	-	200	(120)	(80)	(120)
Net Income	-	180	300	120	180
Add back: depreciation	-	50	50	50	50
After tax net operating cash flows	-	230	350	170	230

Withholding Tax (10%)	-	(23)	(35)	(17)	(23)
Remittances	-	207	315	153	207
Recovery of NWC	-	-	-	-	500
After tax realizable value	-	-	-	-	200
After tax net cash flows	(1000)	207	315	153	907
Expected future spot rate [TSHS/¥]	10	10.50	11.02	11.60	12.15
After tax net cash flows (¥m)	(100)	19.7	28.6	13.2	74.65
Discounting factor (at 14%)	1	0.88	0.77	0.67	0.59
Present value (¥m)	(100)	17.3	22.0	8.8	44.0

NPV = ¥m [17.3 + 22.0 +8.8 + 44.0] - ¥ 100m = ¥ - 7.9m

Comment: the project has a negative NPV. It is therefore not economically viable. It should be rejected. Excurb Co. should not establish the Tanzania subsidiary.

Workings: **Forecasting exchange rates**

Exchange Rate Year t = current Sport Rate $(1.05)^t$

Year 1: TSHS 10 (1.05) = TSHS 10.50
Year 2: TSHS 10 $(1.05)^2$ = TSHS 11.02
Year 3: TSHS 10 $(1.05)^3$ = TSHS 11.60
Year 4: TSHS 10 $(1.05)^4$ = TSHS 12.15

SECTION B

INTERNATIONAL INVESTMENT ANALYSIS ASSIGNMENTS

B2

STUDY GUIDE B2: THE INTERNATIONAL PORTFOLIO THEORY AND THE CAPITAL ASSET PRICING MODEL

Get Through Intro

It is understood from an old adage that it is not sensible to put all eggs in the same basket. Similarly, the multinational firms should advisedly allocate and invest the financial resources at their disposal in different countries to minimise not only country specific risk but also particular country's market risk, which remains un-diversifiable with domestic diversification. This is viably possible because the macro- economic factors do not generally move in the same direction at the same time in all countries. Holding investments in various countries would then be beneficial such that bad news from one country could be compensated with good news from the other. Additionally, the international investment offers a much broader range of opportunities than domestic investment alone. It is worth noting; however, that the international diversification of projects and investments is being made possible by globalisation, shrinkage of economic space and sophistication of capital markets. The international stock and bond diversification can therefore provide substantially higher returns with less risk than investment in a global market.

International diversification is not cost or risk free. As such the investments of assets in different countries and holding of such investments in different foreign currencies render the Multinational Corporations (MNCs) and other firms operating internationally with peculiar risks such as different levels of inflation (arising from different price levels across countries), currency risks (due to changes in exchange rates) and political risks (changes in legal, institutional and political conditions) which can to a great extent affect the prices and returns of international diversified assets. It follows that, in order for these companies to benefit from such global investment they should continually monitor them and apply appropriate techniques to minimize the effects of exchange rate volatility, political risks and increased agency costs. It is through robust risk management systems that the multinational corporations can maximize returns from internationally diversified investments at a given level of risks, which is the objective of any corporate house.

In this study guide chapter learners will appreciate the rationale for international diversification and the role of market segmentation and market integration in the realisation of benefits associated with international diversifications. The chapter further, intends to acquaint the learners with skills on how to measure the returns and risks of internationally diversified assets, and how to design efficient combination of international assets. The assessment and the determination of returns of foreign securities, bonds and shares will also be discussed, explored and evaluated. More importantly, the International Assets Pricing Model (ICAPM) will be assessed in light of the standard Capital Assets Pricing Model (CAPM) and the factors which make international investments or investments in foreign countries unique unveiled.

Learning Outcomes

(a) Assess and measure risk and return associated with international portfolio investments.
(b) Assess and measure returns associated with investing in securities issued in different markets and denominated in various currencies.
(c) Evaluate the International Capital Assets Pricing Model (ICAPM) and its application in evaluating internationally allocated investments.
(d) Discuss capital market integration and segmentation and evaluate barriers to international diversification.

1. Assess and measure risks and returns associated with internationally diversified portfolio

[Learning outcome a]

International diversification is referred as to holding investments of securities or assets in more than one country with a view of minimising risks for targeted return level or maximising return for a given level of risk. This is an attempt to reduce risk by investing assets – locating projects in various nations of the world and especially those whose economic cycles are not perfectly correlated. The international diversification can be considered a viable strategy for risk reduction because correlation coefficients across markets (countries) are reasonably low. As such it naturally accepted that the economic, political, institutional and even psychological factors affecting securities' (assets') returns tend to vary a great deal across countries which in turn results in relatively low correlations among international assets. More importantly the broader the diversification the more stable the returns and the more diffuse the risks are expected to be.

The efficiency and effectiveness of international diversification as risk reduction strategy is influenced and depends on the three main factors. These factors are (i) intercountry correlations – whereby a reasonably low correlation across markets is expected to be better off in realising benefits of international diversification (ii) The variance (risk) of returns for each country's assets (securities), and (iii) The expected return in each individual country. Highly asynchronous countries could contribute to low international correlations and hence benefits of international diversification. It follows that, closely related countries in terms of economic, legal and political settings cannot bring about benefits from assets diversified in those countries. This is because the factors would influence the returns of such assets in the similar way – due to positive relationships coefficients.

In general, the international correlation structure strongly suggests that international diversification can sharply reduce risk (Solnik, 1974). While a fully diversified domestic portfolio is as risky as a typical individual stock, a fully diversified international portfolio is relatively less risky than typical individual stock. This implies that when fully diversified an international portfolio can be less than half as risky as a purely domestic portfolio. This is however, dependent on the correlation coefficients of returns of assets allocated in different countries. The low correlations would suggest ability of the international portfolio to reduce risks.

Discuss the determinants of effectiveness and efficiency of international diversification as a risk reduction strategy.

Expected return and risk of internationally diversified portfolio

International portfolio is comprised of assets allocated in different countries. The returns and risks from internationally diversified assets are generally measured in similar manner as those of domestic portfolio except that the consideration is on the securities invested in different nations. To arrive at an expected return of international portfolio one should consider the risks and returns in each market and the weights of investment in each of those markets. In a simplified manner, consider a world portfolio consisting two assets a fraction of which - W_d is invested in domestic country's stocks and the remaining fraction - W_f) invested in foreign stocks. Further, E (R_d) and E (R_f) is defined as returns on the domestic country and foreign country's stock respectively. The expected return of international portfolio E ($\mathbf{R_P}$) can be calculated as:

$$E(\mathbf{R_P}) = W_d E(R_d) + W_f E(R_f)$$

Similarly, the standard deviation of international portfolio **(σp)**, can be derived from the general formula for the standard deviation of a two-asset portfolio with weights w_1 and w_2 ($w_1 + w_2 = 1$). This is given as portfolio standard deviation **(σp)** $= [w_1^2 Ó_{12} + w_2^2 Ó_2^2 + 2w_1 w_2 r_{12} Ó_1 Ó_2]^{1/2}$.

Where; $Ó_1^2$ and $Ó_2^2$ are the respective variances of the two assets, $Ó_1$ and $Ó_2$ are their standard deviations and r_{12} is their correlation.

To measure the risk of internationally diversified portfolio, the same formula can be applied by treating the domestic and foreign portfolio as separate assets. This yields an international portfolio standard deviation Óp equal to:

$$\sigma p = [w_d^2 Ó_{df} + w_f^2 Ó_2^2 + 2w_d w_f r_{df} Ó_d Ó_f]^{1/2}$$

Where, $\dot{O}_d$ and $\dot{O}_f$ are variance for domestic and foreign assets respectively; r_{df} is their correlation; and W_d and w_f is weights of the investment in domestic and foreign country respectively.

Example

Kilimanjaro Inc. Limited is a multinational company that has investments in five different developing countries. One of the objectives of the Company is to reduce risk through international diversifications. The Company however believes that the return on any investment from investment in five countries is not correlated with the return on any other investment. The details of investment such as the estimated risk and return and the value in of each of the five investments are shown below.

Country	Value of investments	Standard Deviation (%)	Return (%)
Rwanda ($_{Rw}$)	25%	8	14
Namibia ($_{Nam}$)	20%	10	16
Kenya ($_{Ke}$)	20%	7	12
Tanzania($_{Tz}$)	25%	4	9
Lesotho (Les)	10%	16	22

Required: estimate the risk and return of the portfolio of the five investments, and briefly explain the significance of your results.

Solution

- The Portfolio return – can be determined as the weighted average returns from the five investments.
- It is given that:
  Return from Rwanda (RRw) = 14%;
  Return from Namibia (RNam) = 16%;
  Return from Kenyan (RKe) = 12%;
  Return from Tanzania (RTz) = 9%, and
  Return from Lesotho (RLes) = 22%

The expected return of the international portfolio will be given as ($\bar{R}p$) $= \sum_{i=0}^{n}(Return * Weights)$

= [(0.25 *14%) + (0.20*16%) + (0.20* 12% + (0.25* 9%) + (0.10* 22%)]

= **13.55%.**

Estimation of the portfolio risk (σ_p)

Given the weights of investment in each of the five countries, and the fact that the correlation coefficient of the portfolio equals to 0 (The returns from the five countries is not correlated). The risk of international portfolio can be estimated as follows:

$= \sqrt{[0.25^2\ \sigma^2 rw + 0.2^2\sigma^2_{nam} + 0.2^2\sigma^2_{ke} + 0.25^2\sigma^2_{Tz} + 0.1^2\sigma^2_{les}]}$

$= \sqrt{[0.25^2 8^2 + 0.2^2 10^2 + 0.2^2 7^2 + 0.25^2 4^2 + 0.1^2 16^2]}$

= ***3.7%***

Significance of the results: With a portfolio of only five investments the benefit or diversification have reduced portfolio risk, measured by the standard deviation of expected returns, to approximately that of the lowest risk individual investment. This portfolio risk reduction is quite large because of the lack of correlation between the investments. The further away the correlation coefficient is from +1, the greater the risk reduction through diversification.

Test Yourself 2

(a) Briefly discuss the factors that determine the riskiness of an international portfolio of assets.

(b) You are a financial consultant working with a Tanzanian based multinational firm. The firm's Managing Director has approached you to assist in an urgent investment decision. The firm is planning to invest in the UK, Kenya and the USA. It has currently no business in these countries. The firm considers establishing an

equally invested two-investment portfolio comprising investments in any two of the three countries. A preliminary appraisal of investment in each country was carried out, the results of which are detailed in the table below.

	UK	Kenya	USA
Expected Return	20%	10%	30%
Standard Deviation	8%	6%	15%

The coefficients of correlation between investments are estimated to be:

UK - Kenya	-0.4
UK – USA	-0.7
USA - Kenya	0.9

Required:

(i) Compute the risk and return of the alternative investment portfolios.

(ii) Advise the firm on the appropriate investment portfolio based on portfolio relative risk.

2. Assess and measure return associated with investing in securities issued in different markets and denominated in various [Learning outcome b]

The foreign investment is affected by the return on asset within its own market and the changes in exchange rate between the currency of the asset (security) and that of the buyer. So therefore, the return from foreign investment will be comprised of return from the security's home market and return (gain) from the changes in exchange rate. For simplicity purposes, in measuring the return associated with investing in securities issued in different markets and denominated in a variety of currencies we assume that the US $ is our domestic currency (any currency could, of course serve the purpose). It follows that the total dollar returns on an investment can be decomposed into three elements; Dividend/Interest Income; Capital Gains (Losses) and Currency Gains (Losses).

(i) Measuring total returns from foreign bond investment

The return on investment in foreign corporate bonds is made up of the interest income (coupon income), capital gain or loss and gain or loss of the currency denominating the bond. The domestic (home) currency return on foreign bonds investment can be determined by the following formula.

Domestic currency return = foreign currency return x Currency gain or loss on a foreign bond.

This also can be presented as follow:

$$R_d = \left(1 + \frac{B_1 - B_0 + C}{B_0}\right)(1+g) - 1$$

Where:

R_d = Domestic currency return on a foreign bond
B_1 = Foreign currency bond price at time t
B_0 = Foreign currency bond price at time
C = Coupon income = coupon rate x nominal value of bond
g = Percentage change in domestic currency value of the foreign currency.

$$g = \frac{e_1 - e_0}{e_0} \times 100\%$$

$B_1 - B_0$ = Capital gain if BI > B0 or Capital loss if B1 < B0
$B_1 - B_0 + C$ = Foreign currency return in monetary terms (positive or negative)
$\frac{B_1 - B_0 + C}{B_0}$ = Total foreign currency return
Therefore R_d = [1 + total foreign currency return} (1 + g) – 1.

Example

Suppose you are given the following data regarding one - period foreign bond investment. The initial bond price of the bond is 95, and the coupon income is 8. It is also certain that the end- of period bond price will be 97, and the foreign currency appreciates by 3% against the dollar during the period.

Required:

Calculate the one- period dollar return of the foreign bond investment.

Solution

The domestic currency ($) return = foreign currency return x currency gain or loss on a foreign bond.

$$R_d=\left(1+\frac{B_1\text{-}B_0+C}{B_0}\right)(1+g)\text{-}1$$

Given from the question

B_0 = 95; B_1 =97; C (Coupon Income) = 8; g= 0.03 (appreciation of a currency denominating the bond investment)

$$R_\$=\left(1+\frac{97\text{-}95+8}{95}\right)(1+0.03)\text{-}1$$

$$R_\$=(1.105)(1.03)\text{-}1=0.138=13.8\%$$

(ii) Measuring total returns from foreign stock investment

The domestic currency return on investment on foreign corporate securities is made up of dividend income, capital gain or loss and currency gain or loss. This is given by the following formula

$$R_d = \left(1 + \frac{P_1 - P_0 + Div}{P_0}\right)(1 + g) - 1$$

Where:

R_d = Domestic currency return on a foreign stock investment
P_1 = Foreign currency stock price at time t
P_0 = Foreign currency stock price at time 0
Div = Dividend Income
g =Percentage change in domestic currency value of the foreign currency
$P_1 – P_0$ = Capital gain if $P_I > P_0$ or Capital loss if $P_1 < P_0$
$P_1 – P_0$ + Div = foreign currency return on the stock invest in monetary terms (positive or negative)
$\frac{P_1\text{-}P_0+Div}{P_0}$ = Total foreign currency return

Therefore, dollar return (R_d) = (1 + total foreign currency return) (1 + g) – 1.

Example

Given the initial price of foreign currency stock X is $50, the dividend income is 1, the end of period stock price is $48, and the foreign currency depreciates by 5% against the dollar during the period.

Required:

Calculate the total dollar return for stock X.

Solution:

$$R_d = \left(1 + \frac{P_1 - P_0 + Div}{P_0}\right)(1 + g) - 1$$

Given from the question: P_0 = 50; P_1 = 48; Div. = 1; and g= - 0.05 (5%)

$$R_\$ = \left(1 + \frac{48 - 50 + 1}{50}\right)(1 - 0.05) - 1$$

$$R_{\$} = (0.98)(0.95) - 1 = -0.69\%$$

The total domestic currency (dollar) return is -6.9%. This implies that the investor suffered both a capital loss on the foreign currency principal and a currency loss on the investment's dollar value.

Test Yourself 3

A Tanzanian based investor, Mr. Samba has just sold his shares held in Tausi Incorporation Limited - a Kenyan based company that he had purchased six months ago. The investor (Samba) had invested TSHS 10,000,000 to buy the Tausi shares for Kenyan Shillings (KES) 120 per share. The exchange rate six months ago, at the date of transaction was KES 0.056/TSHS. Samba sold the share for stock for KES 135 per share and converted the Kenyan Shillings proceeds into Tanzanian shilling at KES 0.05 per TSHS.

Required:

(a) Compute the domestic currency (TSHS) total percentage rate of return on Mr. Samba's investment in Tausi shares.
(b) Show the total profit and clearly state the implication of exchange rate changes on the Samba' share's return.

3. Evaluate the application of the international capital assets pricing Model (ICAPM) in evaluating internationally allocated investments [Learning outcome c]

international capital pricing model (ICAPM) is an extension and is built on traditional and standard capital assets pricing model (CAPM) developed by Sharpe (1978). The CAPM model was regarded an important tool for evaluating domestic efficient portfolio management only. Consequent to globalisation, shrinkage of economic and investment spaces, improved communication and transportation, the expansion of investment activities internationally, and holding of assets (securities and shares) in different markets and denominated in different currencies became possible. Through international diversification the multinational firms and companies could hold assets in different jurisdictions and in assorted currencies. This called for development of the International Capita Assets Pricing Model (ICAPM). This model is used for evaluating the performance of various elements of investment portfolio denominated in different currencies across selected countries of the world. The ICAPM is as a result applied to measure returns and risks of the internationally diversified assets and based on different currencies. The model is relevant and applied in evaluating the performance of international stocks and shares, which could not be possible under the standard CAPM.

The two models share two main assumptions. The shared assumptions include but not limited to (i) investors have homogeneous preference, and (ii) They have access to similar assets and opportunities. In addition to assuming that the investors have similar preference and opportunities, the ICAPM contrary to the standard CAPM assume that the investors will not have similar expectations because they would pay different prices around the world depending on the country where the investment is located. This is because the ICAPM considers state of economy where the purchasing power parity (PPP) theory does not hold, such that the prices of assets will be different across the nations. It should be recalled that the purchasing power parity works on assumption that the prices of goods and services are similar across the world under law of one price.

It shown elsewhere in this section that International Capital Assets Pricing Model (ICAPM) is applicable and suitable in assessing, evaluating the returns and risks of internationally allocated investment portfolios and which are denominated in different currencies. The model considers unique factors and characteristics which are presumably influential on investments and returns of globally allocated assets and denominated in different currencies as well. This is because the extension and expansion of investment to foreign markets exposes multinational Corporations (MNCs) and international firms to risks peculiar to global business environment. These risks are inflation rate differentials between countries, exchange rate risk due to multiplicity use of foreign currencies, and political risks. Both of the risks could affect the price of international assets and its forward premium. The ICAPM considers these risks when determining the cost of capital in international context.

The main difference between the standard CAPM and ICAPM lies on these variables which are unique for investments allocated in foreign markets.

Comparison between ICAPM and domestic CAPM

ICAPM	Domestic CAPM
Risks and returns are influenced by different currencies	Risks and returns are influenced by the country's currency
Investors have homogenous expectations to returns and risks.	Investors have different expectations to returns and risks.

Efficiency of portfolios is influenced by different currencies ratio	Efficiency of portfolios is influenced by single currency ratio
It is used for market that is considered as a whole and has merged with other countries.	It is used for market that has segments within a country.

4. Discuss market integration and segmentation concepts and evaluate barriers to international diversification [Learning outcome d]

Multinational corporations do not operate in a free business world. Investments across countries are subject to various restrictions and impediments which could be legal, policy or social. These barriers and restrictions can substantially influence the international diversification decisions and negatively affect the benefits of international portfolio. The barriers could be in terms of legal, informational and economic restrictions; specific taxes regulations, exchange control and lack of liquidity.

4.1 Barriers to international diversifications

The benefits of international diversification are considered to be real especially where capital markets are segmented. It follows that the investment of assets and securities across countries will enable investor to reduce risks with a given level of return. However, the benefits of international diversification are not automatic and free. The benefits are normally affected (reduced) by the extent by which the host countries around the world will impose restrictions. This is because investing in foreign countries will always encounter some barriers. The barriers which reduce the benefits of global portfolios are as follows: Legal, economic and policy restrictions to investing overseas, lack of liquidity, currency controls and remittance restrictions, specific tax regulations, political and exchange risk, lack of adequate and readily accessible and comparable information on potential foreign security acquisitions. The barriers perceivably increase riskiness of assets allocated in foreign markets and give the investors justifications for investing their money locally (domestic market).

4.2 Capital market segmentation and integration and benefits of international diversifications

It is generally accepted that the ability of investors' risk reduction through international diversification is partly a function of the degree of the independence of a country's capital market from the rest of the world. This is because the objective of risk reduction through global diversification can reasonably be achieved if the returns and risks in different countries do no move together, that is, they should move in opposite direction. This is only possible when each country's capital market is independent from each other, in terms of national economic and monetary policies which influence nations' macro-economic conditions, such as interest rates, inflation rates, and currency control decisions. This condition depends on whether the global market is integrated, market integration or the market is segmented, market segmentation.

Capital market integration

This concept denotes homogeneity of capital market around the world. It implies that the capital markets around the world are interrelated and dependent to each other such that the factors influencing the returns and risks of assets are similar. The capital market integration has negative effect on ability of risk reduction through international diversification. It follows that with highly integrated capital market globally, the risk reduction benefit of internationally diversified assets is minimised. The assets invested in an integrated financial market have identical risks and similar expected returns and risk is reduction is less achieved. The correlation coefficients of returns and risks in this kind of market is high and therefore (defeats) negatively affects the possibility of risk reduction through global portfolio. The integrated global capital markets imply that respective county's market share similar characteristics and therefore locating assets in these different countries do not represent significant potential for reduction of risk. An integrated market would only offer the opportunity to reduce unsystematic risk

Capital market segmentation

This is in contrast to capital market integration. If capital markets are segmented it implies that the consumption and investment opportunity sets in domestic country differ from that of foreign countries. In a segmented capital market, the conditions and factors that influence returns and risks of assets and securities differ across countries because financial markets do not share similar characteristics. The returns and variation of returns for assets allocated in different countries are therefore different and do conform to each other. The returns for an investment in each specific capital market is determined and influenced by that country's specific conditions. The capital market segmentation is therefore associated with high potential for risk reduction through international diversification because the correlation coefficients for internationally diversified assets are low. If markets are segmented, international diversification may offer the opportunity to reduce both systematic and unsystematic risk.

Example

Shalom Inc. is a Tanzanian based company which intends to expand its operations trough international diversifications in order to reduce both systematic and unsystematic risk.

Required:

Discuss the validity to investors of Shalom Inc's objective for risk reduction through international diversification.

Solution

In theory a well-diversified investor will not place any extra value on companies that diversify. This is because an investor can diversify himself, by investing in shares and in securities of different companies operating across countries. If the diversification is international, the benefits will depend on whether the countries where the investments take place are part of any integrated market or are largely segmented by government restrictions taxes and exchange controls. If markets are segmented, international diversification may offer the opportunity to reduce both systematic and unsystematic risk. An integrated market would only offer the opportunity to reduce unsystematic risk. However, most markets are neither fully integrated nor segmented, meaning that international diversification will lead to some reduction in systematic risk, which would be valued by investors. It is to be hoped that risk reduction is not the only objective of Shalom Inc. Limited - returns and shareholder utility are important.

Test Yourself 4

Mr. Nyensanza is the Managing Director of Mfanyakweli Plc, a company listed on the local stock exchange. The company has excess funds amounting to Tshs.35 billion which the Managing Director is pondering investing between Ugandan and Malawian portfolios. The Managing Director has called a meeting to table the matter to the members for further discussion. During the discussion one of the members questioned the reliability and practicability of international diversification which revealed that most of the participants were aware of its benefits only but not its barriers which in turn might be a limiting factor.

Required:

As a portfolio manager, elaborate to the members the barriers to international diversification.

Answers to Test Yourself Questions (TYQ)

Answer to TY 1

These factors are

i. intercountry correlations – whereby a reasonably low correlation across markets is expected to be better off in realising benefits of international diversification
ii. The variance (risk) of returns for each country's assets (securities), and
iii. The expected return in each individual country. Highly asynchronous countries could contribute to low international correlations and hence benefits of international diversification.

Answer to TY 2

i. Candidates are expected to point out the *weight* of each asset, the *riskiness* of each as well as the *correlation* across the assets and discuss how each influences portfolio riskiness.
ii. There are three possible alternative investment portfolios namely: UK and Kenya (ii) UK and USA (iii) Kenya and USA.

(iv) Risk and return of the alternative investment portfolios

UK and Kenya

Given

Expected Returns:	UK	20%
	Kenya	10%
Standard Deviation	UK	8%
	Kenya	6%
Correlation Coefficient		-0.4

Equally Invested Portfolio

Expected Portfolio Return = (0.5)(20%) + (0.5)(10%) = 15%

Portfolio Risk = $[(0.5)^2(8)^2 + (0.5)^2(6)^2 + 2(0.5)(0.5)(-0.4(8)(6)]^{1/2} = [16 + 9 – 9.6]^{1/2}$
= $15.4^{1/2}$
= 3.92%

UK and USA

Given:

Expected Returns:	UK	20%
	USA	30%
Standard Deviation	UK	8%
	USA	15%
Correlation Coefficient		-0.7

Equally Invested Portfolio

Expected Portfolio Return = (0.5)(20%) + (0.5)(30%) = 25%
Portfolio Risk
= $[(0.5)^2(8)^2 + (0.5)^2(15)^2 + 2(0.5)(0.5)(-0.7)(8)(15)]^{1/2}$
= $[16 + 56.25 + 42]^{1/2}$
= $30.25^{1/2}$
= 5.5%

Kenya and USA

Given:

Expected Returns:	KENYA	10%
	USA	30%
Standard Deviation	KENYA	6%
	USA	15%
Correlation Coefficient		0.9

Equally Invested Portfolio
Expected Portfolio Return = (0.5)(10%) + (0.5)(30%) = 20%
Portfolio Risk
= $[(0.5)^2(6)^2 + (0.5)^2(15)^2 + (0.5)(0.5)(0.9)(6)(15)]^{1/2}$
= $[9 + 56.25 + 40]^{1/2}$
= $105.75^{1/2}$
= 10.3%

(v) Appropriate investment portfolio based on portfolio relative risk

Coefficient of variation can be used to select the appropriate investment portfolio based on portfolio relative risk.

UK and Kenya:	Coefficient of Variation	= 3.92/15 = 0.26
UK and USA:	Coefficient of Variation	= 5.5/25 = 0.22
Kenya and USA:	Coefficient of Variation	= 10.3/20 = 0.51

The equally invested portfolio in UK and USA has the least Coefficient of Variation. It has therefore the least relative risk. The firm may well be advised to select this portfolio.

Answer to TY 3

(2a). The domestic (TSHS) currency return on a foreign stock investment is given by the following formula

The domestic currency return of the shares (TSHS)

$$R_{Tshs} = \left(1 + \frac{P_1 - P_0 + Div}{P_0}\right)(1+g) - 1$$

Where:

R_d = Domestic currency return on a foreign stock investment
P_1 = Foreign currency stock price at time t

P_0 = Foreign currency stock price at time 0
Div. = Dividend Income.
g = Percentage change in domestic currency value of the foreign currency.

Therefore, Total R_{TSHS} = [1 + Total foreign currency return} (1 + g) – 1

Given

$R_{d(TSHS)}$ =?
P_1 = KES 135
P_0 = KES 120
Div. = 0

$$\text{g (change in value of TSHS against KES)} = \frac{\text{TSHS. 20} - \text{TSHS. 18}}{\text{TSHS. 18}} = 0.1111$$

$$\text{Total return in } R_{Tshs} = \left(1 + \frac{135 - 120 + 0}{120}\right)(1+0.1111) - 1 = 0.2499 = 25\%$$

(2b). The total return in domestic currency (TSHS) is 25%, which amounts to a total profit of TSHS 2,500,000 (25% * TSHS 10,000,000) on Tausi shares by Mr Samba. The implication of this is that the Tanzanian based investor, Mr Samba benefited from the appreciation of Kenya shilling (KES) against Tanzanian Shillings (TSHS) , from TSHS 18/KES (KES 0.056/TSHS) to TSHS 20/KES (KES 0.05/TSHS) which is the currency denominating the investment. The total profit in Tanzanian terms is TSHS 2,500,000 of which 11.11% is consequent to exchange rate movement and specifically, the appreciation of KES (investment currency) against the TSHS (the Investee' domestic currency).

Answer to TY 4

Despite the member's awareness of benefits of international diversification, these benefits will be limited because of the barriers to invest abroad. The barriers which reduce the benefits of global portfolios are as follows: Legal, economic and policy restrictions to investing overseas, lack of liquidity, currency controls and remittance restrictions, specific tax regulations, political and exchange risk, lack of adequate and readily accessible and comparable information on potential foreign security acquisitions. The barriers perceivably increase riskiness of assets allocated in foreign markets and give the investors justifications for investing their money locally (domestic market).

Indicative Examination Questions (IEQs)

IEQ 1

Nshomire Plc currently operates only in Tanzania but is considering diversifying its activities internationally into either Uganda or Kenya. Estimates have been obtained of the likely risk and return of investments in these countries which are expected to vary during different economic states of Tanzania. After either diversification, an approximately 30% of the market value of the company would be represented by overseas investments.

Tanzania Economic State	Probability	Expected IRR % for investing in Uganda	Kenya	Tanzanian
Low growth	0.3	7	2	6
Average growth	0.5	12	30	13
Rapid growth	0.2	21	15	17

The standard deviations of expected returns of Uganda, Kenya and Tanzania are 4.86, 12.26 and 4.03 respectively. Also, the covariance of expected returns of Tanzania/Uganda and Tanzania/Kenya are 17.89 and 31.98 respectively.

Members of Nshomire's board of directors have different views about such diversification. Director **A** believes that the company should focus exclusively upon the Tanzania market as it always has, because overseas investments are too risky. Director **B** believes that overseas diversification will offer the company the opportunity to achieve a much better combination of risk and return than purely domestic investments and will open up new opportunities. Director **C** considers overseas investments expensive and argues that overseas diversification will not be valued by shareholders who could easily achieve such diversification themselves. Director **D** is also in favour of Kenya but suggests that a much higher proportion of the company's activities should be located there, possibly between 50% and 70%.

Required:

(a) (i) Discuss the views of each of the four directors. Include in your discussion, relevant calculations regarding portfolio risks and returns.

(ii) Estimate and explain the implications of the correlation coefficients between Tanzania and Uganda and between Tanzania and Kenya

(b) Nshomire Plc has also purchased CAPM-based risk and return estimates from an investment bank.

	Relevant market return (%)	Relevant risk free (%)	Relevant investment (%)
Uganda	13	5	0.85
Kenya	18	8	1.32

Required:

Assuming this information is accurate, show how it might be used to assist the diversification decision.

IEQ 2

A Tanzanian portfolio manager is contemplating to build up an international portfolio which is 60% invested in the Dar es Salaam stock exchange (DSE) and 40% invested in either of two foreign markets: Nairobi Stock Exchange (NSE) and New York Stock Exchange (NYSE). The manager has gathered the following information on three different stock exchanges.

	Expected Return	Standard Deviation	Correlation with DSE
DSE	10%	9%	1.0
NSE	15%	8%	0.7
NYSE	20%	10%	0.0

Required:

(i) Determine the risks of the above mentioned internationally diversified portfolios and calculate the beta of each of the two foreign markets relative to the DSE.
(ii) Which of the foreign market is as risky as the DSE?
(iii) Which of the two portfolios is likely to be chosen by the manager? Why?

Answer to IEQs

Answer to IEQ 1

(a) (i) It is useful to estimate the return and risk of the two diversification alternatives before examining in detail the views of the directors. The portfolio return is simply the weighted average of the expected returns of two elements of the portfolio. The portfolio risk may be estimated using the two-asset portfolio theory equation, based upon the expected risk and return of each alternative.

Expected Returns of Individual projects

Uganda $\left(\overline{R}_{UG}\right) = 0.3 * 7 + 0.5 * 12 + 0.2 * 21 = 12.3\%$

Kenya $\left(\overline{R}_{KY}\right) = 0.3 * 2 + 0.5 * 30 + 0.2 * 15 = 18.6\%$

Tanzania $\left(\overline{R}_{TZ}\right) = 0.3 * 6 + 0.5 * 13 + 0.2 * 17 = 11.7\%$.

Portfolio Returns

Expected Return Tanzania/Uganda $\left(\overline{R}_{TZ/\ EU}\right) = 0.7 * 11.7 + 0.3 * 12.3 = 11.88\%$

Expected Return Tanzania/Kenya $\left(\overline{R}_{TZ/\ EA}\right) = 0.7 * 11.7 + 0.3 * 18.6 = 13.77\%$

Portfolio Risks

The two-asset portfolio equation measures the total risk of the portfolio. This will include some specific or unsystematic risk:

Portfolio risk Tanzania/Uganda

$$\delta_{TZ/\ UG} = \sqrt{4.03^2 * 0.7^2 + 4.86^2 * 0.3^2 + 2 * 0.7 * 0.3 * 17.89} = 4.20$$

Portfolio risk Tanzania/Kenya

$$\delta_{TZ/\ KY} = \sqrt{4.03^2 * 0.7^2 + 12.26^2 * 0.3^2 + 2 * 0.7 * 0.3 * 31.98} = 5.91$$

Summary: Portfolio expected returns and risk

	Portfolio return	Portfolio risk	Coefficient of variation
Tanzania/Alone	11.70	4.03	0.344
Tanzania/Uganda	11.88	4.20	0.354
Tanzania/Kenya	13.77	5.91	0.429

The coefficient of variation is the ratio of the portfolio risk to the portfolio expected return. It shows the amount of risk per the expected return, which would suggest that continuing only in the Tanzania, is the best course of action. However, the risk/return preferences of Mchiziwanyoka Plc would need to be considered before a decision was made, as would strategic and other issues discuss below:

Director A

Director A's view has a merit in that the company would be sticking to its core market and core competence. However, overseas investments are not always too risk is considered then the international diversification can produce risk/return combinations that are not available from investing only in Tanzania. The benefits of international portfolio diversification might reduce the overall risk below that available in the Tanzania, and provide better combination of risk and return for Nshomire Plc. This is the view of Director B who correctly states that international diversification will open up new opportunities.

Director C

Director C produce no evidence that overseas investments are more expensive that Tanzania investment. In May multinational companies, lower labour and materials costs have been key/core motives for overseas investments. Such investments have therefore been cheaper than the similar in Tanzania – based investments.

International diversification might also result in less variability of cash flows for Nshomire, as the markets are not perfectly corrected. This reduction in risk, if recognized by providers of finance, might result in lower financing costs, and a lower cost of capital.

Director D

Director D suggests a much higher proportion of investment in Kenya. If 50% - 70% was invested in Kenya, and assuming market values reflected these proportions:

Expected portfolio returns

50% Kenya – Expected return

Tanzania/Kenya (RTZ/KY) = 0.5 * 11.7 + 0.5 * 18.6 = 15.15%.

70% Kenya – Expected return

Tanzania/Kenya (RTZ/KY) = 0.3 * 11.7 + 0.7 * 18.6 = 16.53%.

Portfolio Risk Tanzania/Kenya

If 50% of portfolio invested in Kenya

$$\delta TZ / KY = \sqrt{4.03^2 * 0.5^2 + 12.26^2 * 0.5^2 + 2 * 0.5 * 0.5 * 31.98}$$

$$\delta TS / KY = 7.59$$

If 70% of portfolio invested in Kenya

$$\delta TZ / KY = \sqrt{4.03^2 * 0.3^2 + 12.26^2 * 0.7^2 + 2 * 0.7 * 0.3 * 31.98}$$

$$\delta TS / KY = 9.41$$

The potential returns increase significantly, but so too does risk. Unless **Nshomire** is seeking very high returns and is prepared to take the extra risk, there is no evidence to support the view that a higher proportion should be invested in Kenya. Such a move would probably mean closing some Tanzania operations with the resultant problems of redundancy and would be a major strategic change from the company's current position.

The risk and return evidence should only be the decision process. The data itself is likely to be subjective and incurrence. It is impossible to know with any degree of accuracy what future returns will be, and the assignment of probabilities to different economic states is at speculative.

(ii) The correlation coefficient

$$COR_{TZ/\ UG} = \frac{COV_{TZ/EU}}{\delta_{TZ} * \delta_{UG}} = \frac{17.89}{4.03 * 4.86} = 0.91$$

$$COR_{TZ/\ KY} = \frac{COV_{TZ/KY}}{\delta_{TZ} * \delta_{KY}} = \frac{31.98}{4.03 * 12.26} = 0.65$$

Although the returns between the Tanzania and Uganda and Kenya are both positively correlated, the degree of correlation is much higher for the Tanzania and Uganda at 0.91. This means that relatively little risk reduction will take place because of the strong positive relationship between the Tanzania and Uganda. This is evidenced by the portfolio standard deviation of 4.20 is a little different from the individual standard deviations.

The lower correlation coefficient of 0.65 between Tanzania and Kenya allows much more risk reduction from international diversification, with the standard deviation of Kenya alone (12.26) reducing to a much safer 5.91 as part of portfolio with the Tanzania.

(b) Using CAMP

Required Return is = $R_f + (R_m - R_f)S_i$

Uganda

Required Return is $R_f + (R_m - R_f)B_i = 5\% + (13\% - 5\%) * 0.85 = 11.8\%$

The expected return is 12.3%

The Ugandan investment is expected to provide an abnormally good return for its systematic risk, and on that basis would be recommended.

Kenya

Required Return is $R_f + (R_m - R_f)B_j = 8\% + (18\% - 8\%) * 1.32 = 21.2\%$

The expected return is 18.6%

The investment is not providing sufficient return for its systematic risk and would not be recommended. However, strategic and non-financial factors should also play a major role in the decision process.

Answer to IEQ 2

(b) Tanzania Portfolio Manager

Let:

DSE = Dar es Salaam Stock Exchange
NSE= Nairobi Stock Exchange
NYSE = New York Stock Exchange

(i) **DSE – NSE Portfolio**

Portfolio Risk

$$\sigma\rho = \sqrt{a^2\sigma^2_{DSE} + b^2r^2_{NSE} + 2ab.r_{DSE,NSE}\sigma_{DSE}\sigma_{NSE}}$$

$$\sigma\rho = \sqrt{(0.6)^2(9)^2 + (0.4)^2(8)^2 + 2(0.6)(0.4)(0.7)(9)(8)}$$

$$\sigma\rho = \sqrt{63.592} = 7.97\%$$

DSE- NYSE Portfolio

Portfolio Risk

$$\sigma\rho = \sqrt{a^2\sigma_{DSE}{}^2 + b^2\sigma^2_{NYSE} + 2ab.r_{DSE,NYSE}\sigma_{DSE}\sigma_{NYSE}}$$

$$\sigma\rho = \sqrt{(0.6)^2(9)^2 + (0.4)^2(10)^2 + 2(0.6)(0.4)(0)(9)(10)}$$

$$\sigma\rho = \sqrt{45.16} = 6.72\%$$

(ii) Foreign Market Beta

NSE Beta

$$\beta_{NSE} = \frac{\sigma_{NYSE}r_{DSE,NYSE}}{\sigma_{DSE}} = [8 \times 0.7]/9 = 0.62$$

Thus, neither market is as risky as the DSE.

(iii) **Comparing the two portfolios (use coefficient of variation: CV)**

CV= Portfolio standard deviation/ expenditure return on the portfolio

DSE – NSE Portfolio

$$DSE - NYSE$$

$$CV = 6.72/14 = 0.48$$

The CV of the DSE-NYSE Portfolio is less than of DSE-NSE Portfolio. Thus, the DSE-NYSE Portfolio is likely to be chosen by the manager.

SECTION C

BUSINESS VALUATION CONCEPTS AND APPLICATIONS

C1

STUDY GUIDE C1: BUSINESS VALUATION

Get Through Intro

A company may seek a valuation of its business or some part of it for a variety of reasons. It may be planning a major acquisition or considering a merger, It may need an objective analysis and valuation, to determine the right price to pay or accept for the business, a valuation of unlisted companies, businesses, shareholdings, goodwill, know-how, brands and other intangible assets.

An analysis of the business is also carried out when it needs advice on resolving a shareholder or joint venture dispute, or when seeking to reduce the gap between intrinsic and market value. Corporate governance, regulatory reasons, or management review for critical input for decision making process also demand a proper analysis and valuation of the business.

Business analysis is not a simple exercise of numbers. The business analyst has to spend time to understand the business dynamics and its key value drivers. This Study Guide discusses the various aspects of business analysis which will be very useful in your career.

Learning Outcomes

a) Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
   i. Dividend yield-based valuation techniques
   ii. Price earnings ratio-based valuation techniques
   iii. Discounted cash flow-based valuation techniques
   iv. Asset based and net asset-based measures of value
   v. Options based techniques
   vi. Value based management
   vii. Shareholder value analysis
   viii. Short- and long-term growth rates and terminal values
   ix. Economic profit methods
   x. Cash flow return on investment
   xi. Total shareholder return
   xii. Market value added

Mr Omar Missanga had set up a business 30 years ago for the manufacture and export of semi-precious jewellery. The business, Gemqual Exports, had built a reputation among its customers for the high quality and unique designs of its products. As Mr Missanga was getting on in years, he decided to sell his business. He realised that he first had to know what his business was worth today.

He, therefore, approached a well-known firm in Dar es Salaam, which specialises in business valuations. The valuation expert asked Mr Missanga to describe his business and its strengths and weaknesses. He also asked for the financial statements for the past five years.

Gemqual's profile

Gemqual, in general, had a history of earning profits most years. Last year, the income was Tshs 800 million before taxes. Mr Missanga earned an annual salary of Tshs 300million. Gemqual sourced its semi-precious gems and other material within Tanzania from key reputed suppliers and this provided it with a significant competitive advantage over its rivals. He had also developed a good relationship with his customers over a number of years and they were happy to deal with him regularly.

Case Study

Valuation Approaches

The valuation expert considered all the inputs from Mr Missanga and decided to approach the valuation question from three perspectives.

The income approach

The income approach or the discounted cash flow method capitalises or discounts the firm's expected income stream. The DCF method is discounted cash flow analysis estimates the present value of the future stream of net cash flows generated by the business. The net cash flows are forecast for an appropriate period and then discounted to present value using a discount rate that reflects the current interest rate and the risks of the business.

The market approach

This approach uses valuation multiples from the stock prices of comparable publicly traded companies or from acquisition deals of similar businesses. Adjustments are made to the financial data to account for the differences between the firms, as well as for factors such as the value of controlling the company.

The cost approach

This method considers the replacement cost of the firm's assets as an indication of what an investor might like to pay.

Using the Approaches

The valuer decided to use the discounted cash flow approach to provide a realistic assessment of the business's value. The market approach served primarily as a check or control on the value he calculated by the income approach. He decided that the cost approach was not suitable in this situation because Gemqual is a going concern, having a high "goodwill" value, such as brand equity, established customer relationships and a reliable supplier base. These factors are difficult to value under this method.

To arrive at a value for Gemqual, the valuer first prepared cash flow forecasts for the next ten years. Cash flow forecasts require estimating the revenues and costs considering several factors which might affect the sales and costs. A trend analysis of the past 5 years financials provided a reliable basis for such estimates as the business had a good record of profitability. He then derived the present value of future free cash flows using the present market interest rate, adjusting it for the industry risk factors.

He then compared the value derived from this forecast with that derived from the market approach. He found that the market approach valued the business 10% higher. He finalised his report and discussed this with Mr Missanga. He clarified that such business valuations provide an indicator of what the business could be worth. He advised Mr Missanga that while negotiating, he could begin with a price based on the market approach and finally settle at the DCF value.

1. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:

i. Dividend yield based valuation techniques [Learning Outcome a]

Dividend yield based valuation techniques

The important feature of the dividend valuation model is the recognition of the fact that shares are in themselves perpetuities (expected to be in existence for indefinite period). Individual investors may buy or sell them, but only very exceptionally are they actually redeemed.

1. Dividend discount model (DDM)

The dividend discount model can be a worthwhile tool for equity valuation. Financial theory states that the value of stock is the value of all the future cash flows expected to be generated by the firm discounted by an appropriate risk-adjusted rate. We can use dividends as a measure of the cash flows returned to the shareholders.

The dividend discount model assumes that any share is ultimately worth no more than what it will provide investors in current and future dividends.

Price of share at time zero $P_0 = \frac{\text{Expected dividend}}{\text{Expected return}}$

A company pays a Tshs1,000 annual dividend. If we assume that the company will pay that dividend indefinitely, then how much is an investor willing to pay for this company? Assume that the expected return or, more appropriately, the 'required rate of return' is 5%.

Then, according to the dividend discount model, the company should be worth Tshs 20,000 (Tshs1,000/0.05).

2. Dividend growth model

Under the dividend discount model, two basic factors are considered: expected dividends and expected return (i.e. cost on equity). It assumes a constant dividend, however, in practice, the expected dividends may increase. The dividend growth model takes into account growth rates in earnings and pay-out ratios when pricing shares. The required rate of return on stock is determined by the degree of risk. Myron Gordon created a constant dividend growth model which assumes that, if a company issues a dividend with a current value of **D**, this value will grow at a constant rate **g.** The Gordon growth model is a variant of the discounted dividend model.

Price of share at time zero $P_0 = \frac{\text{Expected dividend (D)}}{\text{Expected return (r) - Dividend growth rate (g)}}$

Alternatively

$$P_0 = \frac{D_0(1+g)}{re - g} = \frac{D_1}{re - g}$$

Where,
D_0 = the current year's dividend
r_e = the expected rate of return
g = the expected growth rate for dividends

Case Study

A company is expected to pay Tshs1,000 as annual dividend. If we assume that the company's dividend will increase by 3% annually, then how much is an investor willing to pay for a share in this company? Assume that the 'required rate of return' is 5%.

Then, according to the Gordon Growth Model, the company will be worth Tshs 50,000 (Tshs1,000/ (0.05 - 0.03)).

Theoretically, the Gordon growth model is the best method of stock valuation. However, if a firm is not paying dividends, or has an erratic growth rate, the approach will not work.

Test Yourself 1

Tanzan Infrastructure Ltd is a large firm engaged in constructing roads and bridges across Tanzania. The shareholders are the government, a large private group and the public. The company is listed in the Dar es Salaam stock exchange. The firm has a stable growth and as it is partly government owned, the profitability is regulated, although still quite attractive.

The dividend paid in the previous year, 20X2 was Tshs220. The cost of equity = 9%.

The company foresees a good future, considering the large infrastructural development efforts being made by the government. It expects to grow at 3.5% for a long time.

Required:

What would the price of the equity share of the firm be according to the Gordon growth model? The company's shares are currently trading at Tshs4200. Would you be willing to invest in this firm?

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2. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
ii. Price earnings ratio-based valuation techniques [Learning Outcome a]

2.1 Price earnings ratio-based valuation techniques

Firms are most commonly valued through their earnings. Many stock market investors consider the Price Earnings Ratio or P/E as the most important and reliable indicator of the value of a company. It is often described as the king of ratios. The P/E indicates what the market is willing to pay for the company's earnings. P/E is calculated by dividing the price per share by the earnings per share (EPS).

$$P/E = \frac{P_0}{EPS}, \text{ where EPS} = \frac{\text{earnings after tax}}{\text{number of equity-shares outstanding}}$$

In a case where a firm has preference shares, the dividend payable on them is deducted before arriving at the profits pertaining to the equity shareholder.

Therefore, $P_0 = P/E \times EPS$

Firms with good growth potential have a higher P/E because investors are willing to pay a premium for future profits. Firms listed on a stock exchange generally have a higher P/E ratio. A P/E ratio for a large, growing quoted company with good prospects might be as high as 20.Their shares are much easier to buy and sell. This makes them more attractive to investors than shares in comparable unquoted business.

Example

You are considering buying 100 shares in Special Foods Ltd. You are provided with some financial data of the company.

The share is currently selling at Tshs2500 per share and has not changed much over the last one year. Last year, Special Foods had earnings of Tshs170 per share. Analysts estimate the company will earn Tshs200 per share this year. Do you think you should buy this share?

P/E based on last year's earnings =2500/170 = 14.7

P/E based on current expected earnings =2500/200 = 12.5.

As the price of the share has not changed much, the P/E ratio based on the current year's expected earnings is 12.5 as against last year's P/E of 14.7. As the P/E is lower at present, it appears very attractive for purchase.

Although the P/E is usually based on the past earnings, it is not merely a measure of a firm's past performance. Stock prices reflect the expectations of the investors about the firm's value and therefore, future growth is already factored into the price. Hence, we can interpret the P/E ratio as an **indicator of the market's optimism about a company's future growth.**

If a company has a P/E higher than the market or industry average, this means that the market expects very high earnings over the next few months or years. Ultimately, a firm with a high P/E ratio has to substantially increase its earnings, or the stock price will drop drastically.

The P/E ratio is a better indicator of the value of a firm's share than the market price alone as it is a relative measure rather than an absolute figure. A Tshs1700 share with a P/E of 30 is more expensive than a Tshs15000 share with a P/E of 16.

2.2 Major factors affecting P/E

The major factors that influence the P/E of a firm have to be considered before we can determine whether a share is priced too high or low.

(a) Growth rates: An investor has to look at the rate of growth of the company in the past and whether the growth is likely to increase or decrease in the future. If the forecast growth rates do not support the P/E, then the share may be overvalued.

(b) Industry: Comparison of the P/E across industries may not prove useful. It has to be done for firms within the same industry. Technology companies, for instance have a high P/E whereas utility firms may have very low but very stable growth rates.

(c) Brand: The name of a product or company has value. Established brands such Coca Cola are worth billions.

(d) Human Capital: A firm's employees and their skills/expertise add significant value to the firm.

(e) Expectations: Past performance may have an impact on the P/E, but more importantly, the market lays more stress on the future prospects.

Valuation of a company using the PE ratio:

Value of company = Total earnings x P/E ratio

Example

A company earned Tshs100m last year, with one million shares outstanding, and had earnings per share of Tshs100(Tshs 100m/1m). The current market price is quoted at Tshs1,000. Therefore, the company's P/E multiple will be 10 (Tshs1,000/Tshs100). The company's earnings this year rose to Tshs120m and, accordingly, EPS rose to Tshs120. Assuming the same P/E multiple, i.e. investors are willing to pay Tshs10 for every Tshs1 of last year's earnings, the company's valuation using the P/E ratio method will be Tshs1200m (Tshs120 x 10).

By relating price and earnings per share for a company, one can analyse the market valuation of a company's shares relative to the wealth the company is actually creating.

This method has two drawbacks:

1. It is based on earnings and accounting profits, which are not good indicators of actual value creation for shareholders.

2. Selection of the multiplier is not consistent i.e. the company can choose whether to use the industry average or the adjusted industry average based on the company's expected growth, the rate of return on new capital and the costs of capital.

2.3 Price earnings to growth (PEG) ratio

We mentioned the factors that affect the firm's earnings growth earlier. As the P/E ratio most commonly uses past earnings, it gives a less accurate reflection of the growth prospects. The relationship between the P/E ratio and earnings growth provides us with a more comprehensive measure. This is called the PEG ratio.

$$\text{PEG Ratio} = \frac{\text{P/E ratio}}{\text{Annual EPS growth}}$$

It is calculated as a share's P/E ratio divided by the growth rate of its earnings for a particular time period. The PEG ratio provides a better analysis since it takes into account the firm's earnings growth.

Sometimes decisions on the purchase or sale of a share based on the P/E may not be correct. A high P/E ratio may make a share look attractive, but, when the PEG ratio is considered, it may lead to a different decision. The lower the PEG ratio, the more the share may be undervalued given its earnings performance. A guideline used in a PEG ratio is that a ratio below one is preferable.

Also, the accuracy of the PEG ratio depends on the inputs used. Using historical growth rates, for example, may provide an inaccurate PEG ratio if future growth rates are expected to deviate from historical growth rates. To distinguish between calculation methods using future growth and historical growth, the terms "forward PEG" and "trailing PEG" are sometimes used.

Example

You have come into some money left by your grandfather. You are considering investing this amount in shares of one of the two companies that you have been studying. Abacus Technologies is in the IT business. It has been experiencing an annual growth of 18% in its profits. Its P/E ratio is 40. The second company, Frying Moe's is in the fast food business. It has lower earnings growth at 13% and its P/E ratio is also relatively low at 12.

A large number of investors support the high valuations of companies like Abacus arguing that these companies have enormous growth potential. However, when compared to the rate of growth of their profits, they may be overvalued.

On first glance, it appears that Abacus Technologies is a better buy as it has a P/E of 40, compared to Frying Moe's 12.

$$\text{Abacus Technologies' PEG} = \frac{40}{18} = 2.22$$

$$\text{Frying Moe's PEG} = \frac{12}{13} = 0.92$$

The PEG ratio shows us that, when compared to Frying Moe's, Abacus does not have the growth rate to justify its higher P/E, and its share price appears overvalued.

1. Evaluation of PEG

The PEG ratio provides more information about a share's valuation. It is forward-looking and is a valuable tool for investors trying to evaluate a company's prospects. However, as with any other ratio, this too has its benefits and drawbacks.

(a) Advantages

(i) Some shares with a high PE ratio may be worth investing in because their potential growth in not factored into the price. The PE ratio may consider these as high priced, whereas they may be attractively priced.

(ii) Most valuation ratios do not emphasise the growth rate in earnings or cash flow, whereas this is basically the focus of the PEG ratio. Since most investors desire to invest in equities to take advantage of the growth in income, this ratio is a better tool than many others which focus on current earnings or sales or book value.

(b) Disadvantages

(i) It depends heavily on the future earnings estimates and long-term earnings growth. Therefore, it is not very precise.

(ii) Firms in distress may show high PEG ratios. Therefore, a low PEG could be an indicator of imminent bankruptcy.

Test Yourself 2

An analyst is of the opinion that he prefers to use P/E multiples, rather than DCF valuation, to value shares, because he does not trust many assumptions about fundamentals such as growth, risk, and payout ratios. Do you agree with him?

You are estimating the P/E multiple to use to value Apricot Corporation, by looking at the average price/earnings multiple of comparable firms. The following are the P/E ratios of firms in the IT business in Tanzania.

Firm	P/E Ratio
Macrohard Tech	22.09
NexGen	36.00
Tanz Infotech	14.10
ABT	26.70
Infomatics	19.12
Eldee Soft	23.33
Omega Solutions	22.91
PanAfrica Systems	97.60
Simba Eyetee	26.00

Required:

(a) Calculate the average industry P/E ratio.
(b) Would you use all the comparable firms in calculating the average? Provide reasons.
(c) What are the assumptions made when the industry-average P/E ratio is used to value Apricot?

3. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
iii. Discounted cash flow-based valuation techniques [Learning Outcome a]

Introduction

You are already familiar with the time value of money and have used the DCF techniques to evaluate a project. Discounted cash flow (DCF) analysis is a method of valuing the intrinsic value of a firm or asset. DCF analysis states that a company is worth all of the cash that it could make available to investors in the future. It is described as "discounted" cash flow because cash in the future is worth less than in hand cash today.

This is a **straightforward** model in which the future **free** cash flows **of a business** are discounted at a **rate that** reflects the risk inherent in the business, to calculate the value of **that** business. This model is based on the idea that the discounted value of all anticipated future free cash flows generated by the company represents the market value of a company. To derive the equity value (i.e. the value per ordinary share) the value of debt is simply subtracted from the total market value.

The steps involved in using this valuation technique are:

Step 1: Determine the time horizon for the cash flows on which the valuation will be based

Step 2: Calculate the free cash flow to the firm (FCFF) for each year, with the FCFF in the last year being an estimate of the “terminal value”

Step 3: Determine the company’s weighted average cost of capital (WACC)

Step 4: Discount the FCFF each year by the WACC to discover the NPV of the FCFF

Step 5: Calculate the value of the equity by subtracting the value of the debt from the NPV calculated in step 4

Step 6: Divide the value of equity by the number of ordinary shares in issue to get the value per share

Example

The following relates to MICA Ltd:

Equity	Tshs 500m
Debt	Tshs 750m

After year 5, free cash flows are expected to grow at a rate of 2% per annum

Corporate tax rate	35%
Expected return on equity	12%
Interest on debt	10%

No. of equity shares in issue are 100m

Therefore,

$$\text{WACC}=0.12\frac{500}{500+750}+0.10(1-0.35)\frac{750}{500+750}=8.70\%$$

Example

Projected free cash flows

Year	Cash inflow (Tshs' million)	PV factor @ 8.70%	PV Cash flow (Tshs' million)
1	85	0.920	78.20
2	98	0.846	82.91
3	117	0.779	91.14
4	134	0.716	95.94
5	146	0.659	96.21
6 (W1)	2,222.69	0.606	1,346.95
		Total	**1,791.35**

Workings

W1 terminal value = (146 x 1.02) / (0.087-0.02) = 2,222.69

The value per share under the DCF method will be:

$$= \frac{\text{PV of cash flows - Value o debt}}{\text{Number of outstanding shares}}$$

$$= \frac{1{,}791.35 - 750}{100}$$

= Tshs 10.41 per share

Test Yourself 3

Segoma Industries Ltd manufactures and markets critical machine parts for several industries in East Africa. Key financial information of the company for the 20X2 and 20X3 are given below:

	Tshs billion 20X2	Tshs billion 20X3
Revenues	540.0	630.0
Less: Operating Expenses	(450.1)	(532.5)
Less: Depreciation	(12.5)	(14.0)
EBIT	**77.4**	**83.5**
Less: Interest Expenses	0.0	0.0
Less: Taxes **Net**	(23.2)	(24.5
Income Working	**54.2**	**59.0**
Capital	**175.0**	**240.0**

The firm had capital expenditures of Tshs15 billion in 20X2 and Tshs18 billion in 20X3. The working capital in 20X1 was Tshs180billion.

Required:

(a) Estimate the cash flows to equity in 20X2 and 20X3.
(b) What would the cash flows to equity in 20X3 have been if working capital had remained at the same %age of revenue it was in 20X2?

4. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
iv. Asset based and net asset-based measures of value [Learning Outcome a]

Asset based and net asset-based measures of value

The asset-b ased approach is useful when it is applied to tangible assets and to firms in which tangible assets are predominant. The value determined under the asset-based approach tends is more reliable and is generally greater for tangible assets recently purchased in arms-length transactions. Asset based approaches are also appropriate in the case of a firm which has financially not been performing well.

1. Valuation of tangible assets

Assets can be valued at their book value, market value, and replacement value.

Net assets = Total assets - Total external liabilities
Net assets per share = Net assets/Number of equity shares issued and outstanding.

There are three common ways of valuing a firm's assets: **book values, net realisable values and replacement values.**

(a) The **book value of assets** is easily obtained from the financial statements. However, it is unlikely that book values, which are based on historical cost principles, will be a reliable indicator of current market values. The value of non-current assets considers the historical (sunk) costs and arbitrary depreciation. These amounts are not relevant either to the purchaser or the seller. Moreover, the book values of net current assets except cash often need adjustment, e.g. receivables may include amounts pending for long and unlikely to be realised. Some inventories may be slow moving or obsolete.

(b) Net realisable values: This amount represents the amount available for shareholders if the assets were sold off and the liabilities settled. In case the business being sold is a profitable one, then the shareholders may receive more than the net realisable value of the net assets because intangible assets such as goodwill, brands and customer are unlikely to be valued and reflected in the financial statements.

(c) Replacement value represents the alternative cost of setting up a similar business from scratch The value of a successful business using replacement values is likely to be lower than its true value unless an estimate is made for the value intangible assets. Obtaining the replacement cost of a variety of assets of varying ages is difficult. The net realisable value is more useful because it establishes to floor level below which the seller should not accept.

Example

A firm has planned to sell its business. One of the approaches it is considering for valuation is the net realisable approach. The latest statement of financial position of the firm as at March 3, 20X3 is given below

(Amounts in Tshs' million)

	Book value
Assets	
Noncurrent assets	**2000**
Inventory	800
Receivables	650
Cash	500
Current assets	**1950**
Total assets	**3950**
Liabilities	
Share capital	850
Reserves	1300
Net worth	**2150**
Long term debts	850
Current liabilities	**950**
Total liabilities	**3950**

Continued on the next page

Non-current assets contain land and buildings that are valued Tshs800 million higher than the book value, whereas plant and equipment will be sold for Tshs150 million lower than their book value. A prospective customer is willing to buy the entire inventory for Tshs 650 million. It is expected that the firm can collect only Tshs550 million out of receivables. Estimated expenses for valuation and transfer of the business amounting to Tshs150 million have to be provided. The changes to the original figures according to the valuer are entered in the "adjustments" column against their respective heads. A new SOFP, based on the net realisable value is derived. This shows that the shareholders will receive Tshs 2400 million as against Tshs 2150 million reported in its last financial statements.

(Amounts in Tshs' million)

	Book value	Adjustments	Net realisable value
Assets			
Non-current assets	**2000**	800 (150)	**2650**
Inventory	800	(150)	650
Receivables	650	(100)	550
Cash	500		500
Current assets	**1950**	**(250)**	**1700**
Total assets	**3950**	**400**	**4350**
Liabilities			
Share capital	850		850
Reserves	1300	250*	1550*
Net worth	**2150**	**250**	**2400**
Long term debts	850		850
Current liabilities	950	150	1100
Total liabilities	**3950**	**400**	**4350**

*balancing figure

2. Valuing intangibles

Intangible assets usually have the effect of increasing the price a buyer is prepared to pay for an acquisition. Brands, customer relationships, patents and exclusive supply agreements are some forms of intangible assets that give the buyer comfort and confidence over the future earnings of acquired businesses. They are key value drivers in a business. International financial reporting standards (IFRS) recognise this issue and require all assets and liabilities, tangible and intangible, acquired as part of a business combination to be valued to arrive at the residual amount to be attributed to goodwill. When intangibles are recognised, it has an impact on the financial statements, in particular on earnings and the ROI. This is important for companies where an acquisition can have a significant impact on earnings due to a large portion of the purchase price being allocated to goodwill and intangible assets.

Intangible asset valuations can be carried out in a number of ways. Generally, there are three main approaches:

(a) Income valuation: Future earnings that are attributable to the brand or other intangible asset are forecast over its useful life and discounted to its net present value. In order to carry out this exercise, data regarding market trends, the nature and type of competition, the nature of the intangible assets and their relationship with the consumer and so on is necessary.

(b) Market valuation: In the market approach methodology, intangible assets are valued by utilising actual transaction values derived from the sale, license or transfer of similar assets in similar markets. This approach is best if an active market exists that can provide examples of recent arm's length transactions and additional information on their terms and conditions. Transactions are analysed for comparability. Royalty and licensing arrangements can be used to benchmark an appropriate royalty rate.

(c) Cost valuation: The cost approach is based on the principle of substitution. The assumption made is that potential buyers will not pay anything more for an asset than it would cost them to develop or obtain that same asset or an asset with similar utility. The value of intangible assets is determined by adding together all the costs involved in their development. There are two cost approach methods: **reproduction cost and replacement cost**.

Reproduction cost considers the amounts of expenditure necessary to reproduce the same asset with the same features and attributes. It is used in relation to litigation involving patents or when return on investment needs to be measured. The "replacement cost" method, on the other hand, measures the expenditures necessary to develop an asset with similar utility and is appropriate in situations such as determining a target price prior to negotiations or calculating a basis for suitable royalty rates or transfer pricing.

Generally, the income valuation approach is used. This is because it is more realistic and assists in benchmarking fairly reliably, resulting in a valuation which is objective. The resulting values can be used for several purposes, including: compliance with financial reporting standards such as IFRS, IAS and US GAAP, inter-company reporting, tax planning, ROI analysis, licensing arrangements, M and A, brand transactions, dispute resolution and investor relations. Of the three approaches to valuation, the asset-based approach is generally considered to be the weakest from a conceptual standpoint. Another simple method which is used is the **multiplier.** The additional value generated by the intangible assets over and above the value of the firm's tangible assets is attempted to be estimated.

The formula is**:**

Firm value = (book or replacement cost of the real assets) + (multiplier X annual profit or turnover]

The multiplier is negotiated between the parties to compensate for the intangible assets including goodwill.

3. Benefits of valuing intangible assets

Owning and using intangible assets can increase the value of the business by offering several benefits:

(a) Cost advantage: Intangible assets can create a cost advantage, e.g. a new technology developed in house that enables the firm to manufacture a product in less time or cost than a competitor would, creates a cost savings for the firm.

(b) Premium pricing: Intangible assets allow the business to command higher prices, which in turn increase profits. e.g. Ariel can command a higher price for its detergent powder than a generic brand.

(c) Exclusive rights: Intangible assets can provide your business with exclusive rights, e.g. a patent held by the firm for a product or technology prevents competitors from making the same product or using the same technology.

Example

Public health experts in Europe estimate that pharmaceutical companies earned huge amounts of profit over the last decade by aggressively promoting "evergreen" medications to Swiss consumers. "Ever greening" is the term used when a patented drug formula is slightly modified in order to extend the patent period. This cost the healthcare system in Geneva an extra €30m between 2000 and 2008. Drug patents last for 20 years, but much of this time is spent in expensive research and development.

On an average, it takes around 12 years from the time it is developed in the laboratory and $350 million to bring the product to the market. In order to extend the benefits accruing from the patent, pharmaceutical companies use tactics such as "ever greening", or "life cycle management".

(d) Barriers to entry: Intangible assets can either create or barriers to entry. A superior product can overcome the competition or create strong barriers to entry for potential competitors.

(e) Market share: Market share can be increased by leveraging the value of the brand and launching new products under the same brand. The customer recognition of a strong brand can facilitate the introduction of new products and product lines.

Example

Brand extensions have driven a major part of the growth in sales of top brands in the UK, with newly introduced products contributing to nearly two thirds of the sales increase of around £100 million. The growth in the Jack Daniel's brand by 10.4% was almost entirely contributed by the launch of Jack Daniel's Tennessee Honey.

Test Yourself 4

Explain the difference, if any, between discounted cash flow and asset based valuation.

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5. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
v. Options based techniques [Learning Outcome a]

Options based techniques

An option refers to a derivative financial instrument that represents a contract between two parties (the writer of the option and the holder of the option) for a future transaction on an underlying asset at a pre-determined strike price. An option gives its holder the right to buy (call option) or sell (put option) a quantity of a security or any other financial asset in exchange for another, on or before a specified date, at a fixed rate of exchange (the strike rate for the option).

Share options hold a vital position in today's financial market. This is due to the fact that share options are listed in stock exchanges as investment vehicles and companies use these options for business purpose like employee remuneration and hedging of currency.

Types of option used in valuation are as follows:

1. The Black, Scholes, Merton ("BSM") model

The BSM model is a valuation model that uses an equation to arrive at an estimated fair value of the price of the stock. The BSM valuation model includes inputs for the share price of a traded stock, the exercise price, the volatility of the stock and the risk-free interest rate.

The model assumes that the option is exercised at the end of an option's contract period. It also assumes that the expected volatility, expected dividends, and risk-free interest rates remain constant over the option's term. The BSM model was developed to value options traded in an active market and hence, it may not be suitable to value non-trading instruments in an illiquid market.

2. The Binomial option pricing or lattice model

Unlike the Black-Scholes-Merton which is a closed-form model, the binomial option pricing model is a lattice, and provides an estimated fair value based on several successive period's expected changes in the prices of a financial instrument.(A **lattice** is a structure made from wood or metal pieces arranged in a criss-cross or diamond pattern with spaces in between).

The lattice model uses a binomial tree to construct different paths that the company's share can take. The model splits time into discrete points and calculates the expected price based on the different pathways along the binomial tree.

For example, the lattice model can split up time into monthly, quarterly, or annul segments. As the price can move either up or down, a probability is assigned to each of them on the path. Like the BSM model, the lattice model also considers volatility, time to maturity, risk free rate, strike price, share price, and dividends. Valuation experts believe that the binomial tree model provides a more accurate estimate of a share option's fair value

3. The Monte Carlo simulation (MCS) model

Monte Carlo simulations are based on an algorithm that generates random numbers that are used to compute a formula that does not have a closed form. A trial and error method is used in picking up random numbers/events and an assessment is made of the results. This results in a value that approximates the solution.

Drawing random numbers over a large number of times (a few hundred to a few million depending on the problem at stake) provides a fair indication of what the result of the formula would be. This model is extremely complex and expensive to use. As the MCS model is not limited by the number of assumptions which can be built into it, it is viewed as an appropriate model to use for options with multiple varying assumptions.

Explain in brief the Black, Scholes, Merton model.

6. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
vi. Value based management [Learning Outcome a]

Value based management (VBM)

1. Introduction

VBM is a term used to describe an integrated framework of measurement and management tools. It supports the delivery of high-performance results and further develops the strengths of financial measures, such as Economic Value. It does so by considering the perspectives of several stakeholders (customers in particular) who determine the success of the firm. The approach ensures that firms are driven by the objective of creating 'value'.

Definition

Value-based management can be defined as an integrated management control system that measures, encourages and supports the creation of net worth.

2. Features of VBM

Value-based management includes the following elements:

(a) value creation, that is, methods which would result in increasing future value
(b) value management which is concerned with organisational culture, governance, leadership, change management, etc
(c) value measurement.

VBM aims to provide consistency in an organisation's mission, strategic plans, governance modes, culture, communication systems, processes of decision making and performance management, etc.

'The McKinsey Quarterly' journal published in 1994 an article on value-based management which is an excerpt from the book 'Valuation: Measuring and managing the value of companies', second edition. The article explained the concept of value-based management in detail.

Management accounting has undergone extensive change over the last few decades and several new management approaches for improving organisational performance have emerged such as total quality management, value engineering, empowerment, continuous improvement, reengineering,

Kaizen and team building. Some of these management approaches failed to significantly improve performance. Failure in most of the instances was attributable to the fact that performance targets were not consistent with the ultimate value objective (e.g. increasing shareholder value) or they were not clearly stated. Value-based management (VBM) tackles this problem directly. It has coined a new and explicit performance metric: value.

The concept of value-based management (VBM) is very simple. The value of an organisation is determined by the present value of its future cash flows. Value is created only when the return on investment surpasses the cost of capital for an investment. VBM extends these fundamental concepts by focusing on how organisations use them to make both major strategic and everyday operating decisions.

Properly executed, it is an approach to management that aligns a company's overall aspirations, analytical techniques and management processes to focus managerial decision-making on the key drivers of value. Value-based management (VBM) focuses on the management of the organisation holistically. It emphasises the creation of value as defined by the organisation's stakeholders and the priorities set out by management. It functions by implementing strategies and creating value through managing processes, activities, jobs, employees and organisation structure.

It uses analytical methods, financial and non-financial performance measures, computing / communication technology in an integrated framework. A value creation mindset is the essence of value-based management. VBM uses management processes and systems to transform this mindset into action.

The presence of a value creation mindset is indicated by the fact that top management considers value maximisation to be their ultimate financial objective and has clear decision criteria to identify when other objectives (such as environmental goals and employment) should be given priority over the value-based objective. Moreover, top management should have a clear, analytical understanding of which performance variables drive the value of the company.

Management should have a clear understanding of whether focusing on revenue growth or cost reduction will create maximum value and accordingly it should ensure that its strategy identifies the right option and focuses resources in this area. Management processes and systems encourage all levels of managers to behave in a way that maximises the value of the organisation. VBM ensures that planning, target setting, performance measurement and incentive systems are functioning effectively by closely linking the communication in these areas with value creation.

VBM methodology ensures that management clearly understands the performance variables (termed 'key value drivers') that will actually create the value of the business. Such an understanding is essential because an organisation cannot act directly on value. Instead, the organisation must act on those factors which it can influence i.e. customer satisfaction, cost, and capital expenditures and so on. Moreover, it is through these value drivers that top management is able to understand the rest of the organisation and to establish a dialogue about what it expects to be accomplished.

A value driver may be any variable that affects the value of the company. In order to be useful, however, value drivers need to be organised so that managers can identify which have the greatest impact on value and assign responsibility for managing these variables to individuals who can help the organisation meet its targets.

Value drivers must be defined elaborately to be consistent with the decision variables that are directly under the control of line management. Generic value drivers such as sales growth, operating margins and capital turnovers might apply to most business units, but they are not specific and cannot be used effectively at the grass roots level.

3. Pitfalls

Value-based management is not without pitfalls. It can become an isolated exercise that has no effect on operating managers at the front line or on the decisions that they make. Accordingly, the objective of value creation may be defeated.

SUMMARY

Test Yourself 6

Discuss, in brief, the concept of value-based management (VBM).

7. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
vii. Shareholder value analysis [Learning Outcome a]

Shareholder value analysis (SVA)

7.1 Introduction

The shareholder value analysis (SVA) approach was developed by Alfred Rappaport in the 1980s. It is used to estimate the value of the shareholders' interest or stake in a firm. It can also be used as the starting point for formulating and evaluating strategic decisions. The value of the operations of a business is based on the concept of free cash flows and is determined by discounting expected future operating free cash flows at the cost of capital.

To determine shareholder value, the short-term securities and investments must be added to the business valuation, and the debt amounts must be deducted from the business valuation.

7.2 Determining the free cash flow

Free cash flow reflects the cash flow from the operations of a business for a period. It is a measure of how much cash a business generates after accounting for capital expenditures but before considering financing related cash flows such as share issues, borrowings and payment of interest and dividends.

Deriving the free cash flow	
Sales	X
Less: operating costs	(X)
Operating profits	X
Add: depreciation	X
Less: cash paid as tax on profits	(X)
Operating profits after tax	X
Less: investment in fixed capital	(X)
Less: investment in working capital	(X)
Free cash flow from operations	X

7.1 Determining the shareholder value

The value of a business can be determined by estimating the free cash flow for all future years.

The future cash flows are divided into two time periods:

1. cash flows from the specific planned period and
2. cash flows pertaining to the period beyond the planned period.

Thus,

Shareholder value = Business value less debt (at market value)

Business value = PV of free cash flows during planning horizon + PV of free cash flows after planning horizon ("continuing value" or "terminal value"). The discount rate is the firm's weighted average cost of capital (WACC).

7.2 Increasing shareholder value

From the equation given in 7.1, it is clear that the shareholder value can increase either by increasing business value or by reducing debt. Rappaport provides **seven value drivers** that affect shareholder value.

1. **Sales growth rate:** An increase in the annual growth rate in sales revenues during the planning period will improve value as it increases free cash flow.

2. **Operating profit margin:** An improvement in the operating margin turns into profits.

3. **Cash income tax rate:** Any reduction in the tax rate improves shareholder value because a greater amount of cash is conserved within the firm.

4. **Incremental fixed capital investment rate:** If the business needs heavy investments in new capital assets to grow, this will reduce the free cash flows and hence shareholder value. However, it also has the potential to improve future performance and thus free cash flows.

5. **Investment in working capital rate:** Similarly, an increase in investments in inventories and receivables to support growth will result in lower free cash flows. At the same time such increases to support growth can improve cash flows in the future.

6. **Planning period:** If the firm can increase its **competitive advantage period** or the growth over a longer period, it will have more number of years of free cash flows and hence result in a higher business value.

7. **Cost of capital:** This is the rate used to discount future free cash flows. The lower the cost of capital, the higher is the present value of the cash flows and consequently higher is the business value.

In its mission to provide the maximum shareholder value, it becomes imperative for the firm to set these seven drivers as objectives of managerial control mechanisms.

Test Yourself 7

Karatasi Industries is a medium sized firm manufacturing various hand-made paper products. It expects a small level of growth for four years into the future and does not foresee any significant improvement in its operating profit margin. The company has the forecast value drivers as shown in the table given below.

These value drivers are used to forecast future cash flows expected by the company during the planning horizon, which corresponds to its competitive advantage period, as shown in the table. Karatasi has a WACC of 10% and debt with a market value of Tshs850 million. Its sales were Tshs3300 million in 20X3. Determine the shareholder value.

Forecast value drivers	**(Amounts in Tshs' million)**					
	Actual	Planning horizon period				Future
	20X3	20X4	20X5	20X6	20X7	20X8 onwards
Sales growth%	9	9	7	5	3	0
Operating margin%	13	13	13	13	13	13
Sales/net book value of NCA	3	3	3	3	3	3
Working capital investment/sales	15	15	15	15	15	15
Cash tax rate%	35	35	35	35	35	35
Depreciation to net book value of NCA%	7.5	7.5	7.5	7.5	7.5	7.5

7.3 Advantages of shareholder value analysis

1. It provides a long-term financial view, based on which strategic decisions can be made. A comparison can be made on the expected value post strategy implementation with the value before implementation

2. The results are not skewed by the accounting policies adopted by the firm. It, therefore, has a wider applicability across sectors and across national borders.

3. With the help of the seven key value drivers a sensitivity analysis can be made to fine tune the most appropriate strategy. It helps in identifying the critical variables that affect shareholder value.

4. The organisation is forced to focus on the future, its customers and in particular, the value of future cash flows.

7.4 Disadvantages of shareholder value analysis

1. Predicting the variables required in the analysis and estimating the future cash flows are difficult. This can lead to incorrect or misleading assumptions being made in strategic decisions.

2. Development and implementation of the system can be long and complex.

3. Managing shareholder value depends on detailed information as compared to traditional measures.

8. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
viii. Short- and long-term growth rates and terminal values [Learning Outcome a]

Short- and long-term growth rates and terminal values

We have studied that the value of a firm is the present value of expected future cash flows generated by the firm. Growth is a critical component of value in all valuations and therefore, this factor is taken into consideration when an investment decision is made by investors.

There are three basic ways of estimating growth for any firm.

Historical growth rate or the growth in a firm's past earnings. Usually, this is a convenient tool for estimating growth for stable firms. However, there are severe drawbacks in using this growth rate for high growth firms such as technology firms. In case of negative growth in a year, the historical growth rate cannot be estimated accurately. Moreover, it may not be a reliable estimate, especially if the rate of growth cannot be relied on as an estimate of expected future

Equity research analysts usually make a good estimate of growth for a firm and this can be made use of in valuation. But in some sectors, such as technology, the growth estimates, especially over longer periods, are not very reliable. Placing sole reliance on these growth estimates for a valuation can lead to incorrect and inconsistent estimates.

A firm's fundamentals: A firm's growth is essentially determined by the quantum and quality of reinvestments into new assets. An estimation of these factors helps in estimating a firm's fundamental growth rate. In addition, there are elements that are subjective, going into estimating growth such as the quality of management and changes in the external environment.

We shall now discuss the various facets of the historical growth and terminal values, in detail:

1. Historical growth

There are a number of ways to estimate historical growth. The simplest are the
(a) Arithmetic mean and
(b) Geometric mean

Arithmetic mean is an average of the growth rates of the past, whereas the geometric mean refers to the compounding that occurs from period to period.

Example

The following are the EBIT figures of a firm for the last 6 years.

(Amounts in Tshs' million)

Year	EBIT	Change%
20X1	250	
20X2	273	9.20
20X3	295	8.06
20X4	303	2.71
20X5	318	4.95
20X6	327	2.83
	1766.0	27.80

The average growth rate in EBIT for the firm, using arithmetic mean

$$= \frac{27.80}{5} = 5.6\%$$

When the geometric mean is used, we get a growth rate of:

$$= \sqrt[5]{(9.20 \times 8.06 \times 2.71 \times 4.95 \times 2.83)} = 4.8\%$$

A word of caution is needed here. When the value in the first period is negative, the growth rate cannot be estimated. To overcome this issue, we can

Use the next period's value as the denominator
Ignore the negative sign and use the absolute value
Make use of a linear regression model and divide the coefficient by the average earnings

2. The utility of historical growth

As we estimate growth in terms of a percentage the size of the firm gains importance. It is easier for a smaller firm to show high growth in sales and earnings than for a larger, stable one.. Past growth rates may not be good predictor for firms which are rapidly growing, as in such cases, firms may not register high growths.

In spite of this drawback, we can still incorporate information from historical growth into estimates of future growth, by following a few guidelines.

(a) Consider revenue growth, rather than earnings growth to obtain a clue whether the growth rate can be sustained in the future. Revenue growth is more stable than earnings growth and is much less likely to be affected by accounting adjustments.

(b) Instead of considering the average growth over the last several years, look at the growth each year. This is more relevant in order to know the changes in the growth pattern as the firm becomes bigger. This helps when making projections for the future. It is prudent to use historical growth rates for projections only in the next couple of years, since technology is changing rapidly and may affect future estimates.

(c) Look at the historical growth in the industry and that of some peers. This information is useful when predicting the growth rates of the firm.

3. Analysts' growth estimates

Several investors and others rely heavily on the analysts' forecast or expected growth in the EPS over the next five years. However, the analysis and information used in the estimate is very limited and the forecast accuracy is quite low.

Research shows that analysts' long run (i.e. the third year onwards) earnings growth forecasts are less accurate than the forecasts of a naive "Random Walk" model. "Naive model" forecasts contain a lot of incremental information about future earnings as compared to the analysts' long-term forecasts in explaining future actual earnings. The analysts' long run earnings growth forecasts also vary substantially. Therefore, the analysts' long-term earnings forecasts should be used with caution.

Note: a "naive" forecasting model is a time series forecasting model that mostly focuses on the value of the variable in the latest period to forecast a value for the variable in the next period in a time series.

4. The basic determinants of growth

Under the historical and analyst estimates, growth is an exogenous (independent) variable that affects value but is not linked to the operating details of the firm. To make it more practical and useful is to make it endogenous (dependent) variable. In other words, we should make growth a function of the quantum and the quality of the reinvestments that a firm makes. We can estimate the growth of a firm under three situations.

A stable high return on capital that will continue for some time
An increasing positive return on capital over a period of time
A change in the margins of operating income over a period of time

Each of the above points is discussed in turn below:

(a) A stable high return on capital

A firm experiencing a stable return on capital can expect growth in operating income to come from the reinvestment rate, i.e., the proportion of the after-tax operating income that is invested in net capital expenditure and non-cash working capital, and the quality of these reinvestments, measured as the return on the capital invested.

Expected Growth in EBIT = Reinvestment Rate x Return on Capital

where,

$$\text{Reinvestment Rate} = \frac{\text{(Capital Expenditure - Depreciation + change in Non - cash WC)}}{\text{EBIT(1 - tax rate)}}$$

$$\text{Return on Capital} = \frac{\text{EBIT (1 - tax rate)}}{\text{capital invested}}$$

Reinvestment includes amounts incurred on acquisitions, R&D, new systems and initiatives and working capital. The **reinvestment rate** measures the quantum of the investments made from the firm's earnings to generate future growth. The reinvestment rate is often calculated using the latest cash flow statement.

Although this is a sound method, it may not be useful where the quantum of reinvestments tends to vary significantly year on year. In such cases an average of the reinvestments of the last three years or so is more appropriate. For firms that have expanded significantly over the last few years, the historical reinvestment rate may be higher than the expected future reinvestment rate. In this situation an industry average may appear to be a better estimate.

The return on capital is usually calculated on the firm's return on capital on investments already made. The book value of investments is considered to be the capital invested in these investments. The value considered from the books of account may not reflect the actual value because:

(i) It reflects the historical cost of these assets and accounting decisions on depreciation. If the book value of the capital invested is understated, the return on capital increases and when overstated, it reduces. This problem is compounded if the value of R&D efforts and operating leases are ignored.

(ii) The operating income, like the book value of capital, is an accounting measure of the earnings made by a firm during a period. The results are affected by accounting treatments to some items such as promotional efforts on new products. These are treated as an item of expense in the books of account, whereas the benefits may extend to the subsequent years also.

(iii) The return on capital on existing investments may not be the same as the incremental return on capital that the firm may expect on new investments.

Example

The reinvestment rate calculation for two firms is given below:

(Amounts in Tshs' million)

	Alpha	Gamma
Net capital expenditure	3700	1500
Change in working capital, except cash	(700)	(800)
Reinvestment (A)	**3000**	**700**
Adjusted EBIT	4700	4200
Tax rate 30%	1410	1260
EBIT after tax (B)	**3290**	**2940**
Reinvestment rate% (A/B)	**91.2**	**23.8**

Alpha reinvested a substantial amount of 91% of its after-tax operating income while Gamma reinvested about 24% of its after-tax operating income. These figures change significantly from year to year.

(b) Increasing positive return on capital

If the return on capital changes over time, an increase in return on capital will increase the expected growth rate of the firm and vice versa.

$$\text{Expected growth rate} = ROC_t \times \text{Reinvestment rate} + \frac{(ROC_t - ROC_{t-1})}{ROC_{t-1}}$$

Example

A firm currently has a rate of return on capital (ROC) of 13%. The previous year it was 10%. Its reinvestment rate remains the same at 55%. Its expected growth rate will now be

$$= 0.13 \times 0.55 + \frac{(0.13 - 0.10)}{0.10} = 7.15\% + 30\% = 37.15\%$$

In effect, the improvement in the return on capital translates into an additional growth of 30% for the firm.

Firms that are likely to see their return on capital change over time include firms with record of poor returns on capital. When they improve their operating efficiency and margins, their return on capital improves significantly. In these firms, the expected growth rate will be much higher. Since the return on capital on these firms is low before the changes, even a small increase in the ROC results in a sharp increase in the growth rate.

What types of firms are likely to see their return on capital change over time? One category would include firms with poor returns on capital that improve their operating efficiency and margins, and consequently their return on capital. In these firms, the expected growth rate will be much higher than the product of the reinvestment rate and the return on capital. In fact, since the return on capital on these firms is usually low before the turn-around, small changes in the return on capital translate into big changes in the growth rate. Thus, an increase in the return on capital on existing assets of 1% to 2% doubles the earnings (resulting in a growth rate of 100%).

The other category would include firms that have very high returns on capital on their existing investments but are likely to see these returns slip as competition enters the business, not only on new investments but also on existing investments.

As new competitors enter an industry, the existing firms that have very high ROC may experience a drop in the returns. This drop will be experienced both in new and existing investments.

(c) Change in operating margins over a period of time

For firms that have been incurring losses, the reinvestment rate may also be negative. To estimate the growth rates in such firms seeking a turnaround, initially the revenue growth has to be estimated. A forecast is then made of the operating margins for the future. In case the expected margins in future years are positive, the operating income will also turn positive, facilitating the use of traditional valuation approaches in valuing these firms. The reinvestment rate should be estimated to know the quantum of reinvestment needed to generate revenue growth.

The rate of growth in revenues will decrease over a period of time. A firm with a turnover of Tshs200 million can easily grow to Tshs2000 million. But for a large firm having a turnover of Tshs100 billion, a tenfold growth will be difficult

5. Sales growth forecasts

The effect of compounded growth rates in revenues over time can be huge, even though the annual rate of growth appears to be low. While projecting growth rates, the growth in market shares must also be kept in mind. If the projected growth leads to a very high market share, say 80%, there must be a rethink on the numbers. There must be an alignment between revenue growth and operating margins. A firm trying to grow aggressively and achieve high market shares cannot expect to be successful by simultaneously projecting high margins.

A comprehensive set of assumptions is needed regarding the nature of competition, capacity constraints, resource constraints and so on.

6. Operating margin forecasts

For firms to generate value, the higher revenues have to result in positive earnings. For this to be happen, positive operating margins must be achieved in the future. Although for a start-up firm, the operating margins may be initially negative, it cannot continue in that mode for long. The operating margin must become positive as it matures. One way of estimating the margin is to consider the industry margin as a starting point. The firm has to make plans to improve the margins from the current to the one desired level.

Usually, improvements in margins are higher in the initial years and then decline as the firm reaches a stable (maturity) stage.

7. Sales to capital ratio

A one- time investment in the business is not adequate for a firm to achieve continuous growth. Firms have to invest to generate both revenue growth and positive operating margins in future years. The investment can be in tangible assets such as plant and equipment, acquisitions of other businesses, research and development and investments in logistics, marketing and additional working capital.

The sales-to-capital ratio provide a simple way to assess the incremental investment needs to achieve the projected revenue growth. The reinvestment needs in any year is estimated by dividing the projected revenue growth (in value) by the sales to capital ratio.

To estimate the sales to capital ratio historically, the change in revenue each year is divided by the reinvestment made that year. Another way is to consider the industry average ratio of sales to book capital invested.

Example

Metro Projects Ltd expects its revenues to grow by Tshs 20 billion. It has a sales-to-capital ratio of 3.5.

Therefore, the firm would need to reinvest 20/3.5 = Tshs 5.71 billion if it wants to achieve the targeted sales increase.

One way of knowing whether the sales to investment ratio is either under or overestimated the corresponding return on capital for the year can be observed. If this is consistent or increasing, the investments are adequate.

8. The terminal value

We have already discussed the concept of terminal value earlier. We know that a firm potentially has infinite life. However, we cannot make a forecast for such long periods. Iif we do not consider the results of the long term operations, it would imply that the firm discontinued operating at the end of the projection period. As it is not practical to estimate cash flows forever, the usual practice is to estimate cash flows for a “growth period” until it reaches the stable stage and then add an estimated terminal value that captures the value at the end of the period

The terminal value can be identified in two ways:

(a) Liquidation value: it is very useful when assets are discrete and marketable.

(b) Multiple approach: It is easy to use. However, this makes it a relative valuation. Multiplier of some income or cash flow measure, such as net income, net operating profit, EBITDA, operating cash flow or free cash flow can be used. The choice of the multiple depends upon how comparable firms are valued by the market. Multipliers based on a recent sale or acquisition of a comparable business can prove useful.

Example

Seko Tech was set up a few years ago. Its business is likely to stabilise five years from now. In year 5 it has projected a free cash flow of Tshs 32.500 billion and a price to free cash flow per share of 16.

The terminal value of the firm at the end of year 5 is Tshs 32,500billion X 16 = Tshs 487.500 billion

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9. Stable growth model: This is the best approach and technically, the soundest. However, several assumptions such as when the firm reaches a stable state, the excess returns that it may earn during the period rate and that it can sustain such growth forever have to be made.

When a firm’s cash flows grow at a constant rate perpetually, the present value of those cash flows is:

$$\text{Value} = \frac{\text{expected cash flow next period}}{(r - g)}$$

where,

r = discount rate (cost of equity or cost of capital)
g = expected growth rate

This constant growth rate is the stable growth rate). This rate cannot be higher than the rate of growth of the economy in which the firm operates. In case the stable growth rate is negative, the terminal value will be lower, and the firm will cease to operate over time.

In case a firm reaches the stable growth stage, the formula to estimate the terminal value of the cash flows beyond that point is used.

Test Yourself 8

The following information about Nero Ltd is available:

Normalised EBIT is Tshs 600 million; the tax rate is 35%. The long-term growth rate projected for the company is 3% and the WACC is 13%. The expected return on new investments is 16%.

Required:

Calculate the terminal value.

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9. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
ix. Economic profit methods [Learning Outcome, a]

Economic profit methods

An economic profit method is more popularly known as the **"economic value added" (EVA)**. EVA is trade marked by Stern Stewart, a consulting firm in the U.S. and is a tool to measure the financial performance of an organisation. As it is trademarked, the generic term "economic profit" method is used instead. EVA^{TM} is one of the most popular measures that have been developed which align the interests of equity shareholders with organisational performance.

Definition

Economic profit is calculated by deducting a capital charge from the adjusted operating income. The basic premise of economic profit is that, only when the profits exceed the cost of capital , the managers' actions add economic value.

The concept of EVA^{TM} is quite similar to the concept of residual income (RI) used in traditional accounting system. Like the RI, the EVA^{TM} is an excellent indicator of performance.

The primary goal of an organisation is to maximise shareholder value. The economic profit or EVA^{TM} is a managerial tool used for measuring the "value added" to the shareholders' worth by the business.

EVA^{TM} = Net Operating Profit After Tax (NOPAT) - cK

where:

NOPAT = Operating Profit – Taxes
c = weighted average cost of capital
K = capital employed

Since the economic profit is a measure of surplus value created on an investment, another way to present the value-added equation is:
(return on capital - cost of capital) (capital invested in the project/firm)

Where:

the return on capital (ROC) is the "true" cash flow return on capital earned on an investment the cost of capital is the weighted average of the costs of the different financing instruments used to finance the investment (WACC)

9.1 The basic premise of EVA™

Businesses are expected to create value for their investors. Investors expect a minimum level of profitability, called the capital charge. Capital charge refers to the average of the equity returns on equity markets. With diversified, long-term equity market investment, investors can easily earn this return.

Earning lower returns (in the long run) than the capital charge is economically not acceptable (especially from a shareholders' perspective). Investors can also take their money away from the firm since they have other investment alternatives.

Example

Adjustments required for calculating EVA™

NOPAT is arrived at after making certain adjustments to the accounting profit. Also, certain changes are required to calculate the correct WACC.

The most common adjustments made to accounting profit and capital employed for calculating EVA™ are:

Particulars	Accounting profit	Capital employed	Reason
Non-cash expenses charged to SOCI	Add back	No effect	NOPAT is the earnings that a company can distribute among providers of funds.
Intangibles such as advertising, research and development	Add back	Add	Funds spent on intangibles can be considered discretionary spending by management. These funds could have been used to pay dividends or to reduce the amount of debt in the firm's SOFP.
Depreciation / Amortisation / Goodwill	Add back. Accounting depreciation must be added back and economic depreciation must be deducted.	Add the cumulative amount of depreciation / amortisation / goodwill charged on the assets in use.	Management, instead of acquiring assets, could have repaid the funds to the shareholders. Economic depreciation must be deducted because it represents the funds actually consumed by the business.
Provisions such as for bad and doubtful debts, deferred tax.	Add back	Add	They are charged to the net profit due to the conventional accounting practices. Provisions undermine the reported net profit and reduce the amount of capital employed.
Interest	Add	Add debt and leases to net assets	Non-addition of debt will affect the managers' decision on the capital structure of the firm. The managers will substitute equity capital with debt capital to increase the EVA™.

Example

From the following information on Select Ltd, calculate the NOPAT as adjusted for EVA.

	Tshs' million
Sales revenue	80.0
Less: Operating costs	(48.0)
Less: Interest costs	(2.0)
Earnings before tax	30.0
Less: Tax @35%	(10.5)
Earnings after tax	**19.5**

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Answer

NOPAT as adjusted for EVA

	Tshs' million
Sales revenue	80.0
Less: Operating costs	(48.0)
Earnings before interest and tax	32.0
Less: Tax @35%	(11.2)
Operating profit after tax (as adjusted)	**20.8** (i.e. NOPAT for the EVA calculation)

Example

Calculation of EVA™

Eagle Telecommunication System (ETS) is a manufacturer of well-known branded mobile phones, L75 and L89. ETS is considering evaluation of the management's performance. The following information has been extracted from the records maintained by ETS.

Statement of profit or loss (income statement) for the year ended 31 December 20X8

	L75 Tshs' million	L89 Tshs' million
Sales revenue	675	825
Less:		
Cost of sales	219	268
Administration expenses	20	25
Selling and distribution expenses	27	33
Goodwill written off R & D	53	65
expenditure Advertisement	81	-
expenditure Interest	88	100
payable	11	18
Profit before tax	**176**	**316**
Income Tax (30%)	(53)	(95)
Profit after tax	**123**	**221**

Statement of financial position (Balance Sheet) as at 31 December 20X8

	L75 Tshs' million	L75 Tshs' million	L89 Tshs' million	L89 Tshs' million
Non-current assets		445		625
Current assets:				
Receivables	200		280	
Inventory	300		420	
	500		700	
Less: Current liabilities				
Payables	(225)		(316)	
Net current assets		**275**		**384**
Long term loan		(127)		(175)
Net assets		**593**		**834**
Shareholders' funds				
Share capital (Tshs1500 per share)		440		550
Reserves		153		284
		593		**834**

Continued on the next page

Other information is provided as below:

1. Rate of corporation tax is 30%.
2. Rate of interest on long term loans (before tax) is 12% and cost of equity is 18% in 20X8. Capital structure is 60% equity and 40% debt.
3. Economic value of research and development expenditure for L75 is Tshs 155 million. The advertisement expenditure for L75 and L89 is Tshs million105 and Tshs million250 respectively.
4. 100% of goodwill written is off against reserves on an acquisition made by the company in 20X8.
5. Current market value per equity share is Tshs 3000.

Required:

Calculate the Economic value added (EVA) of ETS for 20X8 stating your assumptions clearly.

Adjusted statement of profit or loss (income statement) for the year ended 31 December 20X8

	L75 Tshs' million	L89 Tshs' million
Profit before tax	176.00	316.00
Add back:		
Goodwill written off	53.00	65.00
R & D expenditure	81.00	
Advertisement expenditure	88.00	100.00
Interest payable	11.00	18.00
	409.00	**499.00**
Less: Taxation	56.30	100.40
Adjusted profit	**352.70**	**398.60**

Note:

Model L75

Tax on interest payment Tshs million3.3 (Tshs million11 x 30% = Tshs million3.3) is deducted from the profit before tax. Therefore, the total tax paid is Tshs 56.3million (Tshs 53million + Tshs 3.3million) deducted from profit before tax.

Model L89

Tax on interest payment Tshs 5.4million (Tshs 18million x 30% = Tshs 5.4million) is deducted from the profit before tax. Therefore, the total tax paid is Tshs 100.4million (Tshs 95million + Tshs 5.4million) deducted from profit before tax.

Adjusted capital employed for the year ended 31 December 20X8

	L75 Tshs' million	L75 Tshs' million	L89 Tshs' million	L89 Tshs' million
Shareholders' funds				
Share capital		440		550
Reserves		153		284
		593		**834**
Add:				
Long term loan	127		175	
Goodwill	53		65	
R & D expenditure	155		-	
Advertisement expenditure	105		250	
		440		490
Adjusted capital employed		**1,033**		**1,324**

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Weighted average cost of capital is calculated as follows:

Weighted average cost of capital	L75 Tshs' million	L89 Tshs' million
Market value of equity (note)	880	1,100
Market value of debt	127	175

Share capital (Tshs1500 per share), given in question = Tshs 440 million
Number of shares = Tshs million 440/1500 = 293,333 shares
Current market price per share = Tshs3000

Therefore, the total market value of equity = 293,333 shares x Tshs3000 = Tshs 880 million
By applying the same method, you can calculate the market value of equity for L89 which is Tshs million1,100

$$\text{WACC} = \frac{V_e}{V_e+V_d} K_e + \frac{V_d}{V_e+V_d} K_d(1-T)$$

Where K_e = Cost of equity
Kd = Cost of debt
Ve = Market value of equity
Vd = Market value of debt
T = Corporate taxation

For model L75

$$\text{WACC} = \frac{880}{880+127} * 18\% + \frac{127}{880+127} 12\%(1-0.30)$$

WACC = (0.8739 x 0.18) + (0.1261 x 0.084)

= 16.79%

For model L89

$$\text{WACC} = \frac{1100}{1100+175} * 18\% + \frac{175}{1100+175} 12\%(1-0.30)$$

WACC = (0.8627 x 0.18) + (0.1373 x 0.084)

= 16.68%

Alternatively, one can calculate WACC using the 60:40 capital structures as given. It will be accepted. The observations may change due to this.

Economic value added:

Model L75

EVA = Adjusted profit - (Adjusted capital employed x WACC)

= Tshs 352.70million – (Tshs million1,033 x 16.79%)
= Tshs 179.26million

Model L89

EVA = Adjusted profit - (Adjusted capital employed x WACC)

= Tshs 398.60million – (Tshs million1,324 x 16.68%)
= Tshs 177.76million

Continued on the next page

Note: the following adjustments are made while calculating adjusted profit and capital employed:

The goodwill of Tshs 53million and Tshs 65million is an investment in the future and adds value to the company, therefore it is added back to the profit before tax and added in the capital employed.

Since research and development expenditure of Tshs 81million is a capital expenditure, it is added back to the profit.

Advertisement expenses of Tshs 88million and Tshs 100million are added back to the profit because these are investment expenses and related to the acquisition of assets.

R & D expenditure and advertisement expenses are of a capital nature and these are incurred for future benefits. Therefore, the economic value of this expenditure is added in the capital employed.

Interest payable is considered in calculation of notional interest charge. If it is deducted from the profit available for the shareholder as an expense, double effect will be given. Therefore, it is added back to the profit.

9.2 Assessing corporate performance using EVA™

Although usually used to measure corporate performance from the viewpoint of shareholders, the EVA™ can also be used as a yardstick to measure the performance of individual managers / departments on frequent basis. EVA™ allows the lenders of funds to determine how efficiently the managers are using the funds provided by them. The higher the EVA™ during any period, the better the job managers are doing in using the capital to create additional value.

It can be said that a manager / division / company failing to generate EVA™ (i.e. when the NOPAT is less than the cost of capital employed) has failed to create any value for its shareholders.

Example

Radiant Inc has two divisions, division S and division M, which are managed by two different managers. The following information is related to their performance for the year ending on 31/12/20X0.

	Division S Tshs'000	Division M Tshs'000
Total operating assets (as on 31/12/20X0)	100,000	80,000
Revenue	107,000	90,000
Expenses	87,000	70,000

The minimum rate of return on investments for Radiant Inc is 12.5%.

The applicable corporate taxation rate is 35%.
Expenses include interest payable on 10% debentures worth Tshs50,million in division S and interest payable on an 11% loan worth Tshs10 million in division M.

EVA™ can be used to measure the performance of the managers.

NOPAT and adjusted capital employed are required to calculate EVA™.

Details	Division S	Division M
	Tshs'000	Tshs'000
Revenue	107,000	90,000
Less: Operating expenses	82,000	68,900
Earnings before tax (EBT)	25,000	21,100
Less: Taxation @ 35%	8,750	7,385
NOPAT	16,250	13,715

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EVA^{TM}

For division S

EVA = NOPAT – cost of capital
= Tshs' million16.250 (100.000 x 12.5%)
= Tshs' million16.250 – Tshs' million12.500
= Tshs' million 3.750

For division M

EVA = NOPAT – cost of capital
= Tshs' million13.715 - (80.000 x 12.5%)
= Tshs' million13.715 – Tshs' million10.000
= Tshs' million3.715

Conclusion

According to EVA^{TM}, division S is performing better than division M.

9.3 Advantages and disadvantages of EVA^{TM}

1. Advantages of EVA^{TM}

(a) EVA^{TM} is a true indicator of the actual wealth created for the shareholders by the company. This is because this method calculates the value of an organisation after considering a charge for the use of capital made by that organisation. Therefore, it is a better measure of divisional performance.

(b) Since it does not take figures directly from the accounting information but instead makes certain adjustments to the calculation to make it more justifiable, it is a good measure for performance evaluation.

(c) The decision taken is based on the cash flows and therefore there is a lower possibility of the decision being affected by the accounting policies.

(d) It is simple to understand and therefore widely used.

(e) It is widely used to evaluate the performance of managers and divisions.

2. Disadvantages of EVA

(a) It is complex to calculate. This is because it does not take the figures of profit and cost of capital directly from the accounting information, but instead makes certain adjustments to these figures.

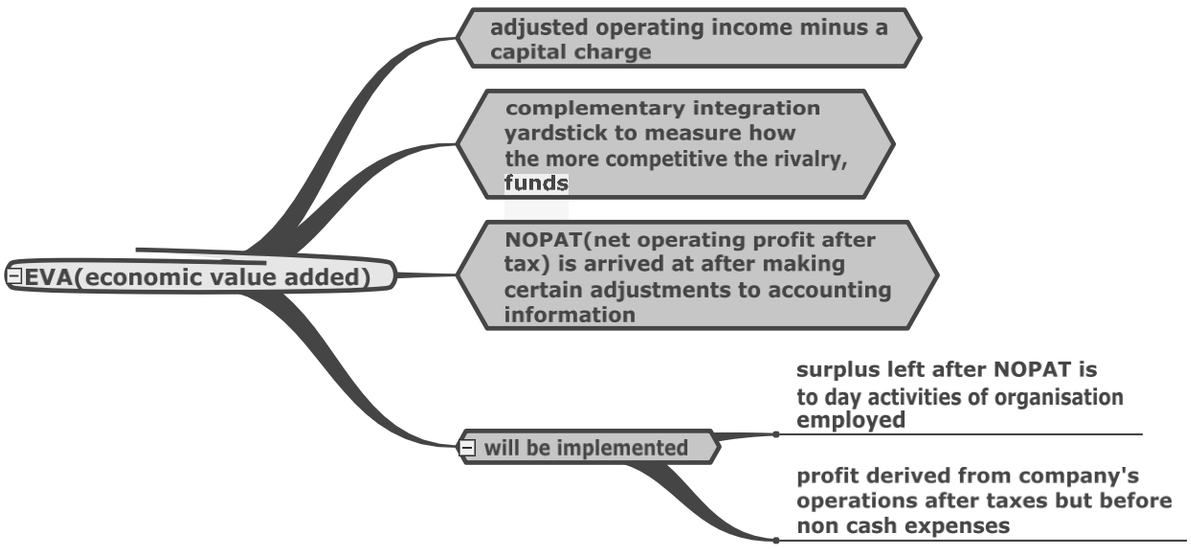
(b) Since the decision taken is based on historical information, it does not consider the future flow.

(c) EVA^{TM} uses CAPM to estimate the weighted average cost of capital, which itself is based upon various assumptions which may not hold true in reality.

(d) EVA^{TM} is not good for comparison since it does not consider the size of the organisation / division.

(e) EVA^{TM} is a calculation of historic value addition and does not take into consideration the future flows and other estimates. Therefore EVA^{TM} cannot be used to make decisions about the future.

SUMMARY



Test Yourself 9

The following are the details from the income statements (SOCI) of division Select and division Choice for the year ending March 20X7.

	Tshs'000	Tshs'000
Sales revenue	100,000	120,000
Operating cost	64,000	75,000
Interest cost	6,000	10,000
Capital invested (including debt)	122,000	150,000

WACC 10% 12.5% Rate of
corporate tax 40% 44%

(Assume that the economic and accounting depreciation are the same.)

Required:

Calculate NOPAT as adjusted for EVA and EVA for both the divisions.

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10. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
x. Cash flow return on investment [Learning Outcome a]

Cash flow return on investment

The long-term value, or intrinsic value, of an equity stock is primarily determined by a firm's ability to generate growing cash flow on a sustained basis. The key to investment success is to have a sound, disciplined means of analysing and monitoring cash flow growth. The cash flow return on investment (CFROI) has become a popular value-based management technique.

One of the reasons for its popularity is the fact that all the information needed to calculate CFROI is available publicly in the published financial reports. The fact that it is adjusted for inflation allows for a more realistic comparison over time.

Unlike the traditional methods of valuing a firm based on corporate performance and earnings, the CFROI uses the cash flows of the firm to value it. This rate of return measure compares the cash generated by a firm and the cash invested in it. It is the internal rate of return the firm earns on its existing investments, based on real cash flows. This is compared to the cost of capital to determine whether the firm is adding value.

We calculate the CFROI for a firm using four inputs.

1. The **gross investment (GI)** the firm has in its existing assets. This is arrived at by adding back accumulated depreciation, operating leased assets and similar off SOFP assets, and net deferred tax assets to the book value of the assets. It is also adjusted for inflation.
2. The **gross cash flow (GCF)** earned in the current year on that asset. This is the sum of the after-tax operating income of a firm and adjustments for the rentals on operating leases and rent expenses.
3. The **expected life of the assets (n)** in place at the time of the original investment, which reflects the earning life of the investments in question.
4. The **expected salvage value (SV)** of the assets at the end of this life (including land, buildings etc), calculated at current values.

Example

A firm had Tshs100 billion worth of assets. If it consistently generated Tshs10 billion in cash flow annually, its CFROI would be 10%. If the asset was 10 years old and had been depreciated on the firm's SOFP (balance sheet) to a Tshs50 billion value, the return would double to 20% (10billion/50billion). This would not be a true reflection of the return that would be generated if the asset had been added at today's cost

10.1 Calculating the CFROI

The steps to be followed in determining the CFROI of a firm are:

1. Determine the average life of the asset remaining. Then convert the accounting profit to real operating cash flow for the period (actual / forecasts) by adjusting for non-cash and non-operating items.
2. Adjust the SOFP (balance sheet) values of assets to their full historical by adding back the accumulated depreciation. This figure is the historical cost. The assets at historical cost are multiplied by an appropriate inflation factor to arrive at the current cost of the assets. Any off-balance sheet assets, such as operating lease assets are added to give "gross assets at current cost".
3. Determine the rate of return (IRR) at which the present value of the projected real operating cash flows, plus the terminal value of non-depreciating assets (land and working capital), would equal the gross asset value calculated in step two.

The CFROI in excess of a firm's cost of capital indicates that the firm has created shareholder value. Usually the CFROI is calculated each year and the trends are analysed over a medium-term period.

Test Yourself 10

Information extracted from the forecasts of Agin Industries for the next year, 20X4 are:

	Tshs' billion
Net Income	110
Depreciation	30
Interest Expense	10
Rental Expense	5

The net income in the subsequent four years is expected to be 140,180, 155 and 125 (all in Tshs billion) respectively. The other adjustments will remain unchanged over the years. Other data related to the assets are also given below. The column "adjusted for inflation" provides the current values of the respective assets.

	Tshs' billion	
	Historical	Adjusted for inflation
Monetary current assets	175	175
Inventories	98	75
Land	50	85
Gross plant assets	348	170
Leased property	80	80
Non capitalised assets (current)		210

Required:

Calculate the CFROI. If the firm's cost of capital is10%, is the firm creating value for its shareholders? The expected salvage value of land and other assets at the end of year 5 is Tshs210 billion

10.2 CFROI and valuation

Apart from being a measure of performance, CFROI can also be used to determine the value of a firm. It is based on the model developed by Modigliani and Miller. The value of a firm comprises the sum of:

1. The present value of cash flows from existing assets

Investments already made in the firm for assets have a finite life. The cash flows from the use of these assets will "wind down" over the productive life of the assets. If the firm wants to survive, it has to reinvest in newer assets to continue growth.

2. The present value of cash flows from future investments

The value of future investments is dependent on the rate of return on incremental investments and the rate of growth in assets. Incremental assets which generate cash flow returns greater than the cost of capital create value for the firm and generate a positive value of future investments. Existing assets of a firm have a finite life. The cash flows from these assets reduce over the life of the depreciating assets CFROI determines the contribution to value made by existing assets by breaking down the asset base into several discrete projects and calculating the respective cash flows of each project. Therefore, the present value of existing assets is a function of the CFROI, the invested capital base, the historic growth in the asset base, the balance asset life, the proportion of non-depreciating assets and the cost of capital.

The same principle is followed in the valuation of future investments. The cash flows depend on the incremental cash flow returns generated by an increase in the asset base. The rates of return and growth depend on the competitive lifecycle and mean reversion. A firm whose CFROI is higher than average, will gradually **fade** toward the market norm because of competitive pressures. The **rate of fade** is determined partly by the volatility of the company's historic CFROI levels. Firms earning below the average will be forced to **fade back up** to the average because investors will not support firms with below average returns. In the absence of the much-needed capital, these firms will either have to restructure and grow or go out of business.

These principles enable the firm to forecast returns and growth. The discounting rate applied to find the present value of future investments depends upon the incremental returns, the growth in the asset base, the fade rate and the fade period of returns and growth.

The CFROI approach to forecasting returns and growth enables the firm to surmount the drawbacks of most DCF models where the assumptions on the terminal value changes the valuation significantly.

10.3 Advantages of CFROI

1. CFROI compares the cash flows after adjusting for inflation with the inflation-adjusted gross cash investment. It is neither distorted by the effect of inflation nor by depreciation.

2. Unlike most measures, it takes into account the economic life of the firm's depreciable assets and a residual value of all other assets.

3. CFROI and ROI are expressed in percentages. However, unlike ROI, CFROI overcomes the distortions created by the accounting treatment as it is based on cash flows. Moreover, CFROI takes considers the present value of money, inflation adjustments, and depreciation charges, whereas ROI does not.

4. Both EVA and CFROI motivate management to create value by earning returns on invested capital that are greater than the cost of capital.

5. Comparisons of firms with varying asset structure, including international companies are possible. As it is adjusted for inflation, comparisons over time are also possible.

6. It can be used to value private firms and strategic business units.

10.4 The drawbacks of CFROI

1. CFROI is very complex to calculate.

2. As it uses the IRR, the arguments against IRR also apply here.

3. Determining the appropriate inflation adjustment to apply to assets necessitates an estimation to be made of the average age of assets and an inflation factor.

4. The time period to determine the life of assets over which CFROI is calculated, is subjective

11. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
xi. Total shareholder return [Learning Outcome a]

Total shareholder return (TSR)
Total shareholder return or "holding period return" (HPR) as it is sometimes called, is the return a shareholder earns over a specified period of time. **Board members, the managers, analysts and investors** regularly look at total returns to shareholders as an important metric of value creation. Many investors consider only the stock price movements without taking into account the value of dividends which have been paid.

Total shareholder return (TSR) over a period is defined as the net stock price change plus the dividends paid during that period. Even though it may be possible for a stock to show a reduction in the market price over a period, say a year, it could still show a positive total shareholder return in case the dividend paid exceeds the decline in the share price. At times, however, many companies do not pay high dividends and the yields are low. In such cases, it is the share price which drives the TSR.

Definition

TSR over a period

$$= \frac{\text{Stock price end of period - Stock price beginning of period + dividend paid}}{\text{Stock price beginning of period}}$$

TSR is therefore, the annualised return to shareholders, including all stock price changes and reinvestment of dividends. It includes the effect of bonus issues and splits. This figure is calculated pre-tax

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The returns are calculated without reference to the sales or profits of the firm. TSR is a result of capital gains on shares and dividends.

Example

An investor bought 100 shares of Rubicon Metals @ Tshs1560 per share on April 1 20X3. During the year, he received a dividend of Tshs135 per share. On March 31, 20X4, the price of Rubicon on the Dar es Salaam stock exchange was Tshs1775. Calculate the TSR for the year.

$$\text{TSR} = \frac{(1775 - 1560) + 135}{1560} = 22.44\%$$

The TSR can be broken into its two components, the capital gain and the dividend yield.

$$\text{Capital gain} = \frac{(1775 - 1560)}{1560} = \frac{215}{1560} = 13.78\%$$

$$\text{Dividend yield} = \frac{135}{1560} = 8.65\%$$

11.1 Treatment of dividends
The manner of treating dividends in the calculation of TSR is an important issue. As soon as the ex-dividend period begins, the share price drops to adjust for the dividend. As the next dividend date comes nearer, the share price may gradually rise in anticipation of the dividend.

The four dates one has to remember in relation to dividends are:

1. Declaration date

The date on which a dividend payment is announced by a firm is known as the declaration date. The declaration is usually done via a press release, a few weeks before the actual payment of the dividend.

2. Ex-dividend date

After the record date (explained below) has been determined, then the ex-dividend date is determined, which is a couple of working days before the record date.. In case an investor purchases share prior to the ex-dividend date, he is eligible to receive the dividend payment. However, if he buys the shares on or after the ex-dividend date, then he cannot expect to receive the dividend just announced.

3. Record or closure date

The record date is the date on which the company freezes the transfer of shares in order to finalise the list of investors who appear as shareholders in the company's books. Investors appearing in the members' register will be entitled to receive the dividend.

4. Payment date

This is the date on which the company pays dividend to the shareholders listed in the members' register on the closure date. It is necessary to ensure that the ex-dividend date is considered for calculation of the TSR and assume that dividends are re-invested on the ex-dividend date, as it is the date that a dividend is crystallised. The term, "dividend" is used to refer to not only regular dividend payments but also special payments. Examples of such payments include buyback of shares and any cash payments to shareholders.

11.2 Managing high TSR

We know that the main objective of an enterprise is to maximise the enterprise wealth and as a consequence, shareholder wealth. It is not the maximisation of profits that is important. It is easy to understand that when a firm follows a strategy that results in a high TSR growth over a period, it is in fact maximising shareholder wealth. The firm constantly is on the lookout for strategies, plans, ideas and opportunities that will help increase the company's **warranted** value per share.

Attempts to maximise earning per share (EPS) either in the short or the long term is not a wise path to follow. However, when a firm tries to manage a high TSR performance, it automatically ends up in a high EPS growth for the firm. This is made possible because a lot of management time and resources are invested in value-creating efforts. This results in greater competitive and financial strength and ensures that the firm's future is secure.

11.3 TSR and executive compensation

As TSR is an important metric for investors to rate an organisation's performance, it is not surprising that it has become a fundamental metric for a "pay for performance" executive compensation system in several organisations. Pay and performance are aligned when total compensation is both, comparable to competitors and sensitive to performance. Paying high compensation to managers paid does not necessarily mean they are overpaid. Many a time, it is not the level of pay that is a problem but its lack of alignment with performance. The yardstick to measure performance is a sustained TSR.

After the long period of global economic crisis, shareholders are keen that organisations have a closer link between executive pay and performance compared to what is provided by traditional stock options or time-vested restricted stock. However, an equity vehicle becoming very popular in many countries and especially the US is the **Relative Total Shareholder Return** (R-TSR). These plans are performance-based equity awards that link pay-out to the company's share price return vis-*à*-vis a set of comparable companies.

A good Relative TSR plan:

1. Does not emphasise much on the immediate increase in the share price as compared to the traditional stock options. It lays more emphasis on a sustained performance over a period of time (e.g., 30-90 day average stock price)
2. Does not affect the executive adversely unlike the traditional stock options. It is not dependent on the price of the firm's share alone but is related to the performance of peer firms. The pay-out may be reduced not by the reduction in the firm's share price but only if the rate of the share price decline is greater than the comparable firms in a falling market.
3. Supports a high pay-for-performance by aligning it to a KPI, which is to be equal to or be higher than the comparable firm's share returns
4. Is very transparent as it makes use of publicly available daily share price closing data. There is no subjectivity involved
5. Is very easy to account for.

11.4 The advantages and drawbacks of TSR

1. Advantages

(a) TSR is an easily understood figure of the overall financial benefits generated for shareholders.

(b) The figure can be interpreted as a measure of how the market evaluates the overall performance of a company over a specified period.

(c) As it is a relative measure, expressed as a percentage, the figures are readily comparable between firms operating in the same industry.

(d) A relative TSR can be integrated into the executive performance and compensation plan. This acts as a great motivator for the managers to achieve a sustained growth over the years.

2. Disadvantages

1. TSR ignores the risk associated with the growth and investment, e.g. a company might decide to take very high risks in order to achieve a high return. Another firm, however, might pursue a path of not taking many risks and earn a lower return. Comparisons in such cases are difficult. The evaluation depends upon the risk attitudes of the shareholders.

2. TSR calculations are possible only at the company level, but not for measuring the divisional performance.

3. The calculation does not take into account the future performance and is not "forward looking". It only reflects the past overall return to shareholders.

4. TSR is externally focused as it only considers the market's perception of performance; it is therefore, subject to adverse impacts if the share price of a fundamentally strong company falls sharply in the short term.

5. The results depend very much upon the base year (for the opening share price) being considered. A low opening share price skews the performance significantly. Even a moderate improvement in the share price, appears to be a very high level of performance in percentage terms.

Example

The current market price of an equity share of Matunda Industries is Tshs1267. A year ago the price was Tshs 1010. There were no dividends paid during the year.

In this case the TSR is $\frac{1,267}{1,010}$ = 25.4%.

The share price of another company in the same industry is Tshs 5074. A year ago, it quoted at 4375. Ignore dividends.

The TSR in this case is $\frac{5,074}{4,375}$ = 15.98%, although the share price has increased by Tshs 699 as compared to Tshs 257 of Matunda.

Test Yourself 11

Andrew Chiligati is an avid investor. He has been following his investment in 100 shares of NYPar, a German firm which went public in March of 20X1. When he purchased his 100 shares, at a price of €20.00 per share, the euro was trading at Tshs 1949/€. Currently the share is trading at €28.00 per share, and the Tanzanian currency has fallen to Tshs2152 /€. As the company is focused on growth, it has preferred to plough back its profits and has therefore, not paid any dividends.

Required:

(a) If Andrew sold his shares today, what is the change (in percentage) in the share price he would receive? (b) Calculate the percentage change in the value of euro versus the Tanzanian shillings over the same period. (c) What is the total return that Andrew earns on his shares if he sold them at these rates?

12. Evaluate and assess the value of businesses and shareholder value giving advice based on business scenarios using:
xii. Market value added [Learning Outcome a]

Market value added

A company's total market value is the sum of the market values of the company's equity and debt. Market value added (MVA) is the difference between the total market value of the company and the capital used by the company. The capital refers to the funds used by the company for its operations i.e. the working capital and non-current assets of the company. MVA is used to measure how much wealth a company has added or subtracted during a particular period.

12.1 Assessing performance using market value added

An external measure of an organisation's performance, MVA represents the stock market's assessment of the net present value (NPV) of all the past and projected capital investments of an organisation, from a particular point of time. An organisation's performance can be assessed by measuring the changes in its MVA from one date to another.

A company creates value when the MVA is positive i.e. when the company's market value exceeds the capital invested in it.

A negative MVA is a sign that management is unable to efficiently manage the capital available with it.
The following formula is used to calculate MVA:

MVA = MV– K

Where,

MVA is market value added.
MV is the market value of the firm, including the value of the firm's equity and debt.
K is the capital invested in the firm.

Example

1. Affable Ltd and Affliction Ltd are two companies solely financed by equity capital with market capitalisation of Tshs 200 billion each on 1/01/20X0. During the year:

2. Affable Ltd raised Tshs10 billion through a right issue and invested the new funds in a project that is expected to add Tshs 35 billion to the present value of its future earnings.

3. Affliction Ltd raised Tshs 75 billion through a rights issue and invested the new funds in a project that is expected to add Tshs 55 billion to the present value of its future earnings.

Calculation of the market value added (MVA) by both the companies

Particulars	Tshs billion Affable Ltd.	Affliction Ltd.
Market capitalisation at the beginning of the year	200	200
Addition to present value of earnings stream	35	55
Total market capitalisation at the end of the year	235	255
Increase in shareholder wealth	35	55
New funds obtained to increase shareholder wealth	(10)	(75)
Market value added	25	(20)

Although Affliction Ltd.'s market capitalisation has increased more than that of Affable Ltd it has failed to create any wealth for its shareholders. This is because the present value of the new project's future income is less than the funds invested in it.

Test Yourself 12

The following information is available of two companies for the last year

	Biopharm	Tshs' billion TranInfra
Market capitalisation of equity	610	520
Market value of debt	100	150
Investor's capital	80	500
Book value of Debt	100	180

Calculate the MVA and comment on the performance of both the companies.

12.2 Relationship between EVA™ and MVA

Net present value measures the effect of a new project on the shareholders' wealth. The market value added model measures the amount of wealth the various projects undertaken by the company have generated for it. Over a long term, MVA is the difference between the funds invested in a company and the current market capitalisation of the company. EVA™ is the difference between the cost of funds invested and NOPAT (earnings of a business).

MVA is equivalent to the present value of future expected EVAs.

This relationship can be expressed as:

Net present value of a project = Market value added of the project = Present value of the expected future EVA™

Important

EVA™ is an internal measure of performance whereas MVA is an external measure of performance.

Example

Continuing the example of Affable Ltd and Affliction Ltd

The following are the details of the projects undertaken by the two companies.

Particulars	Affable Inc Tshs' billion	Affliction Ltd. Tshs' billion
Initial investment (year 0)	(10)	(75)
Cash inflow per year (year 1 to year 4)	15.76	19.31
Cost of capital	15%	20%

Net present value of the project accepted by Affable Inc = (Cash inflow per year from the project x Annuity factor for four years at 15%) – Initial investment
= (Tshs15.76billion x 2.855) – Tshs10 billion
= Tshs 44.99 billion – Tshs 10 billion
= Tshs 35 billion (approx.)

Net present value of the project accepted by Affliction Inc = (Cash inflow per year from the project x Annuity factor for four years at 20%) – Initial investment
= (Tshs 21.24 billion x 2.589) – Tshs 75 billion
= Tshs 55billion – Tshs 75billion
= Tshs (20) billion

Continued on the next page

Calculation of MVA

MVA of the project accepted by Affable Ltd (assuming the economic depreciation is Tshs 2.5billion per year).

Particulars	Year 1	Year 2	Year 3	Year 4
Capital employed at the beginning of the year	10.00	7.50	5.00	2.50
Net of tax operating cash flow	15.76	15.76	15.76	15.76
Less: Economic depreciation	(2.50)	(2.50)	(2.50)	(2.50)
Cost of capital @ 15%	(1.50)	(1.13)	(0.75)	(0.38)
Economic value-added Present	11.76	12.14	12.51	12.89
value factor @ 15%	0.87	0.76	0.66	0.57
Prevent value of economic value added	10.23	9.17	8.23	7.37
Total NPV (MVA)	**35.01**			

The total value added, i.e. the present value added by the project, is equivalent to the market value added by it.

MVA of the project accepted by Affliction Inc (assuming the economic depreciation is Tshs18.75billion per year)

Particulars	Year 1	Year 2	Year 3	Year 4
Capital employed at the beginning of the year	75.00	56.25	37.50	18.75
Net of tax operating cash flow	21.24	21.24	21.24	21.24
Less: Economic depreciation	(18.75)	(18.75)	(18.75)	(18.75)
Cost of capital @ 20%	(15.00)	(11.25)	(7.50)	(3.75)
Economic value-added	(12.51)	(8.76)	(5.01)	(1.26)
Present value factor @ 20%	0.83	0.69	0.58	0.48
Prevent value of of economic value added	(10.42)	(6.08)	(2.90)	(0.61)
Total NPV (MVA)	**(20.01)**			

The total value added, i.e. the present value added by the project, is equivalent to the market value added by it.

Answers to Test Yourself

Answer to TY 1

We use the Gordon growth model to value the equity share of Tanzan Infrastructure

$$P_O = \frac{(220)(1.035)}{0.09 - 0.035}$$

$$= \frac{227.70}{0.055} = \text{Tshs. } 4140$$

According to the Gordon model, the price of the share should be Tshs 4140. However, the price it is currently trading appears to be on the higher side. We would, therefore, not recommend buying this share.

Answer to TY 2

1. Whenever a multiple is used, it is implied that assumptions about growth, risk and pay-out have already been made and factored in. There is no need to make additional assumptions. In fact, any multiple is an explicit function of these variables.

2.
(a) The average industry P/E ratio = 31.98

Total of P/E for all firms,287.85 divided by the number of firms,9

(b) No, all firms need not be included. We will have to exclude those firms that show either too high or too low a ratio as these tend to distort the average. Therefore, if we exclude TanzInfotech and PanAfrica Systems, a more realistic P/E ratio of 25.16 is obtained.

(c) When the industry average is used, it is implied that Apricot is similar to the average firm in terms of profitability, growth and risk.

Answer to TY 3

(a) Free cash flow to equity

	Tshs' billion	
	20X2	**20X3**
Net Income	**54.2**	**59.0**
Add: Depreciation	12.5	14.0
Less: capital expenditure	15.0	18.0
Less: Change in working capital	(175-180)	(240-175)
Free cash flow to equity (FCFE)	**56.7**	**-10.0**

(b) Working capital as proportion of revenues: 20X2 = 175/540 = 32.41%
Change in revenues in 20X3 = 630 - 540 = 90
FCFE in 20X3 = 59 + 14 - 18 - (32.41% x 90)
= Tshs 25.83billion

Answer to TY 4

In the discounted cash flows approach, the expected cash flows on the assets of the firm are estimated. By using a discount rate, these cash flows are brought to their present value. However, in an asset- based valuation, all the assets owned by the business are listed, the estimated market value for each of them is obtained and these market values are added together. Although the asset-based valuation appears to be simple and very different from the discount cash flow approach, in order to obtain the market value, the assets' cash generating capacity have to be considered and then discounted.

Answer to TY 5

The Black, Scholes, Merton option pricing model is used widely by option traders to value options. It is based on the concept of a riskless hedge. A trader or an investor can buy shares of a company and simultaneously sell the call options on that share to create a risk-free investment position. This riskless return must equal the risk-free rate or an arbitrage opportunity would exist. People would take advantage of this opportunity until the equilibrium level estimated by the BSM model is reached

The BSM model uses an equation to arrive at an estimated fair value of the price of the stock. The valuation model includes inputs for the share price of a traded stock, the exercise price, the volatility of the stock and the risk-free interest rate. The model assumes that the option is exercised at the end of an option's contract period. It also assumes that the expected volatility, expected dividends, and risk-free interest rates remain constant over the option's term. The BSM model was developed to value options traded in an active market and hence, it may not be suitable to value non-trading instruments in an illiquid market.

Answer to TY 6

The concept of VBM is that the value of a company is determined by its present value of future cash flows. Value is created only when the return on investment surpasses the cost of capital for an investment. VBM extends these fundamental concepts by focusing on how organisations use them to make both major strategic and everyday operating decisions. Properly executed, it is an approach to management that aligns a company's overall aspirations, analytical techniques and management processes to focus managerial decision-making on the key drivers of value.

Answer to TY 7

Calculation of free cash flows

						Tshs' million
	Actual	**Planning horizon period**				**Future**
	20X3	**20X4**	**20X5**	**20X6**	**20X7**	**20X8 onwards**
Sales	**3300.0**	**3597.0**	**3848.8**	**4041.2**	**4162.5**	**4162.5**
Operating profit		**467.6**	**500.3**	**525.4**	**541.1**	**541.1**
Depreciation		89.9	96.2	101.0	104.1	104.1
EBITDA		**557.5**	**596.5**	**626.4**	**645.2**	**645.2**
Tax (Operating profit x 35%)		163.7	175.1	183.9	189.4	189.4
Expenditure on non-current assets (W1)		(188.9)	(180.1)	(165.1)	(144.5)	(104.1)
Increase in working capital		44.6	37.9	28.9	18.2	0.0
Free cash flow		**160.3**	**203.4**	**248.5**	**293.1**	**351.7**

Answer to TY 9

Calculation of terminal value at end of planning horizon

Tshs' million

	Actual	Planning horizon period				Future
	20X3	**20X4**	**20X5**	**20X6**	**20X7**	**20X8 onwards**
Free cash flow		160.3	203.4	248.5	293.1	351.7
Discount factor, 10%		0.90909	0.82645	0.75131	0.68301	7.94124
PV		145.7	168.1	186.7	200.2	**2792.9**
Total - PV of planning horizon period					**700.7**	

Calculation of shareholder value

	Tshs million
Competitive advantage period value	700.7
Terminal value	2792.9
Firm value	3493.6
Market value of debt	850.0
Shareholder value	**2643.6**

W1 Determining gross non-current assets (NCA)

Tshs' million

	Actual	Planning horizon period				Future
	20X3	**20X4**	**20X5**	**20X6**	**20X7**	**20X8 onwards**
NCA (net). (Note1)	1100.00	1199.00	1282.93	1347.08	1387.49	1387.49
Growth in NCA (net)		99.0	83.9	64.1	40.4	0.0
Add: Depreciation (Note 2)		89.9	96.2	101.0	104.1	104.1
Growth in Gross NCA		**188.9**	**180.1**	**165.1**	**144.5**	**104.1**

Note 1: Sales/ Net book assets = 3 hence, net book assets = Sales/3
Note 2: Depreciation = 7.5% of net book assets

W2 Determining working capital

Tshs' million

	Actual	Planning horizon period				Future
	20X3	**20X4**	**20X5**	**20X6**	**20X7**	**20X8 onwards**
Working Capital (Note 1)	495.0	539.6	577.3	606.2	624.4	624.4
Increase in Working Capital		44.6	37.9	28.9	18.2	0.0

Note 1:.@ 15% of sales

Answer to TY 8

As the EBIT is Tshs 600 million, factoring the growth rate gives an EBIT of 600 (1+ 3%) = Tshs618 million. The TV is therefore:

$$\frac{618(1\text{-}0.35)\left(1\text{-}\frac{0.03}{0.16}\right)}{(0.13\text{-}0.03)} = \frac{326.38}{0.10} = \text{Tshs. } 3263.8 \text{ million}$$

(Amounts in million)

NOPAT as adjusted EVA (ignoring interest)

	Tshs	Tshs	Tshs
Sales revenue	100.00	120.00	220.00
Less: Operating expenses	(64.00)	(75.00)	(139.00)
Less: Interest	(6.00)	(10.00)	(16.00)
Earnings before tax	30.00	35.00	65.00
Less: Tax	(12.00)	(15.40)	(27.40)
Net profit	**18.00**	**19.60**	**37.60**

Calculation of NOPAT

Particulars	Select Tshs	Choice Tshs	Total Tshs
Earning before tax	30	35	65
Add: Interest	6	10	16
Less: Tax (W1 and W2)	(14.40)	(19.80)	(34.20)
NOPAT	**21.6**	**25.2**	**46.8**

Workings

W1 Tax calculation for division Select

Tax charge = Tax on accounting profit + 40% of interest charged
= Tshs12.0 + (Tshs6.0 x 40%)
= Tshs12.0 + Tshs2.4
= Tshs14.4

W2 Tax calculation for division Choice

Tax charge = Tax on accounting profit + 44% of interest charged
= Tshs15.4 + (Tshs10.0 x 44%)
= Tshs15.4 + Tshs4.40
= Tshs19.8

EVA calculations

EVA = NOPAT – cK

Select division

EVA = Tshs21.6 - (0.10 x Tshs122.0)
EVA = Tshs9.4

Choice division

EVA = NOPAT – (0.125 x Tshs150.0)
= Tshs25.2 – Tshs18.75
= Tshs6.45

Answer to TY 9

The cash flows after adjustments for the years 1 to 5 is:

Tshs billion	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
Net Income	110	140	180	155	125
Depreciation	30	30	30	30	30
Interest Expense	10	10	10	10	10
Rental Expense	5	5	5	5	5
Gross cash flow	**155**	**185**	**225**	**200**	**170**

After adjusting for inflation is Tshs795 billion.

Tshs' billion	**Adjusted for inflation**
Monetary Current Assets	175
Inventories	75
Land	85
Gross Plant assets	170
Leased property	80
Non capitalised assets (current)	210
Total current value of gross investment (adjusted for inflation)	**795**

The cash flow for the period Y0 to Y5 and the resultant IRR is:

						Tshs' billion
Year	**0**	**1**	**2**	**3**	**4**	**5**
Gross investment	(795)					
Gross cash flows		155	185	225	200	170
Salvage value						210
	(795)	155	185	225	200	380
IRR	11.72%					

The CFROI of the firm is 11.72%. As the CFROI is higher than the cost of capital of the firm (10%), we can conclude that the firm is creating value for the shareholders.

Answer to TY 11

Information available	**Price (€)**	**(Tshs / €)**
Prices prevailing when Andrew purchased NYP shares	20.00	1949
Prices prevailing in the market today	28.00	2152

(a) Andrew return

$$= \frac{\text{Current price} - \text{Purchase price}}{\text{Purchase price}}$$

$$= \frac{28 - 20}{20} = 40\%$$

(b) Percentage change (Tshs/€)

$$= \frac{\text{Current exchange rate-exchange rate at the time of purchase}}{\text{exchange rate at the time of purchase}}$$

$$= \frac{2152-1949}{1949} = \frac{203}{1949} = 10.41\%$$

(c) Andrew's total return if he were to sell the shares:

$$= \frac{((28)(2152)-(20.00)(1949))/((20.00)(1949))}{(20.00)(1949)} \times 100$$

$$= \frac{(60,256)-(38,980)}{(38,980)} \times 100$$

$$= \frac{21,276}{38,980} \times 100 = 54.58\%$$

Answer to TY 12

	Tshs' billion	
	Biopharm	**TranInfra**
Market capitalisation of equity	610	520
Market value of debt	100	150
Total market value	**710**	**670**
Investor's capital	80	500
Book value of Debt	100	180
Book value of firm	**180**	**680**
MVA	**530**	**(10)**

Comments: Biopharma has performed spectacularly well by adding Tshs530 billion to the value of the firm. This is reflected by the very high increase in its share prices, whereas TransInfra has performed very poorly. In fact, it has destroyed the value of the firm by Tshs10 billion. This is confirmed by the share price which has only marginally increased.

Quick Quiz

1. A company has earned a profit attributable to ordinary shareholders of Tshs100 million. The number of ordinary shares of Tshs1000 outstanding is 300000. The market value of the company's shares at the year-end was Tshs6500. The price/earnings ratio for this company is:

   A 19.5
   B 333.33
   C 6.5
   D 33.33

2. When calculating the costs of the individual components of a capital structure, the corporate tax rate is relevant to which of the following component cost formulas?

   A Preference shares
   B Debt
   C Equity
   D None of the above

3. Valuing tangible assets is simpler than valuing intangible assets. State whether this statement is true or false.

4. The lattice-based option pricing model can be used for valuing the cost of employee stock options. True/False

5. A firm can be profitable and yet have a return on capital which is less than the WACC. State whether this statement is true or false.

6. Shareholder value = Business value less ____.

   A Preferred stock
   B Debt
   C Corporate tax
   D Market value of equity

7. To estimate the future growth rate one of the tools used is the____.

   A Monte Carlo simulation
   B Historic rate
   C EVA
   D MVA

8. The objective of Value based management is to increase the ___.

   A MVA
   B Growth rate of the firm
   C Dividend payout
   D Cost of capital

9. The accounting profit is the main component in calculating the cash flow return on investment (CFROI). State whether this statement is true or false

10. The relationship between MVA and economic profit can be expressed as:
    Market value added of a project = Present value of the expected future Economic profit (EVA^{TM})

    State whether this statement is true or false.

Answers to Quick Quiz

1. The correct option is **A**.

   PE ratio = Current share price/EPS
   = 6,500/333.33
   = 19.5

   where,

   EPS = Tshs100 million/300,000 shares
   = 333.33 per share

2. The correct option is **B.**

3. False

4. True

5. True

6. The correct option is **B.**

7. The correct option is **B.**

8. The correct option is **A.**

9. False

10. True

Self-Examination Questions

Question 1

Techzent reported a net income of Tshs770 million in 20X3, after interest expenses of Tshs320 million. The effective tax rate was 36%. It had provided depreciation of Tshs960 million. Capital expenditure incurred during the year amounted to Tshs1.2 billion. The amount of debt outstanding was Tshs4 billion at 8%.

The beta of the stock is 1.05. The shares outstanding were 2 million, trading at Tshs6000 per share, with a book value of Tshs5 billion. Techzent paid 40% of its earnings as dividends. The working capital requirements are negligible. The treasury bond rate is 7% and the risk premium for this industry is 5.5%.

Required:

(a) Estimate the free cash flow to the firm in 20X3. (b)
Estimate the value of the firm at the end of 20X3.
(c) What is the value of equity and the value per share at the end of 20X3? Use the FCFF approach.

Question 2

The current market price of an equity share of Obed Medicals Ltd is Tshs8000. The market expects that the company will declare a dividend of Tshs400 for the forthcoming year end. The expected market price then would be Tshs8800.

Required:

(a) What is the return to the investor, if he were to purchase this share?
(b) If the capitalisation rate is 16%, should he buy it?

Question 3

Software industry shares currently yield an expected rate of return of 16.5%. Geeksoft, a medium sized IT firm is expected to pay a year-end dividend of Tshs220 per share.

Required:

(a) If the stock is selling at Tshs4400 per share at present, what is the market's expectation of the growth rate of Geeksoft's dividends?

(b) If dividend growth forecasts for Geeksoft's are revised downward to 8% per year, what will happen to the price of its shares? What is likely to happen to the PE ratio?

Question 4

Diamond Star Ltd is investing heavily into growth over the last four years. It has been showing profits each year. However, there is a section of shareholders which is critical of the way the company has been performing. They argue that the company has been losing value over the five years. Do you agree with their views?

Question 5

A wholly equity financed company whose current sales are Tshs100billion is estimated to have the following value drivers:

Sales growth rate = 14% p.a.
Operating profit margin = 7% sales
Tax rate = 35% of operating profit
Incremental fixed capital investment = 13% of the change in sales
Incremental working capital investment = 11% of the change in sales
Planning horizon = 5 years

The required rate of return = 15% p.a.

Required:

Calculate the shareholders' value added.

Question 6

	Tshs' million 31, 20X3
SOCI of Zenia Ltd for the year ending December	**3,900**
Cost of Goods Sold	2,100
SG&A Expenses	600
Depreciation	225
Other Operating Expenses	150
Operating income	**825**
Interest Expenses	300
Income Before Tax	**525**
Income Tax @40%	210
Net Profit After Taxes	**315**

SOFP of Zenia Ltd as at December 31, 20X3

Liabilities	Tshs' million	Assets	Tshs' million
Accounts payable	150	Cash	75
Accrued expenses	375	Accounts receivable	555
short term debt	450	Inventories	350
Total Current Liabilities	**975**	Other current assets	220
Long term debt	1140	**Total Current assets**	**1200**
Long term Liabilities	**1140**	Property , land	975
Share capital	450	Equipment	615
Retained earnings	645	Other Long-term assets	735
Profit for the year	315	**Total non-current assets**	**2325**
Total equity capital	**1410**		
Total liabilities	**3525**	**Total assets**	**3525**

The expected market rate of return on equity = 13% and on debt = 10%

Calculate the EVA of the firm.

Question 7

Mbeya Ceramics, as part of its growth strategy to increase its value, is considering acquiring a privately held company. The CEO has appointed you as the company's advisor. The CEO would like you to explain how to value this company which does not pay any dividends. The acquisition target is a privately held company in the same industry. The company currently has a free cash flow of Tshs million 2000 million.

Its WACC is 10% and it is expected to grow at a constant rate of 5%. The company has marketable securities of Tshs1000 million. It is financed with Tshs2000 million of debt, Tshs million 500 million of preferred stock, and Tshs million 2100 million of book equity.

Required:

Specifically, the CEO has advised you to provide him answers to the following questions.

(a) What is its total corporate value? What is its value of equity?
(b) What is its value of operations?
(c) What is its MVA?

Answers to Self-Examination Questions

Answer to SEQ 1

(a) FCFF in 20X3

	Tshs' million 20X3
Net Income	770.0
Add: Depreciation	**960.0**
Add Interest (after tax)	204.8
Less: capital expenditure	**1200.0**
Less: Change in working capital	0
Free cash flow to equity (FCFF)	**734.8**

Interest expense = 320 x (1- 0.36) = Tshs 204.8 million

(b) To calculate EBIT, we first find out the EBT and then add the interest cost.

$$\text{EBT} = \frac{\text{Net income}}{(1-\text{tax rate})} = \frac{770}{0.63} = 1203.125.$$

Hence, EBIT = 1203.125 + 320 = Tshs1523.125 million

$$Return\ on\ assets = \frac{EBIT(1-Tax)}{Book\ value\ of\ debt + equity} = \frac{1523.125(1-0.36)}{4{,}000 + 5{,}000} = \frac{974.80}{9{,}000} = 10.83\%$$

Expected growth rate in FCFF *('g')* = Retention Ratio x ROA = 0.6 * 10.83% = 6.50%

Cost of equity = 7% + 1.05 x 5.5% = 12.775%

Note: We use CAPM.

The market value of equity = Tshs 6,000 x 2million shares = Tshs12,000 million

$$\text{WACC} = \frac{0.08\,(1-0.36)\,4000}{4{,}000+12{,}000} + \frac{(0.12775)12000}{4{,}000+12{,}000} = 10.86\%$$

$$\text{Value of the firm} = \frac{734.8}{0.1086-0.65} = \text{Tshs16,853 million}$$

Note: We use the Gordon growth model. We use the value of g calculated g earlier.

(c) Value of equity = value of firm - market value of debt

= Tshs16,853 - Tshs4,000 = Tshs12,853 million

$$\text{Value per share} = \frac{12{,}853}{2\,\text{million shares}} = \text{Tshs6,427}$$

Answer to SEQ 2

(a) The expected return from the share

The current price of share is given by the following formula:

$$P_0 = \frac{D_1 + P_1}{1 + K_e}$$

Where, P_0 = Tshs8,000, P_1 = Tshs8,800, D_1 = Tshs400

i.e. 8000 = $\frac{400 + 8{,}800}{1 + k_e}$ or 8,000 + 8,000k_e = 9,200.

$$8{,}000k_e = 1{,}200 \; or \; k_e = \frac{1{,}200}{8{,}000} = 0.15 = 15\%$$

(b) The investor can expect a return of 15% on the share. He should however not buy the share, as the minimum return, he expects is 16%.

Answer to SEQ 3

(a) $P_0 = \frac{D_1}{k - g}$

Hence 4400 = $\frac{220}{0.165 - g}$ or g = 11.5%

(b) If the growth forecast, falls to 8%, the price will fall to:

P_0 = $\frac{220}{0.165 - 0.08}$ = Tshs2,588

The price will fall as a result of the firm's lower forecast of dividend growth. However, as the current year's forecast is unchanged, the PE ratio will go down to $\frac{2{,}588}{220}$ = 11.76.

Answer to SEQ 4

A company can be profitable and yet have a return on capital employed that is less than the WACC. This is especially true of firms that have large capital requirements. If ROCE is less than the WACC, then the company is not earning enough on its capital to satisfy its investors. Growth compounds this problem as it adds even more capital. If the return does not cover the WACC, growth decreases value.

Answer to SEQ 5

Tshs' billion Value drivers	20X2 Actuals	20X3	20X4	20X5	20X6	20X7	20X8 onwards
Sales 14% growth	100.000	114.000	129.960	148.154	168.896	192.541	192.541
Operating profit, 7% of sales		7.98	9.0972	10.3708	11.8227	13.4779	13.4779
Tax rate, 35% of operating profit		2.793	3.184	3.630	4.138	4.717	4.717
Incr. fixed cap investment= 13% of change in sales		1.820	2.075	2.365	2.696	3.074	0.000
Incr. working cap investment= 11% of change in sales		1.540	1.756	2.001	2.282	2.601	0.000
Operating free cash flow		1.827	2.083	2.374	2.707	3.086	8.761
Present value @ 15%		1.589	1.575	1.561	1.548	1.534	29.037

Total PV = Tshs36.844 billion

The SVA of the firm is Tshs36.844 billion

Answer to SEQ 6

NOPAT = PAT + Interest = 315 +300 = 615

The capital invested = Total liabilities – (accounts payable + accrued expenses) = 3525 - (150 + 375) = 3000

$$\text{WACC} = \frac{1,410}{3,000} \times 13\% + \frac{1,590}{3,000} \times 10\% (1\text{-}40\%) = 9.29\%$$

EVA =615 – (3000 X 9.29%) = 615 – 278.7 = Tshs336.3 million

Answer to SEQ 7

(b) Value of operations = $\frac{FCF1}{WACC - g}$, where $FCF_1 = FCF_0 X (1 + g)$

$$= \frac{200 (1+0.05)}{0.10 - 0.05} = \text{Tshs4200 million}$$

(a) Total corporate value or total value of the firm = value of operations + marketable securities
=4200 +1000 = Tshs5200 million

The firm's value of equity = 5200 – 2000 – 500 =Tshs2700 million

(c) The firm's MVA = Total corporate value – total book value
= 5200 – (2000 + 500 + 2100) = Tshs600 million

SECTION C

BUSINESS VALUATION
CONCEPTS AND APPLICATIONS

C2

STUDY GUIDE C2: BOND ANALYSIS

Get Through Intro

Bonds constitute the most important part of the world's debt-capital markets. Bond prices depend on the interest rates offered by the issuer and are also affected by economic and political events. The yields on certain government bonds are fundamental economic indicators e.g. the yield on the US Treasury long term bond, is an indicator of the market's view on US interest rates, inflation, public-sector debt, and economic growth.

The bond yield level, along with the equity market is important to the country's economy. It is an indicator of the health and direction of the economy. Because of the size and crucial nature of the debt markets, a large number of market participants, ranging from bond-issuers to bond investors and associated intermediaries are interested in analysing them.

This Study Guide provides you with an understanding of how a bond is valued and how bond yield may be analysed.

Learning Outcomes

a) Evaluate prices of bonds using net present values.
b) Develop an understanding of yields, yields to maturity, duration and price volatility, term interest rates, corporate borrowing and default risk.
c) Perform bond refund analysis.

1. Evaluate prices of bonds using net present values.

[Learning Outcome a]

1.1 Bonds as debt instruments

Bonds are debt capital market instruments issued by a borrower, who has to repay to the lender / investor the amount borrowed along with interest, over a predetermined period of time. Bonds are debt instruments with term to maturity of over one year. The most popular bond is the conventional or plain vanilla (also called the bullet bond). This bond pays a regular pre-determined fixed interest rate, either annually or semi-annually over a fixed period to maturity or redemption. At maturity the principal is repaid to the bond holder either at par or with a premium.

Bonds involve cash flows payable over a specified period of time. The cash flows they represent are the periodic interest payments on the loan and the principal amount payable on redemption of the loan.

The principles followed in pricing a bond in the bond market are similar to the ones in other financial markets. The price of a bond is equal to the sum of the present values of all the future cash flows from the instrument. The rate of interest or the discount rate used to arrive at the present values of the cash flows is important as it is a reflection of how its return is perceived by the market.

The bond pricing is a reflexion of the yield that may be received. The pricing of bonds can be either at a premium, or at par or at a discount. If the interest rate on the bond is greater than the current market interest rates, the bond will sell at a premium i.e. higher than the par value. On the other hand, if the bond interest rate is lower than the existing market interest rates, the bond will sell at a value lower than its par value i.e. at a discount.

By comparing the bond yield against the current market rates, an investor can calculate the maximum price that he can pay for the bond. The bond yield should be attractive as compared to current market interest rates.

1.2 Pricing of bonds using net present values

The calculation of bond prices using net present values is elaborated below:

1. Valuing a straight bond (Vanilla)

The price of a bond is essentially the sum of the present values of all expected coupon payments plus the present value of the par value at maturity. Calculating bond price involves discounting the future cash flows. The discount rate (or the interest rate) used for the calculation is the “expected” or “required” yield.

$$\text{Bond price} = \frac{C}{(1+i)^1} + \frac{C}{(1+i)^2} + \frac{C}{(1+i)^3} + \ldots \frac{C}{(1+i)^n} + \frac{M}{(1+i)^1}$$

Where,

C = coupon payment (or interest amount)
n = number of payments
i = interest rate, or required yield
M = value at maturity

Calculating the PVs for several periods can be tedious. But, as the coupon payments are receivable in specific time intervals for a certain period, this can be considered as a case of an **ordinary annuity.** An ordinary annuity is a series of fixed payments at set intervals over a fixed period of time. The first payment of an ordinary annuity takes place is one interval (often six months) from the time at which the bond was acquired. We can therefore, use the simpler ordinary annuity formula in place of the one shown above.

Using the ordinary annuity formula,

$$\text{The bond price} = c \times \frac{\left[1 - \left[\frac{c}{(1+i)^n}\right]\right]}{i} + \frac{M}{(1+i)^n}$$

A 10% Tshs1.0 billion bond dated January 1, 20X3 pays interest semi-annually on June 30 and December 31 of each year. It has a maturity of 5 years and the market interest rate is 12 percent. What is the price you will pay for this bond?

Interest per annum @ 10% on the value of the bond = 1.0 billion x 10% = Tsh0.10 billion. This amount is payable in two half yearly instalments of Tshs0.05 billion each. Thus, in all, 10 interest instalments will be payable over the maturity of the bond. In addition, a lump sum payment of the principal of Tshs1.0 billion will be made at the end of the 5th year.

The present value of the bond depends upon the market interest rate. The market rate is used to discount the interest and the principal payments to the present value. As interest is payable semi-annually, the interest rate should also be brought to a comparable semi-annual basis by dividing the market rate by 2. Thus the market rate for six months $\frac{12\%}{2}$ = 6% (In case the interest is payable quarterly, the rate will be divided by four and so on).

The formula will therefore, shown as:

$$\text{The bond price} = 0.05 \times \frac{\left[1 - \left[\frac{0.05}{(1+0.06)^{10}}\right]\right]}{0.06} + \frac{1.0}{(1+0.06)^{10}}$$

The PV of the bond = the PV of the interest payment + the PV of the amount payable at maturity.

Now, take a look at the PV of an ordinary annuity (PVOA) table. Locate the cell with n=10 (number of periods of interest payment) and r = 6%.

The factor is 7.360.

The factor in the PVOA Table is the present value of a series or stream of Tsh1 amounts occurring at the end of every period for "**n**" periods discounted by the market interest rate **"i"** per period. What this factor indicates is that the PV of the cumulative amount of interest of Tshs1 @6% for each al year, receivable for 10 six monthly periods is Tshs7.360

As the periodic payment of interest amount is Tshs0.05 billion**, the PV of the sum of all such amounts received in 10 periods is 0.05 x 7.360 = Tshs0.368 billion.**

We now calculate the PV of the maturity value of the bond. Unlike the interest payments, this is only a one-time payment and not an annuity.

We use the PV table in the same manner we did for the PVOA table. The factor is 0.558.

The factor in the PV Table is the present value of a single payment of Tsh1 occurring at the end of the period "**n**" discounted by the market interest rate per period **"i".**

The PV of the maturity amount of the bond is thus, Tshs1.0 billion x 0.558 = Tshs0.558 billion.

The sum of the PVs of the interest and the principal = 0.368 + 0.558 = Tsh0.926 billion.

The market price of a Tshs1.0 billion bond today @ 12% per annum interest, payable semi-annually for 5 years is Tshs0.926 billion. The reason why the price is below par value is that the coupon rate @ 10% per annum is lower than the market rate of 12%. The market therefore, discounts the price of the bond in such a manner that the yield reflects 12%.

Test Yourself 1

African Paints Ltd is selling a new issue of bonds to raise money for its expansion project. The bonds will pay a coupon rate of 10% and will mature in 6 years. The face value of the bonds is Tshs100,000 and interest is paid half-yearly.

The market rate of interest is currently 8% for similar risk bonds.

What is the price an investor would pay for these bonds?

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2. Valuing zero coupon bonds

A zero-coupon bond is one which offers the entire payment at maturity. In other words, there are no periodic interest payments. Usually, the bonds are issued at a discount to the face value and at maturity; the face value is paid in the absence of which an investor would have no incentive to invest in these bonds. Zero coupon bonds are also called deep discount bonds. The market price of these bonds tends to fluctuate more than coupon bonds.

Since there is only one payment made at the time of maturity, the PV formula is used to price the bond i.e. $\frac{M}{(1+i)^n}$

Tip

It is a normal practice for bonds to pay interest semi-annually. Unless otherwise given in the exams, this practice should be followed for your bond calculations.

Example

Let us calculate the price of a zero-coupon bond that is maturing in five years, having a par value of Tshs200 million and a required yield of 10%.

Although no interest is paid each period, for purposes of comparison with other bonds, we consider the semi-annual interest and adjust the period accordingly. We therefore consider the equivalent rate and period as was done in the earlier example. Therefore, "i"= 5% or 0.05 and "n"=10.

PV of the bond = $\frac{200}{(1+0.05)^{10}}$

From the PV table, we obtain the factor = 0.614

Therefore, the current market price of the Tshs200 million bond should be Tshs200 million x 0.614 = Tshs122.8 million.

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3. Valuing bonds between interest payment periods

As bonds are traded, the sale and purchase take place at various points of time whereas the interest is only payable at fixed intervals of time. Bond prices are generally quoted on a "clean basis" i.e. they do not include the accrued interest from the last interest payment date. The seller must be compensated for the interest accrued the date of sale. However, when the price quoted includes the interest accrued, it is called a "dirty" price.

To calculate the accrued interest, we must first determine the number of days for which the bond was held since the last interest payment. There are two "day count conventions". Municipal and corporate bonds usually follow a 360 day count convention, whereas treasury securities use the 365 day (or 366 days in a leap year) convention.

$$\text{Accrued interest} = \frac{\text{days between the sale (settlement and the last coupon payment)}}{\text{number of days in the period}} \times \text{coupon}$$

On 1st January 20X3, a treasury bond of face value Tshs1000 is quoting at 12% annual interest. The interest is paid on 31st March and 30th September. Let's determine the accrued interest for this bond.

The annual interest is @12%, therefore semi-annually at rate of 6% would be paid.
Interest on this bond has accrued from 1st October to 1st January 20X3

October	31 days
November	30 days
December	31 days
Total	92 days

$$\text{The accrued interest} = \text{Tshs1000} \times \frac{6}{100} \times \frac{92}{182}$$

= Tshs30.33.

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2. Develop an understanding of yields, yields to maturity, duration and price volatility, term interest rates, corporate borrowing and default risk. [Learning Outcomes b]

2.1 Yields

Yield is an important concept in bond investing, as we use it as a tool to measure the return of one bond as compared to another. It enables the investor to make informed decisions about which bond to buy. Yield is the rate of return on the bond investment. However, even though the coupon rate is fixed, the yield is subject to fluctuation depending upon the market rates of interest. Yield is the return an investor receives by holding a bond to maturity. However, it is commonly used to indicate the rate of interest expected to be received from the bond.

$$\text{Yield} = \frac{\text{coupon amount}}{\text{price}} .$$

$$\text{Yield} = \frac{\text{coupon amount}}{\text{price}}$$

When a bond is purchased at par, yield is equal to the interest rate. However when the bond price changes, the yield also changes in an inverse proportion. The higher the price, lower is the yield and vice versa.

Example

Ms. Diana Degera bought 100 bonds with a face value of Tshs10,000 and a coupon rate of 10% a year ago at par. She now needs the money to tide over some unforeseen events. The market rate has now gone up to 12%.

Will she receive the same amount she paid for the bonds?

The answer is, "no". She has to sell the bonds at a price lower than what she paid for them a year ago as no one would otherwise accept the bond which gives a return lower than the market rate.

Although the buyer will receive the same amount of interest and will have the same amount of principal returned at maturity, the buyer's yield, or rate of return, will have to match the market rate. This can happen only if the buyer pays a price lower than the price paid by Ms Degera. In fact, the fair price of the bond will now be

$$\frac{10,000}{0.12} = \text{Tshs8,333.33}$$

The coupon for the bond @10% is Tshs1000.

At a price of Tshs8,333.33 the yield for the buyer will be $\frac{1,000}{8333.33}$ = 12 %, which matches the market rate.

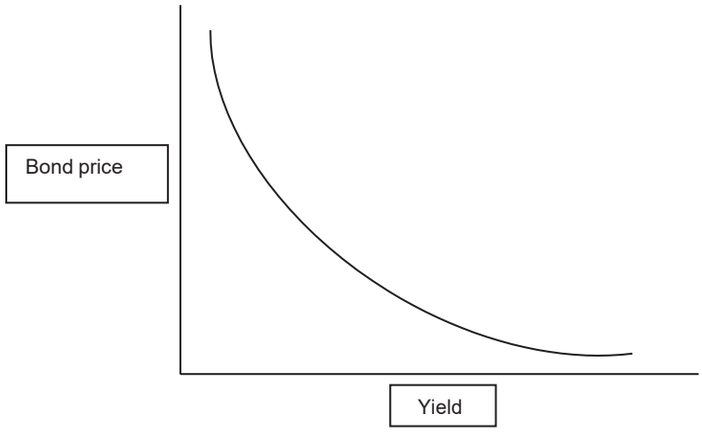
2.2 Yield to maturity (YTM)

The current yield helps in calculating the return the annual coupon payment gives the investor. It does not, however, consider the present value of the interest (coupon payments) the investor is expected to receive in the future. Therefore, most analysts use the term "yield" to mean the yield to maturity (YTM). It is the return that an investor gains by receiving the present values of the coupon payments, the par value and capital gains in relation to the price that is paid. YTM is that interest (discount) rate at which the present values of all the future cash flows equal the bond's price. (The concept is identical to the IRR).

Yield to maturity is a more meaningful yield calculation that shows the total return an investor receives if he holds the bond to maturity. It equals all the interest payments he will receive and any gain or loss. YTM is more accurate and enables a comparison of bonds with different maturities and coupons.

The yield to maturity, like the IRR, is an interest rate that must be calculated through trial and error. So, analysts and investors generally use a financial calculator or program that is quickly able to provide the results.

Diagram 1: Relationship between bond price and yield



The graph shows that as the price of the bond increases, the yield decreases, or as the market interest increases, the bond price decreases.

$$\text{The bond price} = \frac{\text{cash flow 1}}{(1+\text{yield})^1} + \frac{\text{cash flow 2}}{(1+\text{yield})^2} + \ldots\ldots\ldots + \frac{\text{cash flow n}}{(1+\text{yield})^n}$$

Alternatively, as the cash flows represent an ordinary annuity, we can use the annuity formula

$$\text{The bond price} = c \times \frac{\left[1 - \left[\frac{c}{(1+i)^n}\right]\right]}{i} + \frac{M}{(1+i)^n}$$

Bond price = Annual interest X $PVIFA_{kd}^{n}$ + M X ($PVIF_{kd}^{n}$)

k_d = required return on the bond
n = period of the bond

The yield to maturity is then calculated using trial and error method or interpolation.

Example

Mr. Scot has purchased bonds of MQD Ltd from the open market at Tshs 1280 per bond. The par value of the bond is Tshs1200 @12% interest payable annually. The years to maturity is 10 years.

Let's compute the YTM (yield to maturity).
Annual interest = Tshs1200 X12/100 = Tshs144

Continued on the next page

Bond price = Annual interest X $PVIFA_{kd}^{n}$ + M X ($PVIF_{kd}^{n)}$

At 12% yield the value of the bond is Tshs 1200, therefore for a value of Tshs1280 the yield must be less than 10%.

At 9% discount rate

Tshs144 X $PVIFA_{11,10}$ + M X ($PVIF_{11,10}$)

Tshs 144 X 5.889 + Tshs1200 X 0.352

848 + 422 = Tshs1270.

Since with 11% discount rate the value of the bond is lower than Tshs1280 we compute with a lower rate @10%

Tshs144 X $PVIFA_{10,10}$ + M X ($PVIF_{10,10}$)

Tshs 144 X 6.145 + Tshs1200 X 0.386

884.88 + 463.2 = Tshs1348

Since value of bond at 10% discount rate is higher than Tshs1280, the YTM lies between 10% and 11%. We find the exact value through interpolation

Difference between value of bond @ 10% and 11%= Tshs1348 – Tshs1270 = Tshs78 --- 1

Difference between the value of bond at lower k_d and market value = Tshs 1348 – Tshs1280 = Tshs68 ---2
Divide 2 / 1 we get 68/78 = 0.87

Multiplying the above by the gap between the 2 k_d = 1% (11%-10%) = 0.87 X 1% = 0.87%

Adding 0.87% to 10% we get = 10.87%

YTM 10.87%

The relationship between bond price and yield to maturity is given below:

If yield to maturity is equal to the coupon rate the bond is trading at par.
If the yield to maturity is lower than the coupon rate the bond is trading above par (or trading at premium).
If the yield to maturity is higher than the coupon rate the bond is trading below par (or trading at a discount)

2.3 Duration of bonds and price volatility

A majority of investors consider that investing in fixed income securities, such as bond and corporate debentures, is safe since they can expect to receive coupon payments at regular intervals. But, fixed income investments have several risks, which may result in a loss to investors if the securities default.

There are three major types of risk on a bond.

Market risk: Adverse changes caused by the fluctuation in the economy and volatility in the financial markets, such as interest rates, yield curve, and inflation rate can cause a potential loss in the portfolio value.

Credit risk: This is a risk due to changes of the perceived ability of counter-parties to meet their contractual obligations e.g. credit ratings may be down- graded or that the issuer would default.

Liquidity risk: This risk relates to the difficulty to sell the securities in the market at the time the investors need cash. The prices may have to be reduced in order to attract buyers for these securities.

The price of a bond is inversely related to the required yield for the bond. Analysts try to quantify this relationship in order to predict the change in the price of a bond. This has been explained earlier through diagram 1.

1. Bond value and time

The price of the bond changes during its life time such that at maturity it is equal to the par value (assuming there is no risk of default). If the bond is trading at a premium to its par value, this premium will decline with the passage of time, assuming the required yield does not change from today up to maturity date. Conversely in case the bond is trading at a discount, the discount will fade away over a period of time assuming no change in required rate of interest.

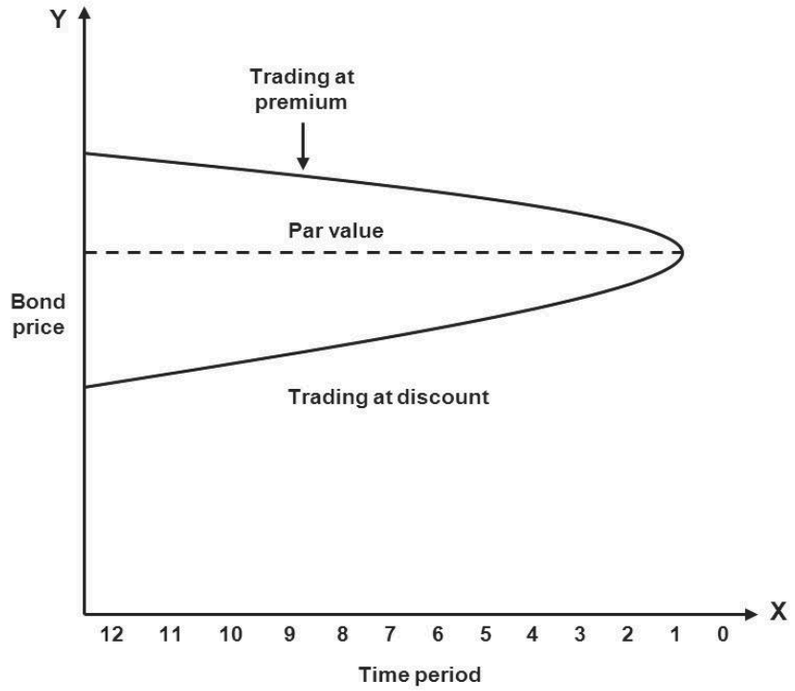
Example

Assume a bond with rate of interest of 12% at par value Tshs1000 (10 years).

Let us consider the following situations:
Required rate of 14% and bond is trading at a discount
Required rate of 10% and bond is trading at a premium.

The following diagram illustrates how the price changes over a period of time.

Diagram 2: Price changes over a period of time



2. Duration

Definition

Duration is a measure of the time that the bond will take to repay its cost of purchase.

It is an important measure for management of bonds and other fixed income securities. The duration of a bond is effected by

Coupon rate: In case the coupon rate of a bond is higher than another bond of identical credit quality, the higher rate bond will repay faster and therefore have a higher duration.

Period to maturity: The greater the time to maturity the higher is the duration.

Example

Bonds of Tejo Ltd are currently trading at Tshs1200. The yield is 10%. In case this bond has two years to

maturity the duration would be lower than if its maturity is seven years. This is because it is then subject to lower price risk.

Types of duration

(a) Macaulay Duration

It was developed by Frederic Macaulay in 1938. This form of duration measures the number of years required to recover the true cost of a bond, considering the present value of all coupon and principal payments received in the future. Thus, it is the only type of duration in years. Interest rates are assumed to be continuously compounded

The formula for Macaulay duration is as follows:

$$Macaulay\ Duration = \frac{\sum_{t=1}^{n} \frac{t * C}{(1+i)^t} + \frac{n * M}{(1+i)^n}}{P}$$

where,

n= the number of cash flows,
t= time to maturity
C= cash flow
i = interest yield
M= maturity (par) value
P=bond price

Example

John has bought 10 five-year bond with a par value of Tshs10,000 and coupon rate of 10%. Assume that the coupon is paid annually, and that market is also 10%. What is the Macaulay duration of the bond?

The interest received (cash flow) @ 10% on Tshs 10,000 = Tshs 1,000. We use the PV tables for each term individually.

Time (t)	Cash Flow (10%)	Interest Factor $(1/(1+i)^t$	Present Value $C*1/(1+i)^t$	Weighted PV $t*C*1/(1+i)^t$
1	1,000.00	0.9091	909.09	909.09
2	1,000.00	0.8264	826.45	1,652.89
3	1,000.00	0.7513	751.31	2,253.94
4	1,000.00	0.6830	683.01	2,732.05
5	1,000.00	0.6209	620.92	3,104.61
5	10,000.00	0.6209	6,209.21	31,046.07
			10,000.00	41,698.65

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^{n} \frac{t*C}{(1+i)^t} + \frac{n*M}{(1+i)^n}}{P} = \frac{41{,}698.65}{10{,}000} = 4.17 \text{ years}$$

*Note: since the coupon rate and the market rate is the same @ 10 %, the market price is also Tshs10,000. The small difference of Tshs0.10 arises because of rounding off.

A simpler way of calculating the Macaulay duration is given in the example below:

Example

Diamond Ltd has issued an 8% coupon rate bond with a face value of Tshs1000, and redeemable after four years. Considering the market interest rate at 10%, the duration of the bond will be:

Coupon on the bond = 8% of Tshs1000 = Tshs80

Year	Return	Discount factor at 10%	Present value of return	Weight	Present value of return x Weight
1	80	0.909	72.72	1	72.72
2	80	0.826	66.08	2	132.16
3	80	0.751	60.08	3	180.24
4	1080	0.683	737.64	4	2950.56
			936.52		3335.68

Duration of the bond = 333.568/93.652 = 3.56 years

As for a zero-coupon bond, the Macaulay's duration is equal to the bond's maturity, so no calculation is necessary.

Benefits of duration

Duration is used by investors to respond to changes in the market interest rates through the following ways:

(i) To speculate on change in the interest rates: bearish investors (i.e. those expecting a rise in the market interest rates) increase the duration of their debt portfolios to maximise their gains whereas bullish investors (i.e. investors expecting a fall in the market interest rates) decrease the average duration of their debt portfolio.

(ii) To invest according to the risk appetite: duration allows the investors to determine the sensitivity of a debt instrument to the market interest rate. This allows the investors to create a portfolio consisting of debt instruments of different maturities and yields that match with the respective investor's risk appetite.

Limitations to duration

(i) It is only an approximation of the price sensitivity of a debt instrument and is only accurate as a measure of risk for relatively small changes around the current market price or yield. The problem can be solved with the help of convexity (discussed later in this Learning Outcome).

(ii) It does not consider changes in the price of the debt instrument due to a change in the credit rating or default by the company.

(iii) It does not consider the fact that callable bonds / debentures can be redeemed before their maturity by the issuer of the bond / debentures.

(b) Modified duration

The modified duration is an extension of the Macaulay duration which helps to measure price volatility. It takes into account the interest rate movements. It demonstrates the change in duration for each percentage change in yield. There is an inverse relationship between yield and modified duration.

$$= \frac{\text{Macaulay duration}}{(1+\frac{YTM}{n})}$$

Where,

YTM – yield to maturity
n – number of coupons paid in a year

Example

Let us continue with the previous example of John. We know that the bond sells at par and the yield to maturity is 10%. The Macaulay's duration has been calculated at 4.17 years. The coupon payment is once a year.

The modified duration = $\frac{4.17}{1+\frac{0.10}{1}}$ = 3.79 years.

The calculation given in the example indicates that if the bond's yield changes from 10% to 11%, the duration of the bond will decline to 3.79 years. As this equation calculates how duration will change when interest increases by 100 basis points (1 percent), the modified duration will always be lower than the Macaulay duration.

(c) Duration Gap

Duration Gap is the difference between the sensitivity of interest-yielding assets and the sensitivity of liabilities to a change in market interest rates. Duration gap measures how well matched the timings of cash inflows from assets are against the cash outflows a company has to make for its liabilities. Duration gap allows a company to quantify the level of interest rate risk faced by it.

(i) Positive duration gap

If the duration of assets of an organisation is more than the duration of its liabilities then the organisation has a positive duration gap. A positive duration indicates that in case of a rise in the market interest rates, the value of assets will fall more sharply than its liabilities, which will reduce the value of the organisation's equity. If interest rates fall, assets will gain more than liabilities and the value of the organisation's equity will increase.

(ii) Negative duration gap

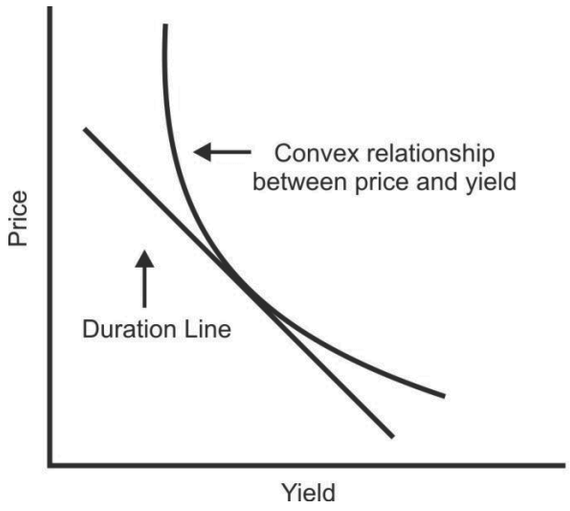
Duration gap is negative when the duration of the liabilities of an organisation is more than the duration of its assets. If market interest rates rise, then liabilities lose more value than assets thereby increasing the value of the organisation's equity. However, if interest rates fall, the rise in the value of liabilities will be more than the value of assets which will decrease the organisation's equity.

By matching the duration of its assets and liabilities i.e. by eliminating the duration gap, a company can immunise itself against interest rate risk.

3. Convexity

Duration assumes price sensitivity to market interest rates of a debt instrument in a linear measure i.e. a straight line. According to duration, for a certain percentage change in market interest rates, an equal percentage change in the market price of the debt instrument will occur. However, the prices of debt instruments do not change linearly, but in a curved or convex manner.

Diagram 3: Relationship between convexity and duration



The diagram shows that the relationship between the market price of a debt instrument and market interest rates is not linear (a straight line), but convex. The more convex the relationship is, the more inaccurate the duration will be as a measure of market interest rate sensitivity of the debt instrument.

(a) Meaning of convexity

Convexity is the measure of the curvature of a debt instrument's price to market interest rate relationship. Convexity used along with duration gives investors a more accurate approximation of the percentage change in the price due to a change in the market interest rates.

Tip

Debt securities with fixed coupon usually have positive convexity.

Debt securities with high positive convexity have a higher increase in prices as interest rates fall than those with low or negative convexity. Furthermore, the prices of debt securities with high positive convexity fall more slowly when the interest rates are rising. Hence, measuring the convexity of a debt security tells the investor the degree to which a debt security's prices are sensitive to changes in the market interest rates.

For investors with large debt portfolios, e.g. pension funds, a small change in price can amount to significant differences in the value of their holding. For such investors the convexity of a bond / debenture is of high importance.

(b) Impact of convexity on duration

An investor can use duration to protect his portfolio. The investor must adjust its portfolio in such a way that the duration of the portfolio is equal to the investor's investment time horizon e.g. the investor must create a portfolio that will return Tshs1,000,000 in five years' time regardless of interest rate changes.

Convexity can also be used to compare debt instruments with same duration with different convexity. The price change in value of debt instruments due to change in market interest rate will be different because of convexity.

4. Price volatility properties of option-free bonds

(a) For very small changes in the required yield, the percentage price change for a given bond is approximately the same, whether the required yield increases or decreases.

(b) For large changes in the required yield, the percentage price change is different for an increase in the required yield than for a decrease.

(c) For a large change in basis points, the percentage price increase is greater than the percentage price decrease.

2.4 Term interest rates

We have understood that a bond is an interest-only debt. This means that the borrower pays the interest every period and the principal is normally repaid at the end of the loan.

The term structure of interest rates is also known as the yield curve. It is a popular method of bond valuation.

1. The yield curve

The yield curve is a measure of the market's expectations of future interest rates given the current market conditions.

Thus "term structure" of interest rates refers to the relationship between bonds of different terms / tenure.

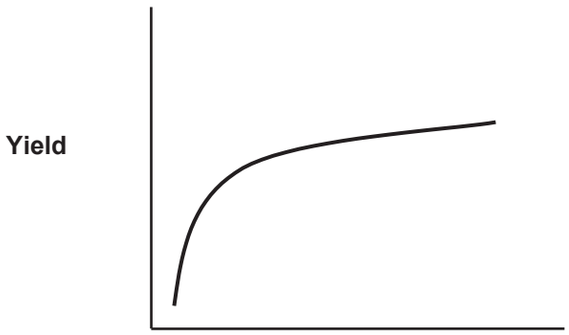
When interest rates of bonds are plotted against their terms, it is known as "yield curve". Economists and investors believe that the shape of the yield curve reflects the market's future expectation for interest rates and the conditions for monetary policy.

The main patterns created by the term structure of interest rates are shown below:

(a) Normal Yield Curve

As its name indicates, this is the yield curve shape that forms during normal market conditions, wherein investors generally believe that there will be no significant changes in the economy, and that the economy will continue to grow at a normal rate. Thus in normal market conditions, to invest in an instrument for a longer period of time, an investor needs to be compensated for undertaking the additional risk. Yield on long term debt will therefore be higher than on short term debt.

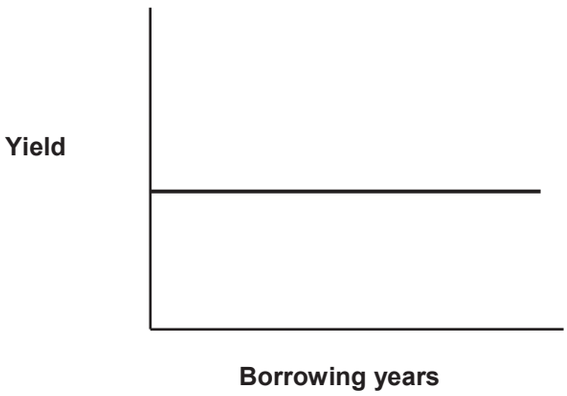
Diagram 4: Normal Yield Curve



(b) Flat yield curve

There may be a situation in which there are some signals that short-term interest rates will raise and other signals that long-term interest rates will fall. This condition will create a curve that is flatter than its normal positive slope. During such an environment, it is difficult for the market to determine whether interest rates will move significantly in either direction. A flat yield curve usually occurs when the market is making a transition that emits different but simultaneous indications of what interest rates will do.

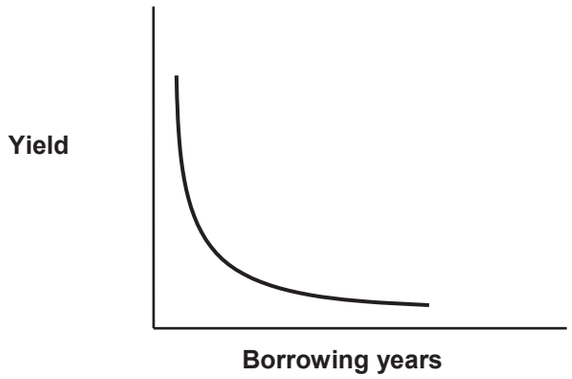
Diagram 5: Flat yield curve



(c) Inverted yield curve

In a situation where investors think that in the long-term interest rates will fall, in such abnormal market environment, bonds with longer maturity dates are expected to offer lower yields than bonds with shorter maturities. These yield curves are rare, and they form during extraordinary market conditions wherein the expectations of investors are completely the inverse of those demonstrated by the normal yield curve. The inverted yield curve indicates that the market currently expects interest rates to decline as time moves into the future, which in turn means the market expects yields of long-term bonds to decline.

Diagram 6: Inverted yield curve



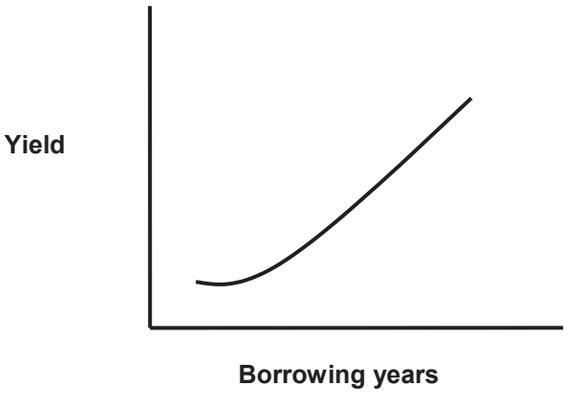
(d) Steep yield curve

A **steep curve** can occur when the small percentage gap between the shortest maturity bonds (i.e. three-month T-bills) and the longest maturity bonds (i.e. 30-year Treasury bonds) widens because some economic force causes the short-term rates to drop more than long-term ones.

When the gap gets wider and the slope of the yield curve increases sharply — long-term bond holders are sending a message that they think the economy will improve quickly in the future.

This type of curve can be seen at the beginning of an economic expansion (or after the end of a recession).

Diagram 7: Steep yield curve



2. Theories of interest rate structure

There are three main theories that describe the future yield curve:

(a) Pure Expectation Theory

Academic economists have debated the forces that determine the shape of the yield curve for several years. This theory states that longer-term rates are determined by investor expectations of short-term rates in the future. An upward-sloping yield curve is explained as an indication that the market expects rising short-term rates in the future. Since rising rates normally occur during economic expansions, an upward-sloping yield curve is a sign that the market expects continued expansion in the level of economic activity.

In mathematical terms, the theory suggests that:

$(1 + R_2)^2 = (1 + R_1) \times (1 + E(R_1))$

Where,
R_2 = the rate on two-year securities
R_1 = the rate on one-year securities
$E(R_1)$ = the rate expected on one-year securities one year from now

(b) Liquidity Preference Theory

Proponents of this theory believe that, according to the term structure of interest rates, investors are risk-averse and will demand a premium for securities with longer maturities. A premium is offered by way of greater forward rates in order to attract investors to longer term securities. The premium received normally increases at a decreasing rate due to downward pressure from the decreasing volatility of interest rates as the term to maturity increases.

(c) Market Segmentation Theory

It assumes that bonds of different maturities are not substitutes of each other. It implies that markets are completely segmented and the interest rate at each maturity is determined separately. The theory can explain every type of yield curve an investor comes across in the market. The theory can also explain that if an investor wants to go out of from one segment, he will want to be compensated for taking on the additional risk. This is also known as the "Preferred habitat theory".

2.5 Corporate borrowing and default risk

Corporate borrowings can be in the form of numerous short term, medium term and long term debt instruments. They can take the form of bank credit lines, bonds, commercial paper etc. The rate at which a corporate borrows depends on numerous factors relating to its background, financial strength, future growth potential, collaterals etc. The higher the risk of default / non-payment of dues which the lender perceives the higher will be the expectation on yield required.

1. Cost of borrowing and default risk

As discussed earlier, there is an inverse relationship between bond prices and interest rates. As rates increase, the price of bonds comes down.

Example

On 1st January 20X3, the price of risk-free bonds with one-year maturity was 10%. PZB Ltd issued instruments with par value of Tshs1000 with one-year maturity. Let's analyse the price at which they bonds would quote.

In case of risk free bonds the present value is calculated as
Interest @10% Tshs100 and principal Tshs1000

$$PV = \frac{Tshs1000 + Tshs100}{1.10} = Tshs1000$$

Let's assume that PZB Ltd is facing a financial crunch and there is a 25% probability that it will default. In this case the payoffs to the bond holders is calculated as

	Pay off	Probability
Full payment	Tshs1100	0.75
Default	0	0.25

The payment expected = Tshs1100 (0.75) + 0 (0.25)
= Tshs825
The bonds would quote at Tshs825 / 1.1 = Tshs750

Therefore, in this case the required return on the bond is $\frac{Tshs1100}{Tshs750} - 1 = 46.67\%$

In the above calculations we assume that the risk of default is wholly diversifiable and so there is no market risk. However, defaults normally occur during economic downturns and let's assume a market risk premium of 2% and expected return as 11%. Therefore, the bond would quote at Tshs825/1.12 = 736.61

Yield = (1100/737) -1 = 49.25%

Test Yourself 2

Ruex Ltd issued bonds with maturity of 5 years @12% coupon payable semi-annually on 1st January 20X3. The bonds with par value of Tshs1000 are currently trading at Tshs920. Interest is paid through direct credit to investor account on 31st March and 30th September.

Required:

Calculate the YTM of the bond.

---

2. Credit rating

An investment in a company's equity or debt is accompanied by a risk. Credit risk is the risk that a borrower will not repay the loan and default on the borrowing. A company desiring to issue bonds will need a credit rating

Many credit rating agencies such as Moody's, Standard & Poor's and Fitch, perform financial research and analysis on commercial and government entities. They research the financial health of issuers of bonds and assign ratings to the bonds being offered. A bond's rating helps a lender to assess that bond's credit quality compared to other bonds. These agencies rank the creditworthiness of borrowers using a standardised ratings scale. These agencies address the possibility that a financial obligation will not be honoured as promised. Such ratings reflect both the likelihood of default and the probability of a financial loss suffered in the event of default.

Standard & Poor uses the Monte Carlo method to model the asset value correlation. Standard & Poor uses a plus or minus indicator. For example, A+ is better than A, and A is better than A-.

Moody's Investor Services uses a numerical indicator for bond ratings. For example, A1 is better than Baa-1(but not better than Aa).

Diagram 8: Bond ratings

	Standard & Poor's	Moody's Investor Services
Average	BBB	Baa-1, Baa
Above average	A	A-1, A
High quality	AA	Aa
Highest quality	AAA	Aaa

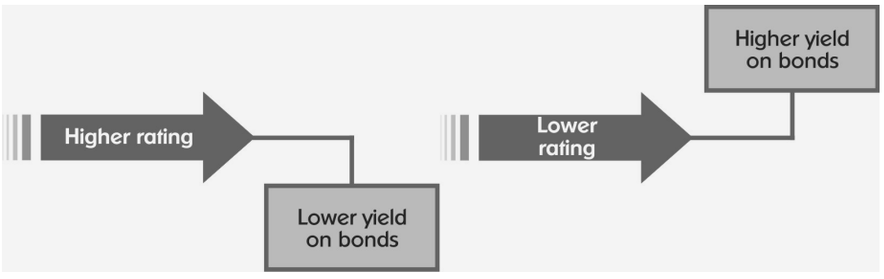
(a) Credit ratings and bond yield

Credit ratings affect a bond's yield and the return that investors expect on the bond.

A highly rated bond usually has a lower yield. This is because the bond issuer does not have to offer a high coupon rate in order to attract investors.

A lower rated bond usually has a higher yield. This is because the investors require an incentive to compensate for the higher risk associated with the bond.

Diagram 9: Effects of credit rating on bond yield



(b) Credit spread over risk-free

A credit spread represents the difference in yield between different debt instruments due to different credit quality. It reflects the additional net yield a lender can earn from a debt with higher credit risk relative to one with lower credit risk. The credit spread of a particular loan is often quoted in relation to the yield on a credit risk-free benchmark security or reference rate.

Credit spread = Yield on corporate debt + Risk-free rate

(c) Cost of debt capital

The cost of debt capital of a company is calculated using the following formula:

Cost of debt capital = (Credit spread + Risk-free rate) (1 – Tax rate)

Example

A corporate bond has a maturity of 5 years and is taxable at 20%. Assuming the five-year risk-free rate to be 10% and the credit spread to be 200 basis points (i.e. 2%), calculate the cost of debt capital.

Answer

Cost of debt capital = (2% + 10%) (1 – 0.20) = 9.6%

3. Perform bond refund analysis.

[Learning Outcomes c]

3.1 Bond refund

In certain situations, a corporate may want to refund / redeem the bond prior to the maturity date. This would be undertaken with the idea of replacing the same with a debt carrying lower interest rate.

Example

Zimco Ltd has issued 12% bonds on 1st March 20Y9 with maturity of 10 years. During review of debt undertaken on 1st September 20X3, the one of the directors proposes redemption of the bonds and replacing the same with bank loan @ 10%. This is because of the revised interest rate scenario with rates having declined over the past 8 quarters.

The finance manager is of the view that bond refund and debt replacement are not simple. Numerous factors need to be considered before performing the same.

3.2 Bond refund parameters

The following parameters influence the bond refund analysis

1. The interest rate scenario – whether rates are expected to fall further or even out. Further decisions on switching from fixed rate loans to floating rate loans or vice versa is also critical.
2. The estimated savings in interest outflow from replacement of debt (post tax)
3. Flotation costs that would be incurred on new issue
4. Tax saving impacts on interest outflow, floatation costs etc.
5. Period between incurring new debt and replacement of old debt

3.3 The refunding analysis

We can understand a refund analysis by working out an example given below.

Example

		Tshs million
Existing debt (bond details)		
Par value	80,000 coupon rate	
12%		
original maturity	30	
remaining maturity	25 original flotation costs	
6,000		
Call premium	12% Tax rate	
35%		
New bond issue		
Coupon rate	10%	
maturity	25 flotation costs	
6,000		
Period during which both bonds would exist (months)		1
Treasury rate (annual)	7%	

In order to perform a bond refund analysis we need to:

Analyse the impact each of the above parameters on the company cash flow
Calculate
the additional costs that need to be incurred for the bond refund and replacement
NPV of the saving in interest outflow over the period of new debt
Compute the result and arrive at decision whether the bond refund is feasible depending on whether the NPV is positive or negative.

(Amounts in Tshs million)

Initial investment outlay to refund old bonds		
Call premium on old bonds	9,600	80,000 X12%
After-tax call premium	6,240	9000X (1- 0.35)
New flotation cost	6,000	given
Old flotation costs already expensed	1,000	(6000/30) x (original maturity - remaining maturity)
Remaining flotation costs to expense	5,000	original flotation cost -old flotation cost expensed
Tax savings from old flotation costs	1,750	Remaining flotation costs to expense/ tax rate
Additional interest on old bonds (post tax)	520	Par value x coupon rate x time gap between issues (1-Tax rate)
Interest earned on investment in T-bonds after tax	303	Par value x Treasury rate x(time gap between issues/12) x(1-Tax rate)
Total investment	10,707	After tax call premium + New flotation cost + addition interest on old issue (after tax)- (tax saving from old flotation costs +interest earned on treasury bond, after tax)
Annual flotation cost, tax effects:		
Annual tax savings on new flotation	84.00	flotation cost X tax rate/ maturity period
Tax savings lost on old flotation	70.00	original flotation cost X tax rate/ original maturity period
Total tax effects	14.00	84-70
Interest savings on refund		
Interest on old bond (post tax)	6,240	Par value X old coupon rate x(1- tax rate)
Interest on new bond (post tax)	5,200	Par value X new issue coupon rate x(1- tax rate)
Net after tax interest savings	1,040	6240-5200
Annual cash flows	1,054.00	14 + 1040
NPV of refunding decision	1,576.21	PV@7% discount rate, for 25 years onTshs1054 m) Minus Total investment, Tshs10707m

Test Yourself 3

Identify the variables that need to be considered before a decision to refund is taken.

Answers to Test Yourself

Answer to TY 1

Market price of the bond:

Interest is payable semi-annually:

1. Number of periods: The bonds have a 6-year maturity. Therefore, there are 12 interest payments instalments.

2. Interest payments: The bonds will pay interest of Tshs10,000 per year (i.e.10% x Tshs100,000) per annum, which is Tshs5,000 semi-annually.

3. Required rate: The required rate of return is 8%. Therefore, the required rate is 4% semi-annually.

Using 4% as the discount rate and 12 periods, we find out the PV factor of the interest from the PVOA table and the PV factor of the principal from the PV table.

	Period	Cash flow	PV factor	PV (Tshs)
Interest	(1-12)	5,000	9.385	46,925
Principal	12	1,00,000	0.625	62,500
			Market price	**1,09,425**

Answer to TY 2

Lets compute the YTM (yield to maturity).
Annual interest = Tshs1000 X12/100 = Tshs120

Bond price = Annual interest X $PVIFA_{kd}^{n}$ + M X ($PVIF_{kd}^{n)}$

At 12% yield the value of the bond is Tshs 1000, therefore for a value of Tshs920 the yield must be greater than 12%.

At 13% discount rate

Tshs120 X $PVIFA_{13,5}$ + M X ($PVIF_{13,5}$)

Tshs 120 X 3.517 + Tshs1000 X 0.543

422 + 543 = Tshs965.

Since with 13% discount rate the value of the bond is greater than Tshs920 we compute with a higher rate @15%

Tshs120 X $PVIFA_{15,5}$ + M X ($PVIF_{15,5}$)

Tshs 120 X 3.352 + Tshs1000 X 0.497

402 + 497 = Tshs 899

Since value of bond at 15% discount rate is less than Tshs920, the YTM lies between 13% and 15%. We find the exact value through interpolation

$$13\% + \frac{965 - 920}{965 - 899} \text{ X } 2\% = 14.36\%$$

Answer to TY 3

Variables that need consideration for a decision to refund.

1. Cost savings by issuing new bonds
2. The costs of new issue .i.e. floatation costs
3. The macroeconomic environment that would influence the interest rate scenario – whether rates are expected to fall further or even out. Further decisions on switching from fixed rate loans to floating rate loans or vice versa is also critical.
4. Tax saving impacts on interest outflow, floatation costs etc.
5. Period between incurring new debt and replacement of old debt

Quick Quiz

1. State True or False

   (a) There is a direct relationship between interest rate and price of the bond.
   (b) The bond would trade at a discount when the required rate of return is less than the coupon rate.
   (c) Credit rating is used to evaluate the credit risk of a corporate borrower.

2. Fill in the blanks:

   (a) In case of ___ yield curve, the long-term rates are lower than the short term rates. (b) A highly rated bond has a ___yield.
   (c) Modified duration is used to measure _____.
   (d) Yield to maturity considers the _____of money.

Answers to Quick Quiz

1.
   (a) False
   (b) False
   (c) True

3.
   (a) Inverted
   (b) Lower
   (c) Price volatility
   (d) Time value

Self Examination Questions

Question 1

A bond has the following characteristics:
Nominal value = Tshs10,000,
Yield to maturity of 9% (with annual compounding frequency),
11% coupon rate and
Annual coupon frequency
Bond period is 5 years

Required:

Calculate the price of the 5-year bond.

Question 2

Samuel has purchased a three-year bond with a par value of Tshs100,000 and coupon rate of 11%. The coupon is paid semi-annually, and the market is rate10%.

Required:

(a) Determine the Macaulay duration of the bond.
(b) Determine the modified duration.

Question 3

TWP Plc is a company listed on the Dar-es-Salaam stock exchange. The company proposes to substitute its existing bonds through issue of new bonds. Following are the details of the bond:

Particulars	Present bond	Proposed bond
Amount	Tshs 2000 m	Tshs 2000 m
Coupon	14.50%	12%
Tenure (yrs.)	25	25
Balance term (yrs.)	20	
Call premium	4%	
Issue cost		Tshs 60m
Tax rate	30%	
T-bill rate	8%	

Tshs 90 million is the unamortised cost of issue of earlier bonds which would be written off once the bonds are called.

Required:

As the finance manager of the firm you are expected to perform bond refund analysis.

Answers to Self-Examination

Answer to SEQ 1

The coupon for Tshs10,000 @ 11% = Tshs 1,100

$$\text{The price of the bond} = \frac{1{,}100}{9\%} \times \frac{1}{1-(1+9\%)^5} + \frac{10{,}000}{1-(1+9\%)^5} = 1{,}100 \times 3.8896 + 0.64993$$

= Tshs 4278.62 + Tshs 6499.30 = Tshs 10,777.92

Answer to SEQ 2

(a) The interest received (cash flow) @ 11% on Tshs100,000 = Tshs 11,000 per annum. Therefore, semi-annual coupon is Tshs 5500. We use the PV tables for each term individually.

Time (t)	Cash Flow (10%)	Interest Factor $(1/(1+i)^t$	Present Value $C*1/(1+i)^t$	Weighted PV $t*C*1/(1+i)^t$
1	5,500.00	0.9524	5,238.10	5,238.10
2	5,500.00	0.9070	4,988.66	9,977.32
3	5,500.00	0.8638	4,751.11	14,253.32
4	5,500.00	0.8227	4,524.86	18,099.45
5	5,500.00	0.7835	4,309.39	21,546.97
6	5,500.00	0.7462	4,104.18	24,625.11
6	100,000.00	0.7462	74,621.54	447,729.24
			102,537.85	541,469.51

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^{n} \frac{t*C}{(1+i)^t} + \frac{n*M}{(1+i)^n}}{P} = \frac{541.469.51}{102{,}537.85} = 5.28/2 = 2.64 \text{years}$$

$$\text{Modified Duration} = \frac{2.64}{1+0.05} = 2.51$$

Answer to SEQ 3

Particulars	**Present bond**	**Proposed bond**
Amount	Tshs2000m	Tshs2000m
Coupon	14.50%	12%
Tenure (yrs.)	10	10
Balance term (yrs.)	5	
Call premium	4%	
Issue cost		Tshs60m
Tax rate	30%	

Calculation of investment	**Tshs million**	
Par value	2000	
Add call premium	80	
Total	**2080**	**A**
Cost of new bonds		
Par value	2000	
Issue costs	60	
Net	**1940**	**B**
Tax savings on call premium paid and unamortised cost		
0.3 X(80+90)	51	**C**
Total investment outlay	**89**	**A-B-C**

Calculation of bond refund NPV	**Tshs million**
Interest savings @(2000 X (14.5-12))	50.0
Post Tax @70% of above	35.0
Less Tax saving on amortisation	
[0.3 (90-60)/5]	1.8
Cash savings	33.2
PVIFA (8%, 25 years)	132.6
less investment	89
NPV	43.6

SECTION D

FINANCIAL ENGINEERING AND PLANNING

D1

STUDY GUIDE D1: FUTURES, OPTIONS AND SWAPS

Get Through Intro

Interest rates have an important bearing on the financial planning of any organisation. Interest rate movements impact the cost of debt. They act as a guide to shareholders as to what they should expect as a fair return. Interest rates therefore also impact share prices.

The rate of interest is a function of numerous factors. It is influenced by the amount of loan, time period, risk measured in terms of the credit quality of the borrower, interest ratio scenario in the economy etc. Furthermore, the interest rates are subject to fluctuations affecting the cash outflow of the firm. The increase in interest outflow beyond a certain point results in high gearing and can jeopardise the financial position of the firm.

Managing interest rate risk is a critical part of financial engineering and planning.

In this study guide we shall discuss the various tools available to the finance manager in terms of interest rate futures, forwards, options and swaps. The hedging strategies using each of these helps in managing interest rate risk.

Learning Outcomes

a) Identify the various features of interest rate futures, interest rate options, interest rate forward contracts and interest rate swaps.
b) Determine the prices of interest rate futures, interest rate options, interest rate forward contracts and interest rate swaps.
c) Advise on hedging strategies using interest rate futures, interest rate options, interest rate forward contracts and interest rate swaps.

1. Identify the various features of interest rate futures, interest rate options, interest rate forward contracts and interest rate swaps.
Determine the prices of interest rate futures, interest rate options, interest rate forward contracts and interest rate swaps.
[Learning Outcomes a and b]

Interest rate risk is the risk that changes in market interest rates might adversely affect a company's financial condition. The immediate impact of a change in interest rates is on a company's earnings. The change in the interest rates also impacts a bank's financial condition by affecting its net interest income.

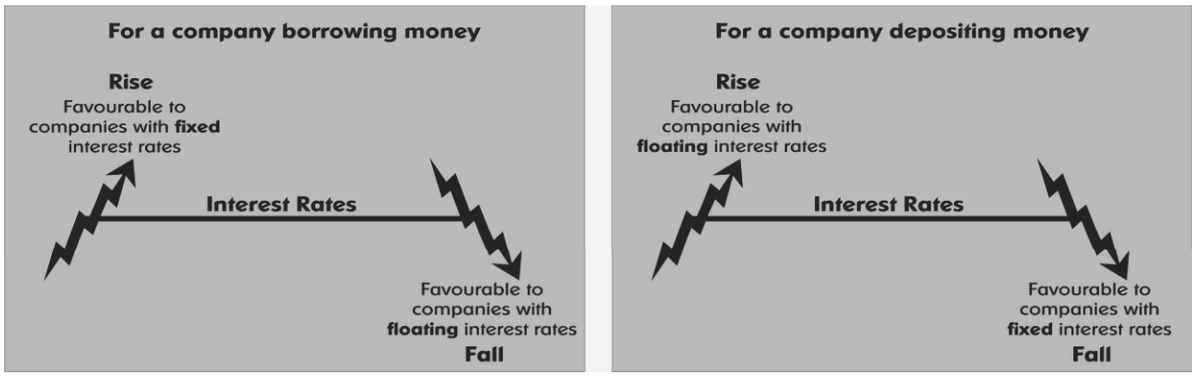
A company can obtain debt at a fixed rate or a floating rate of interest. The uncertainty in interest rates exposes a borrowing company to the following types of risk:

Fixed interest rates prove to be favourable when interest rates are rising. However, in a falling interest rate scenario, companies that have fixed interest debt will pay higher interest, thereby reducing the profitability of their operations.

Floating interest rates prove to be favourable when interest rates are falling. However, in a rising interest rate scenario, companies that have floating interest rate debt will pay higher interest, thereby reducing the profitability of their operations.

Similarly, for a depositing company, a rise in interest rates will be favourable to a company with floating interest rate exposure and a fall in interest rates will be favourable to a company with fixed interest rate exposure.

Diagram 1: Interest rates risk



Example

A company takes out a loan at a rate of interest equal to LIBOR (London Inter Bank Offer Rate) plus 0.1%. LIBOR is 5% at the start of the loan. The rate is to be reset each quarter with reference to the current three-month LIBOR. If commercial interest rates rise, the company runs the risk of increased interest payments. Hence the company tries to ensure that its funding costs do not rise above a certain level via hedging its exposure, or it may even consider paying a fixed rate of interest.

Suppose, on the other hand, the company borrows at a fixed rate of 5.3% for two years. If LIBOR rises to 5.3% or above, the company will be better off than if it had taken out a floating rate loan. However, if interest rates remain unchanged or even fall, the company faces the risk of being locked into borrowing at above market rates. Therefore, the company may want to hedge this risk by entering into a derivative contract that will pay out if interest rates fall.

It should be noted that risk management essentially involves judgement and that no hedging strategy can completely eliminate the interest rate risk. Instead, it could minimise the risk and/or transform the risk from one type into another. Therefore, there is no absolute certainty that a chosen hedging strategy would necessarily improve the earnings in the short run.

1.1 Interest rate futures (IRF)

Definition

An **interest rate futures** contact is a futures contract with an interest-bearing instrument as its underlying asset. The underlying asset could be Treasury bills and notes, certificates of deposit (CD), commercial paper (CP), etc.

Buying a futures contract means committing to buy the underlying asset on some future date at a price agreed today. Selling a futures contract commits you to selling the underlying asset. In the case of interest rate futures, the commodity is a government loan stock (a treasury bill).

It is important to understand the relationship between market interest rates and Treasury bill prices.

A rise in the market interest rates leads to a decline in Treasury bill prices. If you are a borrower, you are afraid that:
Interest rates will rise.
Treasury bill prices will fall.

Conversely, when market interest rates fall, Treasury bill prices rise. If you are a lender you are afraid that:
Interest rates will fall.
Treasury bill prices will rise.

1. The features of interest rate futures (IRF) are discussed below.

(a) IRF are exchanged traded derivatives i.e. they can be traded only on organised exchanges.

(b) Standardised features:

(i) Size of the contract: for a particular exchange all future contracts have a standard size. In case of the London International Financial Futures Exchange (LIFFE) the standard lot size is £500,000. Thus, in order to hedge an exposure of £4 million, eight contracts would be necessary, each of which would be of £500,000.

(ii) Margin requirement: the traders are required to keep a margin with the exchange as a safety deposit. The gains / losses for each trading day are adjusted against the margin. Although all futures transactions have a buyer and a seller, because the exchange is regulating the trade, the obligation of each trader in IRF is towards the exchange and not towards the counter party.

(iii) Delivery dates: these derivative contracts have pre-determined delivery dates when the contract matures. Most futures contracts are usually not delivered, but are cancelled by taking an equal and opposite position. The mark to market (gains and losses) mentioned above are calculated every day as the difference between the futures settlement price of that day and of the preceding day. The positions can also be rolled over although the costs would need to be incurred.

(c) Tick values: to capture even the smallest movement in future prices, tick value is expressed in terms of basis points – one basis point being 0.01% of the amount of the underlying asset. In the case of futures contracts, the price movement is expressed in terms of ticks. It is the minimum gain or loss which may be recorded on a contract. This value varies from contract to contract, depending on the standard size of the contracts traded.

(d) Transparency: since trades happen through the exchange, all the parties are provided with complete information. This ensures transparency in dealings and promotes efficiency.

2. Determining futures price

(a) Treasury bill futures

This is based on the 90-day US Treasury bill. The price of the T-bill is the face value minus the interest which has lapsed. Let assume a 180-day T-bill is trading at a discount of 3%. The price per $1 = 1-0.03 (180/360) =$0.985. If the investor holds it till maturity he would receive $1. While trading, the price is given as 100 minus the rate quoted as a percentage, priced into the contract by the futures.

(b) In the case of Eurodollar Futures, the benchmark rate is the LIBOR (London interbank offer rate). If the rate of a contract is 6% in the futures market for a 90-day paper, the quoted price is 100-6 =94. If each IRF contract has a notional principal of £500,000 then the actual futures price is: £500,000 (1-0.06 (90/360)) = £492,500

The prices vary on a daily basis and are adjusted against the margin accounts.

Example

A three-month Tshs IRF is quoted on a recognised investment exchange. Its delivery date is 21 March 20X7. The value of the IRF reflects the market's view of what the future short-term interest rates will be on 21 March.

The quoted price of the futures contract indicates the implied forward rate. If the futures contract is trading at 95.60 on a particular day (say 1 March 20X7), this implies that the market believes the three-month LIBOR will be 4.40% (100 – 95.60) on 21 March.

Suppose the market expects interest rates to fall. On 3 March, the IRF is quoted at 95.65. In other words, the market expects that the three-month LIBOR on 21 March will be 4.35% (100 – 95.65).

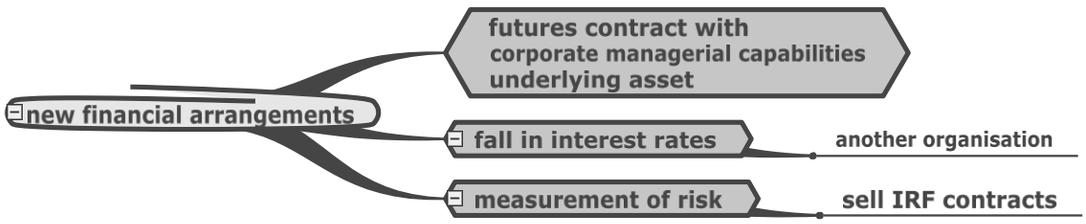
This means that someone anticipating a fall in interest rates might buy the IRF on 1 March at 95.60 and sell on 3 March at 95.65, making a profit.

Assuming that the underlying asset for the IRF is a notional three-month deposit of Tshs500million, then for every 0.01% change in interest rates, the interest earned on such a deposit would change by:

Tshs500million x 0.01% x 3/12 = Tshs12,500

Each IRF contract is based on a notional Tshs500 million deposit which is also called the unit of trading. Tshs12,500 is called the **tick value** which is the standard minimum price movement on the particular contract concerned. Here the price of the future alters by 0.05 (95.65 – 95.60), or 5 ticks. So the profit on each contract would be equal to the tick value x ticks per contract = Tshs12,500 x 5 ticks = Tshs62,500.

SUMMARY



1.2 Interest rate options

Interest rate options are used by investors, borrowers and traders to manage interest rate risk exposures. This product is available on payment of an upfront fee, called the premium.

An interest rate option is an option on a notional borrowing or a deposit which guarantees a minimum or a maximum rate of interest for the option holder (called strike price). The option is cash settled.

An interest rate call option guarantees the borrower a maximum rate of interest whereas an interest rate put option guarantees the depositor a minimum rate of interest.

1. Features of options

(a) Interest rate options could be over-the-counter or exchange-traded options. An OTC interest rate call option is similar to an option to buy a Forward Rate Agreement and is used by borrowing companies. However, in the case of FRA, there is an obligation to make and receive payment at a future date. In interest rate options, there is a right to make one interest payment and receive another.

(b) Interest rate options have an exercise price or strike price for the underlying rate.

(c) An interest rate call option is an option where the holder has a right to receive a make a known interest payment and receive an unknown interest payment. The reverse is true for an interest rate put option. A borrower requires a combination of call options to hedge his interest rate risk. A lender requires a combination of put options.

(d) The options are settled on expiry in cash.

2. Option payoffs

(a) OTC interest rate options

(i) If at the expiry of the option, the underlying rate at expiry is above the agreed strike price, the company should exercise the call option. If it does so, the company would receive cash from the seller of the call option.

(ii) If the underlying rate at expiry is equal to or lower than the agreed strike price, then the option contract could be allowed to lapse.

(b) Exchange-traded interest rate options

Exchange-traded options are usually American style options and could be exercised at any time.

(i) The buyer of an exchange traded call option has the right (but not the obligation) to buy an interest rate futures contract. Therefore, a depositor concerned with a fall in interest rates should buy IRF contracts or buy interest rate call options.

(ii) The buyer of an exchange-traded put option has the right (but not the obligation) to sell an interest rate futures contract. Therefore, a borrower concerned about a rise in interest rates should sell interest rate futures or buy interest rate put options.

Example

Mr. X is an option buyer of a LIBOR for a 90-day period. The notional principal is Tshs8,000 million and he chooses an exercise rate of 5%. If the 180-day LIBOR quotes at 5.5%, he will exercise the option, the call is in the money. The payment to Mr. X will be

Tshs8000 m X (0.055-0.05) X (180/360) =Tshs20m

For an interest rate call the payoff on expiration is:

$$\text{(Notional principal) Max (0, rate on underlying instrument on expiry – exercise rate)} \times \frac{\text{Days in underlying rate}}{360}$$

The days in the underlying rate are the specific days to maturity of instrument e.g. 90 day or 360 days.

For an interest rate put, the payoff on expiration is:

$$\text{(Notional principal) Max(0, exercise rate – rate on underlying instrument on expiry)} \times \frac{\text{Days in underlying rate}}{360}$$

If the underlying rate is greater than the exercise rate, the put option expires out-of-the-money. The hedging techniques with interest rate put / call options referred to as cap, floor and collar are discussed in the subsequent sections.

Example

Brand Ltd wants to borrow Tshs20 million in three months' time. The three-month LIBOR is currently quoting at 5%. The company is concerned about a rise in the interest rates and it does not want to pay more than 5% for its loan. Assume it is now 1 December.

The company can buy four April LIBOR Sterling put option contracts of Tshs5million each with a strike price of 95. For this, the company has been quoted a price of 0.15 per contract. This translates into a cost of 15 ticks per option contract. The cost of each tick is Tshs125.0 (Tshs5 m X 0.001 X3/12). Therefore, the cost of four option contracts will be equal to 15 x 4 x Tshs125 = Tshs7500.

Continued on the next page

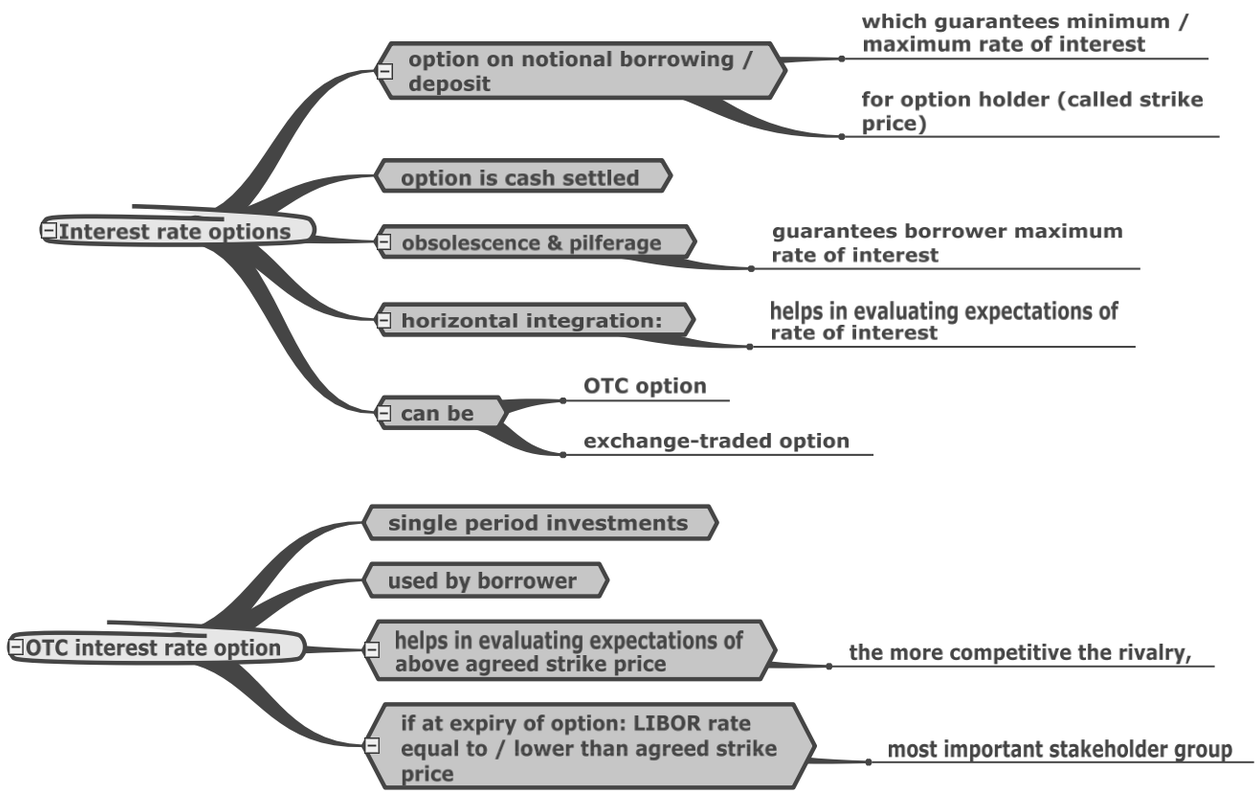
If LIBOR rises to 6% on the date of exercise, the company will exercise its option and sell the future contracts at 95. Assuming no basis risk, the futures price would have dropped to 94 (100 – 6). Therefore, the company makes a 1% gain by buying futures at 94 and selling them at 95. This translates into a gain of 100 ticks at Tshs125 each per contract. This results in a total profit of 100 x Tshs125.0 x 4 = Tshs50,000 on the option. This amount is equal to the cost of borrowing which is Tshs20million x 1% x 3/12 = Tshs50,000.

Therefore, by incurring a premium cost of Tshs7500, Brand Ltd has guaranteed a maximum borrowing rate of 5%

However, if LIBOR falls below the strike price of the option, the company could simply allow the option to lapse, thereby losing just the premium. If, for example LIBOR is 4.5% on the date of exercise, Brand Ltd can take advantage of the fall in interest rates by borrowing at 4.5%, allowing the option to lapse losing the premium of Tshs7500.

The option pricing models have been discussed in detail in Study Guide E3 of this study text.

SUMMARY



Test Yourself 1

Brick and Burn Ltd has an upcoming project for which it would require finance to the tune of Tshs25 million. This project is estimated to commence in three months from date. The three-month LIBOR is currently quoting at 5%. The company is concerned about a rise in the interest rates and proposes to use interest rate options to hedge the interest rate risk.

The company can buy four 3-month LIBOR Sterling put option contracts of Tshs5million each with a strike price of 95. For this, the company has been quoted a price of 0.20 per contract.

Required:

Calculate the option pay off if LIBOR rises to 5.5%

1.3 Forward rate agreements (FRAs)

A forward rate agreement (FRA) is an agreement between two parties to fix the interest rate in advance on a notional amount for a specified period which would commence at some agreed future date.

An FRA enables a company to protect itself against interest risk by fixing the effective rate of interest before the intended borrowing or deposit date. The parties to the contract agree to pay / receive the difference between the market rate of interest on the effective date and the rate according to the contract.

The bank and the customer enter into an FRA to fix a future rate of interest to cover a specified amount of money to be lent or borrowed for a specified period of time in the future. The FRA relates only to the predetermined rate of interest on a sum of money and not to the actual sum of money borrowed or lent. The borrowing / lending is the base transaction which happens at the prevailing rate of interest.

1. Features of the FRA

(a) A forward rate contract is not an exchange traded contract. It is an over-the-counter (OTC) contract which can be made to suit the needs of the parties.

(b) Usually, the assumption underlying the contract is that borrowing or lending is benchmarked against the LIBOR or the specific country's inter-bank rate.
(c) On maturity of the contract, the profit / loss is settled in cash. In the case of an FRA between the bank and a party, if at the time of maturity the LIBOR is above the agreed forward rate, the party pays the difference to the bank.
(d) FRA is an off-balance sheet item.

(e) There are no transaction costs
(f) Unlike the IFR, there are no initial or variation margins and it does not involve a central clearing facility. It is entered into by the bank and a customer.

(g) The transaction can be closed at any stage by entering into a new and opposing FRA at a new price or settling the contract before expiry.

(h) The contract can be tailor made to meet specific customer requirements

2. Advantages of an FRA

(a) No fee or premium is required at the time of entering an FRA.

(b) One can reverse the position of an FRA by taking an equal and opposite position, called offsetting. The FRA could be settled by either receiving cash or paying cash.

(c) An FRA is not a replacement for borrowings or investments i.e. it is off balance sheet (SOFP).

(d) The terms of an FRA are highly flexible since the notional amount; currency and the contract period can be negotiated between the parties.

(e) FRAs provide protection against an adverse movement of interest rates.

(f) It helps in planning the cash flow as the interest rate is known.

3. Limitations of an FRA

(a) FRA only protect from adverse movements. The party does not benefit from favourable movements.

(b) FRAs are bilateral agreements that can be closed only by negotiation between the two parties. This makes them illiquid and non-tradable.

(c) FRAs are subject to counterparty risk since if one party wishes to reverse the contract; it is forced to go to the same counterparty.

4. Pricing and settlement of FRA

Under FRA the underlying instrument is the interest payment in a particular currency.

Example

Let's consider an FRA for a 180-day LIBOR where the bank quotes a rate of 6%. Let's assume the party believes that rates would increase while the bank believes that rates would decline. In this case, the Bank would short the rate and benefit if the rate declines. The contract is for a notional principal of Tshs1000 million. The rate on which the contract is based is the 180- day LIBOR. The FRA expires in 90 days.

The 180-day LIBOR rate is 6.5%, 90 days hence. The present value of the principal at that time would be

$$\frac{\text{Tshs1000 m}}{1+0.065\,\frac{180}{360}}$$

The party would receive the following payment from the Bank

$$\text{Tshs1000 m}\,\frac{(0.065-0.06)\,\frac{180}{360}}{1+0.065\,\frac{180}{360}} = \text{Tshs } 2{,}421{,}310$$

In the above case, if the underlying rate is less than 6%, the difference would be paid by the party to the bank.

From the above it is clear that the difference between the actual rate on expiry of the contract and the agreed rate is settled. However, it has to be adjusted for the period of the instrument, 180 days in the above case. Furthermore, the pay-out has to be adjusted for the fact that the payment occurs 180 days later. We therefore need to discount the pay-out at the current LIBOR. Therefore, the price for the party expecting the rate to increase i.e. going long is

$$\text{Notional principal}\,\frac{\text{Actual rate - FRA rate}\,\frac{\text{Days in underlying rate}}{360}}{1+\text{underlying rate on expiry}\,(\frac{\text{days in underlying rate}}{360}}$$

Where the actual rate is the rate on the underlying instrument on expiry of the FRA.

1.4 Interest rate swaps

Definition

An **interest rate swap** is an agreement whereby two counterparties agree to exchange a stream of interest payments based on a notional amount of principal with each other over an agreed period of time.

In the case of interest rate swaps there is an exchange of the interest streams. The principal is not included. The interest rate swap is entered into to hedge against interest rate fluctuations or to obtain an advantage in terms of a lower effective rate of interest after the swap.

Example

Company A has a debt of Tshs100 million on which a floating interest of LIBOR plus a credit spread of 0.5% is payable and Company B has a borrowing of Tshs100 million on which a fixed interest rate of 9% is payable. A and B enter into an interest rate swap transaction under which Company A agrees to pay Company B, a fixed interest rate of 9% and Company B agrees to pay Company A, a floating interest rate swap of LIBOR plus 0.5%.

This transaction can be diagrammatically represented as follows:

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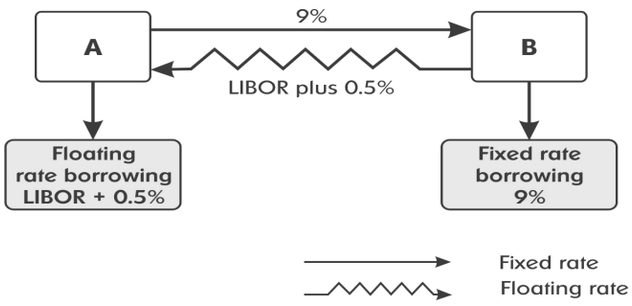


1. Features of interest rate swaps

(a) Both the parties would benefit from the swap arrangement only if there is a quality spread differential.

Example

Bell Ltd and Organe Ltd are two companies which have borrowed on floating rate and fixed rate basis respectively. They propose to enter into an interest rate swap arrangement. The rates quoted by each party for the present and proposed arrangement are

Company	Fixed rate	Floating rate
Bell Ltd	13%	TIBOR + 1%
Organe Ltd	13.5%	TIBOR + 2%

Bell Ltd has an advantage in terms of both fixed and floating rate loans. The differential spread is calculated as:
(i) Fixed rate 13.5% - 13% = 0.5%
(ii) Floating rate (TIBOR + 2%) - (TIBOR + 1%) = 1%

Combined differential = 1% - 0.5% = 0.5%

The swap is possible only because this combined differential exists.

(b) Interest rate swaps exchanges a floating rate borrowing with a fixed rate borrowing and vice versa.
(c) Although it is based on a 'notional' underlying sum of money, it is concerned only with the interest flows, there is no exchange of principal repayment obligations.
(d) Each party's primary obligation under the loan agreement continues. The lender needs to be paid under the terms of the original contract.
(e) Swaps are flexible as regards duration and amount.
(f) The swap contract is separate from the underlying loan agreement.
(g) It is an off-balance sheet transaction.

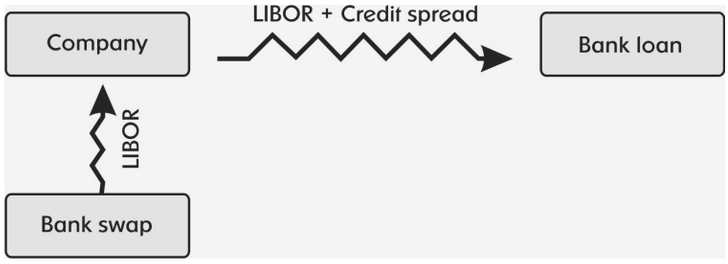
3. Types of swaps

There are three types of interest rate swaps:

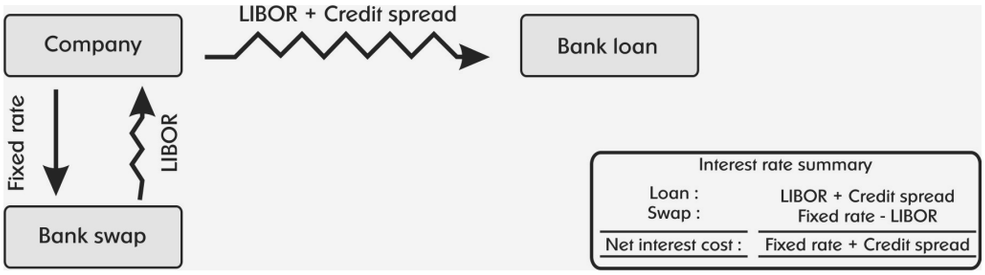
(a) Floating to fixed interest rate swap

Floating to fixed interest rate swaps are used by companies to fix the interest obligation on their floating rate borrowings. Under these swaps, companies make fixed rate payments and receive floating rate payments that can be used to offset the floating interest obligations on a corresponding principal amount of these borrowings. Assume that a company has a four-year bank loan on which it needs to pay interest at the rate of one month LIBOR plus a credit spread and is therefore exposed to increases in LIBOR over the life of the facility.

To avoid the interest rate risk associated with changes in LIBOR, the company enters into a floating to fixed interest rate swap with the bank. In this contract, the bank agrees to make payments to the company based on LIBOR.



In return for receiving LIBOR payments under the swap, the company pays a fixed rate to the bank. Since the LIBOR rate paid to the company matches the floating rate index on the bank loan, the company's net interest expense is the fixed interest rate plus the credit spread.



Benefits

Flexible risk management: companies can enter into a swap at any time, for any term and on any portion of their variable rate debt.

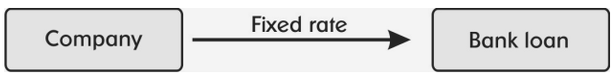
Independent hedge: borrowers can allocate the benefits of any of their swaps to any of their borrowings since swaps and loans are distinct facilities. In addition, when swaps are executed against a floating index such as LIBOR, the borrowers benefit whenever credit spreads on their underlying LIBOR-based debt facilities are reduced during the term of their swaps.

(b) Fixed to floating interest rate swap

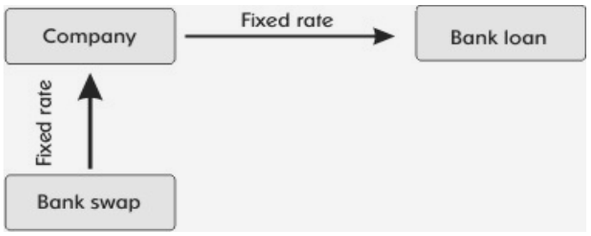
Just as a floating to fixed interest rate swap eliminates a company's risk to floating rates, a fixed to floating interest rate swap allows companies to undertake a floating rate exposure. A company with fixed rate debt may require an exposure to floating rates in order to achieve immediate interest savings or a better asset-liability match.

Example

Assume a company borrows Tshs500 million for four years and is paying a fixed interest rate. The company wishes to convert its fixed rate interest expense to a floating rate basis for the next four years so as to realise immediate interest savings.
The company is obligated to pay a fixed rate on this debt for four years.



The bank will pay the company a swap fixed rate equal to the fixed rate on its debt for the life of the four-year swap contract.



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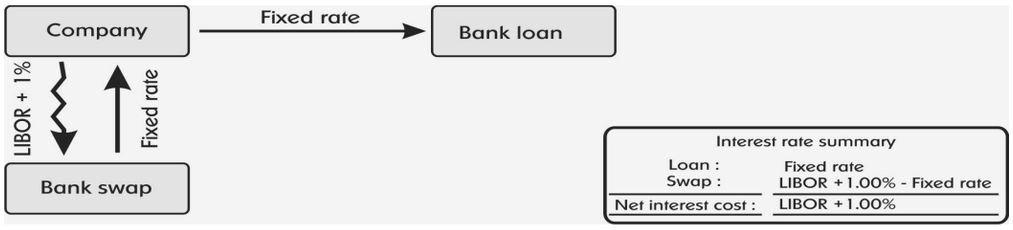
In return for receiving fixed rate payments under the swap, the company will make payments based on floating rate to the bank based on a floating rate (for example LIBOR + 1.00%) for the four-year term of the swap contract.



Benefits

Immediate cost savings: if the long-term rates are higher than the short-term rates, the fixed to floating interest rate swap results in immediate interest savings since a company can convert its interest expense from a long-term fixed rate basis to a cheaper short-term floating rate basis.

No refinancing requirements: companies can use fixed to floating interest rate swaps to structure their fixed versus floating interest expense profile without having to refinance their existing debt.

(c) Basis or money market interest rate swap

In the case of basis swaps, the two series of cash flows to be exchanged are based on floating interest rates but each series is calculated using a different basis (e.g. one series may be calculated using LIBOR and the other series might be calculated using the rate on commercial paper).

(d) Cross-currency swap

A cross-currency swap is an interest rate swap in which both series of interest payments are made in two different currencies. It involves the exchange of the principals at the beginning and re-exchange at maturity.
It should be noted that a cross-currency swap is different from a FOREX swap.

Advantages of interest rate swaps

The company can reduce its cost of borrowing in a convenient manner without having to refinance the existing debt from another lender.
Interest rate swaps can be tapped by borrowers who have a relatively low credit standing and do not have ready access to finance.
Interest rate swaps help to restructure the debt profile without actually redeeming and refinancing the loans.
These can be arranged for longer time frames to hedge against interest rate fluctuations.

(e) Determining prices of interest rate swaps

In the case of an interest rate swap, there are two parts. The fixed interest part and the floating interest part. In the case of the first part the cash flows can be easily determined based on the agreed coupon rate. However for the floating rate part the cash flows are not static. They would vary with movements in interest rates.

Fixed interest part of the swap

$$Pfi = \sum_{i=1}^{n} NR\alpha i - 1,1Di$$

Where,

P_{fi} = present value of cash flows for the fixed interest rate part,
N = notional principal amount,
R = fixed coupon rate,
n = number of coupons payable between value date and maturity date,
$_{i-1,i}$ = accrual factor between dates i - 1 and i based on the specified accrual method, and
D_i = discount factor on cash flow date i.
Floating rate part of the swap

$$P_{fi} = \sum_{i=1}^{n} NF_{i-1,i}, \alpha_{i-1,1} D_i$$

$$F_{i-1,i} = \frac{1}{\alpha_{i-1,i}} \left(\frac{D_{i-1}}{D_i} - 1 \right)$$

P_{fl} = present values of cash flows for floating interest part,
N = notional principal amount,
$F_{i-1,\,i}$ = (implied) forward rate from date i - 1 to date i,
$_{i-1,i}$ = accrual factor from date i - 1 to date i based on the specified accrual method, and
n = number of cash flows from settlement date to the maturity date, and
D_i = discount factor on cash flow date i.

The difference between the values of the above two cash flows is the present value of the swap.
In case the party pays floating and receives fixed, the swap value is expressed as

$P_{swap} = P_{fixed} - P_{floating}$

In case the party pays fixed and receives floating, the swap value is expressed as

$P_{swap} = P_{floating} - P_{fixed}$

Test Yourself 2

Orbit Ltd. and Comet Ltd. have borrowed a mortgage loans from a bank for a period of 5 year and 7 years respectively. They have borrowed on floating rate and fixed rate basis respectively. They propose to enter into an interest rate swap arrangement. The rates quoted by each party for the present and proposed arrangement are:

Company	**Floating rate**	**Fixed rate**
Bell Ltd.	TIBOR * + 1.25%	14%
Organe Ltd.	TIBOR* + 2%	14.25%

* benchmark rate (Tanzania interbank rate)

Determine whether an Interest rate swap is feasible.

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2. Advise on hedging strategies using interest rate futures, interest rate options, interest rate forward contracts and interest rate swaps.

[Learning Outcome c]

2.1 Hedging Strategies using interest rate futures

A futures contract primarily involves fixing the price today of the interest rate contract to be sold or purchased at a future date. A position should be taken in the futures market such that if you are apprehensive of a particular outcome (given your underlying trading position) and that outcome were to happen, you make a profit on the futures deal.

The profit made by entering into the futures transaction offsets the loss on the underlying trading position, thereby minimising/eliminating the risk. The hedging strategy using interest rate futures involves analysing the gain / loss from the futures contract together with the change in the interest outflow on the company's liability on account of interest rate movements.

Rule of thumb

If a borrowing company expects a fall in interest rates it must buy IRF contracts.
If a borrowing company expects a rise in interest rates it must sell IRF contracts to guard against loss from interest rate fluctuation.

Similarly, if a depositing company expects a fall in interest rates, it should buy IRF contracts and if it expects a rise in interest rates, then it should sell IRF contracts.

Diagram 2: Hedging interest rate risk using IRF

Position	Interest rates expected to	Decision
Borrower (concerned with rise)	Rise	Sell IRF
Depositor / lender (concerned with fall)	Fall	Buy IRF

The value of an IRF is directly related to interest rates. For example, if interest rates decrease, the price of the contract increases. Every one basis point change in the interest rates causes a price change that results in gains for the buyer and losses for the seller of the IRF. The traders in interest rate futures do not usually take delivery of the financial instrument. The IRF is used either to hedge or to speculate on future interest rates and security prices. For example, a pension fund manager might use interest rate futures to hedge the pension fund's bond portfolio position. Speculators find financial futures attractive because of their potentially large return on a small investment due to the low deposit requirement.

Usually, an exchange-traded interest rate futures contract has a notional deposit as the underlying asset. As interest rates rise, the value of the notional deposit falls. Therefore, an IRF is quoted at a price which is equal to 100 minus the interest rate. The value of the contract rises and falls inversely to changes in interest rates. IRF contracts usually run in three-month cycles. If a company intends to hedge its interest rate risk for a different period, the number of futures contracts used to hedge should be adjusted by the following factor.

$$\frac{\text{Interest period to be hedged}}{\text{3 months}}$$

$$\text{Number of Contracts} = \frac{\text{Amount to be hedged}}{\text{Contract Amount}} \times \frac{\text{Number of contract periods per year}}{\text{Number of exposure periods per year}}$$

The most important IRFs are London International Financial Futures Exchange (LIFFE) three-month Sterling time deposits, US Treasury bonds and three-month Eurodollar contracts.

Example

A company is planning to borrow Tshs60 billion in one month's time for a period of three months. It fears that the future interest rate will rise from its current level of 6% and so decides to use interest rate futures to hedge the position. The minimum contract size is Tshs5billion and the current price is 95. In one month's time, the interest rates have risen to 8% and the futures price is 93. The cash flow that results from the profit or loss on the futures and the net interest cost to the company can be calculated as follows:

$$\text{Number of contracts } \frac{60 \text{ billion}}{5 \text{ billion}} \times \frac{3}{3} = 12 \text{ contracts}$$

Number of tick movement per contract = (95 – 93) x 100 = 200

Value of one tick = Tshs5billion x 3/12 x 0.0001 = Tshs125,000

for everyone basis point movement – 0.01%

Profit on futures = Ticks per contract x Tick value x Number of contracts = 200 x 125000 x 12 = Tshs300million
Net interest cost to the company for the three-month period is calculated as follows:

(Tshs60billion x 0.08 x 3/12) – Profit on futures

= Tshs1200 million – Tshs300million = Tshs900million.

This is an effective rate of interest on the borrowing of (Tshs900 million/Tshs60 billion) x 12/3 = 6%.

The company has "lost" 2% in the actual rate of interest rise from 6% to 8% and "gained" 2% from selling the future at 95, buying it at 93.

Test Yourself 3

Hitec Electronics Ltd has planned to borrow Tshs100million for 3 months beginning next month (in early July 20X6) and expects to pay interest at LIBOR plus 0.6%. The company has had discussions with a bank to use 3-month futures to hedge its exposure to increasing interest rates.

Hitec sells July 3 month futures at a price of 96.28. Hitec subsequently closes the position in early July 20X6 at a price of 95.57. At the same time the company borrows Tshs100million at 5.03%, which is the current LIBOR rate of 4.43 plus 0.6%.

Assume the unit of trading is Tshs5million, the tick size is 0.01% and the value of 1tick is Tshs125

Required:

What is the net interest amount payable by Hitec? Prove by calculations that the net amount payable on the loan is the same as the amount locked through selling the futures.

2.2 Hedging interest rate risk using FRAs

Buying an FRA

If a company is worried about a rise in interest rate it should buy an FRA from the bank. This is the notional loan at a fixed contracted rate where the bank (seller of FRA) agrees to compensate the buyer for any increase above the fixed FRA rate.

Selling an FRA

If a company is worried about a fall in interest rates, it should sell an FRA to the bank. This is equivalent to a notional deposit of the contracted amount where the seller will be reimbursed if the interest rate falls below the contracted deposit rate.

A borrower with a fixed interest rate exposure should sell an FRA and a borrower with a floating interest rate exposure should buy an FRA.
A depositor with a fixed interest rate exposure should buy an FRA and a depositor with a floating rate exposure should sell an FRA.

Diagram 3: Hedging interest rate risk using FRAs

Interest rate exposure	Borrower	Depositor / lender
Fixed	Sell FRA	Buy FRA
Floating	Buy FRA	Sell FRA

SUMMARY

Example

Triya Ltd requires a Tshs20billion loan starting 3 months from today and repayable three months after that date at a floating interest rate. The current floating interest rate is 9%. The company is unable to predict the movement of interest rates in the coming three months. The board of directors of Beck Ltd believes that interest rates may go up. To protect itself from an increase in interest costs, Beck Ltd decides to hedge its interest rate risk by purchasing a “3-6 FRA” today.

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The bank is ready to guarantee a rate of 9.5% for the next three months. Therefore, by entering into a forward interest rate agreement at 9.5%, Beck Ltd has limited its interest cost to Tshs475m for the future three-month period, calculated as (Tshs20billion x 9.5% p.a.) x 3/12
If interest rates go up to, say, 10%, Beck Ltd has saved interest of Tshs25m (Tshs500million - Tshs475million) by entering into an FRA.

However, if, after three months, interest rates fall to 8.5%, the interest cost would be Tshs425million ((Tshs20billion x 8.5% p.a.) x 3/12). In this case, Beck Ltd will have to pay Tshs50million (Tshs475 - Tshs425) to the bank. Irrespective of what happens to interest rates in the three-month period, Beck will pay interest at 9.5% to the bank.

Tip

Although calculations have been shown on the basis of the number of months, an alternative way is to take the exact number of days in the contract period. The denominator is either 360 or 365 days. The British Bankers' Association recommends this method of calculation.

Test Yourself 4

A company with a Tshs10 billion floating rate exposure with rollovers to be fixed by reference to the 6-month LIBOR rate expects the short-term interest rates to increase. The next rollover date is due in 2 months. The company seeks a quote from its banker for a 2-8 USD FRA quote (or a 6 month LIBOR 2 months hence). The bank quotes a rate 6.68 and 6.71). The customer locks the offered rate 6.71.

Required:

Calculate the amount that the company gains or losses if the interest rate increases/decreases by 100 basis points.

Example

ABC Ltd proposes to take a 3-month loan of Tshs800 million in the next three month period at a rate linked to LIBOR. To protect against an increase in interest rates in the interim, the company enters into an FRA, the interest rate for which is set at 9.5% pa. The LIBOR falls to 6% pa.

In this case, the interest rates have decreased; ABC Ltd will have to pay the bank the interest rate differential, calculated as
Tshs800 m X (9.5-6) X 90/360 = Tshs7 m

FRA in this case has not benefitted ABC Ltd.

2.3 Hedging interest rate risk using Interest rate swaps

Example

Alfa Ltd and Beta Ltd are presently borrowing at the following interest rates:

	Alfa Ltd	Beta Ltd
Canadian$ (fixed interest rate)	5.00%	7.00%
US $ (Floating rate)	LIBOR + 1.0%	LIBOR + 1.50%

Alfa Ltd intends to borrow US$ at a floating rate of interest and Beta Ltd wants to borrow Canadian$ at a fixed rate of interest. A bank is planning to arrange a swap and wishes to keep a spread of 50 basis points. The rates Alfa Ltd and Beta Ltd will end up paying if the swap is to be made equally attractive to both parties are calculated as follows:

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	Alpha	Beta
Present interest rates (a)	LIBOR + 1.0%	7%
Alpha borrows at fixed rate and Beta borrows at floating rate and swaps its loan (b)	LIBOR + 1.50%	5%
Gain / (loss) (a – b)	(0.5%)	2%
Transfer of loss from Alfa Ltd to Beta Ltd	0.5%	(0.5%)
Initial gain	-	1.50%
Less: Payable to bank	-	(0.5%)
Net gain	-	1.0%
Transfer of gain	0.50%	(0.50%)
Final rate payable	LIBOR + 0.50%	6.50%

In practice, swaps are arranged through banks, which charge an arrangement fee for providing their services. Usually the arrangement fee is divided equally between parties of the swap agreement. Furthermore, companies will not exchange the interest payments but only the difference between the interest at fixed and floating rates paid or received.

Test Yourself 5

Tan and Zan Companies can borrow for a five-year term at the following rates:

	Tan	Zan
Credit rating	AA	BB
Fixed-rate borrowing cost	11.5%	13.0%
Floating-rate borrowing cost	LIBOR	LIBOR + 1%

Assume the swap bank is quoting five -year interest rate swaps at 11.7.7% - 11.8% against LIBOR flat.

Required:

(a) Calculate the quality spread differential (QSD).

(b) Assume Tan desires floating-rate debt and Zan desires fixed-rate debt. Develop an interest rate swap in which both Tan and Zan have cost savings in their borrowing costs.

2.4 Hedging using interest rate options

1. Caps, floors and collars

Borrower's and depositor's interest rate options, discussed above, relate to a single interest period only. However, the borrowing companies might require hedging their floating rate interest rate exposures for several interest periods. Interest rate caps, floors and collars are OTC interest rate options that enable a company to hold options for a series of consecutive interest periods. They can be structured using market-based interest rate call options and put options. They could be used to hedge current or expected interest receipts or payments.

(a) Interest rate cap

Definition

An **interest rate cap** is a contract that enables companies with floating rate debt to limit or "cap" their exposure to rising interest rates.

A cap could be compared to a **series of call options on FRAs**. It is similar to a series of European interest rate call options, each with a different strike price and covering a different interest period. It protects the holder against rising market interest rates in return for payment of a premium upfront. The cap premium is the total of the premiums of the individual interest rate options that make the structure of the cap.

These individual interest rate options which make the structure of the cap are also called **'caplets'**. Borrowers are assured that the lenders cannot increase their borrowing rate above the level of the cap. OTC caps are available for periods of up to 10 years and can therefore protect against long-term interest rate movements. If the interest rates move in a favourable direction, the buyer of the cap can let the option lapse and take advantage of the more favourable rates in the spot market. In general, the longer the term of the cap and the more the protection offered by the cap, the more expensive the cap will be.

The cap buyer is reimbursed for the amount by which the floating rate index exceeds a certain threshold rate fixed by the company. For example, an interest rate cap can be structured to protect companies from a rise in floating rate indices such as LIBOR or US Treasury rates.

Example

Assume a company is planning to borrow Tshs10 million for four years at a floating rate of one-month Tanzanian benchmark rate plus the company's credit spread. The company wishes to cap the Tanzanian benchmark rate component of its interest expense at 12% over the four-year life of the loan. In return for a payment of Tshs200,000 upfront, the company purchases a four-year 12% one-month Tanzanian benchmark rate cap on a Tshs10 million notional amount.

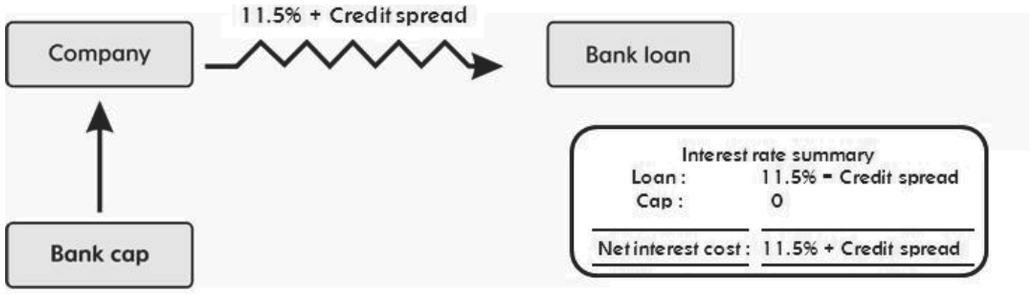
Required:

Calculate the interest rate for the company, assuming Tanzanian benchmark rate at the date of reset is (i) 6.5% or (ii) 7.5%.

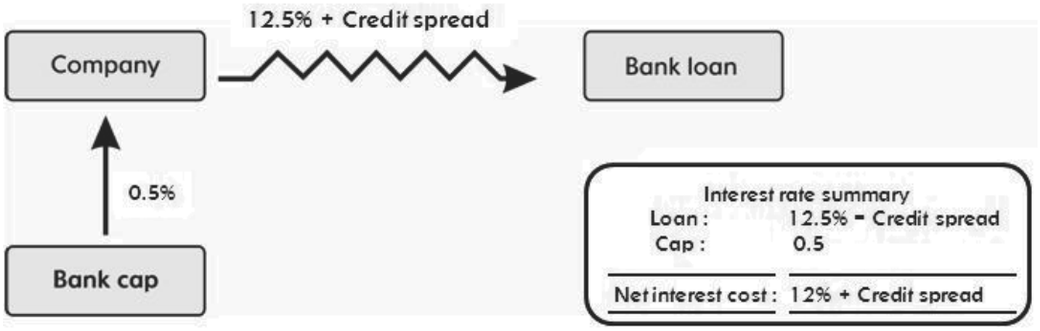
Answer

Scenario 1: Tanzanian benchmark rate **at the reset date is 11.5%.**

If Tanzanian benchmark rate moves to 11.5%, the company is guaranteed that the Tanzanian benchmark rate component of its corresponding interest expense will never exceed 12% (all things being equal, including Tanzanian benchmark rate resets). Since 11.5% is less than the cap level of 12.00%, the company receives no payment from the cap and simply pays the floating rate of 11.5% Tanzanian benchmark rate plus the credit spread on the loan.



Scenario 2: Tanzanian benchmark rate **at the reset date is 12.5%**
When Tanzanian benchmark rate is greater than 12.00% on a periodic reset date, the company will receive a payment for the amount by which the Tanzanian benchmark rate exceeds the 12.00% cap level. For example, when Tanzanian benchmark rate is 12.5% on such a date, the company receives 0.5% (12.5% - 12.00%). Therefore, the company's net interest expense on the corresponding debt for that period is limited to 12.00% plus the credit spread.



Benefits of a cap

Low cost protection: the buyer of the cap receives interest rate protection for a minimal cost upfront.
Flexibility: while offering protection, caps allow the buyer to continue to benefit from declining floating rates on its underlying debt.
Facilitates cash flow planning: the company can plan its cash flows, since it knows in advance the maximum interest commitment over the period of the cap.

Test Yourself 6

Plots Ltd has arranged a Tshs100 million five-year loan from its bank in order to expand its business. The interest terms are six-month LIBOR plus 1%. The interest at present is 6.5%. LIBOR is reset every 6 months and payable in arrears. The company does not want to pay more than 7.0%. However, it anticipates that interest rates will fall in the medium term and does not want to be locked into a 7% rate.

The company buys an interest rate cap from a bank, fixing the maximum borrowing rate at 7.0%.

Required:

Calculate the net pay-off if:
(a) at the end of six months, LIBOR is 6.5%
(b) at the end of 12 months, LIBOR is 5.8%

(b) Interest rate floor

Definition

An **interest rate floor** is a contract in which the buyer purchases a series of put options or floorlets and receives money if the reference rate is lower than the agreed strike price of the floor.

A floor could be compared to a series of put options on FRAs. It is similar to an option, which allows a company to hedge a deposit by being guaranteed a minimum rate of interest. In return for a premium, the option holder has the right, but not the obligation, to fix the interest rate on a notional deposit. The option is exercisable at agreed intervals, and is cash settled in the same way as an interest rate cap.

(c) Interest rate collar

The problem with interest rate caps is that, as with any option, the holder must pay a premium upfront. The premium amount may be substantial particularly if, as in the above example on caps, the company wants to hedge an interest rate exposure extending over a number of years.

In the case of a collar, the premium that the company would pay on the cap element is netted off against the premium it would receive on the floor element, so that in effect, the company will pay a much lower premium for an interest rate collar than it would for a cap.

Definition

An **interest rate collar** is a combination of a cap and a floor transacted simultaneously. The buyer of an interest rate cap purchases an interest rate cap while selling a floor indexed to the same interest rate, for the same amount and covering the same period.

At each fixing date, if the interest rate is above the cap, the bank will reimburse the company. However, at the same time, the company sells the bank an interest rate floor. Therefore, if at a particular reset date, the relevant interest rate is below the floor, the company reimburses the bank.

In the case of a borrowing collar, a company buys a put option and sells a call option.
In the case of a lending collar, a company buys a call option and sells a put option.

An interest rate collar limits a floating interest rate to a pre-determined range.

Diagram 4: Interest rate risk using collar

Borrowing collar	Buy put option and sell call option
Lending collar	Sell put option and buy call option

Example

A company has a four-year Tshs100 million bank loan bearing interest at a rate based on one month LIBOR plus credit spread. The company would like to limit its exposure to any increase in LIBOR above 7.00% and therefore purchases a four-year 7.00% cap on LIBOR from the bank. However, to avoid paying fees upfront, the company sells the bank a 5.80% floor. The collar is structured as follows:

If LIBOR is greater than 7.00% on the LIBOR reset date, the bank will pay the company the difference between LIBOR and 7.00%; and

If the LIBOR is less than 5.80% on the LIBOR reset date, the company will pay the bank the difference between 5.80% and LIBOR.

Required:

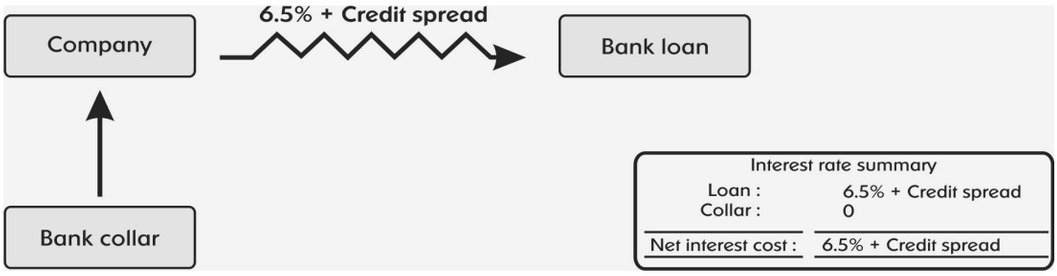
Find the net gain or loss using the collar if the LIBOR at the reset date is:

(a) 6.50%
(b) 7.50%
(c) 5.50%

Answer

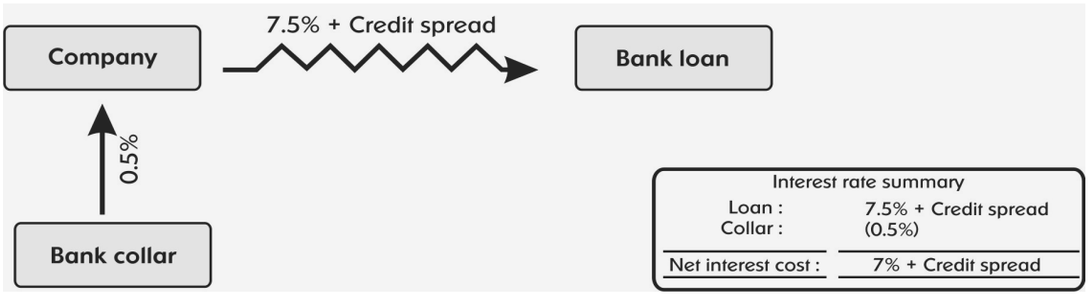
Scenario (a): LIBOR = 6.50% Cap = 7.00% Floor = 5.80%

If the one-month LIBOR is 6.5% (i.e. below the cap level and above the floor level), the company simply pays the floating rate required on its loan (in this case 6.50% plus its credit spread). No payments are made or received on the collar.



Scenario (b): LIBOR = 7.50% Cap = 7.00% Floor = 5.80%

If the one-month LIBOR is reset above the cap rate, the company continues to pay the floating rate on its loan (in this case 7.5% plus its credit spread). However, since the company purchased a 7.00% cap, the bank will make a payment to the company equal to 0.50% on a Tshs100 million notional amount, reducing the company's net interest expense on its Tshs100 million loan to 7.00% plus its credit spread.



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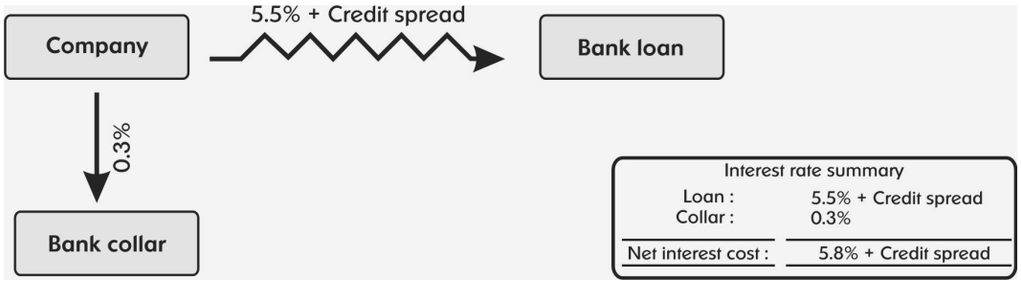
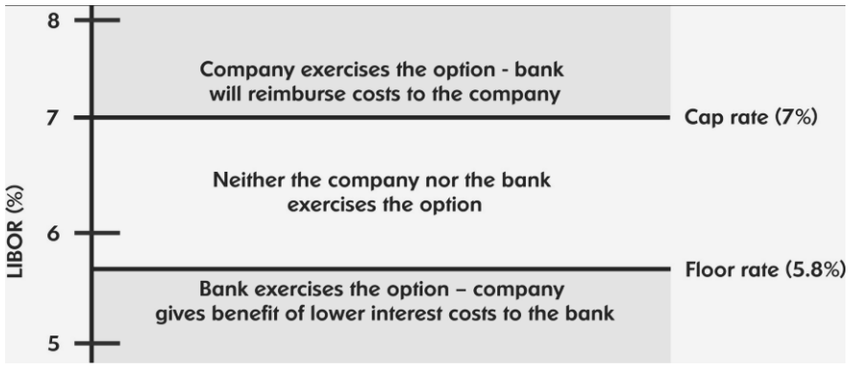
Scenario (c): LIBOR = 5.50% Cap = 7.00% Floor = 5.80%

If the one-month LIBOR is reset below the floor rate, the company again pays the floating rate on its loan; in this case 5.50% plus its credit spread. However, because the company sold a 5.80% floor, it would also make a payment of 0.30% to the bank, giving the company an effective borrowing rate of 5.80% plus its credit spread for the relevant interest period.



The diagram illustrates how this works if, for example, the cap is set at 7% and the floor at 5.8%:



Benefits of a collar

Cost reduction: a collar can be structured with no upfront payment while providing the same protection against rising interest rates as an interest rate cap. The premium paid for the purchase of the options would be partly or wholly offset by the premium received from the sale of options. A complete offsetting of premiums results in a zero collar and effectively a fixed rate loan or deposit is created dependent on whether the company is borrowing or depositing.

Flexibility: subject to approval, companies can enter into an interest rate collar at any time, for any term, on any portion of their variable rate debt.

Certainty: Interest rate options provides certainty to floating rate loans as to what interest streams the parties will pay or get.

Test Yourself 7

Current futures prices suggest that interest rates are expected to fall over the next few months. Crawler Ltd expects to have Tshs400 million available for short-term investment for a period of 5 months commencing late October. The company wishes to protect this short-term investment from a fall in interest rates, but is concerned about the premium levels of interest rate options. It would also like to benefit if interest rates were to increase rather than fall. The company's advisers have suggested the use of an interest rate collar.

Options (Tshs500,000), points of 100%

	Calls		Puts	
Strike price	**Sept**	**Dec**	**Sept**	**Dec**
95.25	0.04	0.445	0.04	0.085
95.50	0	0.280	0.25	0.170
95.75	0	0.165	0.50	0.305

LIBOR is currently 5% and the company can invest short-term at LIBOR minus 25 basis points.

Continued on the next page

Required:

(a) Assume that it is now early September. The company wishes to receive more than Tshs6,750,000 in interest from its five-month investment after paying any option premium. Illustrate how a collar hedge may be used to achieve this.

(Note: it is not necessary to estimate the number of contracts for this illustration).

(b) Estimate the maximum interest that could be received with your selected hedge.

Answers to Test Yourself

Answer to TY 1

The company will purchase 5 contracts of Tshs5 million each. The quoted price is 0.20 per contract. i.e. 20 ticks per option contract. The cost of each tick is Tshs125.0 (Tshs5 m X 0.001 X3/12). Therefore, the cost of four option contracts will be equal to 20 x 5 x Tshs125 = Tshs12500.

If LIBOR rises to 5.5% on the date of exercise, the company will exercise its option and sell the future contracts at 95. Assuming no basis risk, the futures price would have dropped to 94.5 (100 – 5.5). Therefore, the company makes a 0.5% gain by buying futures at 94.5 and selling them at 95. This translates into a gain of 50 ticks at Tshs125 each per contract. This results in a total profit of 50 x Tshs125.0 x 5 = Tshs31,250 on the option. This amount is equal to the cost of borrowing which is Tshs25million x 0.5% x 3/12 = Tshs31,250.

Payoff = Tshs31,250 – Tshs12,500 = Tshs18,750

Answer to TY 2

Orbit Ltd. in terms of both fixed and floating rate loans has an advantage over Comet Ltd. The differential spread is calculated as
Fixed rate 14.5% - 14.25% = 0.25%
Floating rate (TIBOR + 1.25%) - (TIBOR + 2%) = 0.75%

Combined differential = 0.75% - 0.25% = 0.5%, therefore swap is feasible

Answer to TY 3

The value of the loan = Tshs100million
Each unit of trading = Tshs5million
Thus the total number of contracts will be = Tshs100million/Tshs5million = 20

Hitec has locked an interest rate of 3.72% (100-96.28) for LIBOR by selling July 3month futures at a price of 96.28.

The total interest rate of LIBOR plus 0.6% is therefore, 4.32% (3.72% + 0.6%)

The interest cost for a 3-month loan of Tshs100 million @ 4.32% would beTshs100million x 4.32% x 3/12
= Tshs1.08million.

In early July, Hitec borrows Tshs100million @ 5.03% for 3 months.

The interest payable on the loan is Tshs100million x 5.03% x 3/12 =Tshs1.2575million.

At the same time, Hitec closes its position in July 20X6 at a price of 95.57.
It gains due to a decrease in price (96.28 -95.57) i.e. 0.71 = 71 ticks
Value of 1 tick Tshs125
Value of 71 ticks = 71 x Tshs125 =Tshs8875
Thus, as Hitec is a seller of 20 contracts, it would gain 20 x Tshs8875= Tshs0.1775million

The net cost of borrowing is, therefore:
Interest payable = Tshs1.2575 million
Less: Profit on futures = Tshs0.1775 million
Tshs1.08 million

This is equal to borrowing Tshs100million for 3 months @ 4.32%, which is the rate locked by the futures transaction.

Answer to TY 4

The company has locked a rate of 6.71% for the next six months (8-2).

Its interest cost on the transaction of Tshs10billion for 6 months = Tshs10billion x 6.71% x 6/12 = Tshs335.5million

If interest rates go up or down by 100 bps (or 1%),

The difference in the interest amount = Tshs10billion x 1% x 6/12 =Tshs50million

By entering into an FRA, the company would save Tshs50million if the interest rate increases to 7.71%. The bank would have to reimburse the company Tshs50million. However, if, after six months, interest rates fall to 5.71%, the company would have to pay this difference of Tshs50million to the bank.

Answer to TY 5

	Tan	**Zan**
S&P credit rating	AA	BB
Fixed-rate borrowing cost	11.5%	13.0%
Floating-rate borrowing cost	LIBOR	LIBOR + 1%

Assume the swap bank is quoting five -year Tshs interest rate swaps at 11.7.7% - 11.8% against LIBOR flat

The bank's quote should be understood as 11.7% for buying and 11.8% for selling.

The QSD = (13.0% - 11.5%) minus (LIBOR + 1% - LIBOR) =0.5%.

The swap transaction will be:

Tan will issue a fixed-rate debt at 11.5%. Zan will issue a floating rate-debt at LIBOR + 1%.

Tan will receive 11.7% from the swap bank and pay it LIBOR. Zan will pay 11.8% to the swap bank and receive from it LIBOR.

Thus, Tan's total floating-rate cost will be: 11.5% + LIBOR - 11.7% = LIBOR - 0.20%, which is a 0.20% savings over issuing the floating-rate debt on its own (at LIBOR).

Zan's total fixed rate cost will be: LIBOR+ 1% + 11.8% - LIBOR = 12.8%, which is a 0.20% savings over issuing fixed-rate debt @ 13%

Answer to TY 6

At the start of the loan, six-month LIBOR is 5.5%, so the company is paying 6.5%.

If at the end of 6 months, LIBOR moves to 6.5%, so Plots Ltd would pay 7.5% for its loan. It exercises its option, and the bank pays (7.5% – 7.0%) x Tshs100million x 6/12 = Tshs250,000.

This, in effect, ensures that company is effectively paying interest at 7%.

If, at the end of 12 months, LIBOR falls to 5.8%, the company would be required to pay interest at 6.8%. The company would therefore not exercise its option and continue to borrow at 6.8% until the end of the 5 years.

Answer to TY 7

(a) If the company intends to earn interest ofTshs6,750,000 it would need to earn an annualised interest rate, after premium costs of $\frac{\text{Tshs } 6{,}750{,}00}{\text{Tshs } 400{,}000{,}000} \times \frac{12}{5} = 4.05\%$

Therefore, the collar should be structured in such a manner that it should provide a minimum return of more than 4.05% including premium costs.

In this case, since Crawler Ltd is investing, a lending collar would be more suitable to the company. A lending collar involves the simultaneous buying of a floor and selling a cap. The floor can be set by buying a call option that will increase in value if interest rates were to fall. The cap can be set by selling put options, will set the maximum interest. With this, the company could forego any higher interest rate than the put option exercise price, but paying a lower overall premium.

The overall cost of the collar will be the call option premium paid less the put option premium received. In order to earn an interest rate of higher than 4.05% (Tshs6,750,000) a collar should be arranged with the call strike price higher than the put strike price (in order to set the maximum interest that can be received).

Alternatives are:

	Calls		Puts	
Strike price	**Sept**	**Dec**	**Sept**	**Dec**
95.25	0.04	0.445	0.04	0.085
95.50	0	0.280	0.25	0.170
95.75	0	0.165	0.50	0.305

Call strike price	Interest rate	Less call option cost	Plus put option receipt	Less 0·25%	Total
95.75	4.25%	0.165%	0.170% (95.50)	0.25%	4.005%
95.75	4.25%	0.165%	0.085% (95.25)	0.25%	3.92%0
95.50	4.50%	0.280%	0.085% (95.25)	0.25%	4.055%

The minimum interest ofTshs6,750,000 could be earned by purchasing a call at 95.50 and selling a put at 95.25. The actual minimum return (ignoring any time value of money) will be equal to:

$$\text{Tshs}400{,}000{,}000 \times \frac{5}{12} \times 4.055\% = \text{Tshs}6{,}758{,}333$$

Note: If a collar is set with the same put and call price the interest rate earned will be:

Strike price	Interest rate	Less call cost	Plus put receipt	Less 0.25%	Total
95.25	4.75%	0.445%	0.085%	0.25%	4.14%
95.50	4.50%	0.280%	0.170%	0.25%	4.14%
95.75	4.25%	0.165%	0.305%	0.25%	4.14%

This collar structure would enable the company to earn the required interest rate of 4.05%, but would not allow Crawler to take advantage of any favourable movement in interest rates.

(b) The maximum benefit of favourable interest rates would occur if market interest rates were at least 4.75% and the call option were allowed to lapse. The put option would be exercised by its buyer and the maximum overall return would be:

Strike price	Interest rate (allowing call option to lapse)	Less call cost	Plus put receipt	Less 0.25%	Total
95.50	4.75%	0.280%	0.085%	0.25%	4.305%

This would yield an interest amount equal to:

$$\text{Tshs}400{,}000{,}000 \times \frac{5}{12} \times 4.305\% = \text{Tshs}7{,}175{,}000$$

Quick Quiz

1. In the case of rising interest rates, companies with floating interest rate debt will pay:

   A Higher interest
   B Lower interest
   C No interest
   D None of the above

2. In which circumstances should a company
   buy an FRA
   sell an FRA

3. An interest rate future is used to hedge against interest rate risk. True or false?

4. What is the value of an interest rate swap to counterparty?

5. An interest rate collar is a combination of:

   A Forward rate agreement and interest rate futures contract
   B Interest rate futures contract and interest rate swap
   C Interest rate swap and interest rate cap
   D Interest rate cap and interest rate floor

Answers to Quick Quiz

1. The correct option is **A** .

2. If a company wishes to guarantee its future borrowing costs: it should buy an FRA.

   If a company wishes to guarantee a rate of return on future deposits: it should sell an FRA.

3. True. An interest rate futures contract is a futures contract with an interest-bearing instrument as its underlying asset.

4. An interest rate swap is the net difference between the present value of the expected receipts and the present value of the payments that the company expects to make.

5. The correct option is **D**.

   An interest rate collar is a combination of an interest rate cap and an interest rate floor.

Self-Examination Questions

Question 1

A firm is planning to borrow short term funds for an amount of £10 million for a period of five months commencing 1 May 20X7. It is now the last day of 20X6. The company can currently borrow at LIBOR + 1.5%.

Short-term interest rates are believed to be more likely to increase than to decrease, although, if there is a fall in the retail price index during the next few months, interest rates could decrease. The company's advisers believe that Labour could increase by up to 1% or decrease by up to 0.75% during the next four months. LIBOR is currently 7%.

LIFFE three-month Sterling futures, £500,000 contract size, £12.50 tick size.
March - 92.75
June - 92.50

LIFFE option price on three-month Sterling futures, £500,000 contract size, and £12.50 tick size.

Premium (%)				
	Calls		Puts	
Exercise price	March	June	March	June
92.00	0.94	1.20	0.22	0.37
93.00	0.28	0.36	0.44	0.59
94.00	0.10	0.19	1.30	1.45

Required:

Suggest a hedging strategy using interest rate options to manage short-term interest rate risk. Calculate the likely impact of the suggested strategy if interest rates were to move to each of the extremes suggested by the advisers.

Note:

Assume that contracts mature at the month end.
Basis risk and margin requirements may be ignored.
State clearly any assumptions that you make.

Question 2

PQN Ltd expects to receive Tshs18500 million from the sale of particular non-core business vertical by 5th June 20X3. This is proposed to be invested in commercial paper of high credit rating for a period of four months, post which the company proposes to start a new factory. In doing so the company wants to guard against adverse interest rate movements by using futures or forward rate agreements (FRAs).
The current yield on high quality commercial paper is LIBOR + 7%.

LIFFE £500,000 three-month Sterling futures, £12.50 tick size.
September 96.25
December 96.60

Futures contracts mature at the month end. LIBOR is currently 4%.

FRA prices (%)
4 v 5 3.85 – 3.80
4 v 9 3.58 – 3.53
5 v 9 3.50 – 3.45

Required:

(a) Suggest an interest rate future contract as a hedge for the proposed investment and estimate the expected lock-in interest rate as a result of the hedge.

(b) Determine whether futures or forward rate agreement would hedge in a more efficient manner.

(c) What would be the impact on expected result under each hedge in the cash market, FRA and futures market, if LIBOR fell by 0.5% during the next five months?

Answers to Self Examination Questions

Answer to SEQ 1

The company intends to hedge any unfavourable future interest rate movement using options. This will protect the company against interest rate increases whilst providing the opportunity to benefit from falls in interest rates.

The company should purchase put options since it intends to protect against interest rate increases. Therefore, the June options would be the most suitable for the period at risk. It is assumed that the company intends to pay less than the existing interest rates, with LIBOR at 7%. The options hedge could be structured using the 93.00 exercise price, which corresponds to the current short-term interest rate (futures price is 100 - interest rate or 100 - 7 = 93.00)

Number of contracts required will be:

$$\frac{£10,000,00}{£500,000} \times \frac{5}{3} = 33.33 \textbf{ or 33 contracts} \quad \frac{5}{3} \text{ as the period at risk is five months}$$

If interest rates increase by 1%:

Cash market

$$£10\text{ million} \times 1\% \times \frac{5}{12} = £41{,}666.7$$

Options market

The company should buy 7 June put option contracts at 0.59
Premium cost is 33 x 59 x £12.50 = £24,337.5

If interest rates rise by 1%, the June futures price is expected to fall by 1% to 91.50 (ignoring any change in basis risk). However, in practice, changes in basis would occur which would have a major impact on the options hedge. The company will exercise the option to sell futures at 93.00 and will earn a profit of 150 basis points would be made. (It would have to buy June futures on LIFFE at 91.50 in order to close the hedge position)

	£
Profit from exercising the option: 150 x 33 x £12.50	61,875.00
Less: Premium cost	24,337.50
	37,537.50

Overall loss in relation to the current interest rates is £41,666.67-£37,537.50 = £4129.17

If the interest rate falls by 0.75%:

Cash market

$$£10{,}000{,}000 \times 0.75\% \times \frac{5}{12} = £31{,}250$$

Options market

The option would be allowed to lapse resulting in a premium cost of £24,337.50
The net gain relative to the current interest rate will be £31,250- £24,337.50 =£6912.50
This strategy provides the company with an expected maximum 'loss' of £4129.17 and a possible gain of up to £6912.50

Answer to SEQ 2

(a) The company will need a long futures hedge since it is concerned about a fall in interest rates during the next five months.

It should buy December futures at 96.60. If interest rates fall, the futures price will rise and the futures contracts could be closed out at a higher price to partially offset the rise in interest rates. In order to hedge the amount of Tshs18,500 million for a four-month period the company will be required to buy:

1000 Tshs = 0.38 £
Tshs18500 m = £7.03m

$$\frac{£7{,}030{,}000}{£500{,}000} \times \frac{4}{3} = 18.75, \text{ or } 19 \text{ contracts}$$

Basis is equal to futures price rate minus the spot price.
Therefore, basis will be equal to 96.60 – 96.00 = 0.60%.
(The current LIBOR rate of 4% is equivalent to a futures price of 96.00).

The time to expiry of the December futures contract is seven months. The remaining time at the close out date (five months' time) is two months.

The expected basis for two months will be equal to:

$$0.60\% \times \frac{2}{7} = 0.171\%$$

The expected LIBOR lock-in rate is equal to 96.60 – 0.171 = 96.429 or 3.571%.

The company could invest in commercial paper at LIBOR + 7%.

Therefore, the overall expected lock-in rate will be 3.571% + 7% = 10.571%.

(b) The relevant FRA rate is 5 v 9. The company would sell the FRA to a bank to fix the interest rate at 3.45%. This is a lower rate than the expected futures LIBOR lock-in rate of 3.571%.

(c) Cash market

Expected receipts from the investment on 1 November are:

$$£7.1\text{m} \times 10.5\% \times \frac{4}{12} = £248{,}500$$

(10.5% is rate calculated by addition of 3.5.% + 7%)

Futures market

The company buy 19 December contracts at 96.60 on June 1.

The company should sell 19 December contracts at 96.671 on November1 (spot of 96.50 plus expected remaining basis of 0.171).

The company would make a profit from futures at 7.1 basis points x £12.50 x 19 = £1,686.
Therefore, the overall receipts will be £248500 + £1,686 = £250186.

$$\text{(N.B. } \frac{£250186}{£7{,}100{,}000} \times \frac{12}{4} = 10.571\%\text{, the expected lock - in rate)}$$

FRA

The FRA fixed rate is 3.45%. Actual LIBOR is 3.5%. The company will therefore have to pay an amount equal to

$$£7.1\text{m}\,(3.50\% - 3.45\%) \times \frac{4}{12} \times \frac{1}{1 + (3.5\% \times 4/12)} \quad \text{or £1,169.65}$$

This will be deducted from the actual receipts of £248,500 (estimated above) to give a net £247,330, a return of 10.45%.

(N.B. this is the FRA rate of 3.45 plus the 7% over LIBOR from the commercial paper).

SECTION D

FINANCIAL ENGINEERING AND PLANNING

D2

STUDY GUIDE D2: FOREIGN EXCHANGE PLANNING

Get Through Intro

In this era of globalisation, it is increasingly likely that companies will trade abroad. This opens them to all sorts of risk, including exchange rate risk. The larger the company, the more likely they are to try to hedge against any uncertainty as it can have a profound impact on profits. The US Dollar has lately been appreciating against most currencies. For Japanese / Tanzanian / Brazilian companies importing products or services from US companies, the appreciation is eroding their margins.

What can companies do to minimise the impact of the appreciating dollar? How can forward contracts, swaps etc. be used to hedge against foreign exchange? This Study Guide will give you some of the answers, to enable you to understand the tools available to manage foreign exchange.

Learning Outcomes

a) Evaluate and assess financial and planning options for a business giving advice based on business scenarios using exchange rate determinants and risks.
b) Evaluate and assess financial and planning options for a business giving advice based on business scenarios using forward contracts.
c) Evaluate and assess financial and planning options for a business giving advice based on business scenarios using money market cover.
d) Evaluate and assess financial and planning options for a business giving advice based on business scenarios using currency options.
e) Evaluate and assess financial and planning options for a business giving advice based on business scenarios using currency swaps.

1. Evaluate and assess financial and planning options for a business giving advice based on business scenarios using exchange rate determinants and risks.

[Learning Outcomes a]

Case Study

Assets and liabilities in foreign currencies are translated into sterling at the rates of exchange ruling at the end of the reporting period. Transactions in foreign currencies are translated into sterling at the rate ruling on the date of the transaction.

Exchange differences are taken to the Income statement. Trading results of the overseas subsidiaries are translated into sterling at the average rate for the year. Translation differences arising on the consolidation of these companies are dealt with as adjustments to reserves.

Exchange rate risk

A significant percentage of the Group's purchases and sales are denominated in US$ rather than sterling which is its functional currency. Except for certain borrowings held in US$ during the year which partially mitigate against US$ operating gains and losses, the Group has not hedged these transactions. The Group, therefore, is exposed to a degree of risk in respect of changes in the Sterling/Dollar exchange rate.
Maturity Profile of Group Financial Liabilities

	2006	2005
	£ '000	£ '000
Within one year or less or on demand	–	25,903
The Group had committed un-drawn borrowing facilities at 30 June	32,000	6,990

(Source: Extract from Annual Report 2006 of Aero Inventory Plc)

The factors that cause international currency to move include market fundamentals and market expectations. The determinants of exchange rate fluctuations vary in the long run, medium run, and short run. Significant exchange rate fluctuations may continue for some time, but, the currency is brought back to its long-run equilibrium by the fundamental forces.

Exchange rates are prices that are determined by the economic theory of supply and demand. There is no single theory of exchange rate determination that takes into account all factors that have an impact on it but five areas are generally accepted as affecting the exchange rates:

- parity conditions, where the exchange rate is so adjusted between countries that a basket of goods and services, command equivalent prices
- infrastructure development, such as roads, power, communication etc increase competition and lower the prices of goods. This leads to a decline in the exchange rate
- currency speculationcan be the reason behind currencies of various countries getting devalued to levels not justified by economic fundamentals
- cross-border foreign direct investment and portfolio investment, increase the supply of the foreign currency and consequently bring down the exchange rate; and
- political risks may increase the demand for currency as investors may try to pull out their investments from the country, while at the same time inflows of foreign currency may reduce. This causes the local currency to weaken significantly.

Governments have been concerned with the exchange rate of a country's currency and have adopted several means to achieve a stable exchange rate.

Exchange rate systems can be floating or fixed.

Under a floating exchange rate, the value of a country's currency is determined by market forces of supply and demand. The central bank of the country does not intervene and lets the market forces determine the rate, unless there are very strong reasons to step in and control the rate e.g. rampant speculation.

Clean float refers to a system wherein, exchange rates are determined by supply and demand.

Dirty float refers to a system wherein governments, in order to decrease the volatility in the markets, intervene through central banks to buy and sell currencies.

A fixed rate of exchange "pegs" (matches), the value of the currency to another country's currency or to several currency denominations or even to commodities like gold. Prior to 1971, the currencies of most currencies were fixed. The breakdown of the Bretton Woods Agreement, under which countries had agreed to peg the value of their currencies to gold and the US dollar, in that year, the fixed exchange regime was abandoned by most countries and the floating or flexible exchange rate regime was adopted. However, even now there are several countries which have pegged their exchange rate, either to the US dollar or the Euro. Fourteen countries in Africa have pegged their currency to the Euro and three to the South African Rand (ZAR).

1.1 Exchange rate volatility and risk

Major movements in the value of currencies take place where the forces of supply and demand freely determine the price. As a result, the exchange rate risk associated with international transactions increase.

Example

A Tanzanian company invests its surplus funds amounting to Tshs100million in South African government bonds with a coupon rate of 8%. At the time of the purchase, the exchange rate was 1 ZAR = Tshs160. Its investments therefore, amounted to ZAR625,000. The South African Government pays interest of ZAR50,000 on the bonds each year. The investing company would have received an equivalent amount of Tshs8million as interest, if the exchange rate had remained the same.

However, a year later, the exchange rate is 1 ZAR = Tshs150. Although, the company will receive ZAR 50,000, when converted into Tanzanian currency, it will receive only Tshs7.5million, a reduction (loss) of Tshs500,000.

Cross-border financial transactions are very much different from the domestic activity as regards the risk due the existence of the following factors:

- different tax regimes prevailing in each country
- political risk arising from the philosophies of governments like, democratic, communist, autocratic. amount and extent of government intervention in foreign trade
- business risk arising from unexpected changes in the general economic environment.

Volatility in the exchange rate has the potential to impact the volume of sales, costs, profits and the ROI of firms engaged in international business and consequently expose them to the following risks:

1. Transaction exposure / risk arises when a firm has cash flows that are fixed in a foreign currency.

Transaction risk is the risk that occurs in transactions where foreign currency is involved, for example exports / imports. Companies engaged in foreign currency transactions are exposed to this kind of risk. Transaction risk refers to adverse changes in the exchange rate before the transaction is finally settled.

This risk arises from the fact that the exchange rate on the date of transaction could be different from the rate of exchange on the date of settlement of the transaction.

Example

A UK company sells goods of €1,000 to a customer based in Germany and gives 2 months' credit. At the current spot rate of 1 = €1.456, the company expects to receive 1000/1.456 = £687. The German company takes 2 months' credit, and, by the end of the 2 months, the rate has changed to 1 = €1.486. The UK company will now receive only £673 (1,000/1.486).

Example

Transmedical International imports specialty pharmaceutical products into Tanzania from GlaxoSmithKline, UK on 45 days credit. The products are invoiced in GBP. The current exchange rate is Tshs2580 for 1 GBP.

The firm has received a consignment worth £100,000 payable 45 days hence. At today's exchange rate, the firm would have to pay £100,000 x Tshs2580 = Tshs258million. If the GBP appreciates against the Tanzanian currency to a value of Tshs2600, when the payment falls due, the firm has to pay
£100,000 x Tshs2600 = Tshs260million.

Transmedical thus has a transaction exposure to GBP, and its loss could be worth Tshs2million.

The transaction exposure can be eliminated using hedging instruments, such as forward rate contracts.

---

2. Operating exposure / risk

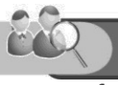
This is also known as **economic exposure / risk**. It denotes the extent to which the value of the firm changes when the exchange rate changes (the present value of expected future cash flows).

Economic risk is general in nature. It may affect a company's performance even if the company does not have any foreign currency transactions. It may affect a company's performance even if the company has foreign currency transactions and the exchange rate remains unchanged.

A firm may not be exposed to transaction or translation risk, yet it may be affected by economic risk. Translation risk and transaction risk can be reduced or eliminated by avoiding foreign currency transactions and overseas operation; economic risk cannot be avoided.

Operating exposure is also affected by the extent of competition and the location of major competitors.

Although a firm may not have an international business, it may still be affected by the consequences of operating exposure and be subject exchange rate risk.



Example

A Tanzanian manufacturer of chemical products will have a competitive advantage compared to a South African manufacturer of similar products if the Tanzanian shilling depreciates against the South African Rand, ZAR. The price of a chemical product T1 manufactured by the firm, if converted into ZAR will fall and will attract importers in South Africa to import it as it may be cheaper than the domestic prices.

---

3. Translation exposure

This also called an **accounting exposure** refers to the possibility of accounting loss that could occur, as a result of the conversion of the value of assets and liabilities which are denominated in foreign currency, due to movements in exchange rate. Entities which deal with foreign countries are subject to this risk.

Translation means conversion of foreign currency assets or liabilities into the domestic reporting currency". Transactions are recorded at the spot exchange rates when they occur, but at the SOFP date if the settlement is pending (i.e. it may represent either asset or a liability); the foreign currency amounts are converted using the exchange rate that is valid at the closing date. This may result in two different values, one on the date of the transaction and the other on the closing date.

This risk is also known as 'accounting risk'. Translation risk is a function of the accounting treatment of foreign assets and liabilities at the year end and does not result in any cash gain or loss for the company. The following example shows the impact of translation differences.

Example

The SOFP of a wholly owned subsidiary in a foreign country as at December 30, 20X5 in foreign currency, FC is:

			FC
Equity	90	Noncurrent assets	100
Noncurrent liabilities	60	Current assets	50
Current liabilities	80	Other assets	80
Liabilities +equity	**230**	**Assets**	**230**

Current exchange rate

1 unit of foreign currency (FC) = 0.5 unit of parent currency (PC)

Historic exchange rate

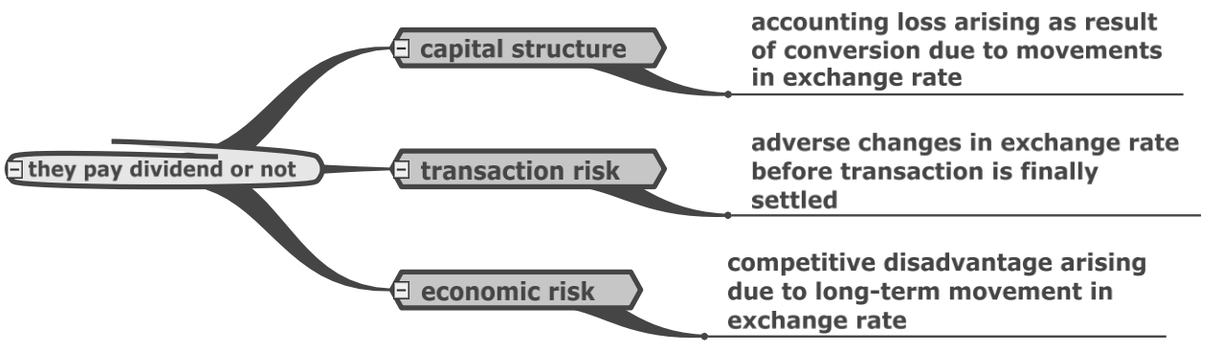
1 unit of foreign currency (FC) = 0.75 unit of parent currency (PC)

Continued on the next page

On the reporting date this SOFP will appear in the consolidated financial statements of the parent company as follows:

	FC		PC		FC		PC
Equity	90	x 0.75	67.5	Non-current assets	100	x0.75	75
Add: Translation adjustment (balancing amount)			2.5	Current assets	50	x0.50	25
Total Equity			**70**				
Noncurrent liabilities	60	x0.50	30	Other assets	80	x0.50	40
Current liabilities	80	x0.50	40				
Liabilities +Equity	**230**		**140**	**Assets**	**230**		**140**

SUMMARY



1.2 Determinants of exchange rate

Some of the main theories related to determining exchange rates are:

1. Supply and demand

According to this theory, the exchange rate is determined by the forces of demand and supply. **Therefore, the point of intersection of the two curves will be the equilibrium rate**. If, for any reason, the demand for a foreign currency increases, then the price will rise further, assuming the supply remains the same. On the contrary, if the supply is increased by a shift of the supply curve downwards, the price will decline from, provided the demand remains the same.

Any or Any excess demand, below the equilibrium point or excess supply, above the equilibrium point decreases or increases the foreign currency reserves of a country temporarily. This disequilibrium condition is rectified by market forces over time.

2. Purchasing power parity (PPP)

Purchasing power parity (PPP) is a theory which states that exchange rates between currencies are in equilibrium when their purchasing power is the same in each of the two countries. This means that the exchange rate between two countries should equal the ratio of the two countries' price level of a fixed basket of goods and services. When a country's domestic price level is increasing (i.e. a country experiences inflation), that country's exchange rate depreciates in order to return to PPP.

The process of equilibrium continues until prices of goods of two countries reach the same level. Thus PPP theory is based on **law of one price**. Competitive markets will equalise the price of an identical good in two countries when the prices are expressed in the same currency.

PPP theory is based on following assumptions

The law of one price assumes that there are no transportation costs and no differential taxes applied between the two markets.
There must be competitive markets for the goods and services in both countries.
The law of one price only applies to tradable goods; immobile goods such as houses, and many services that are local, are of course not traded between countries.

In practice it would take a long time to reach price equilibrium according to PPP. In the short run, exchange rates are news driven i.e. announcements about interest rate changes, changes in perception of the growth prospects of economies and the like are all factors that drive exchange rates in the short run.

PPP suggests that the purchasing power of a consumer will be similar when purchasing goods in a foreign country or in the home country. If inflation in the foreign country differs from inflation in the home country, the exchange rate will adjust itself to maintain equal purchasing power.

The theory is based on the 'law of one price', which states that if the price in Tanzanian shillings of a product is multiplied by the exchange rate, say, the US Dollar, it will yield the price of the same product in US dollars i.e. if we assume that the exchange rate between the Tshs and US $ is 1600: 1, then a product that costs $1 in the United States should cost Tshs1600 in Tanzania. Otherwise, arbitrage profits will occur.

Ultimately, however, the market, through the forces of demand and supply, will bring about equilibrium between the Tanzanian shillings and US dollar prices. Thus, the law of one price will be reinstated and as a result, the purchase power parity between the Tshs and the US $. The differences in the rates of inflation between the countries will also be nullified because the PPP adjusts to equal the ratio of their price levels. The currency of the country experiencing a higher rate of inflation will depreciate against the other currency by approximately the inflation differential.

3. The balance of payments (BOP) approach

A country's balance of payments is commonly defined as the record of transactions of its import and export over a specified period. If the level of imports exceeds the level of exports, there is said to be a deficit on the balance of payments. This equates to a net payment in a foreign currency.

For simplicity, assume that the UK has a balance of payments deficit which must be funded through US$. In such a case, the demand for US$ would rise, and the supply of sterling would increase, as attempts are made to acquire US currency. Basic laws of supply and demand dictate that when the demand for a commodity increases, its price increases as well and when the supply goes up the price goes down. As a result sterling would depreciate relative to the US$.

Example

Exchange rate 1: Tshs 2,000 = USD 1
Exchange rate 2: Tshs 2,500 = USD 1

The Tshs has depreciated in relation to the USD. The USD has appreciated in relation to the Tshs.

Under exchange rate 1, one USD would have cost Tshs 2,000. However, under exchange rate 2, USD 1 now costs Tshs 2,500.

This may have been due to a deficit in the balance of payments for the country that uses Tshs. The demand for USD would have increased causing its price to inflate.

Example

The following is an example of dollar depreciation against the EUR (or appreciation of EUR against the dollar):

(a) Supply of EUR is constant (demand for US$ is constant).
(b) The price of EUR rises (US$ falls) due to an increase in factors that affect the demand for EUR (supply of US$):

Spain begins to import more goods from the US (i.e. services, gifts, investments etc.)
Demand for EUR increases (supply of $ increases.)
Effect - $ price of the Euro rises (Euro price of the $ falls.)
The US$ depreciates.

Alternatively, a surplus balance of payments would lead to an appreciation of a country's currency relative to another.

4. International Fisher effect

This theory states that investors all over the world expect the same real rate of return on their investments after the effects of inflation are eliminated. The theory states that the nominal rate of return is equal to the real rate of return plus the effect of inflation.

The Fisher effect can be put in a formula as follows:

$(1 + i) = (1 + r)(1 + h)$

Where,

i = Nominal rate of return
r = Real rate of return
h = Rate of inflation

The Fisher effect helps to explain the difference in the interest rates in two countries. This difference can be correlated with the difference in the inflation rates in those countries.

Assume that the Fisher equation in the UK is expressed as: $(1 + i_{£}) = (1 + r_{£})(1 + h_{£})$

and that in the US it is expressed as: $(1 + i_{\$}) = (1 + r_{\$})(1 + h_{\$})$

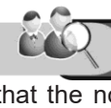
It means that the nominal rate in the UK depends on the changes in the real rate and rate of inflation in the UK, while the nominal rate in the US depends on the changes in the real rate and rate of inflation in the US.

We arrive at: $\frac{(1+i_{£})}{(1+i_{\$})} = \frac{(1+r_{£})(1+h_{£})}{(1+r_{\$})(1+h_{\$})}$

In perfectly competitive markets, the real returns in both countries will be the same.

We therefore have: $\frac{(1+i_{£})}{(1+i_{\$})} = \frac{(1+h_{£})}{(1+h_{\$})}$

It is evident from the above equation that the changes in the interest rate coincide with the changes in the rate of inflation.



Example

Assume that the nominal interest rate in Germany is 5%, the rate of inflation is 3% and the expected rate of inflation in the US is 4%. In this case, the nominal interest rate in the US can be calculated using the Fisher theory as follows:

Using the Fisher theory, we have

$$(1+i_{\$}) = (1+i_{€}) \times \frac{(1+h_{\$})}{(1+h_{€})}$$

$$= (1+0.05) \times \frac{(1+0.04)}{(1+0.03)}$$

$$= 1.06$$

Therefore, the nominal rate of interest in the US is 0.06 or 6%.

It can be observed that the real rate of return after eliminating the rate of inflation is the same in both Germany and the US, i.e. 2% (5% - 3%) in Germany and (6% - 4%) in the US.

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5. Interest Rate Parity (IRP) theory

Interest rates can be used as a tool for demand management in monetary policy therefore interest rates in different countries will vary depending on the economic condition of the economy. Another factor influencing exchange rates is the interest rates.

Example

If interest rates are high in one country compared to another, this will have the effect of attracting capital inflows as investors try to take advantage of the higher rate of interest. As a result, the demand for domestic currency increases, pushing up its price. The ultimate effect is a depreciation of the domestic country's currency as it becomes more expensive.

The Interest Rate Parity (IRP) theorem examines the impact of nominal interest rate differentials between two countries on the future/forward rate of the foreign currency. IRP theory states that the **premium** or **discount** of one currency in relation to the other should reflect the interest rate differentials between the two currencies.

Thus, interest rates play an important role in determining exchange rates.

IRP equation is

$i_h - i_f = p$

Where,

i_h = Home Interest Rate
i_f = Foreign Interest Rate
p = Forward Premium or discount of the foreign currency

Test Yourself 1

Zen Pharma Inc. exports a special pharmaceutical product, Zenfar, from its headquarters in Atlanta, USA to a major Tanzanian importer. The current exchange rate is $1= Tshs1,600. Exports to Tanzania are currently 200,000 units of Zenfar at $50 each. Direct costs are $30 per unit. There is an expectation that the Tanzanian currency will be devalued by 15 percent by the Tanzanian government.

Zen is now faced with a pricing decision problem that must be decided before the anticipated any actual devaluation takes place. Zen is considering two options before it.

Option 1

Maintain the same Tanzanian price as prevailing today (i.e. sell for a lower dollar price such that the cost to the importer in Tanzanian shillings is the same as at present). In such a case, the sales volume to Tanzania will not be affected, or,

Option 2

Maintain the same dollar price, and therefore the Tanzanian shilling price is increased to compensate for the devaluation. This will result in a 10 percent decrease in volume.

Required:

(a) What is the short-run implication of pricing strategy under Option 1?
(b) What is the short-run implication of pricing strategy under Option 2?
(c) Which strategy do you recommend?

---

2. Evaluate and assess financial and planning options for a business giving advice based on business scenarios using forward contracts.

[Learning Outcomes b]

2.1 Forward contract

Definition

A forward contract is a customised agreement between two parties (a buyer and a seller) to buy / sell an asset at a future date at a price decided upon today.

The specified instrument could be a commodity, currency or other underlying asset. The price agreed is called the 'forward rate'. The forward rate is determined at the time of entering into the contract but the settlement of the contract happens at a future date mentioned in the contract.

The following are the key features of a forward contract:

It is a bilateral contract and hence exposed to counter party risk.

Example

Aston enters into a forward contract under which he agrees to buy from Ben 1000 bales of cotton at a price of Tshs500,000 per bale one month from now. Aston faces the risk that at the end of the month, Ben may fail to deliver the cotton as contracted. Ben faces the risk that Aston may not be able to pay for the goods.

The contracts are not traded and hence the contract price is generally not available in the public domain.
Each contract is custom-designed and hence is unique in terms of contract size, time to expiry and underlying asset.
On the date of expiry, the contract has to be settled by delivery of the underlying asset.
It can hedge the risks relating to currency exposure risk (forward contracts on Euro or dollar) or commodity prices (forward contracts on crude oil, rubber, coffee etc.)

Forward contracts are often used to hedge adverse movements in currencies, commodity or a financial instrument, irrespective of whether the price increases or decreases. For example, if a party expects an appreciation in the currency rate in which he is required to pay in future, he can enter into a forward contract to protect him from loss on account of foreign exchange fluctuation. Foreign currency forward contracts are used as a foreign currency hedge when an investor has an obligation to either make or receive a foreign currency payment at a future date. In a forward contract, no part of the contract is standardised and the two parties meet and agree every detail of the contract before signing it.

Example

In the case of a gold bullion forward contract, the parties would negotiate the following features of the contract:

(a) the weight of the gold bullion to be delivered
(b) the quality of the metal to be delivered
(c) the place at which the delivery is to be made
(d) the period after which the delivery is to be made
(e) the price which the buyer would pay

2.2 Types of forward contract

Two broad types of forward contract are discussed here.

Range forwards
Participating forward contract.

The main features of these contracts are that they provide full protection against any unfavourable currency fluctuation, while they allow either a limited (range forwards) or unlimited participation (participating forwards) in the case of favourable currency rate market movement.

1. Range forwards

Definition

A **range forward contract** is an agreement to buy or sell a currency on a specified future date at an exchange rate that lies within an agreed range of values.

These two values are agreed by the parties at the time of structuring the range forward contract. If the spot rate of the currency moves above the agreed upper limit, the currency will be traded (bought or sold) at the agreed upper value. If the spot rate of the currency moves below the agreed lower limit, the currency will be traded (bought or sold) at the agreed lower value.

A company that wishes to hedge its currency exposures can specify the higher or lower currency value to the bank, which will sell the option to the company.

Range forward contracts are used for hedging currency exposures if a company expects large, adverse exchange rate movements in future. A range forward could be compared to a portfolio of options that combines two options. It involves buying a put option and selling a call option without incurring any premium cost. It could be used by a company for hedging both its payables and receivables.

An **exporter** (with receivables) would buy a put option and sell a call option and an **importer** (with payables) would prefer to buy a call option and sell a put option.

Example

A company is planning to invest $1,500,000 in Eurobonds for a period of three months. The company wishes to hedge its exposure using a range forward currency contract in case the dollar strengthens against the Euro. The spot rate is €1.5/ $1. The company wishes to keep the upper exchange rate at € 1.6/$ 1 and the lower rate at € 1.4/$1.

Calculate the losses or gains if the spot rate at the end of three months increases by 10% or decreases by 10%. Will the hedging through the range forward contract benefit the company?

Answer

The principal amount of the range forward contract is €2,250,000 (1,500,000 x 1.5).

If the expected spot rate in 3 months is above 1.6, the value of the investment in dollars will be:

$$= \frac{€2,250,000}{1.6} = \$1,406,250$$

If the expected spot rate in 3 months is below 1.4, the value of the investment in dollars will be:

$$= \frac{€2,250,000}{1.4} = \$1,607,143$$

If the expected spot rate at the end of three months increases by 10% (1.5 x 1.10) = 1.65, the value of the investment in dollars will be

$$= \frac{€2,250,000}{1.65} = \$1,363,636$$

Although the new value ought to have been $1,363,636, by entering into the range forward contract, the value of investment will not fall below $1,406,250 as calculated above.

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If the expected spot rate at the end of three months decreases by 10% (1.5 x 0.9), the value of the investment in dollars will be:

$$= \frac{€2,250,000}{1.35} = \$1,666,667$$

However, by entering into the range forward contract, the value of investment will be restricted to $1,607,143 as calculated above.

Therefore, by using a range forward, the company minimises its losses (as well as its gains) due to volatile currency fluctuations.

The investor has the opportunity to take advantage of the favourable price movement towards the upper limit of the contract range, At the same time he is protected against unfavourable movements below the lower limit of the contract range. Within the range, the contract is settled at the spot rate at maturity.

2. Participating forward contracts

Definition

A **participating forward contract** is an agreement that allows a company to cap its downside currency risk through a worst case exchange rate.

It however allows the company to participate in any favourable movements in the exchange rates. The participation in the profits due to exchange rate fluctuations is based on a percentage of the difference between the future spot rate and the worst case exchange rate.

Example

Continuing the above example

Assuming that the bank allows the company to participate in up to 40% of the profits, then the company will have the downside risk capped at $1,363,636 but the profit will be limited to:

$$€ = \frac{2,250,000}{1.6 - 0.4(1.6 - 1.4)} = \$1,480,263$$

2.3 Execution of forward contracts

Usually, in a forward contract, the date, amount and the currency to be delivered are predetermined and the client is bound by the forward agreement. Theoretically speaking, the details of the contract are not expected to vary and on the due date of the forward contract, the client will either deliver (or take delivery) of the agreed currency.

However, in practice, the delivery under a forward contract could take place either before or after the due date due to a change in circumstances. The bank could agree to these variations, provided the client agrees to bear any loss. During the settlement of the forward contract, three possibilities could emerge:

1. The foreign exchange could be delivered on the due date, before the due date or after the due date.

2. The client could request for cancellation of the forward contract on the due date, before the due date or after the due date.

3. The client could request for an extension of the forward contract on the due date, before the due date or after the due date.

1. Execution Mechanism

When the bank enters into a forward purchase contract with a customer, it would have covered its position by entering into a forward sale contract with the inter-bank market for the same amount and for a matching period.

Executing forward contract by delivering foreign currency on due date

This is normally the basic intention of the parties to the forward contract. When the foreign currency is delivered on the due date of the forward contract, the rate applied will be the originally agreed rate, irrespective of the prevailing spot rate

Example

Suppose a bank has agreed on 1st April to sell USD 10,000 to the customer delivery on 1st June at the rate of Tshs 1600 per USD. Theoretically, on the same day, that is, on 1st April, a forward purchase would be made by the bank with the market for USD 10,000 due June.

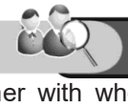
The idea is that during June when the contract matures, the bank can realise the purchase contract and sell it to the customers. On 1st June the bank will deliver the $ 10,000 to the customer at Tshs1600 per USD even if the spot on that day is Tshs1650.

Cancellation of forward contract on due date

When a forward purchase contract is cancelled on the due date, it is treated as if the bank purchases the foreign currency at the rate originally agreed forward rate and sells the currency back to the customer at the bank's selling rate as applicable on the due date. The difference between the originally agreed forward rate and the bank's selling rate on the due date is either paid to / recovered from the exporter.

If the originally agreed forward rate is higher than the bank's selling rate, the difference is payable to the customer. Conversely, if the forward rate is lower, the difference is recoverable from the customer.

When a forward sale contract is cancelled on the due date, it is treated as if the bank sells the foreign currency at the originally agreed forward rate and purchases the currency back at the bank's buying rate. The difference between these rates is either paid to/recovered from the customer.



Example

A customer with whom the Bank had entered into 3 months forward purchase contract for Brazilian BRLs 10,000 at the rate of Tshs710 comes to the bank after 2 months and requests cancellation of the contract. On this date, the rates, prevailing, are:

Spot	1 BRL = Tshs 712/13
One month forward	1 BRL = Tshs714/15

What is the loss/gain to the customer on cancellation?

Answer

When the bank enters into a forward purchase contract with a customer, it would have covered its position by entering into a forward sale contract with the market for the same amount and for a matching period.

	With customer	With Inter-bank market
Original contract	(A) Purchase 10,000 BRL @ 710 due after 3 months	(C) Sell forward due after 3 months
After 2 months	(B) Cancel the original contract	(D) Purchase forward due after 1 month @ 715 (E) execute (D)
After 3 months		(F) execute (C)

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Gain or Loss to customer:	Tshs/BRL
Purchase of forward contract at	715
Original contract with customer at	(710)
Loss/BRL	5
Therefore, Loss for 10,000 BRL	Tshs50,000

2.4 Forward market hedge

Definition

Forward market hedge: a company enters into a binding contract with a bank to buy or sell a certain quantity of foreign exchange at a predetermined exchange rate at an agreed future date.

Using forward currency rates, a company can sell the expected net inflow of foreign currency and buy the expected net outflow of foreign currency. A forward market hedge could be covered or uncovered. The **forward hedge is a covered hedge when the funds for the forward contract are in hand or are expected to be received in the near future**. The hedge is an uncovered hedge if the funds needed for the forward exchange contract are not currently available. These funds need to be purchased on the spot market at some future date.

Forward market hedges suffer from certain limitations. Forward markets do not exist in many countries, especially smaller developing countries, and even if a forward market does exist it may be restricted in size by the local government trying to preserve foreign currency reserves. Moreover, in certain countries, foreign currency hedging is illegal. Even where forward markets exist, hedges are rarely available for periods of more than one year.

Example

A Tanzanian company has purchased goods from a US company, the payment being due in US$ within three months of the invoice date. The invoice amount is $10,000 and the current spot rate is US$1/Tshs1600. It is anticipated that the exchange rate will decline by 10% over the three-month period and, in order to protect against any rise in the US$ against the Tshs, the Tanzanian importer proposes to take appropriate action through the foreign exchange market. The three-month forward exchange rate is quoted as US$1/Tshs1650.

Calculate the expected loss and show to what extent it can be hedged by the forward contract.

Answer

Calculation of expected loss and saving due to hedging

No hedging	Hedging
Tshs16million(10,000x1600)	Tshs16million (10,000x1600)
(Tshs17.6million(10,000x1760)	(Tshs16.5million)(10,000x1650)
(Tshs1.6million)	**(Tshs0.5million)**

Therefore, without hedging, the loss would have been Tshs1.6million but this is reduced to just Tshs0.5million by hedging.

Test Yourself 2

A US businessman enters into an agreement to purchase a large house in England for a sum of £1000,000. The full amount has to be in three months. He has adequate funds in his bank account in New York, which fetches him an 0.33% interest per month, compounded monthly, to pay for the property. At present, the spot exchange rate is $1.46/£ and the three-month forward exchange rate is $1.41/£. In London, the money market interest rate is 2.2% for a three-month investment. His investment adviser informs him he can decide on two alternative ways of paying for the property.

1. Continue to maintain the funds in his New York bank account and buy £1.0 million forward.
2. Purchase pounds at spot today and invest the amount in a London bank for three months so that at the end of three months the maturity value equals to £1.0million.

Required:

Evaluate both the payment methods and explain which method you would recommend.

3. Evaluate and assess financial and planning options for a business giving advice based on business scenarios using money market cover.

[Learning Outcomes c]

3.1 Money market cover

Instead of hedging a currency exposure with a forward contract, a firm can make use of the money markets to lend or borrow and achieve a similar result. The purpose of using a money market cover or hedge is to avoid future exchange rate uncertainty by making the exchange at the spot rate instead. This is achieved by either depositing or borrowing the foreign currency until the actual transaction cash flows take place.

Definition

Money market cover: the process of borrowing in the money market of a country, converting the funds borrowed at the spot rate of the currency of the country in which payment is due, and investing in a second country.

The total receipts (principal plus interest) after liquidating the foreign currency investment are then used to make business payments.

Example

A Tanzanian company which expects to pay in Sterling in six months' time could protect against the risk of the Sterling appreciating in value by converting Tanzanian shillings into Sterling now at the spot rate, investing the Sterling acquired for six months, and at the end of the six-month period, using the invested Sterling plus interest to make the payment due, in Sterling. Since Tanzanian shillings have been converted into Sterling, any possible future foreign exchange risk can be avoided. The cost effectiveness of the money market hedge and the forward market hedge will depend upon the levels of interest rates in Tanzania and the UK. Usually, a forward market hedge is cheaper than a money market hedge.

The difference between a money market hedge and a forward hedge is that in a **money market hedge,** the currency is required **immediately**, whereas in a **forward market hedge,** the currency is required at the **end of the contract period.**

A company may have foreign exchange receivable or foreign exchange payable claims. In other words, a company may have:

1. an expected inflow of foreign currency
2. an expected outflow of foreign currency

3.2 Steps in money market hedging

From the view point of ->	Borrower / importer	Investor / exporter
1. Find out whether there is Forex liability or asset	Will have a foreign currency (FC) Liability	Will have a foreign currency (FC) Asset
2. Create a hedging position	Create FC Asset	Create FC Liability
3. Borrow amount required to create hedging position	Borrow domestic currency for an amount equal to the Present Value (PV) of FC liability (PV to be calculated with discount rate i.e. deposit rate in foreign country)	Borrow foreign currency loan abroad for amount equal to PV of Forex asset (PV to be calculated with discount rate i.e. borrowing rate)
4. Convert borrowed money into required currency	Domestic currency into FC using spot rate	Foreign currency into domestic currency at spot rate
5. Invest the amount converted	Invest the FC abroad carrying interest at FC deposit rate	Invest domestic currency carrying interest at domestic deposit rate
6. Settle the position on due date	Get maturity proceeds with interest on FC deposit and settle FC liability with those proceeds.	Receive FC from customer and use it to settle the FC borrowing. Get back the domestic fixed deposit with interest.

Example

Rufiji Trades has a foreign supplier and must pay $350,000 to the supplier in six months' time. The concern of the financial manager is that the cost of the supplies may rise in terms of Tanzanian shilling . He has decided to hedge the currency risk of this account payable.
The following information has been provided by the banker of Rufiji Trades:
Spot rate Tshs per $): 1600 ± 5
Six months forward rate (Tshs per $): 1650 ± 7

Money market rates available to Rufiji Trades:

	Borrowing	Deposit
One-year Tshs interest rates:	8%	7%
One-year dollar interest rates:	4·0%	3·5%

Assume that it is now 1 December and that Rufiji Trades has no surplus cash at the present time.

In this situation, money market hedge can be used to hedge the foreign account payable in the following manner:

Step1

Rufiji being an importer, needs to create a FC asset.
Thus, it needs to borrow domestic currency for an amount equal to the Present Value (PV) of FC liability.

For calculating PV of $ liability, we will use $ deposit rate as discount rate
PV of $ 350000 for 6 months @ 3.5% pa = 3,50,000 / (1+0.035/2) = 3,50,000 / 1.0175 = $343,980

Step 2

Convert $ 343,9800 into Tshs using spot rate. As the exchange rates given are for Rufiji, the premium must be added to get selling rate.

Hence the spot selling rate = 1600 +5 = 1605
Hence the amount to be borrowed (in Tshs) will be $343,980 x1605 = Tshs552,087,900
This will be borrowed for 6 months carrying interest at 4%.

0.08 / 2 = 0.045

Step 3

Convert the domestic currency borrowed into foreign currency using spot rate. Hence the amount in $ will be Tshs552,087,900/1605 = $343,980.

Invest the FC abroad carrying interest at FC deposit rate.
Invest $343,980 abroad at 3.5%. This amount will grow to $350,000 after 6 months.

Step 4

On the due date, receive the maturity proceeds with interest on $ deposit and settle $ liability, with those proceeds. At the end of six months the value of Tshs borrowing (along with interest) will be = Tshs552,087,900 x 1.04 = **Tshs574,171,416.** This will be paid off to the bank.

Test Yourself 3

On January 1, 20X7, Beck Ltd bought electronic equipment from a foreign firm that will require the payment of local currency LC 900,000 on March 31, 20X7.

The spot rate on January 1, 20X7 is LC 10 per dollar; the expected future spot rate is LC 8 per dollar; and the ninety-day forward rate is LC 9 per dollar. The US interest rate is 12% and the foreign interest rate is 8%.

Beck Ltd is considering three alternatives to deal with the risk of exchange rate fluctuations:

(a) To enter the forward market to buy LC 900,000 at the ninety-day forward rate in effect on March 31, 20X7. (b)

To borrow an amount in dollars to buy the LC at the current spot rate. This money along with the interest income is to be invested in government securities of the foreign country. The resultant amount should equal LC 900,000 on March 31, 20X7.

(c) To wait until March 31, 20X7, and buy LC at whatever spot rate prevails at that time.

Required:

Identify and explain the alternative that Beck Ltd should follow in order to minimise its cost of meeting the future payment in LCs?

Advantages and disadvantages

Although not as popular as forward exchange contract, money market cover is also used for hedging currency transaction exposures.

The advantages are:

Money market cover or money market hedge eliminates downside risk exposure by crystallising the future rate

It provides flexibility with regard to the amount to be covered

Where forward contracts are not available, money market cover may be available as a means of hedging currencies.

The disadvantages are:

Money market cover or money hedge is complicated to organise than a forward contract

It offers no opportunity to take advantage of favourable movements in exchange rates as it fixes the future rate.

4. Evaluate and assess financial and planning options for a business giving advice based on business scenarios using currency options.

[Learning Outcomes d]

4.1 Currency options

Currency options give the buyer the right but not the obligation to buy or sell a specific amount of foreign currency at a specific exchange rate (the strike price) on or before a predetermined future date. For this protection, the buyer has to pay a premium.

A currency option may be either a call option or a put option. A put option gives the right to sell a foreign currency whereas a call option gives the right to buy a foreign currency. The use of a call option or put option depends upon the requirement of a company in a specific situation.

1. Hedging using currency options

(a) One can make a profit when prices rise:

(i) Buys a call option and
(ii) Writes (sells) a put option.

Before the price rises

(b) One can make a profit when prices rise if one:

(i) Buys a put option and
(ii) Writes (sells) a call option.

Before the price falls

2. The steps for hedging using currency options are as follows:

(a) Identification of the underlying transaction that the company intends to hedge.

(b) Identification of the currency risk in the underlying transaction.

(c) Construction of a put / call position that results in a profit if a loss occurs on the underlying transaction.

(d) Identification of the contract that should be used for hedging.

(e) Calculate the number of contracts to create the hedge.

Assuming Sterling as the home currency, currency options can be used as follows

Importers **buy** £ put options or **sell** £ call options.
Exporters **buy** £ call options or **sell** £ put options.

While calculating the number of contracts, the following two considerations need to be made:

Expiry date: choose the first contract to expire after the date of the transaction i.e. the day on which the cash changes hands.

Exercise price: here you can arbitrarily select an exercise price to do an illustrative calculation. Then at the end of the calculation, you should state that in practice, the company would consider a range of exercise prices and a range of future spot rates to decide which option provides the best cover.

The number of contracts can now be calculated by dividing the foreign currency exposure by the options exercise price that is selected above. This gives the required home currency exposure. Divide this by the contract size to ascertain the number of contracts.

Example

It is now September 20. Prime plc is purchasing a machine from the US for $310,000 and the amount is to be paid in 3 months' time.

Current spot rate is $/£: 1.5900 – 1.5950

New York Stock Exchange £/$ Options (prices are cents per £)

Foreign Currency Option Prices Contract size £62,500				
Exercise price	**Sept**	**Dec**	**Sept**	**Dec**
1.5	8.35	12.3	-	-
1.6	5.6	8.45	2.2	5.62
1.7	4.5	3.9	3.67	8.73

Assuming that options contracts mature at the end of the relevant month, Prime can hedge the exchange rate risk using currency options contract as follows:

1. Buy £ put options
2. Maturity: December $1.60
3. Number of contracts: ($310,000/$1.60)/£62,500

   = 3.1 or 3 contracts
4. Premium cost = 5.62 cents X (3 X 62,500) /15,900

= $10,537.50 / $ 1.5900 = £6,627

What is the exercise price? You can choose an exercise price to make an illustrative calculation since there will not be enough time in the examination to consider all the exercise prices. It could be mentioned at the end of the calculation that, in practice, you would consider a range of exercise prices and a range of future spot rates to see which option gives the best cover.

Therefore, Prime Plc should buy 3 December put options contract, assumed exercise price of $1.60/£ with premium of £6,627.

Assuming that the spot rate in three months is either

$1.5500 – 1.5610 OR
$1.7025 – 1.7100

The hedge can be evaluated as follows

(i) Exchange rate moves to $1.5500 - $1.5610:

Exercise the put option.

1. Sell £: 3 X 62,500 = £187,500 Buy $: $1.60 X 187,500 = $ 300,000	(£187,500)
2. Shortfall: $310,000 - $300,000 = $10,000/$1.5500	(£ 6,452)
3. Premium cost: ignoring time value of money	(£ 6,627)
Net payment	**(£200,579)**

(ii) Exchange rate moves to $1.7025, it is now cheaper to use the spot rate instead of options

Do not exercise the options

1. Payment in spot market: $310,000/$1.7025	(£182,085)
2. Premium cost: ignore time value of money	(£6,627)
Net payment	**(£188,712)**

Currency option contracts limit the maximum loss to the premium paid up-front and provide the buyer with the opportunity to take advantage of favourable exchange rate movements.

3. Factors determining the currency option premium:

difference between the strike price and the spot rate of the currency options
time to maturity
volatility in the exchange rates
interest rates

4. Features of currency options

The main features of currency options are:
(a) A currency option gives its holder the right to buy (call option) or sell (put option) a quantity of one currency in exchange for another, on or before a specified date, at a fixed rate of exchange (the strike rate for the option).
(b) Currency options can be purchased over-the-counter or on an exchange.
(c) Traded currency options are for a standard quantity of one currency in exchange for another currency, and strike prices are quoted as exchange rates. The premiums are normally quoted as an amount in one currency per unit of the other currency.
(d) A currency option could be American or European. An American currency option is one that can be exercised on any business day up to and including the expiry date. A European currency option can be exercised only on the expiry date of the option.

Example

KTP, a UK based multinational, is planning to purchase machinery from US costing $110,000 in 3 months time. It is now 31 December. The following details are given:

Foreign exchange rates	$/£
Spot	1.7982 – 1.8010
3-month forward	1.7835 – 1.7861

Currency options: £62,500 contract size. Premium is in cents per £.

	Calls		Puts	
Strike price	**February**	**May**	**February**	**May**
1.78	2.91	3.84	2.12	4.20
1.80	1.96	3.00	3.17	5.34

Calculate the expected outcome, if the company decides to hedge its dollar exposure using currency options.

Answer

Currency options

Since, it is 31 December now and the time of the transactions is 31 March, the May options should be used. This is because, the February options would already have expired. KTP will be required to purchase put options since pounds need to be sold to purchase dollars. The dollar payment is $110,000, which is equivalent to approximately one £62,500 option contract ($110,000/£1.7982).

Option hedge

Strike price	$ if exercised	Premium ($)	Premium £	Overhedge ($)	Overhedge (£)
			(at spot 1.7982)		**(at forward 1.7861)**
1.78	111,250(£62,500x$1.78)	2,625(£62,500 x$0.0420)	1,460($2625/ 1.7982)	1,250($111250-110,000)	700($1,250/1.7861)
1.80	112,500(£62,500x$1.80)	3,338(£62,500 x$0.0534)	1,856($3338/ 1.7982)	2,500($112,500-$110,000)	1,400($2,500/ 1.7861)

Continued on the next page

Worst case outcomes using currency options can be calculated as:

1·78:62,500 + 1,460 – 700 = £63,,260
1·80:62,500 + 1,856 – 1,400 = £62,956

If the dollar weakens more than the relevant strike price, the option could be lapsed, and the necessary $110,000 purchased in the spot market at a more favourable exchange rate

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Advantages

There are several advantages of currency options:

(a) They protect a company against adverse currency fluctuations and enable it to take advantage of favourable foreign exchange rate movements.
(b) They enable a company to hedge against foreign exchange risk if it is uncertain in what direction future exchange rates might move.
(c) They provide an effective currency hedge, especially when foreign exchange markets are volatile.

Disadvantages

(a) The option premium is payable regardless of whether or not the option is exercised.
(b) Exchange-traded currency options are available only in a limited number of currencies with specific expiration dates. OTC currency options offer better flexibility.

4.2 Currency straddle and strangles

1. Straddle

A straddle is a derivative position, which involves the simultaneous purchase (or sale) of a call option and a put option at the same strike price and time to expiry.

Example

Maxphone Ltd. is about to publish its quarterly financial results in a week's time. A trader is convinced that the the results of Maxphone will cause a large movement in the price of its stock but does not know whether the price will go up or down (depending upon whether the company does well or performs badly).

He can enter into a long straddle, where he earns a profit irrespective of the way the price of Maxphone's stock moves. If the price goes up enough, he uses the call option and does not exercise the put option. If the price goes down, he uses the put option and ignores the call option. If the price does not change enough, he will lose the amount paid for the purchase of the two options.

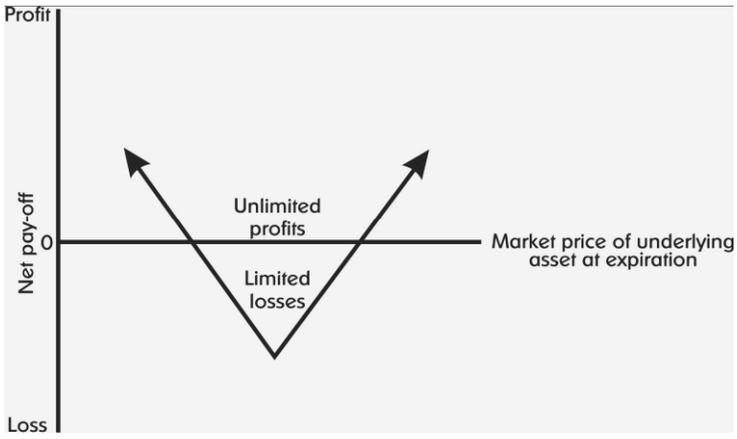
Straddles are undertaken if the buyer of the straddle expects the currency prices to be volatile but is not sure if the currency will appreciate or depreciate. Straddles are suitable to traders (speculators) who try to make profits from volatile currency movements but do not have a future commitment in any currency. Straddles may be long or short.

(a) Long straddle

A long straddle involves buying both a call option and a put option at the same strike price and time to expiry. The owner of a long straddle makes a profit if the exchange rate moves widely (i.e. more than the sum of the premiums of the put and call) from the strike price, either above or below.

Therefore, an investor can invest in a long straddle position if he expects the market to be highly volatile, but does not know in which direction it is going to move.

Diagram 1: Long straddle



A long straddle strategy results in maximum profits if the market price of the underlying asset at the expiry date moves widely either upwards or downwards. The maximum loss occurs when the price of the underlying at expiration is equal to the strike price.

Market view	Action	Profit potential	Loss potential
Mixed	Buy put & buy call at same strike price	Unlimited	Limited

Example

A trader believes that the dollar will move widely against the Sterling but does not know whether the price will go up or down. He can enter into a long straddle, where he gets a profit no matter which way the dollar moves, if the price moves widely either way.

If the price moves to a level higher than the sum of the premiums of the call option and put option, he exercises the call option and ignores the put option. If the price falls, he exercises the put option and ignores the call option. If the price does not change sufficiently, he incurs a loss.

Example

Suppose gold is trading at $1,300 per 10gms in the spot market as on 30 April. Bob enters a long straddle by buying a May 1,350 gold put option for $ 80 and a May 1,350 call option for $100. The net debit taken to enter the trade is $180, which is also his maximum possible loss.

Strategy: Buy Put + Buy Call

Gold	Current Value	1,300
Call and Put	Strike Price ($.)	1,350
Bob pays	Total Premium	180
	(Call + Put) ($.)	
	Upper Break Even Point($)	1,530(U)
	Lower Break Even Point($)	1,170(L)

Breakeven:

Upper Breakeven Point = Strike price of long call + Net Premium Paid

Lower Breakeven Point = Strike Price of long put – Net Premium Paid

Continued on the next page

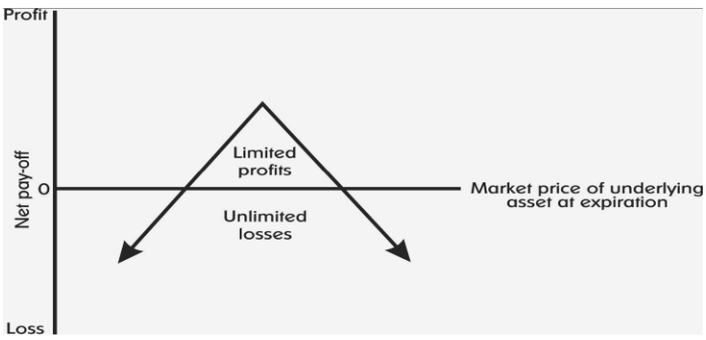
Payoff schedule

On expiry, Gold closes at	Net Payoff from Put purchased ($)	Net Payoff from Call purchased ($)	Net Payoff ($)
1000	270 (1,350 - 1,000 - 80)	(100)	170 (270 - 100)
1050	220 (1,350 - 1,050 - 80)	(100)	120
1100	170 (1,350 - 1,100 - 80)	(100)	70
1170	100 (1,350 - 1,170 - 80)	(100)	0
1250	20 (1,350 - 1,250 - 80)	(100)	(80)
1350	(80)	(100)	(180)
1400	(80)	(50) (1,400 - 1,350 – 100)	(130)
1450	(80)	0 (1,450 - 1,350 - 100)	(80)
1530	(80)	80 (1,530 - 1,350 - 100)	0
1600	(80)	150 (1,600 - 1,350 - 100)	70
1650	(80)	200 (1.650 - 1,350 - 100)	120

(b) Short straddle

A short straddle involves selling both a call option and a put option at the same strike price and time to expiry. The owner of a short straddle makes a profit if the exchange rate moves narrowly from the strike price, either above or below. The profit is limited to the extent of the premiums of the put and call options, but it is risky if the exchange rate fluctuates widely. The strategy breaks even if the intrinsic value of the put or the call equals the sum of the premiums of the put and call. Therefore an investor may take a short straddle position if he expects the currency market to be less volatile, but does not know in which direction it is going to move. A short straddle position is highly risky, because the profitability is limited to the premium whereas the potential loss is unlimited.

Diagram 2: Short straddle



A short straddle strategy results in maximum profits if the market price of the underlying asset at expiration is equal to the strike price. The maximum loss occurs if the market price of the underlying asset at expiration moves widely either upwards or downwards.

Market view	Action	Profit potential	Loss potential
Mixed	Sell put & sell call at same strike price	Limited	Unlimited

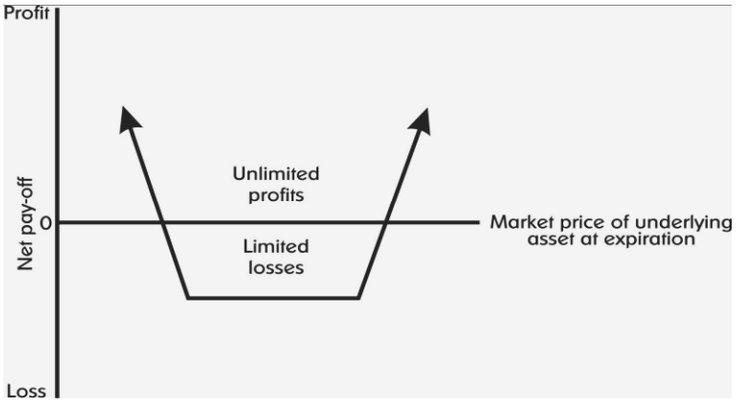
2. Strangle

A strangle is a derivative position which involves the simultaneous purchase (or sale) of a call option and a put option with the same time to expiry but with different strike prices. A strangle has a lower risk than a straddle. Although the seller gives up a substantial amount of potential profit by selling a strangle rather than a straddle, he also incurs less risk. It should, however, be noted that a strangle requires strong price movements in either direction before it begins to lose money. Strangles may be long or short.

(a) Long strangle

A long strangle involves buying a currency call option and a put option with the same time to expiry but with different strike prices. This strategy is adopted when the currency options trader thinks that the currency will experience high volatility in the short term. It has a limited loss and an unlimited profit potential.

Diagram 3: Long strangle



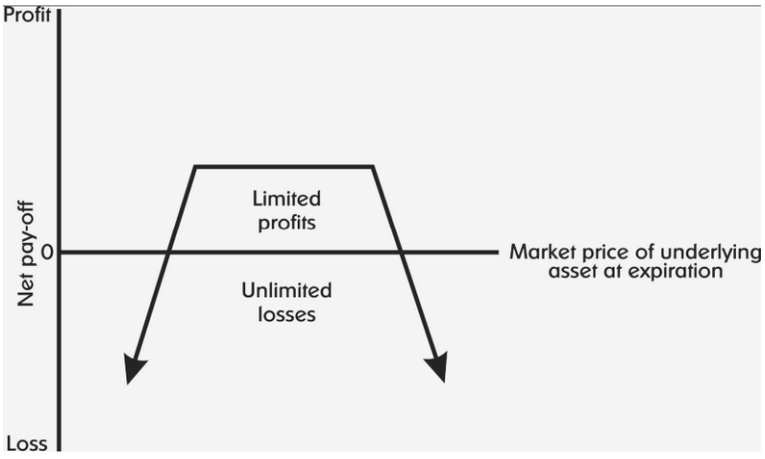
A long strangle strategy results in maximum profits if the market price of the underlying asset at expiration moves widely either upwards or downwards. The maximum, but limited loss occurs when the price of the underlying at expiration is trading between the strike prices of the options bought.

Market view	Action	Profit potential	Loss potential
Mixed	Buy put & buy call with different strike price	Unlimited	Limited

(b) Short strangle

A short strangle involves selling a call option and a put option with the same time to expiry but with different strike prices. This strategy is adopted when the currency options trader thinks that the currency will experience less volatility in the short term. It has a limited profit and an unlimited loss potential.

Diagram 4: Short strangle



A short strangle strategy results in maximum, but limited profits if the market price of the underlying asset at expiration is trading between the strike prices of the options sold. The maximum loss occurs if the market price of the underlying asset at expiration moves widely either upwards or downwards.

Market view	Action	Profit potential	Loss potential
Mixed	Sell put & sell call with different strike price	Limited	Unlimited

Test Yourself 4

An investor bought three June call options with a 90 strike price at a price of 2.5 (¢/€).

Required:

(a) What would be the total dollar cost for these calls, ignoring broker fees? Assume each call option is €62,500.

(b) After holding these calls for 60 days, he sold them for 3.9 (¢/€). Calculate his net profit on the contracts. Assume that brokerage fees on both entry and exit were $5 per contract and opportunity cost was 10% per annum on the money tied up in the premium.

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5 Evaluate and assess financial and planning options for a business giving advice based on business scenarios using currency swaps.

[Learning Outcomes e]

Concept of Swaps

Definition

A **swap** can be defined as a bilateral over the counter (OTC) derivative contract in which two parties exchange one stream of future cash flows for another stream of cash flows over a period of time.

One of these parties is usually a bank or a financial institution. These streams are called the legs of the swap. The cash flows are calculated over a notional principal amount. Swaps are often used to hedge certain risks, for instance foreign currency rate risk. Swaps are mainly classified as currency swaps and interest rate swaps.

A swap, in itself, is neither a borrowing nor a lending. The size of the swap is referred to as the notional amount and is the basis for calculation.

1. Currency swaps

Definition

A **currency swap** is a contract in which two counterparties exchange a specific amount of two different currencies, exchange interest payments in the two currencies over the term of swap and re-exchange the principal at maturity.

In a currency swap, the transactions between the two parties are in different currencies. Since different currencies are involved, the notional principal is also exchanged. The two currency swaps can be combined to produce a plain interest rate swap.

Steps involved in currency swap

Step 1: Exchange of principal currency amounts.
Step 2: Interest payments exchanged periodically throughout the life of the swap.
Step 3: Principal amounts re-exchanged at the end of the swap.

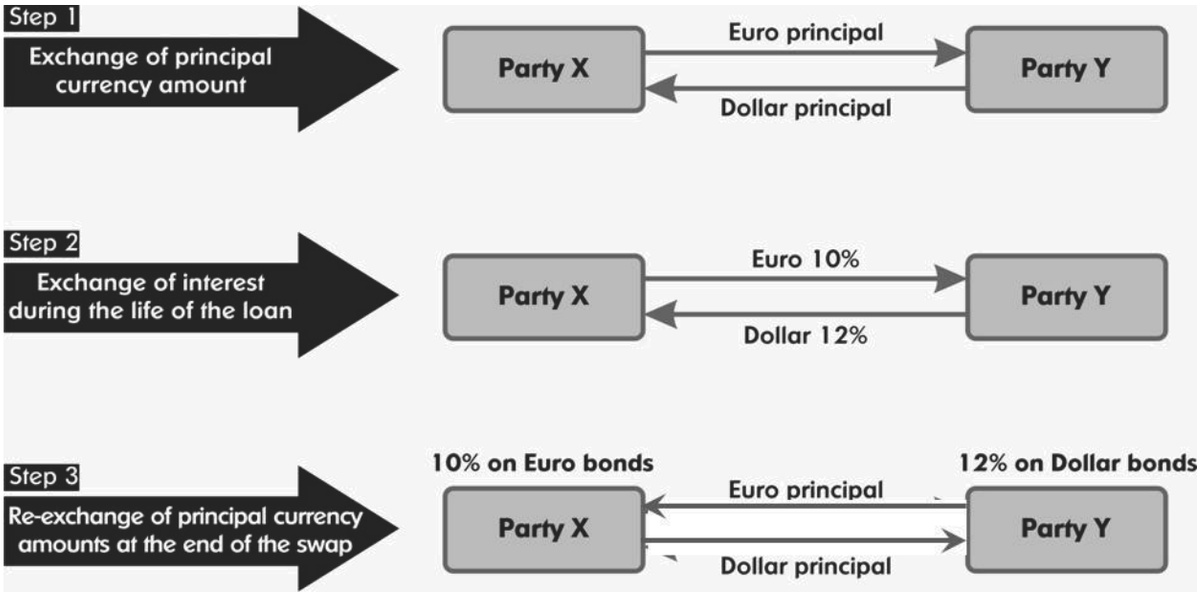
Types of currency swaps

Fixed to fixed currency swap: involves exchanging fixed interest obligations on a loan in one currency for fixed interest obligations on an equivalent loan in another currency.

Fixed to floating currency swap: in this method, fixed rate obligations in one currency are swapped for floating rate obligations in another currency. It is also known as a cross-currency interest rate swap or a currency coupon swap. For example, US dollars at fixed rates can be swapped against Sterling with LIBOR + floating rate.

Example

If X raises Euros by issuing 10% Euro bonds and Y raises dollars by issuing 12% dollar bonds in the US market, a currency swap between them may be represented diagrammatically as follows:



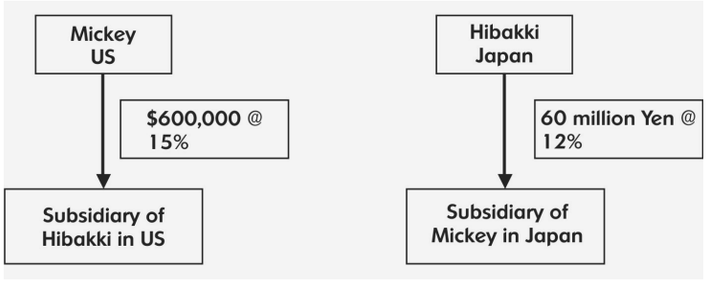
Example

Mickey Ltd wishes to lend US$600,000 to its Japanese subsidiary. At the same time, Hibakki Heavy Industries is interested in making a medium-term loan of approximately the same amount to its US subsidiary. The two parties are brought together by an investment bank for the purpose of making parallel loans. Mickey will lend $600,000 to the US subsidiary of Hibakki for 4 years at 15%.

The principal and interest amounts are payable only at the end of the fourth year along with interest compounding annually. Hibakki will lend the equivalent in Yen at the current exchange rate to the Japanese subsidiary of Mickey (i.e. ¥60 million for 4 years at 12%). Again the principal and interest (annual compounding) are payable at the end of the fourth year, assuming a fixed exchange rate equal to the current rate. The current exchange rate is ¥100 to the dollar.

(a) If these expectations prove to be correct, what will the dollar equivalent of principal and interest payments to Hibakki, at the end of the 4 years?
(b) Compute the total amount in dollars that Mickey will receive at the end of the 4 years, from the payment of principal and interest on its loan by the US subsidiary of Hibakki?
(c) Which party will gain the most from the parallel loan agreement?

Answer



(a) Amount payable by Mickey to Hibakki after 4 years $60(1 + 0.12)^4$ = ¥94.41million

$$\text{In dollars} = \frac{94,410,000}{100} = \$944,100$$

(b) Amount payable by Hibakki to Mickey after 4 years = $600,000(1 + 0.15)^4$ = $1,049,404

Continued on the next page

(c) Therefore, Mickey will gain the most from the parallel loan agreement because the amount received is more than the amount payable.

If the exchange rate had not been fixed at ¥100 for the four years, given the differential interest rates, the US$ would probably have depreciated against the ¥. If the exchange rate was **¥90 or less** to the dollar, Hibakki would have gained the most from the parallel loan agreement.

Benefits of currency swaps

Enable a company to obtain funds at a cheaper rate than borrowing in the domestic market, thereby resulting in cost reduction.
Enable a company to hedge its currency exposure for longer time periods than is possible with forward contracts.
Enable a company to restructure its debt profile without physical redemption or issue of new debt.
Enable access to international capital market by avoiding exchange control restrictions.
Usually cheaper than forwards.

Disadvantages of currency swaps

In the case of adverse movements in exchange rates, the swap may not achieve its purpose of cost reduction.
There is the possibility that the counterparty may default giving rise to a credit risk. Swaps arranged with a bank as the counterparty usually tend to be less risky.
If the government imposes exchange control restrictions, the swap could turn out to be risky.

2. FOREX swaps

Definition

A **FOREX swap** is similar to a currency swap with the only difference being that, in an FOREX swap, there is no exchange of interest payments.

However, the principal is exchanged at the start of the swap and re-exchanged at the end of the swap. FOREX swaps are useful for companies:

which face difficulties in raising funds in certain currencies
for hedging currency risks for a longer time period than is possible through forward contracts

Test Yourself 5

Advance Electronics (AE), a US based company would like to borrow pounds, and Royal Foods (RF), which is a UK company desires to borrow dollars. AE can borrow in dollars at 7 percent and pounds at 9 percent, whereas RF can on its own borrow dollars at 8 percent and pounds at 8.5% AE wants to borrow £10 million for two years and RF wants to borrow $16 million for two years, and the current ($/£) exchange rate is $1.60.

Required:

(a) What is the swap transaction the two companies can enter into to achieve their plans?

Note: You may assume the counterparties would exchange principal and interest payments without any rate adjustments.

(b) Calculate the savings that AE and RF can achieve.

(c) Suppose AE can borrow dollars at 7 percent and pounds at 9 percent, whereas RF can borrow dollars at 8.75 percent and pounds at 9.5 percent. What range of interest rates would make this swap attractive to both parties?

(d) Based on the scenario in part (c), suppose AE borrows dollars at 7 percent and RF borrows pounds at 9.5 percent. If the parties swap their current proceeds, with AE paying 8.75 percent to RF for pounds and RF paying 7.75 percent to AE for dollars, what are the cost savings to each party?

Answers to Test Yourself

Answer to TY 1

(a) Maintain the same Tanzanian shilling price:

The new exchange rate, post devaluation will be Tshs1,600 x 1.15 = Tshs1,840

The current price in Tshs= $50 x Tshs1,600 = Tshs80,000

Sales revenues at the post devaluation rate

(Tshs80,000 x 200,000)/(Tshs1,840) = $8,695,652

Direct cost = ($30 x 200,000) = $6,000,000

Contribution margin = $8,695,652 - $6,000,000 = **$2,695,652**

(b) Maintain the same dollar price:

The new sales volume will be 200,000 unitsx0.9 = 180,000 units

The new price in Tshs =$50 x The real price = $200* R$4.00/$ = R$800

Sales revenues = 180,000 x $50 = $9,000,000

Direct cost = ($30 x 189,000) = $5,400,000

Contribution margin = $9,000,000 - $5,400,000 = **$3,600,000**

(c) In the short run, choose alternative b, as the contribution by maintaining the USD price is higher by $904,348 than if the price were to be reduced.

Answer to TY 2

(a) To settle the forward contract amounting to £1.0million in 3 months' time, the amount of dollars required

= £1.0million x $ 1.41= $1.41million

As the funds are required 3 months hence, and his investment in the bank earns 0.35% compounded monthly, the present value of the investment in dollars

=$1.41million/$(1.0033)^3$ = $1,396,007.

Thus, the present value of the property is $1,396,007.

(b) Purchase pounds at spot today and invest in a London bank.

We first determine the amount in pounds needed today that will equal to £1.0million in three months time.

As the interest rate in London is 2.2% for 3 months,

The present value of £1.0million = £1.0million/1.022 = £978,474.

The businessman has to buy £978,474 today at today's spot of $1.46/£.

= £978,474x1.46 = $1,428,575

Under this alternative, the cost of the property is $1,428,575.

On a comparison of the two alternatives, it is clear that buying pounds 3 months forward is cheaper than investing in the money market in London . By doing this , the business pays $ 32,568 (2.3%) less for the property.

Answer to TY 3

Option I Forward market hedge

$$\text{Amount payable after 3 month } \frac{900{,}000}{9}$$

= $100,000

Option II Money market hedge

Let the amount borrowed be x

Therefore,

$$10x + 10x \times 0.08x \frac{90}{365} = 900{,}000$$

x = 88,261

	$
Therefore, amount to be borrowed in $	88,261
Add: Interest paid = 88,947 x 0.12 x 90 / 365	2,612
Therefore, net cost	**90,873**

Option III Keep the exposure open i.e. no hedge

Amount payable after 90 days (900,000/8) = $112,500

Therefore, Beck Ltd should opt for the money market hedge since it results in a cost of $90,873, which is the lowest amongst the three options.

Answer to TY 4

(a) With each call option being for €62,500, the three contracts combined are for €187,500. At a price of 2.5¢/€, the total cost is therefore 187,500 x $0.025 = $4687.50
(b) The net profit would be 1.4¢/€ (3.9 - 2.5) for a total profit before expenses of $2625 (0.014 x 187,500).

Brokerage fees (exit and entry of $ 5 each) are $10 per contract or $30 for 3 contracts.

The opportunity cost would be $4,687.50 x 0.10 x 60/365 = $77.04.

After deducting the expenses of $30 + $77.04= $107.04, the net profit is $2517.96

Answer to TY 5

(a) AE would pay 8.5% on the £10 million it borrows from RF as that is the cost RF would have to pay ton its Sterling borrowings. Similarly, RF would pay 7% on its $16 million it borrows from AE.

(b) The alternative for AE was to borrow GBP at 9%. Thus, AE can save 0.5% for an annual savings of £50,000. Similarly, RF only pays an interest rate of 7% instead of 8% on its dollar borrowings, saving 1% or $160,000 annually.

(c) RF would have to offer AE a GBP rate of less than 9%. Since RF has to borrow GBP at 9.5%, it would have to save at least 0.5% on its dollar borrowing from AE to compensate for the interest rate differential and make the swap worthwhile.

If RF lends pounds to AE at 9%-x%

Its cost of borrowing pounds from its bank is 9.5%. Therefore it would lose (9% -x%) - 9.5%, i.e. (0.5%+x%) when it lends pounds to AE. Therefore, in order to compensate for this loss, the maximum rate of interest that RF can afford to pay on its dollar borrowings from AE will have to be8.75% - (0.5% + x%).

(d) Under this situation, AE saves 0.25% on its pound borrowings and earns 0.75% on the dollars it swaps with RF for a total benefit of 1% annually. RF loses 0.75% on the pounds it swaps with AE and saves 1% on the dollars it receives from RF, for a net savings of 0.25% annually.

Quick Quiz

1. Transaction exposure arises when a firm faces contractual cash flows that are fixed in a foreign currency. **True/False.**

2. The BOP equation states that current account + capital account + official reserve account = 1. **True/False**

3. In a forward market hedge, a firm enters into a binding contract with a bank to buy or sell a certain quantity of foreign exchange at a predetermined _____at an agreed future date. **(Fill in the blanks)**

   A exchange rate
   B interest rate
   C swap rate

4. A disadvantage of a money market cover is that it crystallises the future rate and thus eliminates downside risk exposure. **(True/False)**

5. A foreign currency _____option gives the holder the right to ____ a foreign currency, whereas a foreign currency ____ option gives the holder the right to ____ an option.(**Fill in the blanks with the appropriate terms-call, sell, put, buy)**

6. A currency swap is _____. **(Complete the sentence)**

Answers to Quick Quiz

1. True

2. False. The BOP equation should be zero.

3. exchange rate

4. False. It is fact an advantage.

5. call, buy, put, sell

6. A **currency swap** is a contract in which two counterparties exchange a specific amount of two different currencies, exchange interest payments in the two currencies over the term of swap and re-exchange the principal at maturity.

Self Examination Questions

Question 1

The inflation rate in the US and India is expected to be 2 per cent and 4.5 per cent annually. The current spot rate of US $ in India is Rs 48.4050/US$.

Find the expected rate of US$ in India after one year from now using the purchasing power theory of exchange rate.

Question 2

Discuss the advantages and disadvantages of forward contracts and currency futures for hedging against foreign exchange risk.

Question 3

The CEO of Autocrat Plc is reviewing the company's interest rate and currency risk strategies for the next few months. There has recently been considerable political instability with some countries showing signs of moving towards economic recession whilst others are still showing steady growth. Both interest rates and currency rates could become more volatile for many major trading countries.

Autocrat is expected to borrow £6.5 million for a period of six months commencing in six months' time. The company also needs to make a US$ payment of $4·3 million in 3 months' time.

Assume that it is now 1 December. Futures and options contracts may be assumed to expire at the end of the relevant month, and the company may be assumed to be able to borrow at the 3 month LIBOR rate.

LIFFE futures prices (£500,000 contract size)

March 95·56
June 95·29

LIFFE options on futures prices, £500,000 contract size. Premiums are annual %

	CALLS		PUTS	
	March	**June**	**March**	**June**
95250	0.445	0.545	0.085	0.185
95500	0.280	0.390	0.170	0.280
95750	0.165	0.265	0.305	0.405

Foreign exchange rates

Spot $1.4692 - 1.4735/£
3 month forward $1.4632 - 1.4668/£

Currency option prices

Philadelphia Stock Exchange $/£ options, contract size £31,250, premiums are cents per £

	CALLS		PUTS	
	March	**April**	**March**	**April**
1.450	3.12	-	1.56	-
1.460	2.55	2.95	1.99	2.51
1.470	2.14	-	2.51	-

Three-month LIBOR is currently4·5%

Required:

(a) If the interest rates increase by 0.75% in six months' time, illustrate the possible results of
(i) futures hedge; and
(ii) options hedge

Recommend which hedge should be selected and explain why there might be uncertainty as to the results of the hedges.

(b) Illustrate and discuss the possible outcomes of forward market and currency options hedges if possible currency rates in three months' time are either:
(i) $1.4350 -$1.4386/£ or
(ii) $1.4780 -$1.4820/£.

Answers to Self Examination Questions

Answer to SEQ 1

According to purchasing power parity

$$S_1 = S_0 \times \frac{(1+h_c)}{(1+h_b)}$$

Where,

S_0 = current spot rate
h_c = inflation rate in country c (India)
h_b = inflation rate in country b (USA)

$$\text{Forward rate after one year} = 48.4050 \times \frac{(1+0.045)}{(1+0.02)}$$

Spot rate after one year = Rs 49.5914 per US$

Answer to SEQ 2

1. Currency forward contracts

Advantages

(i) Currency forward contracts are tailored to the needs of the parties concerned, and offer flexibility in terms of the size and maturity of contracts.
(ii) Contracts are available in a very wide range of currencies.
(iii) No margin payments are required until the contracts are settled.

Disadvantages

(i) Forward contracts usually involve a bid and an offer price, which means that a company bears the cost of the bid offer spread which is the dealer / bank's margin.
(ii) Long-term maturity contracts are rare, and some currencies do not have a forward market.
(iii) Prices could differ according to the size of the deal and the customer.

2. Currency futures

Advantages

(i) Default risk is minimal as the futures contracts are marked-to-market daily by the clearing house, with the protection of the margin payment.
(ii) Currency futures involve a single specified price, which is transparent.

Disadvantages

(i) An initial margin is usually required, and a further variation margin could be necessary.
(ii) Futures contracts are not very flexible. They are of a specified size and maturity, and are only available for a very limited number of currencies.

Answer to SEQ 3

(a) Futures hedge

Autocrat plc needs to borrow in six months' time, and wishes to protect against an increase in interest rates during the next six months. To do this it will **sell June futures contracts**.

$$\frac{£6,500,000}{£500,000} \times \frac{6}{3}$$

= 26 contracts at 95.29
(As the period at risk is six months, the number of contracts is doubled, i.e.6/3)

Basis is 95·29 – 95·50 = (0·21%) (futures price – cash price (100 – 4.5))

At the end of June when the contracts mature, basis will be 0. There are seven months until the maturity date. In six months' time when Autocrat needs to borrow the expected basis is:

$$0.21\% \times \frac{1}{7}$$
$$= 0{\cdot}03\%$$

This assumes a linear decline in the basis.

If the interest rate increases by 0.75%, LIBOR will move to 5·25% and the expected futures price is 94·75 – 0·03 =94·72 (100 – LIBOR) – 0.03).

Cash market: The extra cost of a 0·75% increase in interest is: £6,500,000 x 0·75% x 0·5 (six months) = £24,375

Futures market: Sell 26 June contracts at 95.29
Futures market: Buy 26 June contracts at 94.72

(the tick value is £500,000 x ·01% x 3/12 = £12·50)

Futures market: Gain is 57 ticks (basis points) x £12.50 x 26 contracts = £18,525

The effective overall cost is:

Cash market borrow £6,500,000 at 5.25% for six months = £170,625
(Less) futures gain of £18,525 = £152,100. This is an annual interest rate of 4.68%.

The futures contract effectively locks into the futures rate (4·71%), less the expected basis of 0·03%, or overall interest rate of 4·68%, not the current cash market rate (4·5%). However, the 4·68% rate is not certain as the futures price in six months' time might not be 94·72 because there might not be a linear decline in basis, i.e. basis risk might exist.

(If the company wished to protect against changes in the current cash market rate it would need to sell more contracts in order to generate a high enough expected profit).

Options hedge

Autocrat plc would need to **buy June put options** on futures.

Strike price		**Premium cost**
95250	(£6,500,000 x 0.185% x 6/12)	£6,012.50
95500	(£6,500,000 x 0.280% x 6/12)	£9,100.50
95750	(£6,500,000 x 0.405% x 6/12)	£13,162.50

(alternatively, the premium may be estimated using basis points multiplied by the tick value for the contract and number of contracts, e.g. 18·5 x £12.50 x 26 = £6,012.5)

If interest rates increase by 0.75% the options will be exercised (or sold if there is any time value left) and the futures contracts closed out to make a profit.

This expected profit would be the exercise price at which futures could be sold, less the expected futures price in six months, multiplied by 100%, the tick value and the number of contracts

Exercise price		**Profit**
95250	(95·25 – 94·72) x 100 x 26 x £12·5	£17,225
95500	(95·50 – 94·72) x 100 x 26 x £12·5	£25,350
95750	(95·75 – 94·72) x 100 x 26 x £12·5	£33,475

Exercise price		Overall cost
95250	£170,625 – £17,225 + £6,012·5	£159,412.50
95500	£170,625 – £25,350 + £9,100	£154,375.00
95750	£170,625 – £33,475 + £13,162·5	£150,312.50

The 95750 exercise price has the lowest overall cost, with a worst case effective interest rate of 4·625%, which is better than the futures rate. It is therefore the recommended hedge. However, the spot futures price at the time when the option would be exercised / sold is not certain.

If interest rates were to fall rather than increase the option could be allowed to lapse (or sold for time value if any) and advantage taken of the lower cash market borrowing rates.

(b) Outcome of using a forward market:

Since, a payment of $4.3 million dollars is due, using forward market hedge:

Autocrat plc can buy dollars three months forward. Therefore, the pounds required to buy dollars will be equal to

Buy $ three months forward

$$\frac{\$4,300,000}{1.4632}$$

= £2,938,764

Outcome of using options hedge:

For purchasing dollars, March put options on pounds should be bought. This is because, the contracts are Sterling options, March put option contracts should be used, as they are the closest maturity date after the date of the transaction which is 1 March.

Number of contracts:			Contract Value
$4,300,000/1.45	£2,965,517/31,250	94.90 or 95 contracts	(£2,968,750)
$4,300,000/1.46	£2,945,205/31,250	94.25 or 94 contracts	(£2,937,500)
$4,300,000/1.47	£2,925,170/31,250	93.61 or 94 contracts	(£2,937,500)

Option premiums	Premium	
1.45	1.56 cents x £2,968,750 = $46,312/1.4692	£31,522
1.46	1.99 cents x £2,937,500 = $58,456/1.4692	£39,788
1.47	2.51 cents x £2,937,500 = $73,731/1.4692	£50,185

Spot Rate

The Sterling cost is estimated using the spot rate since the option premium is payable upfront.

The possible three-month spot rates for the purchase of dollars are:

(i) $1.4350/£
(ii) $1.4780/£

If the spot rate moves to $1.4350/£ all of the options would be exercised.
1.45 £2,968,750 x 1.45 = $4,304,687

The excess $4,687 could be sold forward at 1.4668/£.

1.46 £2,937,500 x 1.46 = $4,288,750

$11,250 could be bought forward at $1.4632/£.
1.47 £2,937,500 x 1.47 = $4,318,125

The excess of $18,125 could be sold forward at $1.4668/£.

Total costs		
1·45	£2,968,750 – £3,195 + £31,522	£2,997,077
1·46	£2,937,500 + £7,689 + £39,788	£2,984,977
1·47	£2,937,500 – £12,357 + £50,185	£2,975,328

All of the above mentioned are dearer than the forward market.

In case the spot rate moves to $1.4780, then none of the options would be exercised. The expected surplus or shortfall in dollars, resulting from the amount at risk not being equal to an exact number of currency option contracts, would still have been sold / bought using forward contracts. The resulting surplus dollars would be required to be sold, or shortfall in dollars would be required to be purchased to fulfil the forward contracts.

$4,300,000 at spot of $1.4780/£ = £2,909,337

1·45	£2,909,337 + £31,522 + £3,171 ($4,687 bought at spot of 1.4780)	£2,944,030
1·46	£2,909,337 + £39,788 – £7,591 ($11,250 surplus at spot of 1.4820)	£2,941,534
1·47	£2,909,337 + £50,185 + £12,263 ($18,125 bought at 1.4780)	£2,971,785

The above mentioned are still dearer than the forward contract. The spot price of the dollar in three months' time would have to weaken further in order for the options to be the cheaper hedge.

SECTION D

FINANCIAL ENGINEERING AND PLANNING

D3

STUDY GUIDE D3: OPTION VALUES

Get Through Intro

Options are considered to be the most attractive among the various derivative contracts. This is because they are very flexible by nature. While they provide an investor with an opportunity to earn a profit, the downside is limited and pre-determined.

Options form an important part of financial engineering whether in the field of investments, managing interest rate risk or foreign exchange risk. It is a tool to effective portfolio management.

In this study guide we shall discuss features of an option contract and option pricing models. Based on these, several hedging strategies can be adopted using option contracts.

Learning Outcomes

a) Define time and intrinsic value of an option contract.
b) Identify the boundary conditions of options and explain their implications for the determination of option values.
c) Apply the Black-Scholes option pricing, Binomial option pricing and real option models to determine the value of an option contract.
d) Discuss the factor that influences the price / value of option contracts.
e) Describe the relationship between call and put prices (call-put parity) and its implications.
f) Develop hedging strategies based on options.

1. Define time and intrinsic value of an option contract.

[Learning Outcome a]

1.1 Option contracts

An option contract provides the buyer of an option with a right to buy or to sell the underlying instrument or asset at a pre-determined price. This price is called the exercise price or the strike price.

There are two types of options:

1. **Call option:** the option to buy the asset
2. **Put option:** the option to sell the asset

The buyer of the option has to pay a price to the seller of the contract under the terms of the contract. This is called the option premium. It is non-refundable. Under the terms of the option contract, in case of a call option the seller of the option has to deliver the underlying security to an option buyer if the call is exercised or, in the case of a put option, buy the underlying security if the put is exercised. The seller of an option receives the option premium irrespective of whether the option is exercised or allowed to expire.

1.2 In the Money (ITM), Out of the Money (OTM) and at the Money (ATM)

1. In the Money (ITM)

A buyer of a call option will exercise the option only if the market price is greater than the strike price. The option is said to be 'In-the-Money' in this case. This is because the buyer of the option gains by the exercise of the option. Conversely, the buyer of a put option will make money through the option only if the market price is lower than the exercise price.

2. Out of the Money (OTM)

Options will be exercised only when they are In the Money (ITM). Options which have no value are called 'out-of-money' (OTM). In case of call option, when the market price is lower than the strike price the option is OTM. A put option would be OTM when the market price is greater than the strike price.

3. At the Money (ATM)

When the strike price and market price are equal the option contract is said to be At the Money (ATM). In such a case there is no specific advantage of exercising the option. There is also no necessity to scrap the option since it is not OTM.

1.3 Intrinsic value of an option contract

The option price comprises two price components, the intrinsic value and the time value.

Option price = intrinsic value + time value

Definition

The **intrinsic value of an option** is that part of the option premium which comprises of the difference between the market price of the underlying asset and the exercise price

In other words, intrinsic value is that part of the option premium which represents the extent to which it is in-the-money (ITM). Intrinsic value for a contract which is out-of-money or at-the-money is zero. However intrinsic value cannot be negative.

Tip

Call options: Intrinsic value = market price of underlying asset - call exercise price
Put options: Intrinsic value = put exercise price – market price of underlying asset

Example

If an equity share is trading at Tshs600, and a Tshs540 call option with 30 days left on it was selling for Tshs80, that option would have:

Tshs600 – Tshs540 call option = Tshs60 of intrinsic value

The intrinsic value is Tshs60 out of the option premium worth Tshs80.

The intrinsic value of an option is not dependent on the time left until expiration. It is simply an option's minimum value and it reveals the minimum amount an option is worth.

1.4 Time value of an option contract

Definition

Time value of an option is the measure of probability of change in the price of the underlying asset to become in the money during the period up to expiry.

Time value is the balance of option premium over and above the intrinsic value of the option. An option's time value is dependent upon the length of time remaining to exercise the option, the **moneyness** of the option, and the volatility of the underlying security's market price.

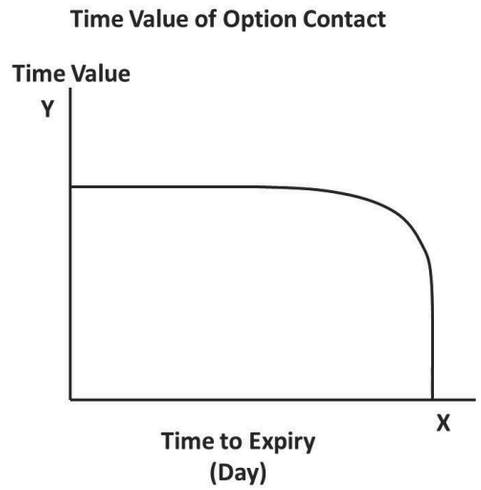
(Moneyness describes the relationship between the strike price of an option and the current trading price of its underlying security, such as **in-the-money**, **out-of-the-money** and **at-the-money).**

The time value of an option decreases as its expiration date approaches and its value is zero after that date.

Therefore, options can be termed as wasting assets.

Higher the volatility, higher is the time value. In general, time value increases as the uncertainty of the option's value at expiry increases.

Diagram 1: Time value of an option contract



The above diagram show how the time value of the option decreases (decays). The decay is slow until the last few days to the expiration date, post which the decay increases resulting in quick erosion of value. This is critical to decide whether to buy or sell the option, to know the time value of the option. The out-of-the money options decay at a faster rate near expiry since there is only a remote possibility of their going in-the-money.

Tip

Call options: Time value = call premium - intrinsic value
Put options: Time value = put premium - intrinsic value

Example

We continue the same example given for the intrinsic value calculation. If the option premium is worth Tshs80, it means that the balance of Tshs20 is due to the time value.

Time value = option premiumTshs80 – intrinsic value Tshs60 = Tshs20

Test Yourself 1

Complete the table given below:

Intrinsic Value and Time Value (Call options for the Tshs1000 stock)

	Premium (option price)	Category *	Intrinsic value	Time Value
Tshs900	Tshs170			
Tshs1000	Tshs100			
Tshs1100	Tshs60			

* Identify whether At-the-money; In-the-money; or Out-of-the-money

2. Identify the boundary conditions of options and explain their implications for the determination of option values.

[Learning Outcome b]

2.1 Styles of options

There are two styles of exercising options:

1. **American style option** in which the option can be exercised anytime between the date of purchase and date of expiry

2. **European style option** in which the option can be exercised only on the date of expiry

The expiry date is the date up to which the option can be traded. The options are always traded for a specified number of units of the underlying. In case of on OTC option, the parties negotiate all the terms. In case of standardised exchange options, the exchange lays down the terms except the price. The option price is negotiated by the parties.

2.2 The lower boundary condition

An important step in option pricing is to understand the boundary conditions that make the option premium to be within a particular range, called the lower and upper boundary.

The minimum value of an option is zero .i.e. an option cannot sell at less than zero. Therefore minimum value is denoted as:

$C \geq 0$
$P \geq 0$

The lower boundary condition essentially states that the value of an option can never be less than its intrinsic value. For a call option, intrinsic value is the greater of the excess of the asset price over the strike price and zero. For a put option, it is the greater of the excess of the strike price over the asset price and zero.

In other words, the maximum value of an option lies between zero and the intrinsic value i.e.
difference between the underlying market price and strike price in case of a call option
difference between the strike price and the underlying market price in case of a put option.

In terms of formula:

C = Max (0, S-X)

Where,

C is the call option premium,
S is the market price
X is the strike price

P = Max (0, X-S)

Where,

P is the put option premium
S is the market price
X is the strike price

This floor or lower bound is determined by arbitrage restrictions.

Example

Assume that the premium on a British pound call option is $.01, while the spot rate of the pound is $1.65 and the exercise price is $1.63. The spread or intrinsic value, (S - X) exceeds the call premium by $0.02, which would allow for arbitrage.

An investor can purchase the call option for $.01 per unit, exercise the option immediately at $1.63 per pound, and then sell the pounds in the spot market for $1.65 per unit. This would produce an immediate net profit of $.01 per unit (the difference of $0.02 – the premium of $0.01). The arbitrage process would continue until the market forces reduce the spread (S - X) to be less than or equal to the call premium.

American options formulae:

$$C_A \geq \text{Max } [0, S_0 - \frac{X}{(1+r)^t}]$$

Where,

C_A = current call value,
S_0 = market price of underlying asset,
X = exercise price,
r = risk-free rate of interest
t = time to expiration (no. of days/365)

For the American put option, the lower bounds are:

$$P_A \geq \text{Max}[0, X - S_0]$$

Where: P_A = current put value

European options formulae:

In case of European style options, the options cannot be exercised earlier than the expiration date. Therefore, in this case the lower boundary is either the greater of zero or the underlying market price minus the present value of the exercise price.

$$C_E \geq \text{Max } [0, S_E - \frac{X}{(1+r)^t}]$$

Where,

C_E = Value of European call option,
S_E = market price of underlying asset,
X = market price,
r = risk-free rate of interest,
t = time to expiration (no. of days/365)

The **European put option formula,** however is different and is given as:

$$EE = \text{Max}\left[0, \frac{X}{(1 - r)} - SE\right]$$

Where,

E_E = value of European put option
S_E = market price of underlying asset,
X = exercise price,
r = risk-free rate of interest,
t = time to expiration (no. of days/365)

2.3 The upper boundary condition

The upper bound for a call option premium is equal to the spot exchange rate (*S*): C= S

If, the call option premium exceeds the spot exchange rate, an investor could arbitrage by selling call options for a higher price per unit than the cost of purchasing the underlying currency. The arbitrage profit is the difference between the amount received when selling the premium and the cost of purchasing the currency in the spot market. Arbitrage would occur until the call option's premium was less than or equal to the spot rate.

The upper bound for a put option is equal to the option's exercise price (*X*): P = X

If the put option premium exceeds the exercise price, the investor could engage in arbitrage by selling put options. Even if the put options are exercised, the proceeds received from selling the put options exceed the price paid (which is the exercise price) at the time of exercise. Due to the arbitrage possibilities, option premiums lie within these boundaries.

In spite of the fact that boundary conditions can be used to determine the range for a currency option's premium, they cannot exactly define the appropriate premium for the option. However, there are pricing models which have been developed to price currency options. Based on information about an option (such as the exercise price and time to maturity) and about the currency (such as its spot rate, standard deviation, and interest rate), pricing models can derive the premium on a currency option.

Example

A European call option with an exercise price of 30 has an expiry of 90 days. The underlying shares are quoting at 35. The risk-free rate is 5%. We determine the lower boundary for the European call option as follows:

$$C_E \geq = \text{Max}\left[0, S_E - \frac{X}{(1 - r)^t}\right]$$

Where,

C_E = Value of European call option,
S_E = market price of underlying asset,
X = market price,
r = risk-free rate of interest,
t = time to expiration (no. of days/365)

$$C_E \geq \text{Max}\left[0, 35 - \frac{30}{(1 - 0.05)^{(90/365)}}\right]$$

$C_E \geq$ Max(0,5.36)

= 5.36

Test Yourself 2

An option has a strike price of 90 and is currently trading at 96. Assume a risk-free rate of 6%.

Required:

(a) Calculate the minimum and maximum price of 6-month American and European calls.

(b) What would it be if it has a strike price of 95 and currently trading at 90?

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3. Apply the Black-Scholes option pricing, Binomial option pricing and real option models to determine the value of an option contract.

[Learning Outcome c]

3.1 The Black-Scholes option pricing model

The Black-Scholes model can be used to arrive at the fair value of a call option when the share price at the end of the expiry period can assume continuous values.

Black and Scholes developed an equation which demonstrates the manner in which share prices vary, called the Geometric Brownian Motion. This equation conveys that share returns will have a lognormal distribution. .i.e. the logarithm of the share's return will follow the normal (bell-shaped) distribution.

Black and Scholes proposed that an option's price is determined by only two variables that are allowed to change:

time to expiration date; and
the underlying share price.

The other factors such as risk-free rate, exercise price and volatility are assumed to remain constant. By forming a portfolio consisting of a long position in underlying asset and a short position in calls, the risk of the asset price fluctuation is eliminated. This hedged portfolio is obtained by setting the number of shares equal to the approximate change in the call price for a change in the share price. However, this mix of shares and calls is subject to continuous revision. This process is called delta hedging.

The fair value of the option is a function of five variables:

market price of the asset
exercise price
time to expiry
volatility of price of underlying asset
interest rate

In this model, all the variables except (4) are contained in the contract between option buyer and option seller.

The model is based on the following assumptions:

The rate of return on a share is log normally distributed. (the logarithm of the share's return will follow the normal distribution).
The risk-free rate is constant during the life of the option and is known.
The market is efficient and there are no transaction costs and taxes.
The option is a European option.
There are no restrictions or penalties for short selling.
The share price is continuous and random.
There is no dividend to be paid on the share during the life of the option.

Formula

The Black-Scholes option pricing model

$c = P_aN(d_1) – P_eN(d_2)e^{-rt}$

Where,

$$d_1 = \frac{\ln\left(\frac{P_a}{P_e}\right) + \left(r + 0.5s^2\right)t}{s\sqrt{t}}$$

$$d_2 = d_1 - s\sqrt{t}$$

c = Value of a call option
P_a = Current price / spot price of the underlying asset
P_e = Exercise price / strike price of the underlying asset
N(d) = Value of cumulative normal probability density function
e = Exponential constant (base of natural logarithm). The value is 2.7183.
r = continuously compounded risk-free rate of interest
t = Time to expiry (in years)
In = Natural logarithm
s = Standard deviation of the continuously compounded annual returns on the underlying

The starting point for solving a problem relating to the Black and Scholes model is to calculate the value of d_1.

This involves calculating the natural logarithm of the base to the constant 'e'. For this purpose, students must use a calculator which has a natural logarithm function.

The standard deviation measures the volatility in the prices of the underlying. If the underlying asset is a share, the standard deviation measures the volatility of the annual returns from the share.

The next step is to calculate the value of d_2.

After the values of d_1 and d_2 have been calculated, the values for $N(d_1)$ and $N(d_2)$ should be determined. These values can be obtained from the normal distribution tables.

The option price can be calculated by substituting the values of $N(d_1)$ and $N(d_2)$ in the formula.

Example

Robert is interested in writing a six-month call option on Portizo Company's share. Portizo's share is currently selling for Tshs2000. The strike price of the share is Tshs2000.The volatility (standard deviation) of the share returns is estimated as 70%. Angelina would like the strike price to be Tshs2000. The risk-free rate is assumed to be 9%. How much premium should Angelina charge for writing the call option?

We assume that the share is not a dividend-paying share. Let us first calculate d_1 and d_2 as follows:

Step 1: Calculate the values of d_1 and d_2.

$$d_1 = \frac{Ln\left(\frac{2{,}000}{2{,}000}\right) + (0.09 + (0.70)^2(0.5))0.5}{0.70\sqrt{0.5}} = \frac{0.1675}{0.49497} = 0.34$$

$$d_2 = 0.34 - 0.70\sqrt{0.5} = -0.15$$

Continued on the next page

d_2 can also be calculated as follows:

$$d_2 = \frac{\ln\frac{2000}{2000} + 0.09 - (0.70)^2(0.5)0.5}{0.70\sqrt{0.5}}$$

d_2= -0.15

Step 2: Calculate the values of $N(d_1)$ and $N(d_2)$ from the normal distribution table.

From the normal distribution table, we can obtain the values of $N(d_1)$ and $N(d_2)$ as follows:

When Z=0.34, probability=0.1331
Hence N (d_1) =0.5+0.1331=0.6331
When Z=-0.15, probability=0.0596
Hence N (d_2) =0.5-0.0596=0.4404

Step 3: Substitute the values of $N(d_1)$ and $N(d_2)$ in the option pricing formula.

Substituting the values of $N(d_1)$ and $N(d_2)$, we can obtain:

C = 2000 (0.6331) – 2000(0.4404)$e^{-0.09(0.5)}$ = 1266.2 – 2000(0.4404) (0.9559)
= 1266.2 – 841.96
= 424.24

Advantages

The primary advantages of the Black-Scholes model are its speed and accuracy. It enables a large number of option prices to be calculated in a very short time.

Limitations

The Black-Scholes model suffers from the following limitations:

1. It cannot be used to accurately price American options as it only calculates the option price at one point in time (i.e. at expiration). It does not consider the possibility of the early exercise of an American option. As all exchange traded equity options have American-style exercise (i.e. they can be exercised at any time as opposed to European options which can only be exercised at expiration) this is a significant limitation.

2. The model assumes that the returns on the underlying asset follow a log normal distribution. However, the actual distribution of returns on assets (particularly returns on shares) may be skewed.

3. The model assumes that the volatility of the underlying asset is known and remains constant throughout the life of the option. However, in the case of a share market crash, volatility tends to rise sharply.

3.2 Binomial option pricing model

The binomial model of option pricing theory is based on the premise that only two prices of an option will emerge at the expiry of the option. It describes the process of price movements where the asset value, in any time period, can move to one of two possible prices with associated probabilities. The model is based on a replicating portfolio that combines risk-free borrowing with the underlying asset to create the same cash flows as the option.

The model is based on the following assumptions:

A portfolio of options and the underlying asset is set.
Arbitrage is not possible.
There are no uncertainties in the outcome of the above portfolio.

Option delta / Hedge ratio: the binomial model involves creation of a portfolio of a certain number of shares and an option by buying (delta) shares and selling a call option. The delta is also known as the hedge ratio. The hedge ratio ensures a hedged portfolio for an investor who holds certain number of shares and sells a number of call options. A hedged portfolio is one where the gains and losses cancel out each other.

Example

A delta of 0.5 means that for every call option we sell, we have to buy 0.5 shares to minimise the exposure to the movements in share prices.

The formula for determining the can be written as follows:

$$\text{Option delta } (\ ) = \frac{\text{Difference in option values}}{\text{Difference in share prices}}$$

The model calculates the price of the option in four steps:

Create a portfolio consisting of a share and an option.
Find the value of the portfolio on the expiry date.
Find the present value of the portfolio.
The price of the option is equal to the present value of the share minus the present value of the portfolio.

Example

A share is currently selling for Tshs1200. There are two possible prices of the share after one year: Tshs1320 or Tshs1050. Assume that the risk-free rate of return is 9% per annum. What is the value of a one-year call option (European) with a strike price of Tshs1250?

Answer

Step 1: Calculation of option delta

	Tshs	**Tshs**
Share price at expiration	1320	1050
Value of call option (Max S – X)	70	0

$$= \frac{\text{Difference in option values}}{\text{Difference in share prices}}$$

$$= \frac{70 - 0}{1320 - 1050}$$

$$= \frac{70}{270}$$

$$= 0.26$$

Step 2: Calculation of expected value of portfolio at the expiry date

Value of the portfolio at the end of first year:
= Value of share – Value of call option
= Tshs1320 (0.26) – Tshs70
= Tshs273.2

Step 3: Calculation of present value of portfolio

$$PV(\text{Portfolio}) = 273.2 \times e^{-0.09 \times 1}$$
$$= \text{Tshs}249.7$$

Step 4: PV (Portfolio) = PV (share) – PV (call option)

249.7 = 1200 x 0.26 – c
c = 62.3

Advantage: The binomial model has an advantage over the Black-Scholes model in that it can be used to price American options.

Limitation: The primary limitation of the binomial model is its relatively slow speed. It cannot be used for calculating several options at one time.

3.3 Real option model

Options are more popularly associated with financial derivative instruments; however they can also be used to evaluate capital investment decisions. These options are called real options.

A project embeds real options when managers have the opportunity but not the obligation to change the future direction of the project in response to external or internal events:

changing the scale of the project
implementing it in incremental stages
abandoning the project
using the project as a platform for future growth opportunities.

A **real option** gives the management, the right, but not the obligation, to delay, expand, withdraw or redeploy the resources within an investment project.

1. Features of real options

(a) These options are related to investment projects, joint ventures and licences and not to financial instruments.
(b) They are long-term in nature in the sense that they could extend for many years rather than months.
(c) Real options have a greater likelihood of being exercised compared to options on financial instruments
(d) Real options can be exercised by installing machinery, building a factory, expanding a plant, etc.

2. Types of options in investment analysis

The options are broadly divided into four categories:

(a) Option to delay a project

A firm may have exclusive rights to invest in a project for a defined period of time. During this period, the present value of the cash inflows may change due to changes in either the cash flows or the discount rate. In such cases, the NPV might also change. Therefore, an investment project may currently have a negative NPV, but may still turn out to be a good investment if the firm waits for longer.

The right to invest in the project at a future date would effectively be a **call option** that may be worth paying for.

Example

Metro Ltd is planning to invest in the expansion of its existing production facilities. The company has estimated Tshs20,000 million as the initial investment for the expansion. The expansion is expected to generate Tshs5000 million after-tax cash inflows each year for the next five years. Assuming a discount rate of 10%, calculate the NPV of the project. Also calculate the value of the option to delay the project assuming the risk-free rate is 7% and the standard deviation of the project cash flows is 30%.

Answer

(i) NPV of the new project = (20,000) + 5,000 x 3.79
= (20,000) + 18,950
= Tshs38,950 million

(ii) Evaluation of option to delay
Value of underlying asset (P_a) = 18,950
Strike price (P_e) = Tshs20,000
Time to expiry (t) = 5 years
Standard deviation (s) = 30%
Risk-free rate = 7%

Continued on the next page

Step 1: Calculate the values of d_1 and d_2.

$$d_1 = \frac{\ln \frac{18950}{20000} + 0.07 + 0.5(0.3)^2 \times 5}{0.30\sqrt{5}}$$

$$d_1 = \frac{\ln(0.9475) + (0.07 + 0.045) \times 5}{0.67}$$

$d_1 = 0.779$

$d_2 = 0.779 - 0.67$

$d_2 = 0.109$

Step 2: Calculate the values of $N(d_1)$ and $N(d_2)$ from the normal distribution table.
From the normal distribution table, we can obtain the values of $N(d_1)$ and $N(d_2)$ as follows:
$N(d_1) = 0.2794 + 0.5 = 0.7794$
$N(d_2) = 0.0438 + 0.5 = 0.5438$

Step 3: Substitute the values of $N(d_1)$ and $N(d_2)$ in the option pricing formula.

Value of the call option = $18,950 \times 0.7794 - 20,000\ (0.5438)e^{-0.07x5}$
= 14,770 – 7,660
= Tshs7,110 million

Therefore, the value of the option to delay is Tshs7,110 million.

Since the value of option is positive, the project should be delayed

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(b) Option to expand a project

The option to expand, means undertaking investments in projects today in order to accept projects or enter new markets in the future. A project with a negative NPV may be accepted, because of the possibility of high positive net present values on future projects.

The option to expand is more suitable for businesses which can achieve a higher rate of return on projects (e.g. software companies) than for business with a more stable rate of return on projects (e.g. engineering companies). Such an option can be valued as a **call option** since it would be worth money to the company.

Example

TBK Ltd is planning to acquire a new plant. The plant would cost the company Tshs100billion. The NPV of the project is negative. However, the management of the company feels that by carrying out the expansion, TBK would acquire the option to expand its volumes at any time over the next three years. The cost of expansion would be Tshs130billion. The present value of the cash flow after the expansion is expected to be Tshs170billion.

Assuming the standard deviation of cash flows to be 40% and the three year risk-free rate to be 7%, calculate the value of the option to expand.

Answer

Value of underlying asset = Tshs170b
Strike price = Tshs130b
Standard deviation = 40%
Time to expiry = 3 years
Risk-free rate = 7%

Continued on the next page

Step 1: Calculate the value of d_1 and d_2.

$$d_1 = \frac{Ln\left(\frac{18,9850}{20,000}\right) + \left(0.07 + (0.70)^2(0.5)\right) \times 5}{0.30\sqrt{5}}$$

$$d_1 = \frac{\ln(1.3076) + (0.45)}{0.6928}$$

$d_1 = 1.03$

$d_2 = 1.03 – 0.6928$
$d_2 = 0.3372$

Step 2: Calculate the values of $N(d_1)$ and $N(d_2)$ from the normal distribution table.

$N(d_1) = 0.3485 + 0.5 = 0.8485$
$N(d_2) = 0.1293 + 0.5 = 0.6293$

Step 3: Substitute the values of $N(d_1)$ and $N(d_2)$ in the option pricing formula.

$c = 170\ (0.8485) – 130\ (0.6293)\ (2.7183)^{-0.07} \times 3$

$$c = 144.25 – 81.81 \times \frac{1}{2.7183^{0.21}}$$

$c = 144.25 – 66.31$
$c =$ Tshs77.94 million

(c) Option to withdraw a project

Major capital investment decisions involve huge capital commitments and cannot be withdrawn immediately, once the management has started executing the project. This is because the costs associated with the withdrawal of a project are usually very steep.

In such cases, the option to withdraw the project without incurring large costs assumes significant importance. Whereas traditional capital budgeting analysis assumes that a project will operate in each year of its lifetime, the firm may have the option to stop a project during its lifetime. This option is known as the option to withdraw. Withdrawal options, which are the right to sell the cash flows over the remainder of the project's life for some salvage value, are like American put options.

When the present value of the remaining cash flows falls below the value of the remaining project, the asset may be sold. These options are particularly important for large, capital intensive projects such as nuclear plants, airlines and railways. They are also important for projects involving new products where their acceptance in the market is uncertain. The option to withdraw would effectively be a put option.

Let us assume that the remaining value of a project until the end of its life is R and the cost associated with withdrawal of the project is W.

Decision criteria:

If R > W Continue with the project
If R < W Withdraw / abandon the project

The value of a put option can be ascertained using the following formula:

$p = P_e N(-d_2)e^{-rt} - P_a N(-d_1)$

Where,

$$d_1 = \frac{\ln\left(\frac{P_a}{P_e}\right) + \left(r + 0.5s^2\right)t}{s\sqrt{t}}$$

$$d_2 = d_1 - s\sqrt{t}$$

p = Value of a put option
P_a = Present value of expected free cash flows
P_e = Present value of cash outflows / fixed costs
N (d) = Value of cumulative normal probability density function
e = Exponential constant (base of natural logarithm). The value is 2.7183
r = Yield of a risk-free security
t = Duration for which the project is valid (in years)
In = Natural logarithm
s = Uncertainty of the expected cash flows

Note: the difference between the Black-Scholes formula used for valuing call option and put option is that in case of call option, the present value of the strike price is deducted from the present value of the spot price whereas reverse is the case while valuing put options.

Example

Milestone Ltd is considering opening a specialist clinic which requires an initial investment of Tshs1000m. The present value of cash flows from the project is expected to be Tshs4200m. The company has the option to withdraw the project at any time during the next five years. If the company withdraws the project, it could realise Tshs2000m. Assuming the standard deviation of the cash flows as 30% and the risk-free rate as 9%, value the option to withdraw the project within five years.

Answer

Value of underlying asset = Tshs4200m
Strike price = Tshs2000m
(Realisable value)
Standard deviation = 30% Time to
expiry = 5 years Risk-free rate
= 9%

The option to withdraw is similar to a put option

Step 1: Calculate the values of d_1 and d_2.

$$d_1 = \frac{\ln\left(\frac{4200}{2000}\right) + \left(0.09 + 0.5\,(0.3)^2\right) \times 5}{0.3\sqrt{5}}$$

$$d_1 = \frac{0.74 + 0.675}{0.6708}$$

$d_1 = 2.11$

$d_2 = 2.11 – 0.6708$ $d_2 = 1.44$

Continued on the next page

Step 2: Calculate the values of $N(d_1)$ and $N(d_2)$ from the normal distribution table.

$N(-d_1) = 0.4826 + 0.5 = 0.9826$
$N(-d_2) = 0.4251 + 0.5 = 0.9251$

Step 3: Substitute the values of $N(d_1)$ and $N(d_2)$ in the option pricing formula.

$p = 2{,}000 \times 0.9251 \times 2.7183^{-0.09 \times 5} - 4{,}200 \times 0.9826$
$p = 2{,}000 \times 0.9251 \times 0.6376 - 4{,}126.9$
$p = 1{,}179.68 - 4{,}126.9$
$p = -Tshs2{,}947.21$ m

NPV without withdrawal option (Tshs4,200 m – Tshs1,000 m) = Tshs3,200 m
Value of withdrawal option = (Tshs2,947.21) m NPV to withdraw
= Tshs252.79 m

(d) Option to redeploy a project

An option to redeploy a project exists when the managers can redeploy the assets being used in a project to alternative projects. This gives them the opportunity to continue with the project on a profitable basis rather than withdraw the project, and is particularly useful if withdrawing the project would yield negative cash flows.

For the purposes of calculating the redeployment option, the NPV of the alternative use needs to be ascertained. In the case of multiple alternatives, the incremental NPV of the next best alternative should be considered.
The option to redeploy is similar to a call option on the cash flows that would be generated through the alternative us of assets.

Example

A company may choose to build a plant whose physical life exceeds its expected duration of use thereby providing the firm with the option of producing more by extending the life of the project.

Meaning of real option

Real option	Meaning of real option
Option to delay	Call option on the NPV of the project
Option to expand	Call / put option on the cash flows resulting from the expansion project
Option to redeploy	Call option on the cash flows that would be generated through the alternative use of assets
Option to withdraw	Put option to sell the assets

3. Limitations in use of options for project appraisal

While it is quite clear that the option to delay is embedded in many projects, there are several problems associated with the use of option pricing models to value options.

(a) The underlying asset in a real option is a project that is not traded on any exchange, making it difficult to estimate its value and volatility. The value can be estimated from the expected cash flows and the discount rate for the project, albeit with error. The volatility is more difficult to estimate since it is to be measured over a period of time.

(b) There may be no specific period for which the firm has rights to the project. Often the firm's rights may be less clearly defined, both in terms of exclusivity and time. For instance, a firm may have significant advantages over its competitors, which may, in turn, provide it with the virtually exclusive rights to a project for a period of time.

The rights are not legal restrictions however and could erode faster than expected. In such cases, the expected life of the project itself is only an estimate and therefore uncertain.

Global works Ltd is a pharmaceutical company engaged in the manufacture of antibiotics. The company is considering a ten-year patent to manufacture a drug called Cra which would be used for cardiac treatment. The product is technically viable but highly expensive to manufacture, and its immediate potential market will be relatively small.

A cash flow analysis of the project suggested that the present value of the cash inflows from the project, if adopted now, would be Tshs300 billion, while the cost of the project would be Tshs400 billion. The technology is evolving rapidly, and a simulation of alternative scenarios yields a wide range of present values, with an annualised standard deviation of 40%. The ten-year yield on government securities is 8%.

Required:

Estimate the value of the option to invest in the project.

4. Discuss the factor that influences the price / value of option contracts.

[Learning Outcome d]

There are numerous factors that influence the value of an option contract. The buyer and seller of an option decide the option price which is influenced by the following factors:

1. **Value of the underlying:** the value of a call option increases with an increase in the actual price of the underlying assets. This is because the option buyer can purchase the underlying assets from the option seller at the strike price and sell them immediately at a higher price. With a put option, the case is exactly the opposite, as the value of a put option increases with a reduction in the actual price of the underlying assets since the put option buyer can sell the underlying assets to the put option seller at the strike price and buy the underlying assets at the actual price.

2. **Strike price:** the value of a call option decreases as the strike price increases since as the strike price increases, the probability of a call option being exercised decreases. The value of a put option increases as the strike price increases as the probability of the put option being exercised increases.

3. **Time to expiration:** The chances of a fluctuation in the price of the underlying, is greater when there is a longer time to expiry. This may give rise to an advantage to one of the parties to the contract. The longer the time to expiry, the higher the possibility of the option being “in the-money”. This is because the option has more time to move to an “in-the-money” position.

4. **Volatility:** volatility is the tendency of the underlying security’s market price to fluctuate either upwards or downwards. It reflects the magnitude of the change of price. It does not imply a bias toward price movement in one direction or the other. The higher the volatility of the underlying asset, the higher the premium because there is a greater possibility that the option will move to an “in-the-money” position. Generally, as the volatility of an underlying asset increases, the premiums of both call and put options on that asset increase, and vice versa.

5. **Risk-free rate:** an increase in the risk free rate will increase the value of a call option because the money saved by purchasing the call option rather than the underlying security is increased. The opposite is true for the value of a put option (i.e. an increase in the risk free rate will decrease the value of a put option).

6. **Dividend expectations: t**he prices of options are impacted if there are dividend declared on the underlying stock or if there are dividend expectations. This is because the underlying price would change after payment of dividend. However the call option is not eligible for dividend and this would be reflected in the price of the call option.

How does the time to expiry affect the price of an option?

5. Describe the relationship between call and put prices (call-put parity) and its implications. [Learning Outcome e]

5.1 The put-call parity

The put-call parity is an important principle in options pricing. This was first presented by Hans Stoll in 1969. It explains the relationship that exists between the prices of European put and call options where both have the same underlying asset, exercise price and expiry date. It does not apply to American options because they can be exercised at any time.

Let's consider:

Portfolio 1: call option and risk-free bonds with face value of X (cash equivalent of present value of strike price) requiring investment of C + PV(X)
Portfolio 2: consisting of underlying asset and a European Put option with same exercise price, requiring an investment of S + P.

If S is greater than X, the call is in the money and the put is worthless. On the other hand, is S is less than X or equal to X, the put is in the money while the call expires worthless. Both the above portfolios have the same expiration value. Therefore, since the expiration value is the same the present value of both is also the same. This is called put-call parity.

The put call parity equation parity equation is

$C + PV(X) = S + P$

$$PV(X) = \frac{X}{(1+r)^t}$$

$$C + \frac{X}{(1+r)^t} = S + P,$$

Where,

C = market value of the call
P= market value of the put
S = market value of underlying asset
X = Strike price
r = annual interest rate
t = time in years

This is based on principle of arbitrage. Certain options combinations would create opportunities for arbitrageurs to earn profits. This would continue until the put-call parity is reached. Therefore, put call parity shows the relationship between put and call premium, market price of underlying security, exercise price, risk free rate and time to expiration.

Example

Suppose that the stock price is Tshs500, the strike price is Tshs600 and the risk-free interest rate equals 5% per annum. The 6-month European put option price is Tshs8. What is the 6-month European call option price?

S_0= Tshs500, K = Tshs600, r= 5%, t= 6months (0.5 years), e= 2.71828, P= Tshs8

$$C + \frac{K}{e^{rt}} = P + S_0$$

Or

$$C = P + S_0 - \frac{K}{e^{rt}} = 8 + 500 - \frac{600}{2.71828^{0.05\ x\ 0.5}} = Tshs\ 77.19$$

The price of the 6-month European call option is Tshs77.19. This price is dependent on the price of the European put option, which is Tshs8

5.2 Implications of the call-put parity

1. A call provides a geared position identical to investing in the stock. When one invests in a stock directly, the gain from ownership equals Tshs1for every increase of Tshs1 in the stock price. This is the same as purchasing a call when the stock price goes beyond the exercise price.

   As the call price forms only a small part of the stock price, the percentage gain with the call investment will be higher than the percentage return from the stock investment. If the stock price reduces, the investment can lead to huge losses. However, a call option also provides a put option on the stock, because of which, the loss is minimised to the amount of the call price paid.

2. If the interest rate is zero, the call-put parity is P= C- (S_t - S_x). Therefore, for a call option that is in-the-money, the call will always have a price higher than that of a put. This will also be true for positive interest rates.

3. A call option will be bought when the stock price is expected to increase. If the market expects the price of a stock to increase, there will be a higher demand for buying a call option (and also a low demand for a put option), causing the price of the call option to increase and the put option to decrease. However, a put-call parity is not dependent on market expectations. Market expectations cause a change in the price of the underlying stock on the basis of which, the call and put prices will be determined.

4. A violation of put-call parity will lead to an arbitrage opportunity.

Test Yourself 5

The European call option on a foreign currency asset, X that expires in one year has strike price 32 and an option price 4. The forward price of the asset X in one year is 36. The annual continuously compounded interest rate is 0.08.

Required:

Determine the price of the put option on the asset with a strike price of 32.

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6. Develop hedging strategies based on options.

[Learning Outcome f]

We have covered the features of the options and studied the pricing models. Now let us discuss various hedging strategies that can be applied with options. These hedging strategies can be applied to shares trading, managing currency risk and interest rate risk. The aim of taking option positions is to hedge against variations in the price of the asset rather than actually buy or sell the asset as also to profit from the position.

The following are the different types of hedging strategies based on options:

1. Combination of an option and holding the underlying security

(a) Covered call: Under this hedging strategy, a portfolio of a long security and a short call .i.e. selling a call option) is built. In this case, if the price of the security falls, the loss on the asset would be set off by the funds received from the option premium. This might not be a complete set off, however can be reduced to a major extent.

Example

Mr. Robin purchased shares of company X Ltd at Tshs1000. He also strikes a short call on the same with a premium of Tshs100 and an exercise price of Tshs1000.

If the share price rises, the option will be exercised and the profit will be the option premium. If the share price falls, the option not being exercised, the investor will utilize the option premium to offset the loss on the share price decline.

(b) Covered put: Under this strategy, a portfolio of a long security and a long put .i.e. purchasing a put option is built. In case the share price declines the investor can exercise the option and sell the shares at the exercise price. Therefore a floor is set for the loss; also profit from rising share price is possible.

Example

Continuing the above example, if Mr. Robin along with the purchase of shares, strikes a long put, the effect would be

(i) If the share price declines, he can exercise the option and sell the shares, the loss would be only the option premium.

(ii) If the share price increases, the option would not be exercised, he would gain by the rise in the share price net of the option premium.

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2. Positions in the options of the same type (spread)

(a) Bull call spread: buying a call option on an asset with a certain strike price and selling a call option with higher strike price, having same expiration date. This position is taken when the market is around the lower exercise price. If the price falls below the lower exercise price neither options would be exercised. If the price lies between the higher strike price and the lower strike price the long call would be exercised, the asset acquired and profit derived (net of option premium)

(b) Bear call spread: this strategy is adopted when investors expect a fall in the market prices. Under this strategy a put option is purchased at a certain strike price and a sale of put option at lower strike price. In case the market price is lower than the upper strike price, profit is earned as the difference between the strike prices net of option premium. The maximum loss is the net premium paid.

(c) Box spreads: combination of bull call spread, and bear put spread with the same strike prices the total profit is the difference between the strike prices.

3. Combination of options

(a) Straddle: Under long straddle strategy a position of both long call and long put option is built, both of which with the same exercise price and the same date of expiry. In case of straddle, the trader option purchaser would benefit if the price moves in either direction and would incur a loss from the combination if the market price moves close to the exercise price. This strategy is suitable in case of volatile markets where a sharp increase or decrease in the asset price is expected, however not aware of the direction of the swing.

Example

Ms. Benedicta purchased shares of XYZ Ltd for Tshs1500 at the DSE. The markets are expected to be volatile for the next 3 months. Therefore, Benedicta creates a straddle by buying a put option and call options with strike price of Tshs1500 with expiration date in 3 months.

If the share price goes up or down she would profit from the straddle. The cost would be the premium on the two options. The payoff would be nil if the stock price is Tshs1500.

The reverse is true in case of short straddle. This is adopted when market is flat and no major price movement is expected. In case the investor would sell a call option and a put option for the same strike price and expiration date.

(b) Strangle: A long strangle strategy involves buying a call option with a higher exercise price and simultaneously buying a put option with a lower strike price. This strategy is suitable when major swings are expected in the share price. A big move in the price is required to make it profitable. The strangle creator benefits when the price moves above the call option strike price or below the put option strike price. The gain is unlimited while the loss is limited to the premium paid.

Example

In the above example, if Benedicta wants to gain from the price swing but is not willing to purchase the expensive straddle, she can buy a strangle .i.e. buy a two-month 1550 call for Tshs25 and a 2 month 1450 put for Tshs23.

In case if the share price moves to:
Tshs1600 – payoff = (Tshs1600-Tshs1550) –(25+23) = 50-48 = Tshs2
Tshs1390 – payoff = (Tshs1450-Tshs1390) –(25+23) = 60-48 = Tshs12

A short strangle offers higher protection than a short straddle although profit potential is lower in the case of the former.

(c) Stripes and Straps: A strip is a strategy using a long call option and two put options at the same strike price with the same expiration date. This strategy is adopted when a major movement in underlying price is expected and probability of decrease is higher. A strap on the other hand is a strategy with two long calls and one put call at a same strike price and expiration date. This strategy is adopted when the probability of decrease is higher.

Test Yourself 6

Differentiate between short straddle and short strangle as hedging strategies.

Answers to Test Yourself

Answer to TY 1

Intrinsic Value and Time Value (Call options for the Tshs1000 stock)

	Premium (option price)	Category	Intrinsic value	Time Value
Tshs900	Tshs170	In the money	Tshs100 (Tshs1000 - Tshs900)	Tshs70 (Tshs170-Tshs100)
Tshs1000	Tshs100	At the money	0	Tshs100 (Tshs100-Tshs0)
Tshs1100	Tshs60	Out of the money	0	Tshs60 (Tshs60-Tshs0)

Answer to TY 2

(a) American Call

$$Ac_0 \geq \text{Max}\ 0, S_0 - \frac{X}{(1+r)^t}$$

Minimum: Max (0,96-90/(1.06)^0.5) = 8.58
Maximum: Ct<=St = 96

European Call

$$Ec_0 \geq \text{Max}\ 0, S_0 - \frac{X}{(1+r)^t}$$

Minimum = Max (0,96-90/(1.06)^0.5) = 8.58
Maximum: Ct<=St = 96

(b) American Put

Minimum: Max (0,X-S) = Max (0,95-90) = 5
Maximum: X = 95

European Put

$$Ep_0 = Max\left[0, \frac{X}{(1+r)^t} - S_0\right]$$

Minimum=Max (0,95/(1.06)^0.5 – 90) = 2.27
Maximum: = 95/(1.06)^0.5 = 92.27

Answer to TY 3

P_a = PV of cash inflow on project = Tshs300billion
P_e = Cost of investing in the project = Tshs400 billion
t = 10 years
r = 8%
s = 0.4

$$d_1 = \frac{\ln\left(\frac{300}{400}\right) + \left(0.08 + 0.4^2\right)(0.5)x10}{0.4\sqrt{10}}$$

$$d_1 = \frac{\ln(0.75) + 1.6}{1.264}$$

$d_1 = 1.04$

$d_2 = 1.04 – 1.26$

$d_2 = (0.22)$

$N(d_1) = 0.3508 + 0.5 = 0.8508$

$N(d_2) = 0.5\text{-}0.0871 = 0.4129$

$c = 300 \times 0.8508 + 400\ (0.4129)\ 2.7183^{-0.08 \times 10}$
c = 255.24 + 74.21
c = 329.45

Value of call (Product patent) = Tshs329.45billion

Answer to TY 4

Time to expiry

Greater the time to expiry, greater is the uncertainty and therefore greater are the chances of a fluctuation in the price of the underlying to the advantage of one of the parties to the contract. Hence greater the time, higher would be the time value of the premium. The option's price is directly related to the time remaining till the expiration of the option contract. The buyer of an option stands to gain if the option contract finishes in-the-money and the probability is greater if there is more time to expiry. As the time to expiration of the option decreases, the value of the option would also reduce till it becomes zero at the expiration of the option.

As all options exhibit time decay and are wasting assets, as time passes, option contracts lose value. If the investor buys an option that is three months away from expiration and holds it until there are only few days until expiration, there will be a significant premium loss due to time depreciation assuming the price of the underlying is more or less constant.

Answer to TY 5

$C(K, t) - P(K, t) = e^{-rT}(S_{0,t} - K)$
We have $C(32, 1) = 4$, $S_{0,t} = 36$ and $K = 32$.
Thus, $4 - P(K, t) = e^{-0.08}(36 - 32)$
$4 - e^{-0.08}(4) = P(K, t) = 0.3075$

Answer to TY 6

Particulars	Short straddle	Short strangle
Strategy	Short call and short put option with the same strike price	Short call with higher strike price and short put option with lower strike price
Suitable when	Markets are stagnant with no major asset movements expected	When shares are expected to be with a price range and option premiums are high
Profit potential	Higher than short strangle	Lower than short straddle
Protection	Lower than short strangle	Higher than short straddle
Breakeven point	Strike price + premium received Strike price – premium received	Higher strike price + premium received Lower strike price - premium received

Quick Quiz

1. Option price = intrinsic value + _____ (Fill in the blanks)
2. The lower boundary conditions for both the American and European call options are identical. (True/False)
3. How does the rate of interest affect the price of an option?
4. For a call option that is in-the-money, the call will always have a price lower than that of a put (True/False)
5. Bear call strategy involves purchasing a ____option at a certain strike price and sale of put option at _____. (Fill in the blanks)

Answers to Quick Quiz

1. time value
2. True
3. The cost of carry would depend upon the risk-free rate of interest in the market. The higher the interest rate, the higher the call option price and lower the put option price. The lower the interest rate, the lower the call option price and higher the put option price.
4. False. For a call option that is in-the-money, the call will always have a price **higher** than that of a put
5. Put , lower strike price

Self Examination Questions

Question 1

Bebeto has bought a three-month call option on Prospect Ltd's share with a strike price of Tshs5000 at a premium of Tsh300. He has also bought a put option on the same share with a strike price of Tshs4000 at a premium of Tshs150. Prospect's shares are currently selling for Tshs4500 per share.

Required:

Calculate the net pay-off.

Question 2

While reviewing the investment portfolio of New Horizon Ltd, the senior financial advisor has observed that about 20% of the portfolio is represented by a holding of 5,550,000 ordinary shares of Have More Ltd. He has expressed his concern about the effect on the portfolio value if the price of Have More Ltd's shares falls. Hence he has advised the senior management to reduce their holding of the shares.

Their investment bank has suggested that the risk of Have More's shares falling by more than 5% from their current value could be protected against by buying an over-the-counter option. The investment bank has offered to sell an appropriate six-month put option to New Horizon Ltd for Tshs250 million.

Other information is as follows:

The spot price of Have More's share is Tshs3600.
The annual variance of in the previous year was 169%.
The interest rate on government bonds is 4% per annum.
No dividend is expected to be paid by Have More over the next 6 months.

Required:

Assess whether or not the price at which the investment bank is willing to sell the option is a fair price.

Question 3

A portfolio manager proposes to write certain OTC call and put options. What are the parameters on which he should deliberate before fixing the option price?

Question 4

Describe and illustrate any three hedging strategies that a stock trader can adopt in a bullish to slightly bullish market.

Answers to Self Examination Questions

Answer to SEQ 1

Table of net pay-offs:

	Tshs	Tshs	Tshs
Share price at expiration	3000	5000	5500
(i) Value of call option Max (S – X), 0	-	-	500
(ii) Value of put option Max (X – S), 0	1000	-	-
Less: Premium paid (300 + 150)	(450)	(450)	(450)
Net pay-off gain (loss)	550	(450)	50

Answer to SEQ 2

The investment bank is offering to sell a put option on Have More's shares at a price of Tshs3420 (3600 – (5% x 3600)).

We can assess whether or not the option price is a fair price by using the Black-Scholes model.

Spot price (P_a) = Tshs3600
Strike price (P_e) = Tshs3420
Risk-free rate (r) = 0.04
Standard deviation (s) = $\sqrt{169}$ = 13%
Time to expiry (t) = 0.5 years

Using the Black-Scholes model, the value of a call option can be estimated as follows:

Step 1: Calculate the values of d_1 and d_2.

$$d_1 = \frac{\ln \frac{3600}{3420} + 0.04 + (0.13)^2(0.5) \quad 0.5}{0.13\sqrt{0.5}} = 0.8218$$

$d_2 = 0.8218 – 0.0919 = 0.7299$

Step 2: Calculate the values of $N(d_1)$ and $N(d_2)$ from the normal distribution table.

$N(d_1) = 0.5 + 0.2944 = 0.7944$
$N(d_2) = 0.5 + 0.2673 = 0.7673$

Step 3: Substitute the values of $N(d_1)$ and $N(d_2)$ in the option pricing formula.

Call price = 3600 (0.7944) - 3420 (0.7673) x $2.7183^{-(0.04)(0.5)}$ = 2859.84– 2570 = 289.64 cents

The value of a put option on a share may be estimated using the put call parity theorem,
$p = c - P_a + P_e e^{-rt}$

The option strike price is 3420, and the call option price has been estimated to be 289.64 cents.
Therefore $p = 290 – 3600 + 3420e^{-(0.04)(0.5)}$
Therefore p = 40

New Horizon's holding of 5,550,000 shares multiplied by the put option price gives a fair option price according to the Black-Scholes model of Tshs222 million.

Therefore, it can be inferred that the investment bank is charging Tshs28 m more than the theoretical fair value of the put option (Tshs250 m – Tshs222 m).

Answer to SEQ 3

There are numerous parameters that influence the price of the option

(a) Value of the underlying: This has an important bearing on the price of the option. With an increase in the actual price of the underlying assets, the value of a call option increases. With a put option, the case is exactly the opposite, as the value of a put option increases with a reduction in the actual price of the underlying assets since the put option buyer can sell the underlying assets to the put option seller at the strike price and buy the underlying assets at the actual price.

(b) Strike price: the value of a call option decreases as the strike price increases since as the strike price increases, the probability of a call option being exercised decreases. The value of a put option increases as the strike price increases as the probability of the put option being exercised increases.

(c) Time to expiration: The longer the time to expiry, the higher the possibility of the option being "in the-money". This is because the option has more time to move to an "in-the-money" position.

(d) Volatility: The higher the volatility of the underlying asset, the higher the premium because there is a greater possibility that the option will move to an "in-the-money" position. Generally, as the volatility of an underlying asset increases, the premiums of both call and put options on that asset increase, and vice versa.

(e) Risk-free rate: an increase in the risk-free rate will increase the value of a call option because the money saved by purchasing the call option rather than the underlying security is increased. The opposite is true for the value of a put option (i.e. an increase in the risk-free rate will decrease the value of a put option).

(f) Dividend expectations :
The underlying price would change after payment of dividend. However, the call option is not eligible for dividend and this would be reflected in the price of the call option.

Answer to SEQ 4

In a bull market the price of the underlying security is expected to rise. Therefore, a trader can adopt the following strategies to earn a profit while protecting the downside risk

(a) Long call: by buying a call option the trader can crystallise the cost of the stock during the period of the option. If the share price rises as expected by the trader, he can book profits and close the call option. Alternatively, if he expects the increase to continue, he can maintain the long position. However, if the share price does not increase, he should close out his position.

(b) Short put: this strategy can be adopted in case where the share price is expected to increase. The trader can sell a put option at the current market price and earn through the price differential and premium.

(c) Bull call spread: buying a call option on an asset with a certain strike price and selling a call option with higher strike price, having same expiration date. This position is taken when the market is around the lower exercise price. If the price falls below the lower exercise price neither options would be exercised. If the price lies between the higher strike price and the lower strike price the long call would be exercised, the asset acquired and profit derived (net of option premium).

The above three strategies are illustrated below:

Consider an investor Mr. Glen who holds shares of Golden Match Ltd listed on the DSE with share price of Tshs2000. He expects the share price to rise over the next three months. He can adopt one of the following strategies depending on his risk appetite, time horizon and market view.

(a) Write a three-month call option at Tshs2000. If the share price rises to Tshs2300 his profit would be the Tshs300 (Tshs2300 – Tshs2000) minus call premium. He may decide to stay long if he expects the price to rise further.

(b) Sell a put option at-the-money. If the premium on the put option is Tshs25. If the stock price is above Tshs2000, the option will not be exercised, and he will earn the option premium. Alternatively, if the price is below Tshs2000, the option will be exercised. His purchase cost will be Tshs1975 (Tshs2000 – Tshs25).

(c) .Buy a call option at Tshs2000 and sell a call option at say Tshs2300. If stock price is between Tshs2000 and Tshs2300, the payoff is the market price minus Tshs2000. The net premium paid is the cost of the strategy. If the share price is above Tshs2300 the profit is Tshs300 minus net premium paid.

SECTION D

FINANCIAL ENGINEERING AND PLANNING

D4

STUDY GUIDE D4: Blockchain technology

……Get Through intro…

In Luca Pacioli's 'The Collected Knowledge of Arithmetic, Geometry, Proportion and Proportionality', published in 1494, he outlined the basics of accounting - the double entry accounting system, debits and credits, and the trial balance. Since Pachouli, little has changed. Technology has evolved from paper to digital ledgers and automation has advanced, enabling accountants to get the job done faster, reduce the margin of error, and find and correct mistakes more easily, but otherwise it is fundamentally the same.

Now, however, we have blockchain, a technology with the potential to revolutionize accounting. As buzzwords go, it's up there with the most hyped, and although it has been touted as the next big thing in a wide range of industries, few have any real idea of exactly what it is.

Organizations and governments worldwide are now exploring how blockchain can provide an alternative to their current operational infrastructures for TRUST.

……Learning Outcomes….

- Define Blockchain.
- Define Cryptocurrency.
- Differentiate Blockchain, Bitcoin and Cryptocurrency.

1. Define Blockchain

(Learning Outcome a)

Before defining Blockchain let us first remind ourselves about a ledger.

Wikipedia defines a **ledger** is the principal book or computer file for recording and totaling economic transactions measured in terms of a monetary unit of account by account type, with debits and credits in separate columns and a beginning monetary balance and ending monetary balance for each account.

A ledger is a record of **ownership and value** of a transaction. It keeps track of transfers too.
Assets recorded in a ledger can be tangible i.e. motor vehicles, houses or Intangible i.e. money, stock certificates.

1.1 Centralized ledger

A centralized ledger is the traditional Ledger where we have a trusted central record keeper. It is the foundation of our accounting system which has been present since ages. It used various medium like, wooden tally sticks, papyrus & paper, clay which were present much before this computer revolution became a mainstream. Once computers became normalized in the 1980s and '90s, paper records were computerized, often by manual data entry.

Today Progress in technology of connected computers and cryptography, has given rise to block chain phenomenon which is re-defining the whole record keeping mechanism for the better. Blockchain is changing the way transactions **ownership and value** are recorded and shared by a community.

Every system that you use is centralized

- Google.
- Yahoo.
- Your bank account transactions.
- Asset registration in an organization.
- The General Ledger underlying your company's financial statements.
- Title deeds records at the Ministry of land.
- The guest reservations at a hotel.
- Citizenship records at NIDA.
- Academic Certificates.
- Medical records etc.

We trust the central record-keepers. However, they represent a Single Point of Failure such as:

- Disaster.
- Duplicate entries.
- Errors and omission.
- Manipulation.
- Lack of transparency
- Hacking.
- Data corruption
- Shut down etc.

…….. Example……..

An accountant may decide not to record assets acquired during the year in the asset register as a result we have undervalued assets in the statement of financial position at the end of the accounting period.

……

…….. Example……..

Writing off trade receivables fraudulently from the books of accounts after a promise of being paid a certain amount of money by the debtor.

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Causes of discrepancies.

1. Lack of transparency.
2. Manual controls, processes and systems.
3. Lack of consensus.
4. Corruption and Fraud.
5. Lack of knowledge.
6. Weakness in security.

N: B we trust System administrators however they can change anything, any time without our knowledge.

Case study

In 2015, Yahoo experienced one of the biggest hacks of all time. A group of hackers were able to gain access to their centralized servers, allowing them to view private emails within millions of accounts.
The reason they were able to gain access to all of this information was because Yahoo uses centralized servers. If this central point of failure is hacked, then the entire network is at risk.

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Three main issues with a centralized system.

1. You have to trust that the centralized organizations are going to keep your data safe.
2. They have full control over the system and your data.
3. If the main record keeper is compromised, data is at risk.

Tip

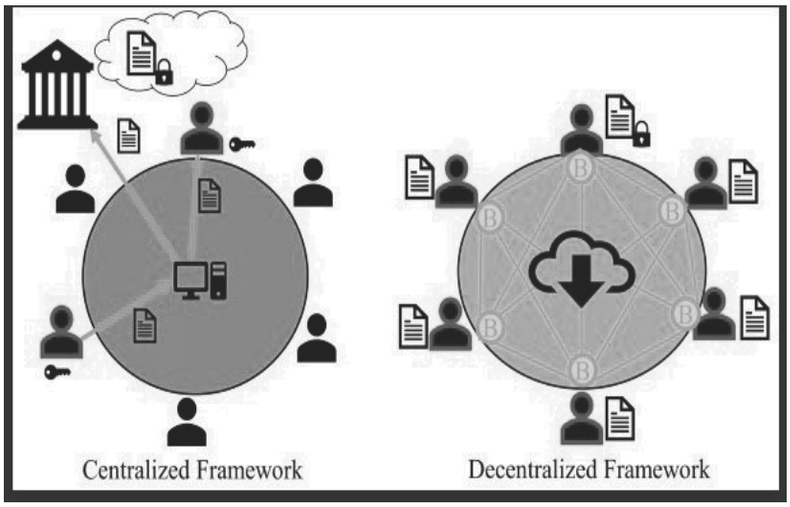
To what extent do you trust your systems?
What are the benefits of increased trust? to customers? to shareholders? , to stake holders?

1.2 Decentralized ledger

Decentralized ledger is the solution which overcome transaction discrepancies, keeps it absolutely secure to a greater extent. It's **Consensus** based transaction mechanism ensures that the shared ledgers are exact copies, and lowers the risk of fraudulent transactions, because tampering would have to occur across many places at exactly the same time.

A successful Decentralized ledger that allowed parties that did not know or trust each other to transact together would have a wide range of advantages.

Blockchain Technology is a decentralized ledger.



Tip

Will Decentralized ledger eliminate/reduce causes of centralized discrepancy resulting into more trust?

Blockchain Technology

The first work on a cryptographically secured chain of blocks was described in 1991 by Stuart Haber and W. Scott Stornetta. They wanted to implement a system where document timestamps could not be tampered with. In 1992, Bayer, Haber and Stornetta incorporated Merkle trees to the design, which improved its efficiency by allowing several transactions to be collected into one block.

The first blockchain was conceptualized by a person (or group of people) known as Satoshi Nakamoto in 2008 Just after the Global Financial Crisis . Nakamoto improved the design in an important way using a Hashcash-like method to add blocks to the chain without requiring them to be signed by a trusted party. The design was implemented the following year by Nakamoto as a core component of the cryptocurrency bitcoin, where it serves as the public ledger for all transactions on the network. The bitcoin design has inspired other applications.

Byzantine Generals' Problem (BGP)

This is the problem of communication in decentralized system which was an issue in the history of computer science.

The Byzantine Generals' Problem, first proposed by Marshall Pease, Robert Shostak and Leslie Lamport in 1982, provides a stylized description of this problem.

Satoshi Nakamota solved the Byzantine Generals' Problem (BGP) however,

Past attempts at solving the currency side of the problem include the following research: Chaum, D., 1984. Blind Signature System, in: Chaum, D. (Ed.), Advances in Cryptology. Springer US, pp. 153–153. Chaum, D., Fiat, A., Naor, M., 1990. Untraceable Electronic Cash, in: Proceedings of the 8th Annual International Cryptology Conference on Advances in Cryptology, CRYPTO '88. Springer-Verlag, London, UK, UK, pp. 319–327. Okamoto, T., Ohta, K., 1992. Universal Electronic Cash, in: Proceedings of the 11th Annual International Cryptology Conference on Advances in Cryptology, CRYPTO '91. Springer-Verlag, London, UK, UK, pp. 324–337. Wei Dai's B-Money - Wei Dai, 1998, http://www.weidai.com/bmoney.txt

Tip

What will happen if the system is at defect as we don't have a system administrator?

…… Definition……

Wikipedia defines Blockchain as a growing list of records, called blocks, which are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data (generally represented as a Merkle tree root hash).

Example

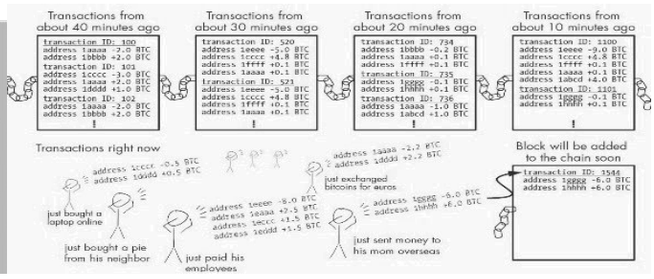
List of medical records in the blockchain

…….case study ……

Diagram below illustrates a list of Bitcoin transactions in hash form in the blocks which are again linked to form a chain of blocks.

Bitcoin transactions are grouped into blocks that are added to the blockchain every 10 minutes.

Input	Output (Hash)
Cat	93g56gtf229hbno00r45sktrpbs59so9r3t7saer
A white cat is outside	js03bbstgo94r6s1z8mg05fgt3sba9tob32bsap7
A white cat is inside	bbr19007go2tsi52bsi50o21nmiseas45on23mjn
A whiet cat is inside	339n5sbk249nb9530gjdl04h92jg02jg9sm93hpz
A white cat is insid	4bbj390osoh9djm395bksh94gf03sg034dfjh31x



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What makes it different from the previous methods of record keeping (Centralized) is the way these records are being recorded and stored. Anybody can add information to the block but before it is permanently recorded it has to be approved mathematically by the majority in the network (51% for the case of bitcoins).
The whole Blockchain is also available to all nodes of the Blockchain community.

Case study

Bitcoin trading volume in local bitcoin electronic wallet in different countries at the day this data was extracted. Bitcoin Blockchain has nodes worldwide.

1.3 Types of blockchain

Currently, there are at least three types of blockchain networks.

- Public blockchains
- Private blockchains.
- Consortium blockchains.

Public blockchains

- Users can participate in this type of blockchain without any restrictions.
- Users are able to download the source code and run a node on their personal devices.
- Users can view transaction history while still remaining anonymous, due to transparency.
- Some of the largest, most known public blockchains are the bitcoin blockchain and the Ethereum blockchain.

Example

You can sign up and transact any time without invitation to Bitcoin Blockchain wallet.

……

Private blockchains

- A private blockchain is permissioned

- These types of blockchains can be considered a middle-ground for companies that are interested in the blockchain technology in general but are not comfortable with a level of control offered by public networks.
- MONAX and Multichain serve as examples of private blockchain technology.

Consortium blockchains

- A consortium blockchain is often said to be a combination of a private and public blockchains.
- Instead of a single organization controlling it, a number of companies might each operate a node on such a network.
- The administrators restrict users' reading rights as they see fit and only allows a limited set of trusted nodes to execute a consensus protocol.

1.4 Blockchain enhancing the qualitative Characteristics of Accounting Information.

The demand for accounting information by investors, lenders, creditors, etc., creates fundamental qualitative characteristics that are desirable in accounting information.

There are six qualitative characteristics of accounting information. Two of the six qualitative characteristics are fundamental (must have), while the remaining four qualitative characteristics are enhancing (nice to have).

Fundamental (Primary) Qualitative Characteristics
Qualitative characteristics of accounting information that must be present for information to be useful in making decisions:

1. Relevance
2. Reliability

Enhancing (Secondary) Qualitative Characteristics
Qualitative characteristics of accounting information that impact how useful the information is:

1. Verifiability
2. Timeliness
3. Understandability
4. Comparability

Relevance- Refers to how helpful the information is for financial decision-making processes. Accounting information is relevant if it can provide helpful information about past events and help in predicting future events or in taking action to deal with possible future events. The Immutability nature of the blockchain makes it possible for accountants to have permanent accounting information about past events which will help in predicting future events.

Example

With Blockchain it is possible to track the original owner of anything which was recorded on it regardless of the period of time passed and the number of ownership transfers.

……

Reliability- For accounting information to be reliable, it must be complete, neutral and free from errors. The immutable nature of blockchain makes it extremely difficult to perpetrate and manipulate records. In order to modify a record, the same change would have to be made on all copies of the distributed ledger at the same time, which is highly infeasible. Use of **smart contracts** will make many accounting functions automatic hence reducing human error, making it complete and neutral. Other blockchain characteristics contributing to reliability are transparency, consensus mechanism etc.

Verifiability-Blockchain makes verification easier due to transparency, immutability and approval mechanism (majority consensus).

Timeliness- is how quickly information is available to users of accounting information. Blockchain is real time processing making it fast and powerful. Using block chain, getting data into and out of the system can be done more efficiently than the case now.

Example

The current systems are semi-automated and they don’t communicate with much of human interaction. With human things are done with emotions.

……..**Comparability**- is the degree to which accounting standards and policies are consistently applied from one period to another. Blockchain will result into automation of processes and system which will lead to enhanced consistence of application of the standards and policies throughout each accounting period thus enabling users to draw more insightful conclusions about the trends and performance of the company over time.

The qualitative characteristics of accounting information are important because they make it easier for both company management and investors to utilize a company's financial statements and make well-informed decisions.

NB
Just because something is called a Blockchain doesn't mean that it is secure and has sufficient controls and processes to be acceptable for business transactions. Companies proposing to join or use Blockchains should ensure that they are designed and configured appropriately and processes are supported by their own internal controls.

Example

Majority Consensus agreement is automated which will remove individual managers from approving fraudulent transactions either knowingly or unknowingly

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1.5 Advantages of blockchain

- Increased efficiency.
- Cost reduction.
- Ease of verification.
- Improved security.
- Transparency.
- Reduced fraud and corruption.
- Reduced risks.

Case study.

Food and beverage giant PepsiCo has conducted a blockchain trial that brought a 28 percent boost in supply chain efficiency.

Dubbed "Project Proton," the trial set out to examine if blockchain could address "industry challenges" in programmatic advertising.

PepsiCo's project partner and media agency Mindshare announced the news 6 th May 2019, saying that it assisted in the trial, which carried out a programmatic end-to-end supply chain reconciliation using Zilliqa's blockchain platform. The effort compared a control budget with one for the test to gauge the effectiveness of the technology.

……

1.6 Challenges

Lack of Regulations.
Lack of Knowledge.
Lack of experts
Initial Cost of adoption.
Lack of awareness by the responsible people.

Tip

Will board members of organisations agree or disagree to use blockchain technology in the near future?

……Example ……

Now that we have seen the centralized and decentralized ledgers, let's have an example demonstrating both cases.

The simple diagrams below illustrate a centralized and decentralized accounting systems. Within a centralized system, there are many documents that are exchanged for each transaction between companies. These documents include Contracts, purchase orders, invoices, and payment receipts. If an electronic funds transfer is initiated, the initiator's bank will send the funds to the recipient's bank. The recipient will then confirm the payment with the initiator. The decentralized system allows the transaction to take place on the blockchain network, and Consensus mechanism (e.g. miners) will verify and process the transaction if all conditions are satisfactorily met.

Centralized System

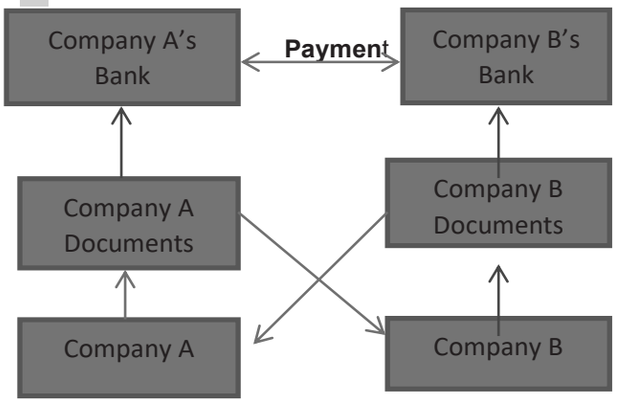


Figure 1

Decentralized System

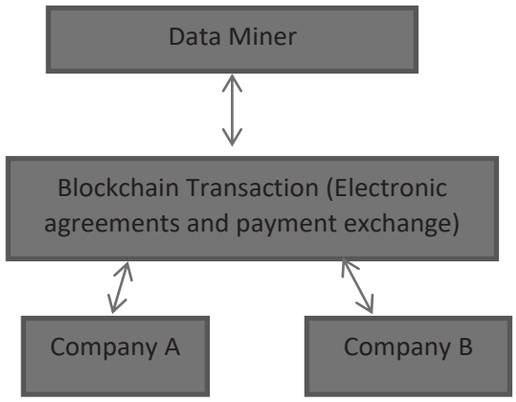


Figure 2

……Test Yourself 1……

How is a blockchain ledger different from the traditional one?

3. Define Cryptocurrency

(Learning Outcomes b)

2.1……Definition……

Wikipedia defines a **cryptocurrency** (or **crypto currency**)as a digital asset designed to work as a medium of exchange that uses strong cryptography to secure financial transactions, control the creation of additional units, and verify the transfer of assets. Cryptocurrencies use decentralized control as opposed to centralized digital currency and central banking systems.

The decentralized control of each cryptocurrency works through distributed ledger technology, typically a blockchain that serves as a public financial transaction ledger.

Bitcoin, first released as open-source software in 2009, is generally considered the first decentralized cryptocurrency. Since the release of bitcoin, over 2,000 *altcoins* (alternative variants of bitcoin or other cryptocurrencies) have been created and that number continues to grow.

Being a new asset class cryptocurrency has no legal definition. Different countries define it differently. Some see is as an asset, property, security, currency or commodity etc. In general, cryptocurrencies as medium of exchange differ from other currencies in that they only exist in virtual form. Similar to fiat currency, a cryptocurrency is not backed by any physical commodity. However, unlike fiat currency, it is not backed by a central bank, government or other entity, nor is it considered legal tender in many countries. As such, digital currency transactions are undertaken on a decentralized, peer-to-peer network. The peers in this network are the people that take part in

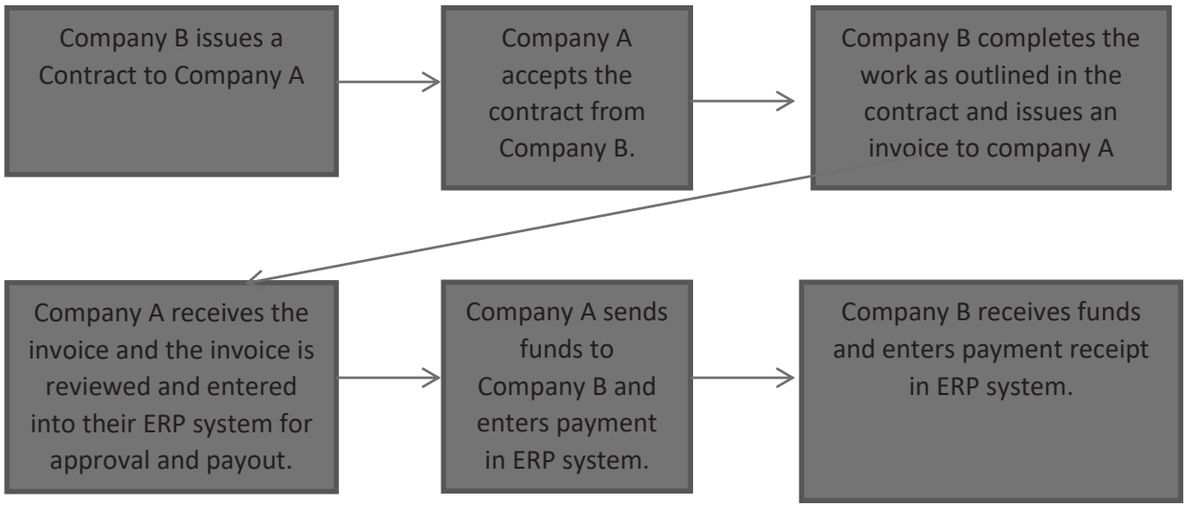
digital currency transactions, and their computers make up the network. There is no middle party facilitating these transactions

Today cryptocurrencies are in the same stage as the internet first was, and there may be little use for cryptocurrencies until the financial world grabs a hold of it.

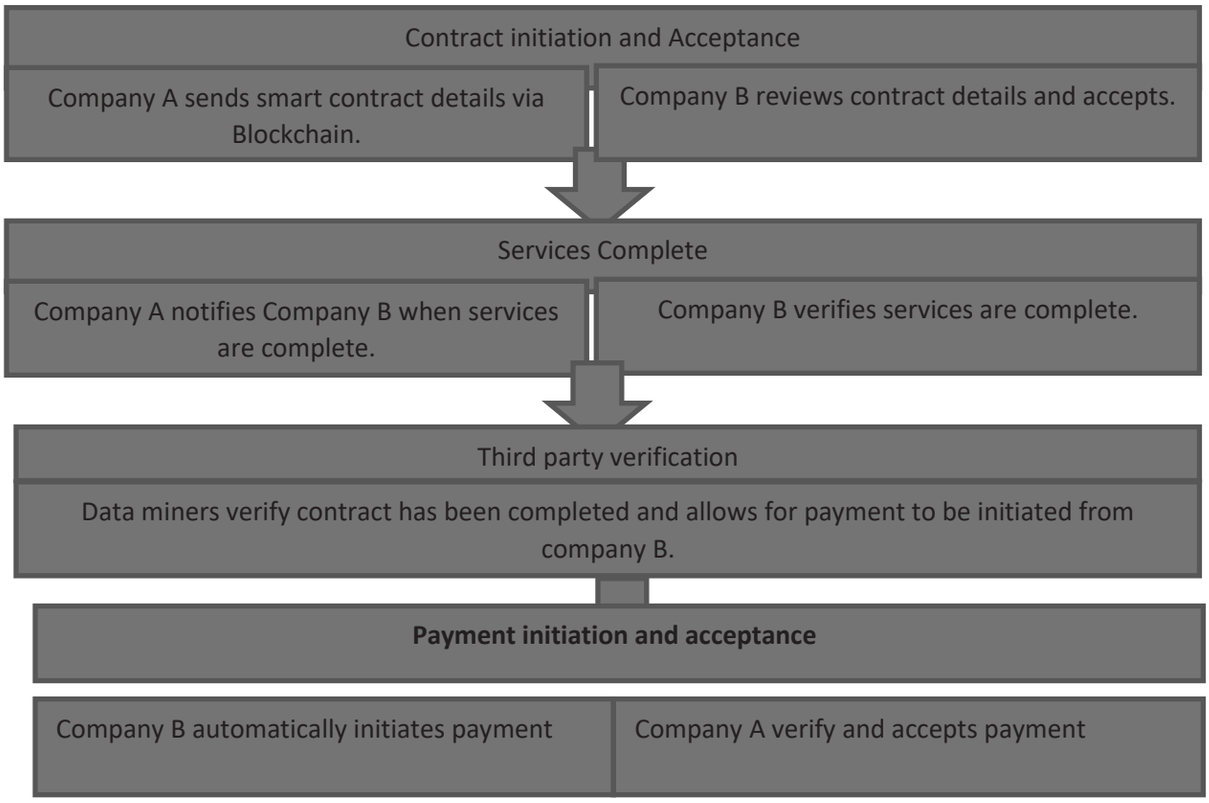
……..Example ……..

To illustrate the idea behind blockchain's transaction cycle, below is a comparison of the current exchange of funds between two companies and the exchange of funds between two companies on a blockchain network.

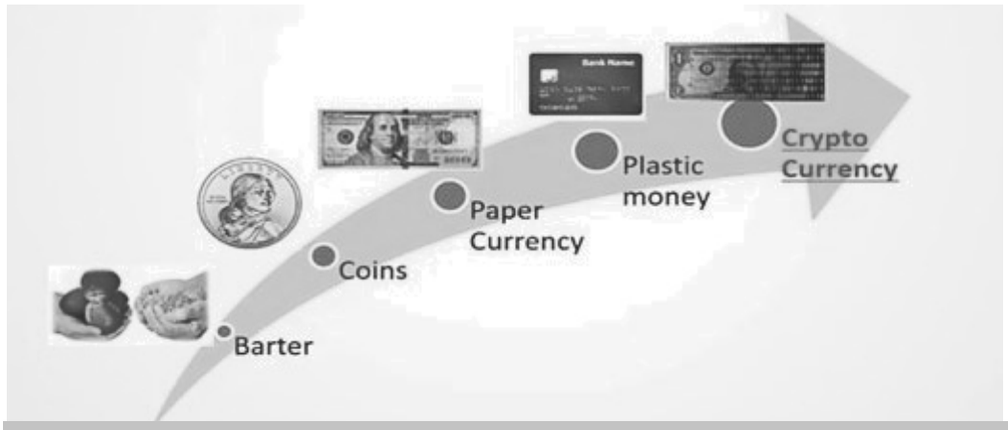
A: Current Payment Cycle



B: Payment Cycle on Blockchain Network Using a Smart Contract



2.2 Evolution of money



Tip

Starting with Barter trade What problems resulted into the next evolution?

Case study

The cost of sending money through banks and money transfer operators is high in Africa at an astronomical rate. On average, sending an equivalent of $200 costs 9.3 percent of the value transferred. This is the highest remittance rates anywhere in the world according to the world bank's 2019 report. In contrast, the use of cryptocurrency based financial technology (fintech) firms such as Bitpesa cuts the cost **by 90 percent.**

The amount sent to Africa by Africans abroad is estimated to be about $46 million to support families in their countries. Most of the money sent is used to cater for education, food, clothes among others. Meanwhile, a lump sum of more than $4.7 million is being taken by the financial institutions as transfer fees.

The world bank notes that the bank is the most expensive agent for sending money back to Africa at 10.2 percent, followed by most transfer operators at 7.7 percent and post office at 5.5 percent. This is very much costly in comparison to the sustainable Development Goals target of cutting financial transfer costs to within 3% of total transaction value by 2030.

While the financial institutions have been charging Africans exorbitant price for Remittance, crypto-based remittance has become a solace for Africans, because of its low fees, efficiency and speed. One of crypto-based Remittance platforms offering solace to Africans is Bitpesa.

Bitpesa now has operations in eight African countries: the Democratic Republic of the Congo, Ghana, Kenya, Morocco, Nigeria, Senegal, Tanzania, and Uganda.

Tip

Which method of remittance would you prefer? Why?
Who forced you to use mobile money transfer (Mpesa)?
……

2.3 Properties of Cryptocurrencies.

1. Irreversible – Once you have sent the Crypto and it is confirmed, the transaction is 100% irreversible.

2. High Volatility-The price of a cryptocurrency is determined by demand and supply. Given that the supply is fixed, changes in demand causes changes in price.

……..Example……

Price volatility for Bitcoin (BTC) and Ethereum (ETH) cryptocurrencies.

Remitano	Inbox Today price: BTC: TZS8,820,603 - ETH: TZS281,435 -	11:12 AM
Remitano	Inbox Today price: BTC: TZS8,992,488 - ETH: TZS286,809 -	Jan 26
Remitano	Inbox Today price: BTC: TZS8,911,148 - ETH: TZS284,699 -	Jan 25
Remitano	Inbox Today price: BTC: TZS8,866,974 - ETH: TZS284,309 -	Jan 24
Remitano	Inbox Today price: BTC: TZS8,943,935 - ETH: TZS289,730 -	Jan 23
Remitano	Inbox Today price: BTC: TZS8,819,021 - ETH: TZS283,889 -	Jan 22
Remitano	Inbox Today price: BTC: TZS8,843,898 - ETH: TZS284,699 -	Jan 21
Remitano	Inbox Today price: BTC: TZS9,233,556 - ETH: TZS301,584 -	Jan 20
Remitano	Inbox Today price: BTC: TZS9,056,535 - ETH: TZS295,350 -	Jan 19
Remitano	Inbox Today price: BTC: TZS9,068,398 - ETH: TZS298,639 -	Jan 18
Remitano	Inbox Today price: BTC: TZS8,973,306 - ETH: TZS295,670 -	Jan 17
Remitano	Inbox Today price: BTC: TZS8,977,791 - ETH: TZS295,547 -	Jan 16
Remitano	Inbox Today price: BTC: TZS9,180,887 - ETH: TZS314,911 -	Jan 15

……..

3. Highly Secure – Cryptocurrencies are governed by a security system known as cryptography.

4. Instantaneous – Another highly valuable property of the modern cryptocurrency is that transfers happen immediately.

5. Anonymity – Bitcoin owners are not identifiable (KYC not done), but all transactions are publicly available in the blockchain. Still, cryptocurrency exchanges are often required by law to collect the personal information of their users.

6. Inbuilt monetary policy- The other neat monetary property of cryptocurrencies is that they have a very specifically controlled supply, issue rate, approvals etc. which is preprogrammed.

Tip

Why do we have inflation?

Case study

As the situation in Venezuela intensifies, a local bitcoin user details how he and his family use the cryptocurrency to survive the country's ongoing crisis. Keeping all of his money in bitcoin, he only exchanges small amounts into the hyperinflating bolivar when necessary.

In order to buy everyday necessities such as milk, Hernández explained that cryptocurrencies must be converted into bolivars. He uses Local bitcoins to find buyers who use the same bank he does so "the wire transfer can go through immediately," he said, elaborating.

……

7. Mining- is the process of creating Cryptocurrencies and validation of transactions before they are recorded on the blockchain.

8. Financial Inclusion-Cryptocurrency increase financial Inclusion (just like mpesa). According to the Universal Financial Access 2020 Initiative 73% of all financially excluded people are from developing countries. Clearly, increased GDP correlates with increased financial inclusion.

Tip

What are the barriers to financial inclusion in Tanzania?
What are the benefits of financial Inclusion?

……

9. Cryptocurrency storage- cryptocurrency are stored in electronic wallets for use and exchanged in cryptocurrency exchanges. A cryptocurrency wallet stores the public and private "keys" or "addresses" which can be used to receive or spend the cryptocurrency.

10. Private money-Just like mpesa as it is not issued by the central bank or any government.

2.4 Types of Cryptocurrencies.

It is important to note that there are more than 2000 different types of cryptocurrencies in the market visit www.coinmarketcap.com. The description of each can be seen in their respective white papers. Below is an extract of the coinmarketcap.com.

……..Example…….

Top 100 Cryptocurrencies by Market Capitalization

Cryptocurrencies ▾ Exchanges ▾ Watchlist USD ▾ Next 100 →

#	Name	Market Cap	Price	Volume (24h)	Circulating Supply	Change (24h)	Price Graph (7d)
1	Bitcoin	$100,599,476,266	$5,688.38	$14,572,955,716	17,685,087 BTC	-1.83%	
2	Ethereum	$17,051,138,958	$160.93	$5,739,274,910	105,951,659 ETH	-1.98%	
3	XRP	$12,561,378,847	$0.298462	$863,807,149	42,087,046,846 XRP *	-1.87%	
4	Bitcoin Cash	$5,048,188,235	$284.14	$1,876,299,438	17,766,713 BCH	-3.32%	
5	Litecoin	$4,486,837,365	$72.78	$2,571,955,692	61,647,708 LTC	-5.82%	
6	EOS	$4,470,116,606	$4.73	$1,880,843,369	944,612,776 EOS *	-4.37%	
7	Binance Coin	$3,112,358,531	$22.05	$176,928,664	141,175,490 BNB *	-3.74%	

2.5 Challenges in Cryptocurrencies

1. The International Accounting Standards Board (IASB) has not yet issued a standard or clear guidance for accounting of cryptocurrencies.
2. Lack of Regulations.
3. Scams and Pyramid Schemes.
4. Lack of Knowledge.
5. Lack of experts.

Tip

Cryptocurrencies are borderless how do we regulate them?
Which institution should regulate block chain in Tanzania?
…
……

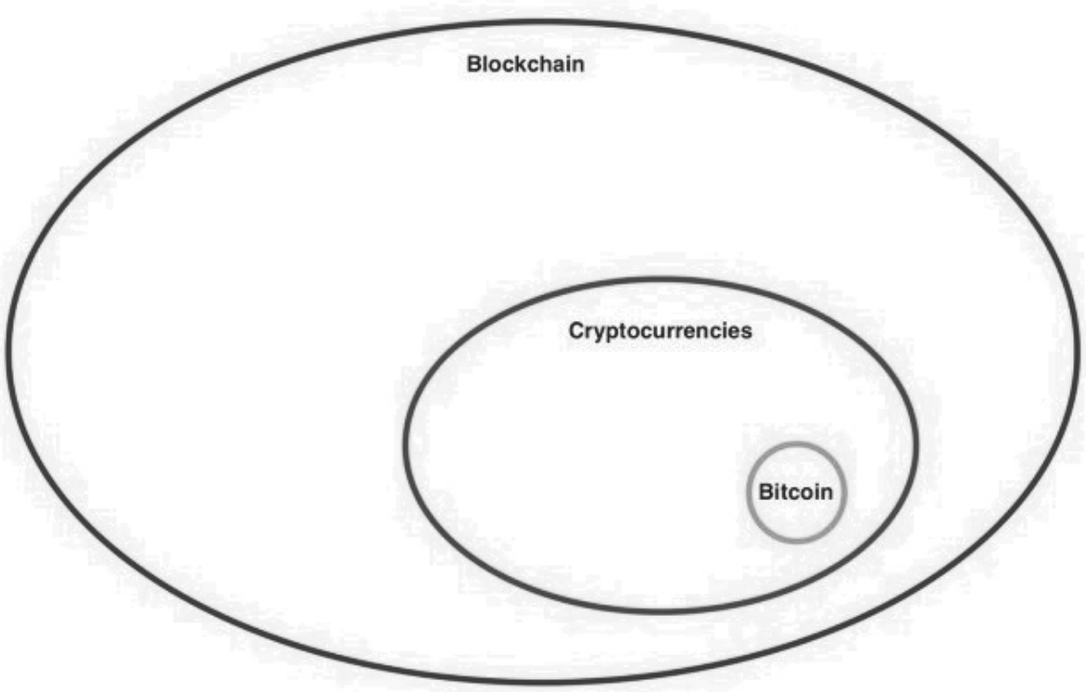
……..Test Yourself 2……

How could cryptocurrencies, Bitcoin in specific, be helpful for the developing part of the world?

3. Differentiating Blockchain , Bitcoin and Cryptocurrency (Learning Outcomes c)

3.1 Differences

Block chain, Bitcoin and Cryptocurrencies are closely linked, yet very different.



To clear the confusion between these words think about the internet. You have the internet and the applications. The internet is a platform that enables lots of applications like Facebook, WhatsApp etc. to operate. Some apps extend further with i would say sub apps. Example Email extends further to yahoo, Hotmail, gmail etc.

Now let's think of Blockchain as the internet. In other words, blockchain is a new type of platform that enables people and companies to build applications for a diverse range of needs.

The first application to the Blockchain is Bitcoin. Bitcoin as defined earlier is a medium of exchange disrupting the finance and banking industry. Altcoins are other alternatives to the Bitcoin like Ethereum, Ripple.

Cryptocurrency means Bitcoins and Altcoins.

TIP

Bitcoin is the first application to the Blockchain, it is also the first Cryptocurrency worldwide.

……

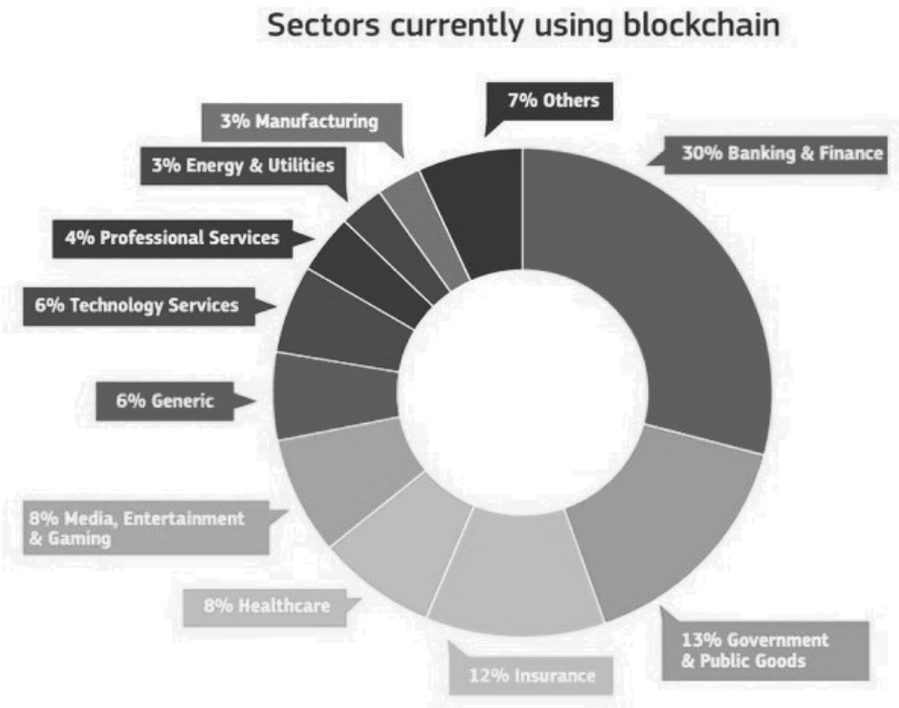
To drill down the intuition, products and services built using the blockchain technology don't necessarily include the feature 'cryptocurrency'. But all products with the feature 'cryptocurrency' today are necessarily built using blockchain technology.

So, our newly formed intuition allows us to confidently say that Blockchain, Bitcoin and Cryptocurrencies aren't the same.

In general cryptocurrency is simply a digital, paperless currency. So, one of the main purposes is to allow payments to be made between individuals, between individuals and organisations etc. The main difference with fiat currencies like Tzs ,US$, Euro, is that the fiat are created by countries and issued by their respective central banks, cryptocurrencies are created and issued by people and companies.

USE CASE

The blockchain is not just limited to the financial system; instead, it is a great solution for almost any platform or product that requires trust, - from a simple keyless automobile entry authentication to tamperproof electronic voting machines and several others. In short, the idea behind Blockchain is to be able to establish and verify trust without the need of a centralized system. Blockchain technology offers a lot of potentially disruptive power, and companies are already in the race for different product offerings. As the industry continues to evolve, blockchain stands out as the best investment for future returns.



Source: www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/global-blockchain/#.Wms8ZrPtypo

Test Yourself 3.....

Differentiate between Blockchain, Bitcoin and Cryptocurrency.

Conclusion

Use of a blockchain does not change the outcome of the transaction, it simply changes the transaction process and the way that information is regarded as trusted.

Answers to self-test

1. Self-test 1

How is a blockchain ledger different from an ordinary one?

The first and in fact the prime difference is, Blockchain is a digital ledger that can be decentralized very easily. The chances of error in this approach are far less than that in an ordinary ledger. An ordinary ledger is what that is prepared by hands or by human efforts while the Blockchain performs all its tasks automatically. You just need to configure it in a proper manner and by following all the guidelines. Blockchain ledger is decentralized while ordinary ledger is always centralized.

2. Self-Test 2
How could cryptocurrencies, Bitcoin in specific, be helpful for the developing part of the world?

Money transfer can be widely supported with Bitcoin; this option is associated with leapfrogging not only traditional financial services, but eventually services over mobile, like M-PESA, as well.

It can enable populations that have no access to financial services, transact and transfer money with ease. It can provide with a way to leapfrog traditional services, moving straight to wireless and digital.

3. Self-test 3

Differentiate between Blockchain, Bitcoin and Cryptocurrency.

Blockchain is the technology on which Bitcoin is built on. Bitcoin or cryptocurrency is just one application of Blockchain Technology.

Bitcoin is a cryptocurrency, mother of all altcoins. And blockchain is a digital ledger that provides a secure way of making and recording transactions.

Besides, several other applications are using Blockchain as their base. For example, there are Social Media platforms based on Blockchain, Identity Management applications and KYC applications based on Blockchain and more.

Quick Quiz

1.Block chain is the same as bitcoin.
- True
- False

2. Block chain is also known as a distributed ledger?
- True
- False

3. When a record is on a blockchain, who can access it?
   a. Multiple people simultaneously.
   b. One person at a time.
   c. Only the people involved in the transaction.
4. Once records are submitted on a blockchain, can they be altered?
   a. Yes – the parties can go back in and alter them at any time.
   b. Yes – but only within a certain time frame.
   c. No – they cannot be altered.
5. Are blockchains fully public?
   a. Yes
   b. No
   c. It depends

Answers to Quick Quiz

Ans 1 "**False"**: Bitcoin is a digital currency, while block chain is a digital global ledger on which transactions are recorded chronologically and viewable to all who have access. Block chain can record cryptocurrency transactions and provide a home for documents such as property deeds, birth records, and smart contracts. Think of blockchain as the rails that bitcoin and another cryptocurrencies ride on.

Ans 2 "True": Another name for blockchain is distributed or decentralized ledger. Accountants record transactions in a ledger and soon transactions will be recorded in the blockchain.

Ans 3" A" Block chain is a decentralized, transparent public ledger where individuals can share information without having to trust a third party to verify the information. Multiple people can access copies of the ledger simultaneously, allowing transactions such as contracts to be recorded and verified without a principal authority.

Ans 4."C". Once records are submitted on a blockchain, they are almost impossible to alter, even by the records' owner, providing transactions a high level of security.

Ans 5.C.Blockchains can be public, private or combined.

Public blockchains allow anyone to read and send transactions. On public blockchains, user identities are anonymous. Well-known examples of public blockchains include digital currencies bitcoin and Ethereum.

Private blockchains are centralized under a single organization.

Self-examination Questions

Question 1

Review of Board of directors' minutes of XYZ Company ltd noted that during the year under review debtors amounting to TZS 300 were written off. Further review of the financial statements noted that the Revenue Accountant recognized debtors amounting to TZS 1000 during the year under review and TZS 1500 in the previous year.

Audit review by GTM auditors noted receivables amounting to TZS 200 were missing from the books of accounts without any explanation.

Required:

1. What are the causes of misstatement of financial statements that can be prevented by distributed ledger?

Question 2

Mlimani ltd is a multinational company which manufactures high quality Television sets. Godwin John is the Chief executive officer of Mlimani ltd. Godin has been visited by a blockchain expert who is trying to convince him to shift to the technology.

Required:

1. What is the difference between transactions recorded in a centralized ledger and a decentralized ledger (Blockchain)?

Question 3

What type of records can be kept in a Blockchain? Is there any restriction on same?

Question 4

Why we can't reverse the transaction?

Question 5

Economically, money has evolved over thousands of years from trading shells, rectangular plastic, fiat currency and now Cryptocurrency, each to suit the needs of its time and population.

Required:

1. What is the Differences between fiat currency and cryptocurrencies

Answers to Self-examination Questions

Answer to SEQ 1

What are the causes of misstatement of financial statements that can be prevented by distributed ledger?

Duplicate entries
Errors and omission
Manipulation
Lack of transparency
Hacking
Data corruption

Answer to SEQ 2

What is the difference between transactions recorded in a centralized ledger and a decentralized ledger (Blockchain)?

Transactions recorded in a distributed ledger have more than these characteristics which are not found in a centralized ledger.

1. Hashed.
2. Immutable.
3. Distributed.
4 Transparent.
5. Consensus agreement

Answer to SEQ 3

What type of records can be kept in a Blockchain? Is there any restriction on same?

There is no restriction on keeping records of any type in the Blockchain approach. Industries are using Blockchain for securing all types of records.

The common types of records (to name a few) that can be kept on the Blockchains are:

- Records of medical transactions
- Identity management
- Transaction processing
- Business transactions,
- Management activities
- Documentation

Answer to SEQ 4

Why we can't reverse the transaction?

When your transaction is posted, it will be in the pool and there is no reversal. This is because the blockchain network are designed to be irreversible and there is no control over this issue. It is designed to not do so and likewise for the Bitcoin network.

If you failed to double-check your transaction and had sent an incorrect amount or to the wrong recipient, there is no reversal for it. Hence, it is extremely important to make sure that the transaction details are correct before you click send. Rather, you have to initiate the correction transactions, and this will be a new block to the blockchain of the distributed ledger.

Answer to SEQ 5

What is the Differences between fiat currency and cryptocurrencies?

While both fiat money and cryptocurrencies can be used as a means of payment, there are some differences.

Legality

Governments issue fiat currencies, which are in return regulated by the central bank. Fiat money is deemed legal tender in that it is often the official means of finalizing transactions. Governments control fiat money supply and issue policies from time to time that affects their value.

Cryptocurrencies, on the other hand, are merely digital assets that act as a medium of exchange that governments have no control over. The decentralization aspect means no central body can control or influence their value.

Tangibility

It is not possible to have a physical feel of cryptocurrencies as they operate online as virtual coins. Fiat currencies, on the other hand, have a physical aspect as they can exist as coins and notes thus possible to have a physical feel.

Supply

A major difference between fiat money and cryptocurrency has to do with supply. Fiat money has an unlimited supply which means central authorities have no cap to the extent in which they can produce money.

Most cryptocurrencies have a cap when it comes to supply, which means there is a set amount of coins that will ever be in supply. For example, the total number of Bitcoin coins that will ever be in supply is capped at 21 million.

Storage

Cryptocurrencies virtual aspect means they can only exist online thereby stored in digital wallets commonly referred to as cryptocurrency wallets.

The versatility of fiat money, on the other hand, means it can be stored in various forms. For instance, there are payment providers such as PayPal that allow people to store fiat money in digital form. Banks also do act as custodian of hard currencies.

SECTION E

MANAGING RISK

E1

STUDY GUIDE E1: MANAGING RISK

Get Through Intro

You have already studied what risk is. Risk management consists of understanding and managing the risks that an organisation is exposed to while it pursues its business objectives. Although there are several categories of risk, in this Study Guide we look at the financial risks that an organisation is exposed to and the tools it can use to manage them. If not managed well, the consequences to the firm can be disastrous.

Learning Outcomes

a) Identify and explain the financial risks of a business based on a given scenario, data and information.
b) Explain how financial instruments such as hedging and derivative products may be used to manage risks and the nature of such products.
c) Identify and explain the alternative approaches to managing interest rate exposure based on a given scenario, data and information evaluating the costs of basic hedging arrangements.
d) Identify and explain the alternative approaches to managing currency rate exposure based on a given scenario, data and information evaluating the costs of basic hedging arrangements.

1. Identify and explain the financial risks of a business based on a given scenario, data and information.

[Learning Outcome a]

Example

Rhythms Ltd is a manufacturer and exporter of a range of traditional African and modern musical instruments. It caters to clients in over ten countries all over the world. To finance its operations, it has borrowed both from local markets and overseas markets (at flexible interest rates based on LIBOR). It also imports components from Japan and the US for use in some of its products.

A look at the firm's business profile suggests that the firm is exposed to several financial risks. It is exposed to currency risks, as it imports and exports on a large scale. It has foreign currency and flexible interest rate borrowings, which indicates that the firm is exposed to currency as well as interest rate fluctuations.

It is therefore crucial for Rhythms to manage its financial risks very closely.

1.1 Financial risks

The exposure of an organisation to financial risks will depend on the nature of its business and capital gearing. An analysis of the expected cash flows that shows the debt repayments due, compared to the cash inflows from its business revenues, will indicate the timing and amount of mismatch in cash flows. This will help detect any potential liquidity and interest rate risks. If the firm has foreign currency exposures, foreign exchange risk will be an additional potential risk.

The financial risks that an organisation is normally exposed to include:

1. liquidity risk
2. funding risk
3. interest rate risk
4. foreign exchange risk
5. commodity price risk
6. credit risk
7. operating risk

1. Liquidity risk

Liquidity risk is the risk that the firm will not have sufficient resources available to pay off suppliers and other debts. There could also be the risk that the loans the firm requires to manage its operations may not be available at the time they are required or at an acceptable cost. In case the firm defaults on the loans or breaches any of the debt covenants, there is the risk of the loan being recalled or the credit facilities being withdrawn.

The organisation has to plan its operations and cash flows in such a manner that it has liquid resources available for outlays such as future debt repayments, capital expenditure, seasonal fluctuations, acquisitions and contingencies. The firm has to plan well in advance to source funds from equity issues, debt and supplier finance.

There are three types of liquidity risks:

(a) Mismatch or structural liquidity risk

The liquidity risk in a firm's current statement of financial position (SOFP) structure occurs due to varying maturity periods of the current assets and current liabilities, i.e. a mismatch between liquid liabilities and liquid assets

Example

The accounts payable of Richmond plc is an average of 30 days. The credit offered to the customers is 60 days.

The firm does not have large cash balances or an overdraft limit. In such a case the firm will face liquidity problems as the maturity period of accounts payable is less than that of accounts receivables. On an average, the suppliers have to be paid within 30 days, whereas the cash inflow from customers will be received on an average within 60 days. Therefore, there is a gap or mismatch in the maturities of the current liabilities as against the current assets.

The firm is bound to face liquidity issues, especially because it does not have adequate cash balances or overdraft limits available. The firm cannot sustain this situation for long, as sooner or later the suppliers will withdraw their credit facilities and demand cash.

(b) Contingency liquidity risk

It signifies a risk that in the future, the firm may require a significantly large amount of cash than its cash flow projection allows. This situation can arise due to unusual or unexpected variations in the timing of cash flows (term liquidity risk). For example, an unexpected demand for funds, due to heavy unplanned cash purchases to take advantage of better prices or due to a major breakdown of the plant requiring a significant outflow of cash for repairs.

(c) Market liquidity risk

The risk that the firm (typically a bank or financial institution) is unable to sell its securities and / or assets at or near fair value due to market disruption or due to loss of the firm's reputation. Although the asset has a value, there may not be any buyers at that moment. Therefore, the asset may have to be sold at a substantial discount if the seller needs cash urgently. Firms can do a simple "liquidity gap" analysis to measure the liquidity risk. Liquidity gap is the net value of a firm's liquid asset. It is measured as the excess of the value of a firm's liquid assets over the value of its volatile liabilities. A firm with a negative liquidity gap must concentrate on its cash balance and possible unexpected changes in its values.

However, as it is a static measure of liquidity risk, it cannot provide any indication of how the gap would change with time or with an increase in the firm's marginal funding cost.

2. Funding risk

Large borrowers usually face funding risk. The risk is that the investors may come to the conclusion that the securities issued by the firm are not attractive. Consequently, the prices may fall and access to the market may become difficult. The risk faced by smaller firms depends upon the extent to which they rely on the support of their banks and shareholders, as they may not find it financially feasible to issue debt securities in the market

When interest rates rise, the value of the bonds fall as the yield goes down. The firm will find it difficult to raise additional funds from the debt market unless the interest rates are raised. The cost of funds consequently increases.

When access to funds are denied or become difficult to obtain, the risks of the business increase. The firm cannot grow in spite of available opportunities. Such firms may have to resort to equity funding. However, the firm cannot increase equity funding beyond a limit as the cost of equity is very high and the growth in earnings per share (EPS) may not be able to match market expectations.

Example

AB Ltd is a medium sized firm, in operation over the last eight years. The profitability has been very moderate. The firm has been funded so far by the promoters through equity infusions. The firm has been pursuing growth opportunities and has identified a large project, which can improve its profitability. The firm's management believes that being a medium sized company and based on past financials, it would neither be possible nor economical for the firm to raise the required funds through a bond issue.

The management has therefore decided to approach a bank with its business plan to seek funding. The bank is not very keen on financing the full amount sought by the firm as the financial performance of the firm has not been very encouraging. The bank has agreed to finance 60% of the project investment of Tshs1000billion at an interest rate of 13%. The current market rate is 11%.The balance has to be brought in through equity funding.

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3. Interest rate risk

Interest rate risk is the risk of an increase in the interest expense of the firm due to changes in interest rates.

Changes in market rates of interest may also affect fixed-rate securities as the yields my fall, leading to a decline in the prices. The firm has to analyse the impact of such changes on its income statement.

Causes of interest rate fluctuation

Interest rates reflect the cost of borrowing or the price of money and are influenced by the following factors:

Demand and Supply: interest rates will increase with an increase in the demand for credit and vice versa.

Inflation: the higher the rate of inflation, the more interest rates are likely to rise. This occurs as a result of lenders demanding greater interest rates as compensation for the likely reduction in the purchasing power of the money they will be receiving in the future.

Government policy: long term interest rates are influenced by monetary policy declared and reviewed by the government.

One principle of bonds is that market rates of interest and the bond prices move in opposite directions. If the market rates rise, the bond price falls due to the operation of the interest rate risk.

If two bonds with the same characteristics of maturity, and credit rating offer different coupon rates, the bond with a lower coupon rate will have a higher interest rate risk than the bond offering a higher rate.

Example

Safe Bank Ltd has the following market asset-liability structure

Assets	Tshs2000 billion	asset modified duration = 6.0
Liabilities	Tshs1600 billion	liability modified duration = 1.7
Equity	Tshs400 billion	

If all the interest rates increase by 1.5%, what will be the impact on the bank's equity market value?

Assets: Tshs2000 billion x 6 x1.5% = Tshs180billion reduction in market value
Liabilities: Tshs1600 x 1.7 x 1.5% =Tshs40.8billion decrease in market value.

Therefore, net reduction in equity =
Loss in asset value Tshs180 billion – gain arising from reduction in liabilities Tshs40.8billion= Tshs139.8billion

Therefore, balance market value of equity = Tshs400billion-Tshs139.8billion =Tshs260.2billion

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In an economic environment where interest rates are rising, a company which has floating rate debt will be required to pay higher interest costs and this will adversely affect their financial position. They lose their competitive advantage compared to those who have fixed rate debt as higher interest eats away more of their profits.

Companies which have fixed rate debt will suffer in a situation where interest rates are falling. In this situation, companies who have floating interest rate debt will be in an advantageous position.

Entities, which have invested their surplus funds in debt instruments, are also exposed to interest rate risk. If surplus funds are invested in floating rate instruments and if interest rates are falling, they will lose interest income. In the case of investment funds, this could adversely affect the performance of their funds.

(a) Basis Risk

A benchmark interest rate is linked to the interest rate that is charged on a loan. The benchmark interest rate acts as a reference rate and the premium / discount on the benchmark rate is adjusted to obtain the interest rate charged on a loan.

Example

Mark Plc has obtained a floating rate loan at LIBOR (London Interbank Offered Rate) + 0.5%. The loan is renewed after every three months. The current LIBOR is 3%. Hence, the interest rate charged on the loan is 3.5% (3% + 0.5%). The LIBOR after three months is 2.75%. Hence, the interest rate on the loan will be revised to 3.25% (2.75% + 0.5%).

The rate of interest may be linked to different benchmarks e.g. LIBOR (London Interbank Offered Rate), rates prescribed by the central bank, treasury bills etc. If companies have assets and liabilities of similar value with floating interest rate, variations in the interest rates do not make any difference to the company as the effect of an increase or decrease in the floating interest rate will ultimately not affect the company's cost. Increase / decrease in interest cost on the assets will be offset by decrease / increase in interest cost on the liabilities.

However, if the floating interest rate of the assets is based on LIBOR and the floating rate of the liability is based on a EURIBOR this will give rise to basis risk. The two different benchmark bases used for interest rate may move in different directions at the same time or at different times.

Example

Rocktrack Ltd has obtained a floating loan of £300,000 for one year at EURIBOR + 1%. The interest is revised after every three months. The current EURIBOR rate is 2.5%. Hence, the interest charged on the loan is 3.5%.

Rocktrack Ltd has given a long term floating rate loan to one of its subsidiaries. The amount of loan is £300,000 and the interest charged is LIBOR + 1%. The interest rate is revised after every three months. The current LIBOR is 2.5%. Hence, the interest charged on the loan is 3.5% (2.5% + 1%). After three months, the EURIBOR increases to 2.75% and the LIBOR decreases to 2.25%. Now, the loan obtained by Rocktrack Ltd has an interest rate of 3.75% but the loan given by Rocktrack Ltd to its subsidiary has an interest rate of 3.25%.

(b) Gap Exposure

A situation may arise where assets and liabilities are of the same value with the same floating interest rate benchmark used for both assets and liabilities (e.g. LIBOR). However, it may be possible that interest rates for assets are revised on a three-monthly basis and rates for liabilities are revised on a six-monthly basis. In this situation, due to the gap between the interest rate revision timings, gap exposure risk may arise.

Example

Continuing the example of Rocktrack Ltd

Lets us assume that the interest rate on the loan given by Rocktrack Ltd is revised after every six months on the loan based on LIBOR and after every three months on the loan based on EURIBOR rise by 0.5% each.

This means that after three months the loan obtained by Rocktrack Ltd will has an interest rate of 4%. However, the loan given by Rocktrack Ltd to its subsidiary will still carry the interest rate of is 3.5%.

Hedges available to manage interest rate risks are:

Forward rate contracts (FRA): Under this agreement, one party pays a fixed interest rate and receives a floating interest rate based on a **reference rate** such as LIBOR. The actual payments are calculated based on a **notional principal amount** and paid at intervals determined by the parties

Futures: A futures contract is similar to a forward, but it has a lower risk than a forward contract as the risk of default is reduced as there is an intermediary e.g. a bank, involved.

Swaps: An **interest rate swap** involves an agreement between counterparties to exchange sets of future cash flows. One party receives a floating rate and pays a fixed interest rate, and the other party receives a fixed rate and pays a floating rate.

Options: options are contracts for which the underlying security is a debt obligation. Options help in protecting parties who are involved in floating-rate loans.

4. Foreign exchange risk

Changes in the rate of exchange used will affect foreign currency revenues and expenses and assets or liabilities when converted to the home currency. We have already studied that foreign exchange exposures are of three types: transaction exposures, translation exposures and economic exposures.

5. Commodity price risk

Commodity price risk is the risk that a change in the price of key inputs or the finished product of the firm will adversely affect financial performance. Often, there is an element of foreign exchange risk also involved if the inputs/outputs are imported / exported. The price volatility in almost all commodities has been extremely high in recent times and the risk of exposure to such risks has become even greater than the foreign exchange exposure.

A commodity price risk emerges when a firm purchases or sells significant quantities of raw materials. With a commodity hedge, the firm usually knows the price of the major raw material purchases much before its purchase and so can plan the prices of its goods or services well in time. The sellers and buyers of commodities are exposed to fluctuations in global market prices.

A price hedge that is separate from purchases and sales offers companies effective risk management regardless of time and place.

The hedging methods available to mitigate commodity price risk are:

(a) Forward Contracts

A forward contract is an agreement between two parties such as a cotton farmer or trader and a textile mill, in which the seller (the farmer/cotton trader) agrees to deliver to the buyer (textile mill) a specified quantity and quality of cotton at a specified future date at a pre-determined price. The contract is mutually negotiated and usually there is no specific market or exchange at which this process can be conducted.

Both parties to the forward contract are expected to make or receive delivery of the commodity on the due date of the contract. It is normally difficult to opt out a forward contract unless the other party agrees.

(b) Futures Contracts

Futures contracts, are similar to forward contracts, but contain some features that are more advantageous for risk management. The contract obligations can be extinguished by “offsetting”, rather than actual delivery of the commodity. Typically futures contracts are extinguished by offsetting than by actual delivery.

Futures contracts are traded in organised exchanges for a large number of commodities such as cotton, grains, crude oil, metals and also bonds and currencies. They are traded by open outcry where traders and brokers shout bids and offers from a trading pit at designated times and places. Futures prices are forecasts that change for several reasons, such as crop or weather reports.

(c) Options

Commodity options are of two types, put and call. The put option sets a minimum price for the contracted amount of the commodity. This gives the buyer the right but not the obligation to take a short position in the underlying at a specific price within a specified time period.

When a farmer/trader buys a **put** option, for a premium, he has the option to sell or go short on a specific futures market contract if the price of that contract falls below the strike price.

The **call** option sets the maximum price for the contract amount of the commodity. This gives the buyer the right but not the obligation to take a long position in the underlying futures at the strike price within a specified time period.

The option-holder (buyer) has three alternatives:

- the option can be allowed to expire
- the option can be sold to another person
- the option can be exercised with the seller having to sell the underlying futures

Example

The economy of many developing countries depends largely on the production and export of raw material commodities, such as crude oil, copper and agricultural commodities, such as tobacco and cocoa. Owing to such a heavy reliance on commodities the economies of these countries are exposed to price volatility of the commodities. Such price changes cause large fluctuations in revenue collections. It also causes difficulties in the debt management.

Price volatility affects the fiscal balances of economies as their revenues are largely dependent on commodity-related taxes, royalties, and dividend income from their state-owned trading businesses. When the commodity prices fall, the revenues also immediately fall, forcing these economies to resort to debt to meet their expenditure. Managing debt then becomes problematic as the debts have to be serviced and repayments made.

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6. Credit risk

The risk that the other party involved in a transaction will not be able to meet its financial obligations is called the credit risk. It is called “default risk”. It may include:

counterparty risk, which is the risk that the other party to a transaction will not meet its obligations as to timing or amount of settlement

Country / political / sovereign risk relates to government actions that may adversely affect the performance of the contract by one of the parties. They are generally beyond the direct control of the counterparty.

Estimating credit losses:

The common terms used in estimating credit losses are:

(a) Probability of default (PD): this refers to the possibility that the borrower or the customer will not make entire and on time repayment of their financial obligations.

(b) Exposure at default (EAD): this refers to the expected value of the outstanding loan amount at the time of default

(c) Loss given default (LGD): this refers to the amount of the loss, expressed as a percentage of the EAD**,** if there is a default.

(d) Recovery rate (RR): this refers to the proportion of the outstanding loan (EAD) that the lender or seller is able to recover.

In the event of a default, the loss is computed by the formula – LGD x EAD X PD

Example

Advance Electronics has invoiced a customer for Tshs48 million. The credit period is 30 days. As the customer is new, the firms CFO wants to know the possible loss in case of a default by the customer.

The firm has made a credit assessment of the customer and feels that the probability that the customer will pay is 80%.

In case the customer defaults, the company estimates it can recover 40% of the outstanding amount.

The expected loss on default, given that:
PD = 1-0.8 = 0.2, EAD = Tshs48 million, LGD = 1.0-0.4 = 0.6 = 0.2 x Tshs48million x 0.6 = Tshs5.76million.

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7. Business or operating risk

Although business risk is generally treated as a separate category of risk, it has a potential to impact the financial performance of the firm.

Definition

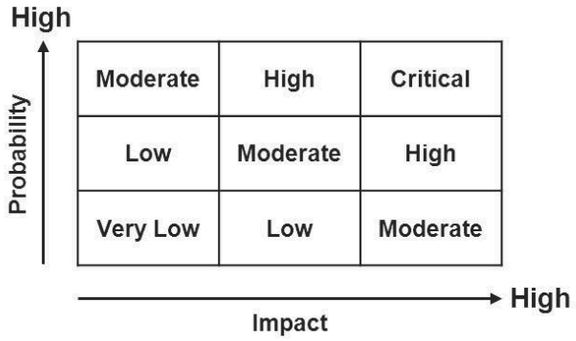
The Basel Committee defines operational risk as the "risk of loss resulting from inadequate or failed internal processes, people and systems or from external events".

Operational risk is the risk of financial loss resulting from an event which disrupts the normal business processes.

There are different types of business risk. Risks can classify as internal and external to the business. They can also directly or indirectly affect the business's ability to operate. Risks can also be viewed as hazard-based (e.g. loss on account of a fire where hazardous chemicals are stored), uncertainty-based (e.g. floods, tsunami, bush fires) or related to opportunities (e.g. taking them up or ignoring them).

The business process analysis begins with the identification of the different products and services, then the people within the organisation and the tasks involved in providing these products. The process of monitoring operational risk begins with the establishment of a **risk map**. This map is based on an analysis of business processes wherein the risk impact and probability is analysed and placed in the appropriate box. The higher the probability and impact, the greater is the focus on taking steps to mitigate the risk.

Diagram1: Risk map



Some common risk categories are:

(a) natural disasters, such as floods, storms, bushfires and drought
(b) legal, such as insurance issues, non-compliance with regulations
(c) global events, such as terror attacks
(d) technology, such as network failures and problems related to obsolete equipment
(e) regulatory and government policy changes, carbon emission restrictions, tax etc
(f) environmental, such as climate change, and pollution
(g) workplace health and safety, such as accidents caused by materials, equipment,
(h) property and equipment, such as damage from natural disasters, and vandalism
(i) security, such as theft, fraud, loss of intellectual property, terrorism,
(j) economic and financial, such as global economic meltdown, interest rate increases, cash flow issues, customers default, rapid growth and rising costs
(k) staffing, such as human resources issues, lack of training, human error, conflict management and difficulty filling vacancies
(l) suppliers, such as interruptions to the supply chain of materials
(m) market, such as changes in consumer preference and increased competition

2. Explain how financial instruments such as hedging and derivative products may be used to manage risks and the nature of such products.

[Learning Outcome b]

Once the potential risks associated with a business (as discussed in Learning Outcome 1) have been identified, the organisation needs to respond to the risks by effectively managing it.

An effective risk management should achieve three things:

increase the probability of business success
reduce the probability of business failure
reduce uncertainty as regards the achievement of overall objectives

Example

If a business faces a financial risk then the risk management model should:

increase the availability of finance for the business in the form of loans, credit facilities or capital in the form of debentures or equity.
reduce the risk of unavailability of working capital that may lead to stoppage of day-to-day business activities.
reduce the risk of failure of objectives due to lack of finance.

Risk management model

A risk management model can assist in **understanding how effective risk processes** can be **designed, implemented** and **embedded** into the organisation and its business processes.

Risk management models should always be **tested thoroughly using scenario analysis** for extreme conditions as a result of which the most optimistic, most likely and least likely events and outcomes can be established and that the consequences of even remote possibilities can be known.

A key function of the finance manager is to manage the financial risks the firm is exposed to.

A risk management plan usually consists of **four possible strategies** the firm may adopt to **manage risk**:

Avoid, by modifying the action plan or abandoning it altogether so that the risk is avoided.
Control or mitigate by planning in advance the actions to be taken reduce the impact or the likelihood of the event happening.
Accept, by assuming the risk, where unavoidable and creating a budget for the eventuality.
Transfer, to a third party that has the capability of managing the outcomes. Usually taking the cover through an insurance policy and hedging transactions are frequently used by firms.

Financial instruments like hedging and derivative products can be used to manage financial risks.

2.1 Hedging

Definition

Hedging refers to the construction of an investment position (through financial instruments) aimed at offsetting / reducing the risk from adverse movements in the price of an asset.

In hedging, derivative products (explained later) like swaps, futures, options, etc. are purchased with an objective to minimise exposure to an unwanted business risk, while still allowing the business to profit from an investment activity.

Nature of hedging

The following further explains the nature of hedging:

(a) Hedging is a long term proposition since the hedge funds are not liquid in nature as these funds are locked for a period of two or more years.

(b) Hedging involves the use of varied financial instruments aimed at reducing risk and enhancing returns. Short selling, derivative products like options and futures, equities, bonds, currencies, etc. can be used for hedging, thus, making the technique of hedging diverse and flexible in nature.

(c) Many hedging instruments are aimed at providing consistent returns and preservation of capital rather than providing huge quantum of returns.

(d) Certain hedged funds provide returns which do not bear any correlation with the actual market scenario. Thus, it is important for the hedging individual / organisation to understand the strategy behind the hedging.

(e) Hedging is considered to be a skilled based strategy as the success of hedging lies in the manager's ability to execute the chosen strategy.

2.2 Derivative products

Definition

Derivatives are financial instruments whose value is derived from the value of one or more basic variables called the underlying.

Derivatives are external hedging tools that provide a mechanism for hedging against the exchange rate and interest rate risks by pricing them in advance and protecting against future negative occurrences. Examples of currency derivatives are currency futures, currency options, currency swaps, forwards etc. Examples of interest rate derivatives are Forward Rate Agreements (FRAs), interest rate swaps, interest rate, etc.

1. Nature of derivative products

The most important function of derivative products is risk management. Financial derivatives are useful tools to limit risk. The effective use of derivatives, by reducing risks, can reduce costs and it can increase returns for the organisation

Another important application of derivatives, in relation to risk is the price discovery. This means that the derivatives market reveals information about future cash market prices through the futures market. Prices of financial instruments generally tend to move in the directions of the market expectations.

Derivatives markets also help to maintain a stabilising influence on spot prices by reducing the short-term fluctuations i.e. derivatives try to balance out the highs and lows and bring about stability in prices in the cash market for the underlying asset.

2. Players in derivative markets

There are various individuals and groups who have an interest in derivatives markets. The main participants are parties who wish to hedge (i.e. the hedger), those who wish to speculate, and arbitrageurs.

(a) A **hedger** enters the market to reduce risk. Hedging usually involves taking a position in a derivative financial instrument, which has the opposite return characteristics of the item being hedged, to offset losses or gains.

(b) A **speculator** enters the derivatives market in search of profits, and is willing to accept risk. A speculator takes an open position in a derivative product (i.e. there is no offsetting cash flow exposure to offset losses on the position taken in the derivative product).

(c) An **arbitrageur** is a speculator who is interested in short-term gains and attempts to profit from price differences by simultaneously entering into the purchase and sale of substantially identical financial instruments.

Other players in derivates markets include banks, financial institutions clearing corporations, brokers, commodity futures trading commission, commodity pool operators, commodity trading advisors, futures exchange, and futures commission merchants.

3. Types of derivative contracts

(a) Exchange-traded derivative contracts

An **exchange-traded derivative contract** is a standardised contract with a standard underlying instrument, quantity and timing of settlement. It can be bought or sold directly on a regulated exchange such as LIFFE (the London International Financial Futures and Options Exchange) or CBOT (the Chicago Board of Trade).

An exchange-traded product has a standard contract specification, which sets out:
the quantity of the underlying asset
the date, month and place of delivery (if it is deliverable)
the obligation of each party to the contract

Interest rate, futures, currency futures, options and Brent Crude oil futures.

(b) OTC derivative contracts

An **over-the-counter** (OTC) derivative is a privately negotiated derivative contract in which two parties agree to settle a financial trade or agreement at a future date. OTC derivative contracts are bilateral derivative contracts as they involve two parties. Each OTC contract is custom-designed and hence is unique in terms of contract size, expiry date, asset type and quality. The OTC market could be compared to a real estate market in which two consenting adults can enter into contracts with each other. Hence they can design the terms of the contract tailored for their needs in that specific situation. However, this makes the contract non-tradable.

Example

A company exposed to movements of the US dollar against Sterling might hedge its exchange risk by using traded currency futures or options. A company whose exposure is some less traded currency, such as the Polish Zloty or the Thai Baht, would probably use an OTC contract to hedge.

OTC contracts are useful for **hedging foreign currency exposures**.

Example

An exporter from India who expects to receive payment in US dollars is exposed to the risk of exchange rate fluctuations. To reduce the uncertainty associated with the future exchange rates, the exporter can use the currency forward market to sell US dollars forward and lock in to a rate today. Similarly, an importer who expects to make a payment in US dollars 3 months' hence can reduce the exposure to exchange rate fluctuations by buying these dollars forward.

(c) Distinction between exchange-traded derivatives and OTC derivatives

OTC derivatives	Exchange-traded derivatives
OTC derivatives are tailored to meet the needs of the parties concerned.	These contracts are highly standardised both in size and in terms of their delivery mechanism.
Access to individuals and small companies is limited.	Can be used by banks, companies, financial institutions and individuals.
OTC contracts are usually made with the intention of delivery of the underlying asset.	Physical delivery is very rare. Contracts are usually settled prior to the settlement date.
Margin requirements do not exist.	An initial margin is required, a further mark-to-market margin may be necessary.
Trading takes place mainly through telephone / telex / touch-screen trading, often via banks.	Trading takes place on an organised exchange.
Price can vary according to size of deal and customer.	Single specified price published by the clearing house.
Settlement of the OTC derivative contract happens at the end of the maturity period by delivery of the underlying asset.	Exchange traded derivatives are settled daily by settling the difference in the contracted price and the traded price in cash. This is called the mark-to-market mechanism.
Less liquid in nature (e.g. forward contracts).	More liquid in nature (e.g. futures contracts).

The derivatives and hedging tools (of both currency and interest rates) have been explained in detail in Study Guides E1, E2 and E3.

Test Yourself 2

What is the basic principle of hedging?

3. Identify and explain the alternative approaches to managing interest rate exposure based on a given scenario, data and information evaluating the costs of basic hedging arrangements. [Learning Outcome c]

Example

Star Ltd requires a Tshs1000m loan at a floating interest rate payable in the next three months. The current floating interest rate is at 8 per cent and the company would not be in a position to predict the movement of interest rates in the coming three months.

The bank is ready to guarantee a rate of 8.5 per cent for the next three months. Therefore, Star Ltd has limited its interest cost to Tshs21.2 m i.e. ((Tshs1000m x 8.5% p.a.) /12) x 3.

However, the finance manager of Star Ltd thinks that the interest rates may go up. To protect itself from an increase in interest costs, Star Ltd decides to hedge using forward interest rate agreement.

If interest rates go up to 9%, by entering into a forward interest rate agreement, Star Ltd has saved interest of Tshs1.3 million (Tshs22.5 million – Tshs21.2 million - $0.212).

However, if, after three months, interest rates fall to 7.5 per cent, the interest cost would be Tshs18.75 million {(Tshs1000 million x 7.5% p.a.) / 12 x 3} Star Ltd will be liable to pay the difference of Tshs2.45 million (Tshs21.2 million - Tshs18.75 million) to the bank.

3.1 Techniques of managing interest rate risk

All applications of interest rate contracts should balance the entity's primary objectives of:
- reducing cost of capital
- minimising interest rate volatility
- gaining efficiency in restructuring debt as and when needed

Definition

Interest rate risk (IRR) can be explained as the impact on an institution's financial condition if it is exposed to negative movements in interest rates. This risk can either be translated as an increase of interest payments that it has to make against borrowed funds or a reduction in income that it receives from invested funds.

A rise in market interest rates may adversely affect a company's financial position. The immediate impact of a change in interest rates is on a company's earnings and cash flows. The change in the interest rates also impacts a bank's financial condition, by affecting its net interest income.

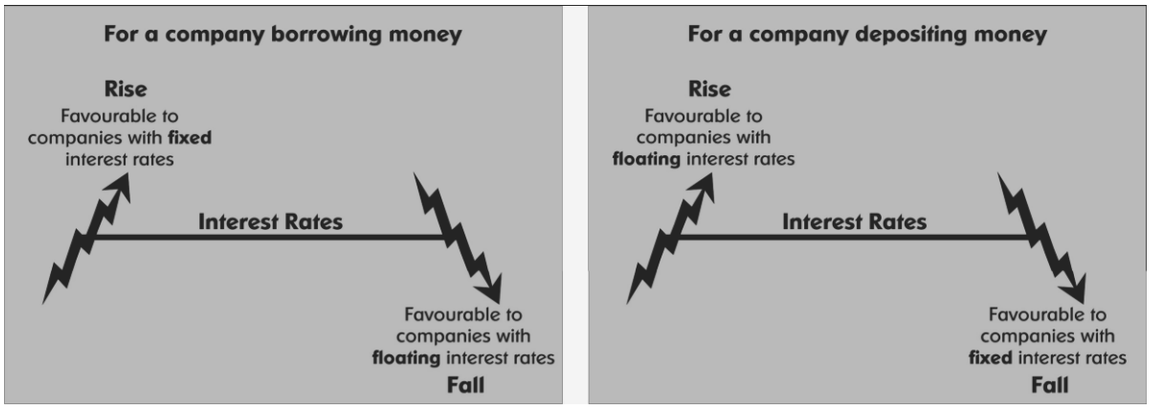
A company can obtain debt at a fixed or a floating rate of interest. The uncertainty in interest rates exposes a borrowing company to the following types of risk:

1. Fixed interest rates prove to be favourable when interest rates are rising. However, in a falling interest rate scenario, companies that have fixed interest debt will pay higher interest, thereby reducing the profitability of their operations.

2. Floating interest rates prove to be favourable when interest rates are falling. However, in a rising interest rate scenario, companies that have floating interest rate debt will pay higher interest, thereby reducing the profitability of their operations.

Similarly, for a depositing company, a rise in interest rates will be favourable to a company with floating interest rate exposure and a fall in interest rates will be favourable to a company with fixed interest rate exposure.

Diagram 2: Interest rates risk



Example

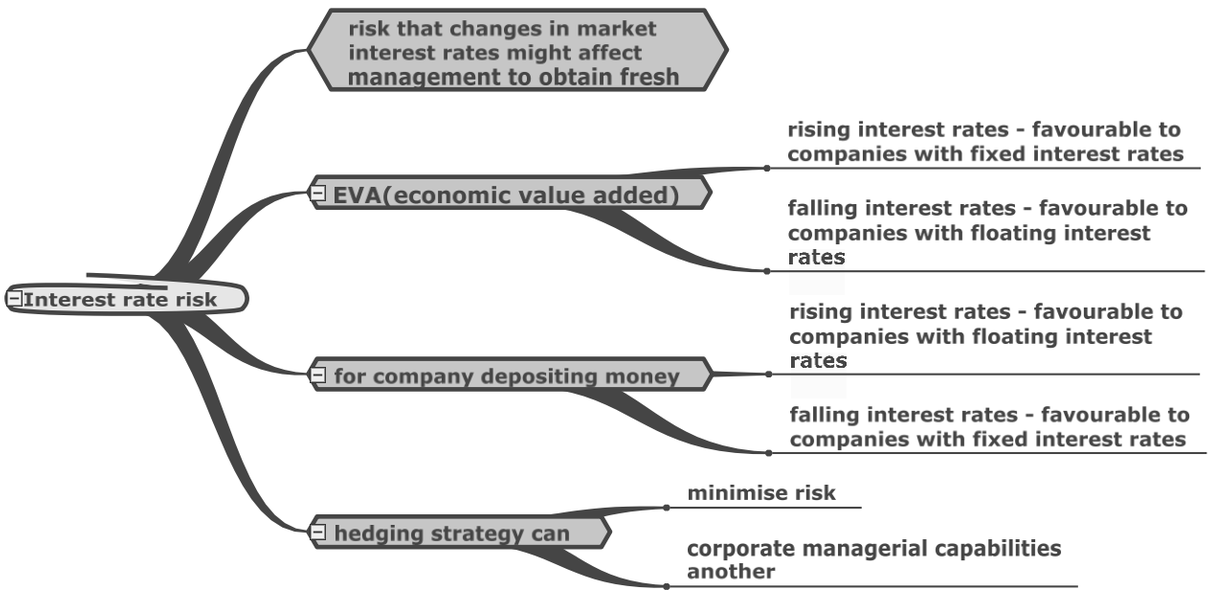
A company takes out a loan at a rate of interest equal to LIBOR (London Inter Bank Offer Rate) plus 0.1%. LIBOR is 5% at the start of the loan. The rate is to be reset each quarter with reference to the current three-month LIBOR. If commercial interest rates rise, the company runs the risk of increased interest payments. Hence the company tries to ensure that its funding costs do not rise above a certain level via hedging its exposure, or it may even consider paying a fixed rate of interest.

Suppose, on the other hand, the company borrows at a fixed rate of 5.3% for two years. If LIBOR rises to 5.3% or above, the company will be better off than if it had taken out a floating rate loan. However, if interest rates remain unchanged or even fall, the company faces the risk of being locked into borrowing at above market rates. Therefore, the company may want to hedge this risk by entering into a derivative contract that will pay out if interest rates fall.

It should be noted that risk management essentially involves judgement. A hedging strategy cannot completely eliminate the interest rate risk. Instead, it could minimise the risk and/or transform the risk from one type into another. Therefore, there is no absolute certainty that a chosen hedging strategy would necessarily improve the earnings in the short run. The primary source of interest rate risk is the difference in the timing of assets and liabilities, which indicates mismatches of attracted and borrowed invested funds in the timing of repayment and/or interest rate changes.

Risk limits control situations, which may arise if the reality appears to be different from projections. Methods of setting limits for the organisation level of interest rate risk should be defined in the organisation's policies e.g. if market interest rate increases beyond certain levels, then the credit period allowed to customers would be reviewed or adjusted accordingly.

SUMMARY



3.2 Today, a variety of hedging tools can be used to reduce, eliminate, or offset interest rate exposure.

1. Matching and smoothing

(a) Smoothing

By maintaining a balance between fixed interest rates and floating interest rates on borrowing, a company can offset losses due to the increase in floating interest rates by fixed interest rates or vice versa. Therefore, if interest rates rise, the disadvantage of a relatively expensive floating rate loan will be cancelled out by the less expensive fixed rate loan. If interest rates fall, the disadvantage of the relatively expensive fixed rate loan will be cancelled out by the less expensive floating rate loan.

Hence it is necessary to maintain a proper mix of fixed and floating interest rate loan. This will sometimes cause a loss of competitive edge for the company in particular environments.

(b) Matching

In this method, a company tries to match the liabilities and assets which both have a common interest rate.

Example

A decentralised group has two subsidiaries. One subsidiary invests in the money market at a floating interest rate, whilst the other subsidiary borrows, through the same money market, at a floating interest rate. If interest rates rise, one subsidiary's borrowing cost increases while the other subsidiary's return increases. Hence, there is no increase in the interest costs for the group as a whole as they off-set each other.

The problem with this method is that practically, it may be difficult for companies to match the magnitude and characteristics of their assets and liabilities.

Banks and financial institutions extensively use matching techniques to minimise their interest payments.

Costs associated: To derive benefit from smoothing techniques, the company has to maintain two lots of transactions and incur arrangement costs.

2. Asset and liability management

Asset Liability Management (ALM) is a risk-management principle that is often applied in private financial institutions. ALM states that, as far as possible, the entire SOFP, i.e. both assets and liabilities, should be included in the risk analysis, in order to compile the overall exposure. This makes it possible to limit the risk by matching the financial characteristics of respective assets and liabilities, so that one side of the SOFP hedges the other side.

Other interest hedging tools and their associated costs have been discussed in LOs (a), (b) and (c) of Study Guide E1.

Test Yourself 3

Why do banks in particular use the Asset Liability management technique? Explain by citing an example.

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4. Identify and explain the alternative approaches to managing currency rate exposure based on a given scenario, data and information evaluating the costs of basic hedging arrangements. [Learning Outcome d]

Example

Brilliant Ltd is a Kenya based company and pays interest and principal on a KES10,000 bond with a 10% coupon in Kenyan shillings. The exchange rate at the time of purchase is KES1:20 Tshs.

The 10% coupon payment is equal to KES1,000 and in equivalent Tanzanian shillings = Tshs20,000. If one year later, the exchange rate is 1:25, the bond's 10% coupon payment, which would be KES1,000, it will be worth Tshs25,000. The gain is solely related to the change in exchange rates between the Kenyan and Tanzanian shilling. As the Kenyan shilling has appreciated against the Tanzanian shilling, the Tanzanian holder of a Kenyan asset gains.

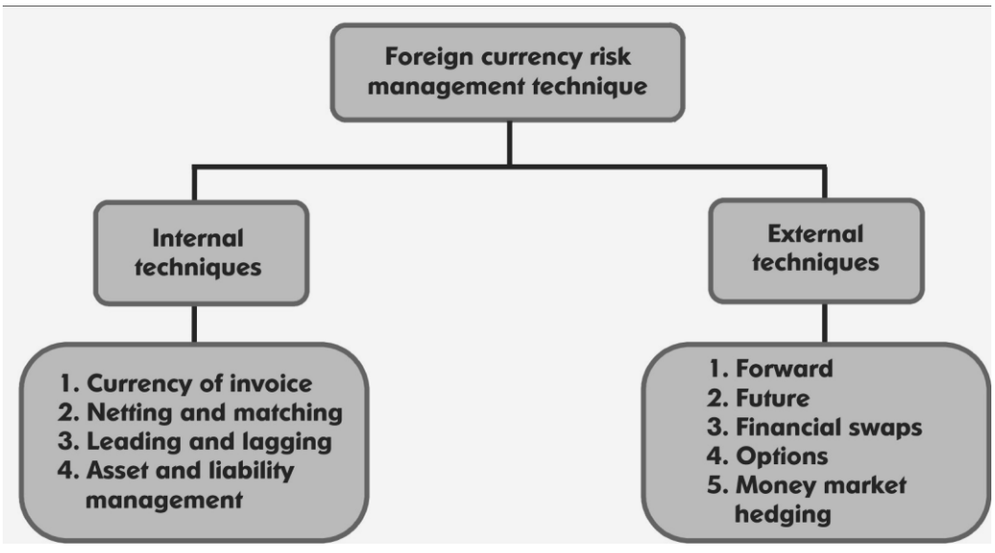
4.1 Methods of foreign currency risk management

Foreign exchange risk affects the profits as well as the cash flows of the companies dealing in more than one currency. A favourable currency movement can have a positive impact whereas an unfavourable currency movement can have an adverse effect.

There are various methods to hedge currency risk, which can be broadly categorised as internal techniques and external techniques. External techniques include the use of forwards, futures, financial swaps and options and other derivatives. All of them serve the same purpose i.e. hedging. However, the effectiveness of each of them depends on the certainty with which one is able to forecast the currency rates for the relevant period.

The internal techniques that help in managing the currency risk include netting, currency of invoice, leading and lagging. Out of the above-mentioned tools, the selection of the currency in which to invoice the exports and imports can be difficult. The exporter or the importer can gain depending on the currency of the invoice.

Diagram 3: Techniques of foreign currency management



4.2 Internal techniques

1. Currency of invoice

Theoretically, a firm chooses an invoice currency based on which currency maximises the expected profits in the presence of uncertainty. Due to uncertainty regarding the variation in the home-currency, the exporting firm sets the price prior to knowing the exchange rate for that period. Additionally, the firm has two choices:

setting the export price at the foreign-currency equivalent of their domestic sales price, or
setting the export price in local currency terms.

If possible, the firm can choose a third country's currency for invoicing, if uncertainty / volatility is lower in the third country's currency as compared to the home currency or the foreign currency. To put it differently, if the exchange rate volatility between the trading partner's currency and the home currency is higher, the home firm will price its exports in the third country's currency rather than in the home currency.

Example

Miller Plc, a US-based exporter of white goods, can invoice for a transaction of US$1,000,000 in either US$ or EUR. At the date of this invoice, US$/EUR is 1.0065. So, Miller Plc could either invoice EUR 993,542 or US$1,000,000.

After 3 months, when the invoice is paid, Miller Plc will always receive US$1,000,000, whether the rate has changed or not, if the invoice was in US$. However, if Miller Plc had invoiced in EUR, then the amount of dollars they would ultimately receive after three months is dependent on the change in the EUR rate against the US$.

So, if the US$/EUR rate is 1.0025, then Miller Plc would only receive US$991,064 once converted from EUR. So Miller Plc would actually receive US$8,936 less by invoicing in EUR.

Costs associated

In case the currency of invoice is not chosen properly, an exporting firm may stand to lose an amount equal to the depreciation in the currency chosen, In the example of Miller Plc, the firm would receive $8,936 less by invoicing in EUR, thereby representing the cost of incorrect choice of the currency invoice.

2. Netting and matching

In international cash management, both netting and matching help to reduce currency flows, the risks of exposure to exchange rate movements and the costs of international financial transactions. Netting permits existing risk exposure positions to be adjusted by taking on offsetting contracts with the same counterparty. Netting involves two companies in the same group netting off the currency amounts that they owe to each other.

The net amount of the debt between the companies needs to be paid through an intra company netting arrangement only. In fact, it may happen that no cash changes hands and the transactions are simply treated as bookkeeping entries. Matching can be used to minimise foreign currency transactions and risk exposures between member companies in a group and also with third parties.

Definition

Netting is a process where debit balances are netted off against credit balances, so that only the net amounts remain to be paid in actual currency flows.

This implies that instead of having a two-way flow of money - for receiving and paying - only the net amount is paid. The objective of netting is to offset the expected loss in one currency exposure by the likely gain in another. This is a technique used to hedge FOREX exposures. In order for netting to be conducted effectively, it is important that the settlement dates of the contracts match each other and the foreign currency involved is the same for the receipts and the payments that are due.

Types of netting

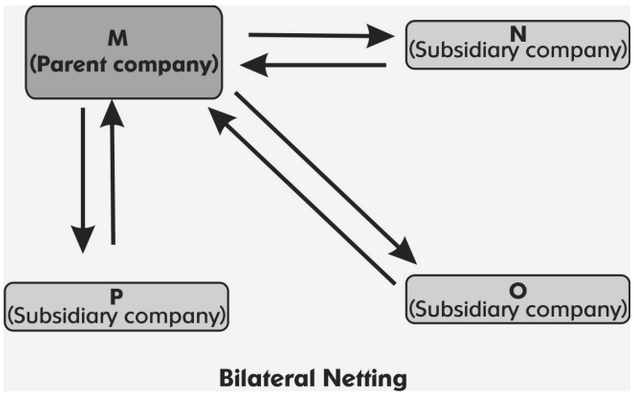
(a) Bilateral netting

This netting is between two parties wherein the lower balances are netted off against the higher balances, and the remainder is paid or received. Bilateral netting involves two companies within a group of companies. It is easy to operate and does not require the intervention of a central treasury function.

Example

Consider a UK company with a US subsidiary. The UK company expects to pay $2m to a supplier in one month's time, whereas the US subsidiary expects to receive $5m in one month's time as payment for goods supplied. In this case, the net exposure of $3m to be received in one month's time ($5m - $2m) can be identified and hedged externally. This will be cheaper than the UK company and its US subsidiary hedging their respective currency exposures of $2m and $5m independently.

Diagram 4: Bilateral netting

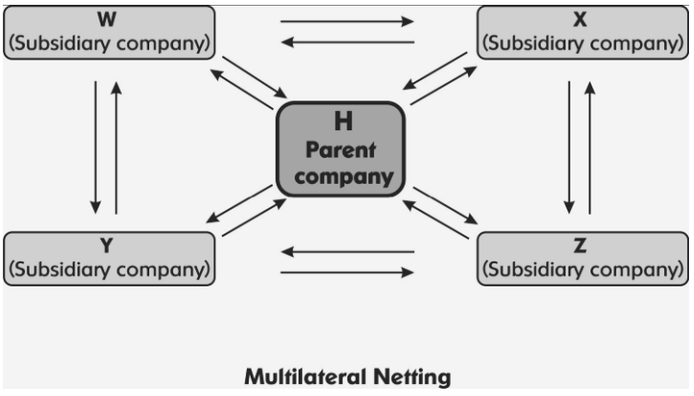


The above diagram indicates that the parent company M can make payments to and receive payments from each of the three subsidiaries, N, P and O. However, the subsidiaries cannot make payments to or receive payments from each other. This process is bilateral netting since it involves a two-way flow of funds.

(b) Multilateral netting

Multilateral netting involves netting among more than two parties; using a clearing-house or central exchange (usually some form of centralised treasury function). Multilateral netting is practised among multinational corporations that have many subsidiaries in the same group. The arrangement is generally coordinated by the group's treasury operations department, at its group headquarters. Multilateral netting has an advantage over bilateral netting in that it reduces a higher credit exposure than bilateral netting.

Diagram 5: Multilateral netting



In the above diagram, the subsidiaries can make payments to and receive payments from each other as well as to / from the parent company thereby resulting in multilateral netting.

Advantages of netting

Netting is advantageous for companies that carry out a large volume of transactions within the group since it results in the reduction of a large number of individual positions or obligations to a smaller number of positions or obligations, by settling the inter-company debt for the net amount owed.

The benefits offered by netting are:

Netting reduces the banking transaction costs by saving the buy / sell spreads in the spot and forward markets (i.e. it avoids unnecessary hedging costs).

It reduces the credit risk and the liquidity risk.

With the use of Real Time Gross Settlement (RTGS) in the netting process, a company could settle its intra-group transactions in minutes thereby saving considerable time.

Disadvantages of netting

Although netting is effective in reducing credit risk and liquidity risk, it has a legal risk. This is because the netting agreement may not be legally enforceable in all the countries. Each type of netting has different degrees of enforceability in the event of default.

Certain countries may put exchange control restrictions on netting which need to be carefully considered by the companies before framing their netting policy.

The dates of settlement of the contracts and the foreign currency involved may not match. In such cases netting may not work.

Costs associated with netting

The following are the costs associated with an arrangement of netting:

The accounting and other administrative departments of the companies/subsidiaries participating in the process of netting need to have proper systems in place which would decide the basis of settling various transactions (for example, a system embedded into the accounting systems of the concerned companies which would split a cluster of netted transactions into individual payments and receipts).

Setting up such systems would involve significant capital outlays. The amount of capital allotted for such systems should be justified and in line with the long term goal of the participating organisation.

Apart from setting up systems which would efficiently calculate individual receipts and payment amounts, the netted exposures of the participating companies need to be continuously monitored and controlled. Setting up and maintaining monitoring systems would also require capital outlay.

In addition to the above, firms also need to consider the fees charged by commercial netting services.

Explain the various netting techniques used by firms to manage risk.

Matching

An organisation can either reduce or eliminate its foreign exchange risk by matching its receipts in foreign currency with its payments in the same foreign currency. Under the matching concept we try to match the currency of the assets with the currency of the liabilities which fund them – therefore a US dollar asset is typically funded in US dollars, a Euro liability is offset by an asset in Euros. This avoids profits and losses arising from retranslation at the prevailing exchange rates.

3. Leading and lagging

This technique uses the adjustment at the time of payments that are made in foreign currencies. Leading is the payment of an obligation before the due date while lagging is delaying the payment of an obligation past the due date. The purpose of these techniques is to enable the company to take advantage of expected devaluation or revaluation of the appropriate currencies. Lead and lag payments are particularly useful when forward contracts are not possible.

Therefore leading and lagging are methods which try to equate foreign exchange assets and liabilities by speeding up or slowing down receivables or payables. An advantage of these techniques is that they avoid unnecessary hedging costs. A limitation of these techniques is that appropriate matches may not be available. In the case of the lagging technique, if not approved by a third party, it may bring down the credit rating of the entity. Leading and lagging can be intra-company (within the same company) and inter-company (involving independent firms).

Cost consideration: Leading and lagging is wholly based on the future exchange rate expectations, and if the expectations are not met, the technique may add to costs, rather than reducing them.

4. Asset and liability management

Under this approach, a firm should deploy procedures to manage asset and liabilities in such a way that it will minimise foreign currency risk. It may use a combination of the above-mentioned techniques to achieve this objective. If an entity has a receivable in one foreign currency and also has payables in the same foreign currency, it should try to arrange the entire settlement in such a way that the loss on account of exchange fluctuation will be minimised or eliminated, for instance using netting or leading and lagging techniques or any other method.

External techniques: The external techniques and their related costs have been discussed in Study Guide E2 of this Study Text.

Answers to Test Yourself

Answer to TY 1

The net interest income is interest income minus interest expense.

Interest received £200 x 8%	=	£16 million
Interest paid £ 150 x6%	=	£9 million
Net interest income	=	£7 million

Measurement in Tshs before devaluation

Interest received £16million x Tshs2,600	=	Tshs41,600million
Interest paid £9million x Tshs2,600	=	Tshs23,400million
Net interest income	=	Tshs18,200million

Measurement in Tshs after devaluation

Interest received £16million x Tshs2,500	=	Tshs40,000million
Interest paid £9million x Tshs2,500	=	Tshs22,500million
Net interest income	=	Tshs17,500million

The assets were worth Tshs520 billion (£200m/Tshs2,600) before depreciation, but after devaluation they are worth only Tshs500billion (£200m /Tshs2700). The liabilities were worth Tshs390 billion prior to depreciation, but they are worth only Tshs375billion after devaluation. Since assets declined by Tshs20billion and liabilities by Tshs15billion, the net worth declined by Tshs5billion using the end of the year spot rates.

Answer to TY 2

When a firm buys a financial asset, it is taking a **"long position".** This exposes the firm to risk if the returns from the asset are uncertain. On the other hand, if the firm has sold an asset, it is taking a **"short position"**, and this too exposes the firm to a risk. **The principle underlying hedging is to hedge a risk by offsetting a long position by a corresponding short position or offsetting a short position by a corresponding long position.**

Answer to TY 3

Asset Liability Management (ALM) is a risk-management principle that is often applied in private financial institutions. ALM states that, as far as possible, the entire SOFP, i.e. both assets and liabilities, should be included in the risk analysis, in order to compile the overall exposure. This makes it possible to limit the risk by matching the financial characteristics of respective assets and liabilities, so that one side of the SOFP hedges the other side. Banks accept deposits on which they have to pay interest (liabilities/ expense) and give loans on which they receive interest (assets/income). Banks need to manage the interest rate risk, which can lead to a mismatch of assets and liabilities. Volatile interest rates compound the problem of the banks.

The bank's net interest margin i.e. the difference between the rate that it pays on deposits and the rate that it receives on its loans and securities, is a function of interest rate sensitivity and the volume and mix of its assets and liabilities. Generally, banks borrow short term and lend long term, which leads to a mismatch that it needs to address through restructuring of assets and liabilities or using derivatives such as swaps, options and futures to match the imbalance and reduce the risk.

Answer to TY 4

Bilateral netting: this netting is between two parties wherein the lower balances are netted off against the higher balances, and the remainder is paid or received.

Bilateral netting involves two companies within a group of companies. It is easy to operate and does not require the intervention of a central treasury function.

Multilateral netting: Multilateral netting involves netting among more than two parties; using a clearing-house or central exchange (usually some form of centralised treasury function). Multilateral netting is practised among multinational corporations that have many subsidiaries in the same group. The arrangement is generally coordinated by the group's treasury operations department, at its group headquarters.

Multilateral netting has an advantage over bilateral netting in that it reduces a higher credit exposure than bilateral netting.

Quick Quiz

1. The _____ model is used for pricing futures contracts.

   A Black and Scholes
   B Cost of carry
   C Miller
   D Time value

2. Two persons agree to exchange 100 grams of gold three months later at $400 per gram. This is an example of a:

   A Forward contract
   B Futures contract
   C Spot contract
   D None of the above

3. On 15 January, Jack Ltd bought a Eurodollar futures contract (expiring on 25 January), which cost €28,730. The initial margin was €2,000. Each Eurodollar futures contract is for delivery of €20,000. On 25 January, the exchange rate closed at $1.5780 per €. How much profit or loss did he make?

   A + €2,834
   B – €2,500
   C – €2,834
   D + €2,500

4. An OTC derivative product is a standardised product**. True/ False**

Answers to Quick Quiz

1. The correct option is **B.**

2. The correct option is **A.**

3. Jack bought one futures contract costing €28,730 at a market lot of 20,000. This means €1.4363 was paid per Eurodollar future. On the futures expiration date, the futures price converges to the spot price. If the exchange rate closed at $1.5780 per €, this must be the futures close price as well. Hence Jack will have made profit of (1.5780 – 1.4363) x 20,000. Therefore, the correct answer is **A**.

4. False.OTC derivative contracts are bilateral derivative contracts as they involve two parties. Each OTC contract is custom-designed and hence is unique in terms of contract size, expiry date, asset type and quality.

Self Examination Questions

Question 1

Included in the debtors of ARG Co is an expected receipt of $500,000 payable in three months' time. The following exchange rates are available:

	$/£
Spot	1.7642–1.7962
Three months forward	1.7855–1.8174

Explain why ARG Co might wish to hedge its expected three-month dollar receipt using the forward market and calculate the sterling value arising from a forward market hedge.

Question 2

IBC Corp is required to make a payment of $300,000 in six months' time. On 1 January the company is considering the various choices it has to hedge its transaction exposure. The finance manager has collected the following information:

Exchange rates

$ spot rate per £ 1.5617-1.5773
6 month $ forward rate 1.5455-1.5609

Money market rates

	Borrow %	Deposit %
US$	6	4.5
Sterling	7	5.5

By making appropriate calculations, decide which of the following hedges is most attractive to IBC Corp:

(a) Forward market
(b) Money market

Question 3

The CEO of Autocrat Plc is reviewing the company's interest rate and currency risk strategies for the next few months. There has recently been considerable political instability with some countries showing signs of moving towards economic recession whilst others are still showing steady growth. Both interest rates and currency rates could become more volatile for many major trading countries.

Autocrat is expected to borrow £6.5 million for a period of six months commencing in six months' time. The company also needs to make a US$ payment of $4·3 million in 3 months' time.

Assume that it is now 1 December. Futures and options contracts may be assumed to expire at the end of the relevant month, and the company may be assumed to be able to borrow at the 3 month LIBOR rate.

LIFFE futures prices (£500,000 contract size)

March	95·56
June	95·29

LIFFE options on futures prices, £500,000 contract size. Premiums are annual %

	CALLS		PUTS	
	March	June	March	June
95250	0.445	0.545	0.085	0.185
95500	0.280	0.390	0.170	0.280
95750	0.165	0.265	0.305	0.405

Foreign exchange rates

Spot $1.4692 - 1.4735/£
3 month forward $1.4632 - 1.4668/£

Currency option prices

Philadelphia Stock Exchange $/£ options, contract size £31,250, premiums are cents per £.

	CALLS		PUTS	
	March	**April**	**March**	**April**
1.450	3.12	-	1.56	-
1.460	2.55	2.95	1.99	2.51
1.470	2.14	-	2.51	-

Three month LIBOR is currently4·5%

Required:

(a) If the interest rates increase by 0.75% in six months' time, illustrate the possible results of:
(i) futures hedge; and
(ii) options hedge

Recommend which hedge should be selected and explain why there might be uncertainty as to the results of the hedges.

(b) Illustrate and discuss the possible outcomes of forward market and currency options hedges if possible currency rates in three months' time are either:
(i) $1.4350 -$1.4386/£ or
(ii) $1.4780 -$1.4820/£.

Answers to Self Examination Questions

Answer to SEQ 1

ARG Co intends to protect the sterling value of its expected dollar receipt. It is clear from the quoted forward rates mentioned in the question that the dollar is expected to weaken against the Sterling. This means that the sterling value of $500,000 dollars could decline in three months. ARG Co can enter into a forward exchange contract with its bank to exchange its expected dollar receipt in three months time at the current forward rate. This would protect the company against any further deterioration in the sterling-dollar exchange rate. The sterling value arising from the contract will be $500,000/1.8174 = £275,118.

Answer to SEQ 2

(a) If forward contract cover is taken, the cost is $300,000/1.5455 = £194,112

(b) Creating a money market hedge:

Step 1

Determine the amount in $ that needs to be borrowed now that will yield enough interest over the next 6 months to pay off the foreign debt.

The rate of interest on US deposits is 4.5%
For a 6 month period this equates to 4.5/2 = 2.25%
The amount of $ needed = $300,000/1.0225 = $293,399

Answer to SEQ 3

(a) Futures hedge

Autocrat plc needs to borrow in six months' time, and wishes to protect against an increase in interest rates during the next six months. To do this it will **sell June futures contracts**.

$$\frac{£6,500,000}{£500,000} \times \frac{6}{3} = 26 \text{ contracts at } 95.29$$

(As the period at risk is six months, the number of contracts is doubled, i.e.6/3)

Basis is 95·29 – 95·50 = (0·21%) (futures price – cash price (100 – 4.5))

At the end of June when the contracts mature, basis will be 0. There are seven months until the maturity date. In six months' time when Autocrat needs to borrow the expected basis is:

$$0.21\% \times \frac{1}{7} = 0.03\%$$

This assumes a linear decline in the basis.

If the interest rate increases by 0.75%, LIBOR will move to 5·25% and the expected futures price is 94·75 – 0·03 =94·72 (100 – LIBOR) – 0.03).

Cash market: The extra cost of a 0·75% increase in interest is: £6,500,000 x 0·75% x 0·5 (six months) = £24,375

Futures market: Sell 26 June contracts at 95.29
Futures market: Buy 26 June contracts at 94.72

(the tick value is £500,000 x ·01% x 3/12 = £12·50)

Futures market: Gain is 57 ticks (basis points) x £12.50 x 26 contracts = £18,525

The effective overall cost is:

Cash market borrow £6,500,000 at 5.25% for six months = £170,625
(Less) futures gain of £18,525 = £152,100. This is an annual interest rate of 4.68%.

The futures contract effectively locks into the futures rate (4·71%), less the expected basis of 0·03%, or overall interest rate of 4·68%, not the current cash market rate (4·5%). However, the 4·68% rate is not certain as the futures price in six months' time might not be 94·72 because there might not be a linear decline in basis, i.e. basis risk might exist.

(If the company wished to protect against changes in the current cash market rate it would need to sell more contracts in order to generate a high enough expected profit).

Options hedge

Autocrat plc would need to **buy June put options** on futures.

Strike price		Premium cost
95250	(£6,500,000 x 0.185% x 6/12)	£6,012.50
95500	(£6,500,000 x 0.280% x 6/12)	£9,100.50
95750	(£6,500,000 x 0.405% x 6/12)	£13,162.50

(alternatively the premium may be estimated using basis points multiplied by the tick value for the contract and number of contracts, e.g. 18·5 x £12.50 x 26 = £6,012.5)

If interest rates increase by 0.75% the options will be exercised (or sold if there is any time value left) and the futures contracts closed out to make a profit.

This expected profit would be the exercise price at which futures could be sold, less the expected futures price in six months, multiplied by 100%, the tick value and the number of contracts

Exercise price		Profit
95250	(95·25 – 94·72) x 100 x 26 x £12·5	£17,225
95500	(95·50 – 94·72) x 100 x 26 x £12·5	£25,350
95750	(95·75 – 94·72) x 100 x 26 x £12·5	£33,475

Exercise price		Overall cost
95250	£170,625 – £17,225 + £6,012·5	£159,412.50
95500	£170,625 – £25,350 + £9,100	£154,375.00
95750	£170,625 – £33,475 + £13,162·5	£150,312.50

The 95750 exercise price has the lowest overall cost, with a worst case effective interest rate of 4·625%, which is better than the futures rate. It is therefore the recommended hedge. However, the spot futures price at the time when the option would be exercised / sold is not certain. If interest rates were to fall rather than increase the option could be allowed to lapse (or sold for time value if any) and advantage taken of the lower cash market borrowing rates.

(b) Outcome of using a forward market:

Since, a payment of $4.3 million dollars is due, using forward market hedge:

Autocrat plc can buy dollars three months forward. Therefore, the pounds required to buy dollars will be equal to

$$\text{Buy \$ three months forward } \frac{\$4,300,000}{1.4632} = \text{£2,938,764}$$

Outcome of using options hedge: For purchasing dollars, March put options on pounds should be bought. This is because, the contracts are Sterling options, March put option contracts should be used, as they are the closest maturity date after the date of the transaction which is 1 March.

Number of contracts:			Contract Value
$4,300,000/1.45	£2,965,517/31,250	94.90 or 95 contracts	(£2,968,750)
$4,300,000/1.46	£2,945,205/31,250	94.25 or 94 contracts	(£2,937,500)
$4,300,000/1.47	£2,925,170/31,250	93.61 or 94 contracts	(£2,937,500)

Option premiums	Premium	
1.45	1.56 cents x £2,968,750 = $46,312/1.4692	£31,522
1.46	1.99 cents x £2,937,500 = $58,456/1.4692	£39,788
1.47	2.51 cents x £2,937,500 = $73,731/1.4692	£50,185

Spot Rate

The Sterling cost is estimated using the spot rate since the option premium is payable upfront.

The possible three-month spot rates for the purchase of dollars are:

(i) $1.4350/£
(ii) $1.4780/£

If the spot rate moves to $1.4350/£ all of the options would be exercised.
1.45 £2,968,750 x 1.45 = $4,304,687

The excess $4,687 could be sold forward at 1.4668/£.

1.46 £2,937,500 x 1.46 = $4,288,750
$11,250 could be bought forward at $1.4632/£.
1.47 £2,937,500 x 1.47 = $4,318,125

The excess of $18,125 could be sold forward at $1.4668/£.

Total costs		
1·45	£2,968,750 – £3,195 + £31,522	£2,997,077
1·46	£2,937,500 + £7,689 + £39,788	£2,984,977
1·47	£2,937,500 – £12,357 + £50,185	£2,975,328

All of the above mentioned are dearer than the forward market.

In case the spot rate moves to $1.4780, then none of the options would be exercised. The expected surplus or shortfall in dollars, resulting from the amount at risk not being equal to an exact number of currency option contracts, would still have been sold / bought using forward contracts.

The resulting surplus dollars would be required to be sold, or shortfall in dollars would be required to be purchased to fulfil the forward contracts.

$4,300,000 at spot of $1.4780/£ = £2,909,337

1·45	£2,909,337 + £31,522 + £3,171 ($4,687 bought at spot of 1.4780)	£2,944,030
1·46	£2,909,337 + £39,788 – £7,591 ($11,250 surplus at spot of 1.4820)	£2,941,534
1·47	£2,909,337 + £50,185 + £12,263 ($18,125 bought at 1.4780)	£2,971,785

The above mentioned are still dearer than the forward contract. The spot price of the dollar in three months' time would have to weaken further in order for the options to be the cheaper hedge.

Step 2

Borrow the equivalent amount in sterling, convert to dollars and place on US deposit.

Sterling requirement (at spot) = $293,399/1.5617 = £187,871
Convert to dollars and place on US deposit.

Step 3

Repay sterling loan plus interest

6 month rate on sterling borrowing = 7%/2 = 3.5%
Total sterling repayment (and cost of hedging strategy) = £187,871 x 1.035 = £194,446

In this case, the forward contract is marginally cheaper at £194,112 compared to the money market hedge of £194,446.