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MODULE 1: MODELLING OF UNCERTAINTY

UNIT 1: MODELLING OF UNCERTAINTY

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1.0 Introduction

The construction and use of models is at the core of operations research. Operations research is concerned with scientifically deciding how to best design and operate man-machine systems, usually under conditions requiring the allocation of scarce resources. Modelling is a scientific activity that aims to make a particular part or feature of the world easier to understand, define, quantify, visualize, or simulate. Models are typically used when it is either impossible or impractical to create experimental conditions in which scientists can directly measure outcomes. Direct measurement of outcomes under

controlled conditions will always be more reliable than modelled estimates of outcomes.

2.0 Objectives

At the end of this unit, you should be able to

- Define a Model
- Describe modelling
- Give a classification of models
- Outline the advantages and disadvantages of models

3.0 Main Content

3.1 Definition

Scientific modelling is an activity the aim of which is to make a particular part or feature of the world easier to understand, define, quantify, visualize, or simulate. It requires selecting and identifying relevant aspects of a situation in the real world and then using different types of models for different aims, such as conceptual models to better understand, operational models to operationalize, mathematical models to quantify, and graphical models to visualize the subject ([http://en.wikipedia.org/wiki/Scientific modelling](http://en.wikipedia.org/wiki/Scientific_modelling))

Adebayo et al (2010) define Modelling as a process whereby a complex life problem situation is converted into simple representation of the problem situation. They further described a model as a simplified representation of complex reality. Thus, the basic objective of any model is to use simple inexpensive objects to represent complex and uncertain situations. Models are developed in such a way that they concentrate on exploring the key aspects or properties of the real object and ignore the other objects considered as being insignificant. Models are useful not only in science and technology but also in business decision making by focusing on the key aspects of the business decisions (Adebayo et al, 2010).

3.2 Classification of Models

The following are the various schemes by which models can be classified:

- i. By degree of abstraction
- ii. By function
- iii. By structure
- iv. By nature of the environment

Let us now briefly discuss the above classifications of models as presented by Gupta and Hira (2012).

i. By Degree of Abstraction

Mathematical models such as Linear Programming formulation of the blending problem, or transportation problem are among the most abstract types of models since they require not only mathematical knowledge, but also great concentration to the real idea of the real-life situation they represent.

Language models such as languages used in cricket or hockey match commentaries are also abstract models.

Concrete models such as models of the earth, dam, building, or plane are the least abstract models since they instantaneously suggest the shape or characteristics of the modelled entity.

ii. By Function

The types of models involved here include

Descriptive models which explain the various operations in non-mathematical language and try to define the functional relationships and interactions between various operations. They simply describe some aspects of the system on the basis of observation, survey, questionnaire, etc. but do not predict its behaviour. Organisational charts, pie charts, and layout plan describe the features of their respective systems.

Predictive models explain or predict the behaviour of the system. Exponential smoothing forecast model, for instance, predict the future demand.

Normative or prescriptive models develop decision rules or criteria for optimal solutions. They are applicable to repetitive problems, the solution process of which can be programmed without managerial involvement. Linear programming is also a prescriptive or normative model as it prescribes what the managers must follow.

iii. By Structure

- **Iconic or physical models**

In iconic or physical models, properties of real systems are represented by the properties themselves. Iconic models look like the real objects but could be scaled downward or upward, or could employ change in materials of real object. Thus, iconic models resemble the system they represent but differ in size, they are images. They thus could be full replicas or scaled models like architectural building, model plane, model train, car, etc.

- **Analogue or Schematic Models**

Analogue models can represent dynamic situations and are used more often than iconic models since they are analogous to the characteristics of the system being studied. They use a set of properties which the system under study possesses. They are physical models but unlike iconic models, they may or may not look like the reality of interest. They explain specific few characteristics of an idea and ignore other details of the object. Examples of analogue models are flow diagrams, maps, circuit diagrams, organisational chart etc.

- **Symbolic or mathematical models**

Symbolic models employ a set of mathematical symbols (letters, numbers etc.) to represent the decision variables of the system under study. These variables are related together by mathematical equations/in-equations which describe the properties of the system. A solution from the model is, then, obtained by applying well developed mathematical techniques. The relationship between velocity, acceleration, and distance is an example of a mathematical model.

Similarly, cost-volume-profit relationship is a mathematical model used in investment analysis.

iv. By Nature of Environment

- **Deterministic models**

In deterministic models, variables are completely defined and the outcomes are certain. Certainty is the state of nature assumed in these models. They represent completely closed systems and the parameters of the systems have a single value that does not change with time. For any given set of input variables, the same output variables always result. E.O.Q model is deterministic because the effect of changes in batch size on total cost is known. Similarly, linear programming, transportation, and assignment models are deterministic models.

- **Probabilistic Models**

These are the products of the environment of risk and uncertainty. The input and/or output variables take the form of probability distributions. They are semi-closed models and represent the likelihood of occurrence of an event. Thus, they represent to an extent the complexity of the real world and uncertainty prevailing in it. As a example, the exponential smoothing method for forecasting demand a probabilistic model.

3.3 Characteristics of Good Models

The following are characteristics of good models as presented by Gupta and Hira (2012)

1. The number of simplifying assumptions should be as few as possible.
2. The number of relevant variables should be as few as possible. This means the model should be simple yet close to reality.
3. It should assimilate the system environmental changes without change in its framework.

3.4 Advantages of a Model

- 1 It provides a logical and systematic approach to the problem.
2. It indicates the scope as well as limitation of the problem.

3. It helps in finding avenues for new research and improvement in a system.
4. It makes the overall structure of the problem more comprehensible and helps in dealing with the problem in its entirety.

3.5 Limitations of a Model

1. Models are more idealised representations of reality and should not be regarded as absolute in any case.
2. The reality of a model for a particular situation can be ascertained only by conducting experiments on it.

3.6 Constructing a Model

Formulating a problem requires an analysis of the system under study. This analysis shows the various phases of the system and the way it can be controlled. Problem formulation is the first stage in constructing a model. The next step involves the definition of the measure of effectiveness that is, constructing a model in which the effectiveness of the system is expressed as a function of the variables defining the system. The general Operations Research form is;

$$E = f(x_i, y_i),$$

Where

E = effectiveness of the system,

x_i = controllable variables,

y_i = uncontrollable variables but do affect E .

Deriving a solution from such a model consists of determining those values of control variables x_i , for which the measure of effectiveness is measure of effectiveness is optimised. Optimised includes both maximisation (in case of profit, production capacity, etc.) and minimisation (in case of losses, cost of production, etc.).

The following steps are involved in the construction of a model

1. Selecting components of the system
2. Pertinence of components
3. Combining the components

4. Substituting symbols

3.7 Types of Mathematical Models

The following are the types of mathematical models available:

1. Mathematical techniques
2. Statistical techniques
3. Inventory models
4. Allocation models
5. Sequencing models

4.0 Conclusion

We have seen that models and model construction are very critical in the practice of operations research because they provide the process whereby a complex life problem situation is converted into simple representation of the problem situation. They further described a model as a simplified representation of complex reality. The basic objective of any model is to use simple inexpensive objects to represent complex and uncertain situations. Models are developed in such a way that they concentrate on exploring the key aspects or properties of the real object and ignore the other objects considered as being insignificant. Models.

3.0 Summary

This unit introduced us to the concept of models. We have learnt about the importance of models to operations research. The unit opened with a consideration of various definitions of models. Among the definitions is that by Adebayo et al (2010) who defined modelling as a process whereby a complex life problem situation is converted into simple representation of the problem situation. A model as used in Operations Research is defined as an idealised representation of real life situation. It represents one of the few aspects of reality.

6.0 Tutor Marked Assignment

- Differentiate between model and modelling.

- List the different classifications of models we have.
- List and explain the classification of models by structure.
- Outline five characteristics of a good model.

7.0 References

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MODULE 2: BASIC FINANCIAL ASSETS AND RELATED ISSUES: BONDS

UNIT 1: BONDS

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1.0 INTRODUCTION

In finance, a bond is an instrument of indebtedness of the bond issuer to the holders. It is a debt security, under which the issuer owes the holders a debt and, depending on the terms of the bond, is obliged to pay them interest (the coupon) and/or to repay the principal at a later date, termed the maturity date. Interest is usually payable at fixed intervals (semi-annual, annual, sometimes monthly). Very often the bond is negotiable, that is, the ownership of the instrument can

be transferred in the secondary market. This means that once the transfer agents at the bank medallion stamp the bond, it is highly liquid on the second market.

Thus, a bond is a form of loan or IOU: the holder of the bond is the lender (creditor), the issuer of the bond is the borrower (debtor), and the coupon is the interest. Bonds provide the borrower with external funds to finance long-term investments, or, in the case of government bonds, to finance current expenditure. Certificates of deposit (CDs) or short term commercial paper are considered to be money market instruments and not bonds: the main difference is in the length of the term of the instrument.

Bonds and stocks are both securities, but the major difference between the two is that (capital) stockholders have an equity stake in the company (i.e., they are investors), whereas bondholders have a creditor stake in the company (i.e., they are lenders). Being a creditor, bondholders have priority over stockholders. This means they will be repaid in advance of stockholders, but will rank behind secured creditors in the event of bankruptcy. Another difference is that bonds usually have a defined term, or maturity, after which the bond is redeemed, whereas stocks are typically outstanding indefinitely. An exception is an irredeemable bond, such as a consol, which is a perpetuity, that is, a bond with no maturity

2.0 Objectives

At the end of this unit, you should be able to

- Define a Bond
- Types of Bonds
- Features of Bonds
- Benefits of Bonds
- Advantages and Disadvantages of Bonds

3.0 Main Content

3.1 Definition

A written and signed promise to pay a certain sum of money on a certain date, or on fulfillment of a specified condition. All documented contracts and loan agreements are bonds.

Construction: A three-party contract (variously called bid bond, performance bond, or surety bond) in which one party (the surety, usually a bank or insurance company) gives a guaranty to a contractor's customer (obligee) that the contractor (obligor) will fulfill all the conditions of the contract entered into with the obligee. If the obligor fails to perform according to the terms of the contract, the surety pays a sum (agreed upon in the contract and called liquidated damages) to the customer as compensation. A surety bond is not an insurance policy and, if cashed by the obligee, its amount is recovered by the surety from the obligor.

Law: An appeal bond deposited by a losing party to stay the execution of a lower court's judgment until the party's appeal against it is decided by a higher court. A bail bond deposited by an accused as a guaranty of his or her appearance in the court when called. A judicial bond deposited by a litigant to indemnify the opposing judicial or governmental body from any loss arising due to the legal proceeding.

Securities: A debt instrument that certifies a contract between the borrower (bond issuer) and the lender (bondholder) as spelled out in the bond indenture. The issuer (company, government, municipality) pledges to pay the loan principal (par value of the bond) to the bondholder on a fixed date (maturity date) as well as a fixed rate of interest for the life of the bond.

Commerce: A bank guaranty posted by an importer for an immediate release of landed goods (with total value not exceeding the amount of bank guaranty) without payment of customs duties and taxes. The bond allows a fixed period

during which the importer must submit the required documents and pay the assessed duties and taxes. See also bonded goods.

3.2 Types of Bonds

i. Municipal bonds

These are debt obligations issued by states, cities, counties and other governmental entities, which use the money to build schools, highways, hospitals, sewer systems, and many other projects for the public good.

When you purchase a municipal bond, you are lending money to a state or local government entity, which in turn promises to pay you a specified amount of interest (usually paid semiannually) and return the principal to you on a specific maturity date. Not all municipal bonds offer income exempt from both federal and state taxes. There is an entirely separate market of municipal issues that are taxable at the federal level, but still offer a state and often local tax exemption on interest paid to residents of the state of issuance. Most of this municipal bond information refers to munis which are free of federal taxes. See Taxable Municipal Bonds for more about taxable municipal issues.

ii. Zero-Coupon Bonds

This is a type of bond that makes no coupon payments but instead is issued at a considerable discount to par value. For example, let's say a zero-coupon bond with a \$1,000 par value and 10 years to maturity is trading at \$600; you'd be paying \$600 today for a bond that will be worth \$1,000 in 10 years.

iii. Agency Bonds

Agency bonds are issued by two types of entities

- 1) Government Sponsored Enterprises (GSEs), usually federally-chartered but privately-owned corporations; and
- 2) Federal Government agencies which may issue or guarantee these bonds—to finance activities related to public purposes, such as increasing home ownership or providing agricultural assistance. Agency bonds are issued in a variety of structures, coupon rates and maturities.

Each GSE and Federal agency issues its own bonds, with sizes and terms appropriate to the needs and purposes of the financing. There are usually minimums to invest in agency bonds \$10,000 for the first investment and increments of \$5,000 for additional investments. Investing in Ginnie Mae Federal Agency bonds requires a \$25,000 minimum investment. The degree to which an agency bond issuer is considered independent from the federal government impacts the level of its default risk. The interest from most but not all agency bond issues is exempt from state and local taxes; some of the biggest issuers such as GSE entities Freddie Mac and Fannie Mae are fully taxable.

In general the agency bond market is considered a liquid market, in which investments can quickly and easily be bought and sold. However, as explained below, some agency bond issues have features that make the bond issues more "structured" and complex, which can reduce liquidity of these investments for investors and make them unsuitable for individual investors.

Agency Bonds issued by GSEs Bonds issued by GSEs such as the Federal Home Loan Mortgage Association (Freddie Mac), the Federal Home Loan Mortgage Association (Fannie Mae) and the Federal Home Loan Banks provide credit for the housing sector. Federal Agricultural Mortgage Corporation (Farmer Mac); the Farm Credit Banks and the Farm Credit System Financial Assistance Corporation do the same for the farming sector. The bulk of all agency bond debt—GSEs and Federal Government agencies—is issued by the Federal Home Loan Banks, Freddie Mac, Fannie Mae and the Federal Farm Credit banks. GSEs are not backed by the full faith and credit of the U.S. government, unlike U.S. Treasury bonds. These bonds have credit risk and default risk and the yield on these bonds is typically slightly higher than on U.S. Treasury bonds.

iv. Corporate Bonds

Corporate bonds (also called corporates) are debt obligations, or IOUs, issued by private and public corporations. They are typically issued in multiples of

\$1,000 and/or \$5,000. Companies use the funds they raise from selling bonds for a variety of purposes, from building facilities to purchasing equipment to expanding their business.

When you buy a bond, you are lending money to the corporation that issued it. The corporation promises to return your money (also called principal) on a specified maturity date. Until that time, it also pays you a stated rate of interest, usually semi-annually. The interest payments you receive from corporate bonds are taxable. Unlike stocks, bonds do not give you an ownership interest in the issuing corporation.

v. High-Yield Bonds

All bonds are debt securities issued by organizations to raise capital for various purposes. When you buy a bond, you lend your money to the entity that issues it. In return for the loan of your funds, the issuer agrees to pay you interest and ultimately to return the face value (principal) when the bond matures or is called, at a specified date in the future known as the “maturity date” or “call date.”

High-yield bonds are issued by organizations that do not qualify for “investment-grade” ratings by one of the leading credit rating agencies—Moody’s Investors Service, Standard & Poor’s Ratings Services and Fitch Ratings. Credit rating agencies evaluate issuers and assign ratings based on their opinions of the issuer’s ability to pay interest and principal as scheduled. Those issuers with a greater risk of default—not paying interest or principal in a timely manner—are rated below investment grade. These issuers must pay a higher interest rate to attract investors to buy their bonds and to compensate them for the risks associated with investing in organizations of lower credit quality. Organizations that issue high-yield debt include many different types of U.S. corporations, certain U.S. banks, various foreign governments and a few foreign corporations.

3.3 Features of Bonds

i. Set Maturity Dates: bonds have set maturity dates that can range from one to 30 years short-term bonds (mature in three years or less), intermediate bonds (mature in three to ten years) and long-term bonds (mature in ten years or more).

ii. Interest Payments: bonds typically offer some form of interest payment; however, this depends on their structure: "Fixed Rate Bonds" provide fixed interest payments on a regular schedule for the life of the bond; "Floating Rate Bonds" have variable interest rates that are periodically adjusted; and, "Zero Coupon Bonds" do not pay periodic interest at all, but offer an advantage in that they are can be bought at a discounted price of the face value and can be redeemed at the face value at maturity.

iii. Principal Investment Repayment: bond issuers are obligated to repay the full principal amount of a bond in a lump sum when the bond reaches maturity.

iv. Credit Ratings: You can evaluate the "default risk" (the risk that the issuers won't be able to make interest or principal payments) of a bond by checking the rating it has been given by a bond rating agency such as Moody's Investors Service or Standard and Poor's.

v. Callable Bonds: If the bond has a "call feature", the issuer is allowed to redeem the bond before its maturity date, repay the loan and thus, stop paying interest on it.

vi. Minimum Investment: Bonds are usually issued in \$1,000 or \$5,000 denominations

3.4 Benefits of Bonds

a. Bonds can be a reliable source of current income depending on the structure of the bond you buy.

b. Bonds provide a certain element of liquidity, as the bond market is large and active.

- c. If you sell a bond before it matures, you may receive more or less than your principal investment because bond values fluctuate.
- d. Generally, interest income from federal government bonds is exempt from taxation at the state and local level, and the interest income from municipal bonds is usually not subject to federal tax.
- e. In the spectrum of the investment options, investment grade bonds are a relatively low-risk investment.

3.5 Advantages and Disadvantages of Bonds

Advantages of Bonds

- 1.** Bonds have a clear advantage over other securities. The volatility of bonds (especially short and medium dated bonds) is lower than that of equities (stocks). Thus bonds are generally viewed as safer investments than stocks. In addition, bonds do suffer from less day-to-day volatility than stocks, and the interest payments of bonds are sometimes higher than the general level of dividend payments.
- 2.** Bonds are often liquid. It is often fairly easy for an institution to sell a large quantity of bonds without affecting the price much, which may be more difficult for equities. In effect, bonds are attractive because of the comparative certainty of a fixed interest payment twice a year and a fixed lump sum at maturity.
- 3.** Bondholders also enjoy a measure of legal protection: under the law of most countries, if a company goes bankrupt, its bondholders will often receive some money back (the recovery amount), whereas the company's equity stock often ends up valueless. Furthermore, bonds come with indentures (an indenture is a formal debt agreement that establishes the terms of a bond issue) and covenants (the clauses of such an agreement). Covenants specify the rights of bondholders and the duties of issuers, such as actions that the issuer is obligated to perform or is prohibited from performing.

There are also a variety of bonds to fit different needs of investors, including fixed rate bonds, floating rate bonds, zero coupon bonds, convertible bonds, and inflation linked bonds.

Disadvantages of Bonds

1. Bonds are also subject to various other risks such as call and prepayment risk, credit risk, reinvestment risk, liquidity risk, event risk, exchange rate risk, volatility risk, inflation risk, sovereign risk, and yield curve risk.
2. Price changes in a bond will immediately affect mutual funds that hold these bonds. If the value of the bonds in a trading portfolio falls, the value of the portfolio also falls. This can be damaging for professional investors such as banks, insurance companies, pension funds, and asset managers (irrespective of whether the value is immediately "marked to market" or not). If there is any chance a holder of individual bonds may need to sell his bonds and "cash out", the interest rate risk could become a real problem.
3. Bond prices can become volatile depending on the credit rating of the issuer – for instance if credit rating agencies like Standard and Poor's and Moody's upgrade or downgrade the credit rating of the issuer. An unanticipated downgrade will cause the market price of the bond to fall. As with interest rate risk, this risk does not affect the bond's interest payments (provided the issuer does not actually default), but puts at risk the market price, which affects mutual funds holding these bonds, and holders of individual bonds who may have to sell them.
4. A company's bondholders may lose much or all their money if the company goes bankrupt. Under the laws of many countries (including the United States and Canada), bondholders are in line to receive the proceeds of the sale of the assets of a liquidated company ahead of some other creditors. Bank lenders, deposit holders (in the case of a deposit taking institution such as a bank) and trade creditors may take precedence. There is no guarantee of how much money will remain to repay bondholders. In a bankruptcy involving reorganization or

recapitalization, as opposed to liquidation, bondholders may end up having the value of their bonds reduced, often through an exchange for a smaller number of newly issued bonds.

5. Some bonds are callable, meaning that even though the company has agreed to make payments plus interest toward the debt for a certain period of time, the company can choose to pay off the bond early. This creates reinvestment risk, meaning the investor is forced to find a new place for his money. As a consequence, the investor might not be able to find as good a deal, especially because this usually happens when interest rates are falling.

3.6 Characteristics of Bonds

Bonds have a number of characteristics of which you need to be aware. All of these factors play a role in determining the value of a bond and the extent to which it fits in your portfolio.

Face Value/Par Value

The face value (also known as the par value or principal) is the amount of money a holder will get back once a bond matures. A newly issued bond usually sells at the par value. Corporate bonds normally have a par value of \$1,000, but this amount can be much greater for government bonds.

What confuses many people is that the par value is not the price of the bond. A bond's price fluctuates throughout its life in response to a number of variables (more on this later). When a bond trades at a price above the face value, it is said to be selling at a premium. When a bond sells below face value, it is said to be selling at a discount.

Coupon (The Interest Rate)

The coupon is the amount the bondholder will receive as interest payments. It's called a "coupon" because sometimes there are physical coupons on the bond that you tear off and redeem for interest. However, this was more common in the past. Nowadays, records are more likely to be kept electronically.

As previously mentioned, most bonds pay interest every six months, but it's possible for them to pay monthly, quarterly or annually. The coupon is expressed as a percentage of the par value. If a bond pays a coupon of 10% and its par value is \$1,000, then it'll pay \$100 of interest a year. A rate that stays as a fixed percentage of the par value like this is a fixed-rate bond. Another possibility is an adjustable interest payment, known as a floating-rate bond. In this case the interest rate is tied to market rates through an index, such as the rate on Treasury bills.

You might think investors will pay more for a high coupon than for a low coupon. All things being equal, a lower coupon means that the price of the bond will fluctuate more.

Maturity

The maturity date is the date in the future on which the investor's principal will be repaid. Maturities can range from as little as one day to as long as 30 years (though terms of 100 years have been issued).

A bond that matures in one year is much more predictable and thus less risky than a bond that matures in 20 years. Therefore, in general, the longer the time to maturity, the higher the interest rate. Also, all things being equal, a longer term bond will fluctuate more than a shorter term bond.

Issuer

The issuer of a bond is a crucial factor to consider, as the issuer's stability is your main assurance of getting paid back. For example, the U.S. government is far more secure than any corporation. Its default risk (the chance of the debt not being paid back) is extremely small - so small that U.S. government securities are known as risk-free assets. The reason behind this is that a government will always be able to bring in future revenue through taxation. A company, on the other hand, must continue to make profits, which is far from guaranteed. This added risk means corporate bonds must offer a higher yield in order to entice investors - this is the risk/return trade off in action.

The bond rating system helps investors determine a company's credit risk. Think of a bond rating as the report card for a company's credit rating. Blue-chip firms, which are safer investments, have a high rating, while risky companies have a low rating. The chart below illustrates the different bond rating scales from the major rating agencies in the U.S.: Moody's, Standard and Poor's and Fitch Ratings.

| Bond Rating Moody's | S&P/ Fitch | Grade | Risk |
|------------------------|------------|------------|--------------------|
| Aaa | AAA | Investment | Highest Quality |
| Aa | AA | Investment | High Quality |
| A | A | Investment | Strong |
| Baa | BBB | Investment | Medium Grade |
| Ba,B | BB,B | Junk | Speculative |
| Caa/Ca/C | CCC/CC/C | Junk | Highly Speculative |
| C | D | Junk | In Default |

Notice that if the company falls below a certain credit rating, its grade changes from investment quality to junk status. Junk bonds are aptly named: they are the debt of companies in some sort of financial difficulty. Because they are so risky, they have to offer much higher yields than any other debt. This brings up an important point: not all bonds are inherently safer than stocks. Certain types of bonds can be just as risky, if not riskier, than stocks.

3.7 How to read a bond table

| | Coupon | Mat. date | Bid \$ | Yld% |
|------------------|--------|-----------|--------|------|
| Corporate | | | | |
| AGT Lt | 8.800 | Sep 22/25 | 100.46 | 8.75 |
| Air Ca | 6.750 | Feb 02/04 | 94.00 | 9.09 |
| AssCap | 5.400 | Sep 04/01 | 100.01 | 5.38 |
| Avco | 5.750 | Jun 02/03 | 100.25 | 5.63 |
| Bell | 6.250 | Dec 01/03 | 101.59 | 5.63 |
| Bell | 6.500 | May 09/05 | 102.01 | 5.95 |
| BMO | 7.000 | Jan 28/10 | 106.55 | 6.04 |
| BNS | 5.400 | Apr 01/03 | 100.31 | 5.24 |
| BNS | 6.250 | Jul 16/07 | 101.56 | 5.95 |
| CardTr | 5.510 | Jun 21/03 | 100.52 | 5.27 |
| Cdn Pa | 5.850 | Mar 30/09 | 93.93 | 6.83 |
| Clearn | 0.000 | May 15/08 | 88.50 | 8.61 |
| CnCrTr | 5.625 | Mar 24/05 | 99.78 | 5.68 |
| Coke | 5.650 | Mar 17/04 | 99.59 | 5.80 |

Column 1

Column 2

Column 3

Column 4

Column 5

Column 1: Issuer - This is the company, state (or province) or country that is issuing the bond.

Column 2: Coupon - The coupon refers to the fixed interest rate that the issuer pays to the lender.

Column 3: Maturity Date - This is the date on which the borrower will repay the investors their principal. Typically, only the last two digits of the year are quoted: 25 means 2025, 04 is 2004, etc.

Column 4: Bid Price - This is the price someone is willing to pay for the bond. It is quoted in relation to 100, no matter what the par value is. Think of the bid price as a percentage: a bond with a bid of 93 is trading at 93% of its par value.

Column 5: Yield - The yield indicates annual return until the bond matures. Usually, this is the yield to maturity, not current yield. If the bond is callable it will have a "c--" where the "--" is the year the bond can be called. For example, c10 means the bond can be called as early as 2010.

3.8 Yield, Price and Other Confusion

Understanding the price fluctuation of bonds is probably the most confusing part of this lesson. In fact, many new investors are surprised to learn that a bond's price changes on a daily basis, just like that of any other publicly-traded security. Up to this point, we've talked about bonds as if every investor holds them to maturity. It's true that if you do this you're guaranteed to get your principal back; however, a bond does not have to be held to maturity. At any time, a bond can be sold in the open market, where the price can fluctuate sometimes dramatically. We'll get to how price changes in a bit. First, we need to introduce the concept of yield.

Measuring Return with Yield

Yield is a figure that shows the return you get on a bond. The simplest version of yield is calculated using the following formula: $\text{yield} = \text{coupon amount} / \text{price}$. When you buy a bond at par, yield is equal to the interest rate. When the price changes, so does the yield.

Let's demonstrate this with an example. If you buy a bond with a 10% coupon at its \$1,000 par value, the yield is 10% ($\$100 / \$1,000$). Pretty simple stuff. But if the price goes down to \$800, then the yield goes up to 12.5%. This happens because you are getting the same guaranteed \$100 on an asset that is worth \$800 ($\$100 / \800). Conversely, if the bond goes up in price to \$1,200, the yield shrinks to 8.33% ($\$100 / \$1,200$).

Yield to Maturity

Of course, these matters are always more complicated in real life. When bond investors refer to yield, they are usually referring to yield to maturity (YTM). YTM is a more advanced yield calculation that shows the total return you will receive if you hold the bond to maturity. It equals all the interest payments you will receive (and assumes that you will reinvest the interest payment at the same rate as the current yield on the bond) plus any gain (if you purchased at a discount) or loss (if you purchased at a premium).

Knowing how to calculate YTM isn't important right now. In fact, the calculation is rather sophisticated and beyond the scope of this tutorial. The key point here is that YTM is more accurate and enables you to compare bonds with different maturities and coupons.

The Link between Price and Yield

The relationship of yield to price can be summarized as follows: when price goes up, yield goes down and vice versa. Technically, you'd say the bond's price and its yield are inversely related.

Here's a commonly asked question: How can high yields and high prices both be good when they can't happen at the same time? The answer depends on your point of view. If you are a bond buyer, you want high yields. A buyer wants to pay \$800 for the \$1,000 bond, which gives the bond a high yield of 12.5%. On the other hand, if you already own a bond, you've locked in your interest rate, so you hope the price of the bond goes up. This way you can cash out by selling your bond in the future.

Price in the Market

So far we've discussed the factors of face value, coupon, maturity, issuers and yield. All of these characteristics of a bond play a role in its price. However, the factor that influences a bond more than any other is the level of prevailing interest rates in the economy. When interest rates rise, the prices of bonds in the market fall, thereby raising the yield of the older bonds and bringing them into line with newer bonds being issued with higher coupons. When interest rates fall, the prices of bonds in the market rise, thereby lowering the yield of the older bonds and bringing them into line with newer bonds being issued with lower coupons.

MODULE 2: BASIC FINANCIAL ASSETS AND RELATED ISSUES: STOCKS

UNIT 2: STOCKS

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2.0 Objectives

3.0 Main Contents

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3.1.1 The Appeal of Common Stocks

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3.1.3 From Stock Price to Stock Return

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3.3 Basic Characteristics of Common Stocks

3.3.1 Common Stock as a Corporate Security

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1.0 Introduction

Investing in common stock is about taking educated risk. It is also about receiving returns, sometimes spectacular ones too. It looks so easy to invest in common stock but it goes with big risk because common stock ownership makes you part owner of the firm and for this reason, you are carrying the most risk. Investors who risk their money in common stock must learn as much as

possible about the company in which they are investing and the industry to which it belongs.

2.0 Objectives

After studying this unit, you will be familiar with

- Common stocks and dividends payable to common stock holders.
- Learn something about the characteristics of common stocks

3.0 Main Content

3.1 What Stocks have to Offer?

The basic investment attribute of common stocks is that they enable investors to participate in the profits of the firm. Every shareholder is a part owner of the firm and, as such, is entitled to a piece of the firm's profit. This claim on income is not without limitations, however, because common stockholders are really the residual owners of the company. That is, they are entitled to dividend income and a share of the company's earnings only after all other corporate obligations have been met. Equally important as residual owners, holders of common stock have no guarantee that they will ever receive any return on their investment.

The challenge, of course, is to find stocks that will provide the kind of return you are looking for. As anyone who has ever purchased stock can attest, it is not really easy to settle at common stock for there are literally thousands of actively traded stocks to choose from.

3.1.1 The Appeal of Common Stocks

Common stocks are a popular form of investing, used by millions of individual investors. Their popularity stems from the fact that they offer investors an opportunity to tailor their investment programmes to meet individual needs and preferences. Given the size and diversity of the stock market, it is safe to say that no matter what the investment objective, there are common stocks to fit the bill. For retired people and others living on their investment holdings, stocks provide a way of earning a steady stream of current income, common stocks can

serve as the basis for long-run accumulation of wealth. With this strategy, stocks are used very much like a savings account. Investors buy stock for the long haul as a way to earn not only dividends but also a steady flow of capital gains. These investors recognize that stocks have a tendency to go up in price over time, and they simply position themselves to take advantage of that fact. Indeed, it is this potential for capital gains that is the real incentive for investment in common stocks. Whereas dividends can provide a steady stream of income, the big returns come from capital gains. And few securities can match common stocks when it comes to capital gains.

3.1.2 Putting Stock Price Behaviour in Perspective

By the special nature of common stock, when the market is strong, investors can generally expect to benefit from steady price appreciation. On the other hand, when the market falters, that is, when the market is weak, stock price will begin to dwindle. The rise and fall characteristic of the stock market dictated by stock market condition gave rise to the concept of “Bull” and “Bear” situation in the stock market.

Bull Market: The stock market is said to be in bull shape when there is general rise in the price of stocks traded on it. There is active buying and selling, and investors are making money.

Bear Market: The stock market is said to be in bear shape when the general stock price is on the decline. There are not lively transactions and investors are losing money.

3.1.3 From Stock Price to Stock Return

So far, we have centred our discussion on stock prices, but what is even more important to investors is stock returns, which take into account, not only price behaviour, but also dividend income and capital gains.

Generally, when a firm is performing well and earning good profits, the chances are that it will declare high figure of dividend to be paid to common stockholders. The market price of shares of a high-performing firm will always be

on the increase. This means too that stockholders can make capital gains when they sell their stock in the stock exchange market.

3.2 The Pros and Cons of Stock Ownership

One reason why common stocks are so attractive to investors is the substantial return opportunities they offer. Stocks generally provide attractive highly competitive returns over the run. Indeed, common stock returns compare favourably to alternative investment outlets such as long-term corporate bonds and treasury bills.

The special advantage of equity securities (common stocks) is that stock holders are entitled to participate fully in the residual profit of the firm. In good times they earn higher dividends greater than the interest payable to bondholders.

3.2.1 Other Benefits of Common Stock

Common stocks offer some other special benefits. They are easy to buy and sell, and the transaction costs are modest. Moreover, price and market information is widely disseminated in the news and financial media. A final advantage of stock ownership is that the unit cost of share of common is usually within the reach of most individual investors. A final advantage of stock ownership is that the unit cost of share of common stock is usually within the reach of most individual investors. Unlike bonds, which carry minimum denomination of at least N100, N150 or N200 a share and any number of shares, no matter how few, can be bought or sold.

3.2.2 Disadvantages of Holding Common Stock

Looking at the other side of the coin, there are some disadvantages, too, associated with holding common stock. The major disadvantage has to do with risk. Common stocks are subject to a number of different types of risk. These risk include business and financial risk, purchasing power risk, market risk, and possibly event risk. All of these can adversely affect a stock's earnings and dividends, its price appreciation, and, of course, the rate of return earned by an investor.

Even the best of stocks possess elements of risk that are difficult to overcome, because company earnings are subject to many factors, including government control and regulation, foreign competition and state of the economy. Because such factors affect sales and profits, they also affect the price behaviour of the stock and even dividends. All of these lead to another disadvantage: The earnings and performance of a stock are subject to wide swings so it is difficult to value common stock adequately.

3.3 Basic Characteristics of Common Stocks

Each share of common stock represents equity (ownership) in a company. Indeed, it is this equity position that explains why common stocks are often referred to equity securities or equity capital. Every share entitles the holder to an equal ownership position and participation in the corporation's earnings and dividends, and equal vote, and equal voice in management. Together, the common stockholders own the company, and the more shares an investor owns, the bigger his or her ownership position. Common stock has no maturity date; it remains in position and in power indefinitely unless the holder decides to sell it to another investor.

3.3.1 Common Stock as a Corporate Security

All business firms (private and public) issue common stock. However, only the common stocks of publicly quoted corporate bodies are traded in the stock market. These are the shares that are readily available to the general public and which are bought and sold in the open market.

Shares of common stock can be issued in several different ways. The most widely used procedure today is the "public offering" of new shares, whereby the corporation, working with an underwriter, offers the investing public a certain number of shares at a certain price. New shares can also be issued using what is known as a "rights offering." In a rights offering, existing shareholders are given the first opportunity to buy the new issues and can purchase new shares in proportion to their current ownership position. For instance, if a stockholder

currently owns one per cent of a firm's stock and the firm issues 10,000 additional shares, the rights offering will give that stockholder the opportunity to purchase one percent of 10,000 shares which boils down to 100 shares.

3.3.2 Classified Common Stock

For the most part, all the stockholders in a corporation enjoy the same benefits of ownership. Occasionally, (though not a common feature in the developing countries), a company can issue different classes of common stock, each of which entitles the holder to different privileges and benefits. These issues are known as Classified Common Stock.” Hundreds of publicly traded companies, especially in the developed economies, have created such stock classes. Even though issued by the same company, each class of common stock is different in a way.

Classified common stock is customarily used to denote either different voting rights or different dividend obligations. For instance, class A stock could be used to designate non-voting shares, and class B could carry normal voting rights. Ford Motor Company in U.S.A. is known for issuing two classes of common stock (ordinary shares). Class A stock is owned by the investing public, and class B stock is owned by the Ford family . The two classes of stock share equally in the dividends, but class A stock has one vote per share and the voting rights of the class B stock are structured to give the Ford Family a 40 per cent absolute control of the company.

4.0 Conclusion

In this unit, we have discussed common stock and what it has to offer investors. We noted that common stock, also referred to as ordinary share or equity share gives the holder ownership right in the firm according to the number of shares each investor holds. An investor in the stock of a firm is interested in the earnings. This earning comes in form of dividend payable to him at the end of every year when the company makes profit. The investor can also benefit from capital through the sale of his shares.

5.0 Summary

Investment in common stock can be said to be the best investment so long as the company is performing profitably. The common stock holder in a well-performing company receives dividend at the end of the year. He can sell his shares to make capital gains, and he has voting right and by voting right, he is indirectly participating in the running of the organization. In good times, the investor makes capital gains out of his shares, and in bad periods he will incur capital losses.

6.0 Tutor-Marked Assignment

- Why is the common stock holder referred to as Residual Owner of the company?
- When can a common stock holder incur capital loss?

7.0 Reference/Further Reading

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UNIT 3: BUYING AND SELLING OF COMMON STOCKS

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1.0 Introduction

In the stock market investors engage in the buying and selling of stocks. The buying and selling of stocks demand that the investor should be familiar with the way stocks are quoted and the costs of executing common stock transactions. This unit will introduce the student to the requirements for successful buying and selling of common stocks.

2.0 Objectives

After studying this unit, the student should be familiar with:

- Knowledge and wisdom required for successful buying and selling of common stocks
- How to determine the “par value” and “book value” of common stocks.

3.0 Main Content

3.1 Buying and Selling of Common Stocks

Whether buying or selling stocks, investors should be familiar with the way stocks are quoted and with the costs of executing common stock transactions. Certainly, keeping track of current prices is an essential element in the buying and selling decisions of investors. They are the link in the decision process that lets the investor decide when to buy or sell a stock. They also help investors monitor the market performance of their security holdings. Similarly, transaction costs are important because of the impact they can have on investment returns. Indeed, the costs of executing stock transactions can sometimes consume most (or all) of the profits from an investment. These costs should not be taken lightly.

3.1.1 Reading the Quotes

Investors in the stock market have come to rely on a highly efficient information system that quickly disseminates market prices to the public. The stock quotes that appear daily in the financial press are a vital part of that information system. To see how price quotations work and what they mean, consider the quotes that appear daily in the Financial Times and other Newspapers. These quotes give, not only the most recent price of each stock, but also a great deal of additional information.

3.1.2 Transaction Costs

Common stock can be bought and sold in round or odd lots. A round lot is 100 shares of stock.

An odd lot is a transaction involving less than 100 shares. The sale of 400 shares of stock would be a round lot transaction; the sale of 75 shares would be

an odd lot transaction. Trading 250 shares of stock would involve a combination of two round lots and an odd lot.

An investor incurs certain transaction costs when buying or selling stock. In addition to some modest transfer fees and taxes paid by the seller, the major cost is the brokerage fee paid by both the buyer and the seller at the time of the transaction. As a rule, brokerage fees amount to one per cent to five per cent of most transactions, though they can go much higher particularly for very small trades. This is so because the purchase or sale of odd lots requires the assistance of a specialist known as an odd-lot dealer. This usually results in an odd-lot differential of 12.5 to 25 kobo per share.

3.2 Common Stock Value

The worth of a share of common stock can be described in a number of ways. Terms such as par value, book value, market value, and investment value are all found in the financial media. Each designates some accounting, investment, or monetary attribute of the stock in question.

3.2.1 Par Value

The term “par value” refers to the stated, or face value of a stock. It is not really a measure of anything, and except for accounting purposes, it is relatively useless. In many ways, par value is a throwback to the early days of corporate law, when it was used as a basis for assessing the extent of a stockholder’s legal liability. Because the term has little or no significance for investors, many stocks today are issued as no-par or low-par stocks, that is, they may have par values of only a penny or two.

3.2.2 Book Value

“Book Value,” another accounting measure, represents the amount of stockholder’s equity in the firm. It is commonly used in security analysis and stock valuation. Book value indicates the amount of stockholder funds used to finance the firm. It is calculated by subtracting the firm’s liabilities and preferred stock from its assets.

Let us assume that a corporation has N10 million assets, owes N5 million in various forms of short- and long-term debt, and has N1 million worth of preferred stock outstanding. The book value of this firm would be N4 million. This amount can be converted to a per-share basis (book value per share) through dividing it by the number of common shares outstanding. For example, if this firm has 100,000 shares of common stock outstanding, then its book value per share is N40. As a rule, most stocks have market prices that are above their book values.

“Market value” of a stock is one of the easiest stock values to determine. It is simply the prevailing market price of an issue. In essence, market value indicates how the market participants as a whole have assessed the worth of a share of stock. By multiplying the market price of the stock by the number of shares outstanding, we can also find the market value of the firm itself, or what is known as the firm’s market capitalization. For example, if a firm has N1 million shares outstanding and its stock trades at N50 per share, the company has a market value (or market cap) of N50 million. Because investors are always interested in an issue’s market price, the market value of a share of stock is generally of considerable importance to stockholders as they formulate their investment policies and programmes.

3.2.4 Investment Value

Investment value is probably the most important measure for a stockholder. It indicates the worth investors place on the stock, that is to say, what they think the stock should be trading for. Determining a security’s investment worth is a complex process based on expectations of the return and risk behaviour of a stock. Every stock has two potential sources of return. The first one is annual dividend payments and the second is possible capital gains that could accrue if the stock is sold after the market price of that stock has appreciated.

In establishing investment value, investors try to determine how much money they will make from these two sources and then use that estimate as the basis

for formulating the return potential of the stock. At the same time, they try to assess the amount of risk to which they will be exposed by holding the stock. Such return and risk knowledge helps them place an investment value on the stock. This value represents the maximum price an investor should be willing to pay for the issue.

3.3 The Dividend Decision

By paying out dividends on annual or half-yearly basis, companies share with their stockholders the profits they earn. Actually, the question of how much to pay in dividend is decided by a firm's board of directors. The directors evaluate the firm's operating results and financial condition to determine whether dividends should be paid and, if so, how much. If the directors decide to pay dividends, they also establish several important payment dates.

3.3.1 Corporate Versus Market Factors

When the board of directors assembles for a regular dividend meeting, it weighs a variety of factors in making the dividend decision. First, the board looks at the firm's earnings. Even though a company does not have to show a profit to pay dividends, profits still are considered a vital link in the dividend decision.

With common stocks, the annual earnings of a firm are usually measured and reported in terms of earnings per share (EPS). Basically, EPS translates total corporate profits into profits on a per-share basis and provides a convenient measure of the amount of earnings available to stockholders. Earning per share is found by using the following simple formula:

$$\text{EPS} = \frac{\text{Net profit after taxes} - \text{Preferred dividends}}{\text{Number of shares of common stock outstanding}}$$

3.3.2 Components of Risk

Let us assume the directors decide to declare a dividend. They then must indicate the date of payment and other important dates associated with the dividend. Normally, the directors will issue a statement to the press indicating their dividend decision, along with the dividend payment dates. These statements are widely published in the Financial Times and other print media.

Three dates are particularly important to the stockholder: The date of record, ex-dividend date, and payment date. The “date of record” is the date on which the investor must be a registered shareholder of the firm to be entitled to a dividend. These stock holders are usually referred to as “holders of record.” When the board specified the date of record, all the investors who are official stock holders of the firm as of the close of business on that date will receive the dividends that have just been declared.

The “Payment date” is also set by the board of directors. Generally, the payment date follows the date of record after one week. The payment date is the actual date on which the firm will mail dividend cheques to holders of record.

Because of the time needed to make book-keeping entries after a stock is traded, the stock will sell on an “ex-dividend” basis for three business days prior to the date of record. That is, the ex-dividend date will dictate whether you were an official shareholder and therefore eligible to receive the declared dividend. If you sell your stock before this date, the new shareholder will receive the recently declared dividend.

4.0 Conclusion

In this unit, we studied the process of buying and selling common stocks. We noted that it is advisable for an investor to get familiar with the way stocks are quoted and the costs of executing common stock transactions. We also looked at common stock values and discussed the par value, book value, market value and investment value of common stock.

5.0 Summary

Keeping track of current prices is an essential element in the buying and selling of common stock. Similarly, transaction costs are important because of the impact they can have on investment returns since the ultimate aim of every investor is to earn the highest possible returns. Common stock holders receive dividend on their holdings. They are interested in receiving high figures of dividend hence the way a firm makes investment decision is of interest to them.

6.0 Tutor-Marked Assignment

- Explain the meaning of “par value” and “market value” of common stock
- How does a publicly quoted firm make dividend decision

7.0 Reference/Further Reading

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UNIT 4 EVALUATION OF COMMON STOCKS

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1.0 INTRODUCTION

The objective of common stock evaluation is to obtain standards against which prevailing prices of stocks may be judged. It is assumed that investors, as a whole, are essentially rational over the long run, and that rational individuals attempt to measure the economic, or “going concern” values of the corporations whose stocks they buy and sell. Since there are millions of investors, there will exist vastly different ideas about the value of any given stock at any given time, and purchases and sales of the stock will be made in accordance with this multitude of ideas. Therefore, over an extended period of time, prices will fluctuate in a wide range but they will tend to fluctuate around some consensus of value.

1.0 OBJECTIVES

After studying this unit, the student will be familiar with:

- How to evaluate common stock

- The general sources of common stock value
- Dividend payment and Dividend Growth Prospects

3.0 MAIN CONTENT

3.1 The Sources of Common Stock Value

Readers who ponder over the problem of common stock valuation will realize that a common stock has value for only three possible reasons. First, the ownership of common stock confers a claim to a corporation's net income. This claim bears fruit when the corporation's board of directors declares dividends. Second, if the corporation enjoys growing success, earnings and dividends will rise, and the price of its stock may rise also. The third, and least significant, source of common stock value is that if a corporation is liquidated, the common stock owner has a pro rata claim to any asset value that may remain after all creditors and the preferred stockholders have been paid. This residual claim, therefore, may give the common stock some value. But it is not a very important source of value because an efficiently operating corporation is not usually liquidated. And if it is liquidated because it is not operating efficiently, the asset value is not likely to be high enough to leave much of residual gain for the stockholders.

3.1.1 Dividend and Common Stock Value

When earnings and dividends are put together and considered in the context of common stock value, it gives rise to an interesting question on both a practical and a philosophical plane.

We often hear the argument that dividends are distinctly subordinate to earnings as a determinant of stock values. The evidence offered in support of this argument is the activity of thousands, perhaps millions, of investors whose dominant objective in buying common stock is to sell it to someone else to at a higher price to make capital gain rather than to keep it in order to collect dividends on it.

It is, of course, true that many individual stockholders do not intend to hold their stocks for dividends, hoping instead to sell their stocks to others at capital gains. But to conclude from this observation that "dividends do not count" would be quite misleading. In the first place, it is a frequent occurrence for the price of common stock to change substantially when a dividend increase or dividend reduction is announced. One likely explanation for this is that since reported earnings do not necessarily "true" earnings, investors look to dividends for an indication of what management really thinks earnings are (or are going to be in the future

3.1.2 What the investor thinks of Dividend Payment

On a more theoretical plane, the significance of dividends has some time been illustrated by hypothesizing the existence of a corporation which has written into its bylaws a perpetual prohibition of dividend payments or a return of capital to stockholders via sale of assets or by any other means. With these bylaws, no rational investor will be willing to purchase the corporation's stock, no matter how high its earnings or how low the asking price. Of course, people sometimes become irrational or follow the "the greater fool theory" where each buyer assumes that he or she will be able to sell at a higher price to a "greater fool." But such bubbles must inevitably burst. Our hypothetical corporation's stock might trade for a while, but people must eventually recognize that they are buying and selling a mere piece of paper, without any value in the absence of an ability to pay dividends. Thus, while much of a stock's value to an investor undoubtedly lies in the prospect of price appreciation prices cannot be divorced from dividend prospects any more than they can be divorced from prospective earning power.

3.2 The Concept of Present Value of Future Dividends

Those who recognize the significance of dividends as a determinant of stock values can understand the reasoning behind a widely accepted tenet of investment theory. The tenet is that a common stock is "worth" the present value of all future dividends.

The concept of present value is really quite simple and can be illustrated with easy understanding. Assume that Mr. A wants to borrow money from Mr. B, repayable at a future date. Mr. B is willing to make the loan, but feels that, considering the risk involved, he is entitled to a 10 percent annual rate of return. This being the case, how much money will Mr. B advance Mr. A on IOU for \$10 payable one year hence? The answer is \$9.09, because the \$10 paid next year provides 91 cents interest, which is 10 percent of a \$9.09 loan. Thus \$9.09 is the present value of \$10 payable one year hence at a "discount" rate of 10 percent.

Likewise, if Mr. A offers \$10 IOU payable two years hence, how much will Mr. B be willing to lend? Answer: \$8.26. Ten percent of \$8.26 is 83 cents (first year's interest); \$8.26 plus \$0.83 = \$9.09. Ten percent of \$9.09 is 91 cents (second year's interest; \$9.09 plus \$0.91 = \$10. The present value of \$10 payable two years hence is \$8.26 at a discount rate of 10 percent.

3.2.1 Present Value of Perpetual Dividend Growth

Let return to the matter of future dividends on common stock, suppose we estimate that dividends on Standard & Poors Stock Price Index will grow at a rate of 7 percent far into the future. Suppose we estimate that “the market” (not any individual investor but all investors as a group) will always demand a 10 percent rate of return in order to undertake the risks of common stock investment. Recognizing that these assumptions are made purely for illustrative purposes, what is the value of the S & P Index today?

There is a simple formula for approximating the present value of perpetual dividend growth, at a constant discount rate. The formula is:

$$\text{Present Value} = \frac{\text{Current dividend rate}}{\text{Discount rate minus growth rate}}$$

Under our illustrative assumption, this becomes:

$$\frac{\text{Current dividend rate}}{0.10 \text{ minus } 0.07}$$

3.2.2 Today's Investors and Dividend Growth

Does it mean then that today's investors actually have to estimate dividend growth and discount rates to perpetuity in order to utilize the theoretical concept of present value of future dividends? This is not really so because the proportion of the total value represented by distant years' dividends diminishes rapidly unless the discount rate is quite close to the growth rate. Under most reasonable discount and growth rate assumptions (for example, where the discount rate is at least several percentage points higher than the growth rate), two thirds or more of the total “value” is accounted for by the first 30 years of dividends. Note that if one assumes a growth rate equal to, or greater than, the discount rate, a nonsense “value” results.

Of course, 30 days is by no means a short period for estimating either growth rates or discount rates. Indeed, most security analysts consider themselves fortunate if their growth rate estimates for the companies they follow hold good for five years. On the other hand,

while long-term estimates are highly uncertain for individual stocks, the potential errors are diminished when considering all stocks in aggregate.

3.3 Growth Prospects for Stocks in Aggregate

As economists, the authors have a proclivity to relate most economic variables to gross national product, which they feel can be subjected to future estimation more accurately than most other variables. The question of aggregate dividend growth, therefore, is broken into three parts. First, what rate of GNP growth can be expected in the years ahead; second, will earnings per share of common stock keep pace with GNP; and third, will dividend growth keep pace with earnings growth? It should be emphasized at the outset that our main purpose is to provide a frame-work for thinking about these problems rather than to argue that our specific perspectives and specific answers are correct.

3.3.1 Growth of Gross National Product (GNP)

The growth of gross national product can be conveniently divided into four variables for analytical purposes: The growth of the employed labour force; the trend of average hours worked per week; the trend of output per hour worked (productivity); and the rate of change in the price level. By combining forecasts of the first three of these variables, a forecast of growth of so-called GNP is derived, that is, growth of physical output of goods and services excluding the effects of price changes. The three determinants of real GNP have had a stable enough history during the past century to enable us to make some long-term estimates with a far degree of confidence. Without outlining their views in detail, it can be said that the estimates of most economists fall within the following ranges; approximately 1.5% to 2% annum growth in the employed labour force; 0.5% per annum decline in hours worked per week; and 2% to 3% per annum growth of output per hour worked. These elements combine to produce a 3% to 5% range of real GNP growth possibilities, with about 3% to 4% being the most common forecast.

3.3.2 Earnings Per share Relative to GNP

Turning to the question whether earnings per share will keep pace with GNP, a look at the past is in order. That is to say, we should study the history of earnings of the company for the past six years. The trend will generally give us an idea as to whether then earning per share is keeping pace with the GNP.

Dividends Relative to Earnings: Except during periods of recession, when dividend payout ratios may rise sharply because management may wish to maintain payments to stockholders even in the face of declining earnings. Most well-established companies adopt this strategy to ensure that stock prices in the market are not affected by a decrease in the dividend pay out to shareholders.

4.0 CONCLUSION

Under this unit, we made it clear that the objective of evaluating common stock is to obtain standards against which prevailing prices of stocks may be judged. We mentioned that there are three sources of common stock value. These are: Through ownership of stock which confers part-ownership of the company to the investor, dividend payment by the company, and third, possible residual gains from the company's assets in the event of liquidation.

4.0 SUMMARY

Common stock is valued to obtain standard or yardstick for measuring prevailing prices of stocks in the market. It is assumed generally that investors are rational human beings and that rational individuals attempt to measure the economic value of the company whose stocks they buy and sell. Since there are many investors, there will always be different ideas about the value of any given stock at a given time. Dividend payment level to shareholders has tremendous impact on the price of a company's shares.

5.0 TUTOR-MARKED ASSIGNMENT

- What is the reason for evaluating common stocks
- Enumerate and explain the three sources of common stock value
- What do you understand by "present value of future dividends"?

7.0 REFERENCE/FURTHER READING

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UNIT 5 INVESTING IN FIXED-INCOME SECURITIES

CONTENTS

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1.0 INTRODUCTION

Under this unit, we shall be studying investment in fixed-income securities. Some securities such as bonds carry fixed-income payable at maturity. Other investments instruments, such as, common stock has no fixed-income. An investor in common stocks receives dividend and dividend payment is dependent on the earnings power of the issuing firm.

2.0 OBJECTIVES

After studying this unit, the student will be familiar with:

- The process of investing in fixed-income securities
- The advantages and disadvantages in fixed-income investment

3.0 MAIN CONTENT

3.1 Investment in Fixed-Income Securities

The oil industry is one of the world's most capital intensive businesses today. It requires billions of Naira worth of equipment for exploration and production of natural resources. One of the largest oil companies operating in Nigeria is Mobil, which searches for oil and natural gas throughout the world. Much of Mobil's equipment is financed through the issuance of long-term bonds. Because Mobil is such a strong company, investors in its bonds are confident that the debt will be paid. Mobil, of course, must pay investors interest on these bonds, but because it has a strong credit rating, it does not have to pay as high an interest rate as some other less well-established companies.

3.1.1 Why Invest in Bonds?

In the past, investment in bonds was viewed as rather dull investment that produced current income and little else. It is no longer true today, instead bonds are regarded as highly competitive investment instruments that offer the potential for attractive returns.

Bonds are publicly traded long-term debt securities whereby the issuer agrees to pay a fixed amount of interest over a specified period of time and to repay a fixed amount of principal at maturity. Bonds are issued in convenient denominations and by a variety borrowing companies, government corporations, states and local governments. Bonds are referred to as fixed –income securities because the debt-service obligations of the issuer are fixed. That is, the issuing organization agrees to pay a fixed amount of interest periodically and to repay a fixed amount of principal at maturity.

Like any other type of investment instrument, bonds provide investors with two kinds of income:

- (1) They provide a generous amount of current income.
- (2) They can often be used to generate substantial amounts of capital gains.

The current income is, of course, derived from the interest payments received over the life of the issue. Capital gains, in contrast, are earned whenever market interest rates fall. A basic trading rule in the bond market is that interest rates and bond prices move in opposite directions. When interest rates rise, bond prices fall, and when interest rates drop, bond prices move up. Thus, it is possible to buy bonds at one price and to sell them later at a higher price. Of course, it is also possible to incur a capital loss, should market rates move against you.

3Taken together, the current income and capital gains earned from bonds can lead to attractive investor returns.

3.1.2 Bonds as Versatile Investment Outlet

Bonds are also a versatile investment outlet. They can be used conservatively by those who primarily (or exclusively) seek high current income, or they can be used aggressively by those who go after capital gains. Although, bonds have long been considered attractive investments for those seeking current income, it is only since the advent of volatile interest rates that they have also been recognized as outstanding trading instruments. Investors found that, given the relation of bond prices to interest rates, the number of profitable trading opportunities increased substantially as wider and more frequent swings in interest rates began to occur.

In addition, certain types of bonds can be used for tax shelter. Municipal obligations are perhaps the best known in this regard, but certain federal agency issues also offer some tax advantages. Finally, because of the general high quality of many bond issues, they can also be used for preservation and long-term accumulation of capital. With quality issues, not only do investors have a high degree of assurance that they will get their money back at maturity, but the stream of interest income is also highly dependable.

3.1.3 Putting Bond Market Performance in Perspective

The bond market is driven by interest rates. In fact, the behaviour of interest rates is the single most important force in the bond market. These rates determine not only the amount of current income investors will make but also the amount of capital gains (or losses) bondholders will incur. It is not surprising, therefore, that bond market participants follow interest rates closely and that bond market performance is generally portrayed in terms of market interest rates.

3.2 Total Returns in the Bond Market

As with stocks, total returns in the bond market are made up of current income and capital gains (or losses). Not surprisingly because rising rates mean falling prices, the drawn-out bear market in bonds mean depressing returns for bondholders. For investors just entering the market, the higher market yields were welcomed, because they meant higher levels interest income. But for those already holding bonds, the implications were much different, as returns fell way below expectations and, in many cases resulted into outright losses.

Some market experts go so far as to question whether bonds should have any place at all in an investment portfolio. They reason that if interest rates have bottomed out, then bonds will not have a lot to offer investors (other than relatively low returns).

3.2.1 Exposure to Risk

Like any other type of investment instrument, fixed-income securities should be viewed in terms of their risk and return. Generally speaking, bonds are exposed to five major types of risks; interest rate risk, purchasing power risk, business/financial risk, liquidity risk, and call risk.

Interest Rate Risk: Interest rate risk is the number one source of risk to fixed-income investors, because it is the major cause of price volatility in the bond market. In the case of bonds, interest rate risk translates into market risk: The behaviour of interest rates, in general affects all bonds and cuts across all sectors of the market including the government treasury bills market. When market interest rates rise, bond prices fall, and vice versa. And as interest rates become more volatile, so do bond prices.

Purchasing Power Risk: Purchasing power risk accompanies inflation. During periods of mild inflation, bonds do pretty well, because their returns tend to outstrip inflation rates. Purchasing power risk really hits up when inflation takes off. When that happens, bond yields start to lag behind inflation rates. The reason: You have a fixed coupon rate on your bond, so even though market yields are rising with inflation, your return is locked-in during the inflation period.

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3.2.2 Other Risks Associated with investment in Bonds

Business/Financial Risk: This is basically the risk that the issuer will default on interest and/or principal payments. Business/financial risk has to do with the quality and financial integrity of the issuer; the stronger the issuer, the less business/financial risk there is to worry about. This risk does not even exist in some securities. For example, the government treasury bills do not have business/financial risk.

Liquidity Risk: Liquidity risk is the risk that a bond will be difficult to unload if you want or have to sell it. In certain sectors of the market, this is a far bigger problem than a lot of investors realize. Even though the bond market may be enormous, the market is chiefly over-the-counter in nature, and much of the activity occurs in the primary/new issue market.

Therefore, with the exception of the Treasury market and good deal of the agency market, relatively little trading is done in the secondary markets.

Call Risk: Call risk is sometimes referred to as prepayment risk, and this is the risk that a bond will be “recalled,” that is, retired long before its scheduled maturity date. Issuers are often given the opportunity to prepay their bonds, and they do so by calling them in for prepayment.

When issuers call their bonds, the bondholders end up getting cashed out of their deal and have to find another place for their investment funds, and there lies the problem. Because bonds are nearly always called for prepayment after interest rates have taken big fall, comparable investment instruments will just not be available. Thus the investor will be forced to replace a high-yielding bond with a much lower-yielding issue.

3.3 Essential Features of a Bond

A bond is a negotiable, long-term debt instrument that carries certain obligations (including the payment of interest and the repayment of principal) on the part of the issuer. Because bondholders, unlike holders of common stock, are only lending money to the issuer, they are not entitled to an ownership position or to any of the rights and privileges open to the common stock holders. But bond holders and well as bond issuers do have a number of well defined rights and privileges that together help to define the essential features of a bond.

Bonds Interest and Principal: In the absence of any trading, a bond investor’s return is limited to fixed interest and principal payments. That is because bonds involve fixed claim on the issuer’s income and a fixed claim on the assets of the issuer. As a general rule, bonds pay interest every six months. There are sometimes exceptions. Some issues carry interest payment intervals as short as two months and others as long as one year. The amount of interest due is a function of a “coupon.” A coupon is the feature on a bond which defines the amount of annual interest income due to an investor. For example, a N1,000 bond with an 8 per cent coupon pays N80 interest to the investor. Also, the principal amount of a bond, known as an issue’s par value, specifies the amount of capital that must be repaid to the investor at maturity.

3.3.1 Maturity Date

Unlike common stock, all debt securities have limited lives and will expire on a given date in the future which is called the issue’s “maturity date.” Although, a bond carries a series of specific interest payment dates, the principal is repaid only once; on or before maturity.

Because the maturity date is fixed (and never changes), it not only defines the life of a new issue but also denotes the amount of time remaining for older, outstanding bonds.

Two types of bonds can be distinguished on the basis of maturity; term and serial issues.

A “term bond” has a single, fairly lengthy maturity date and is the most common type of issue. A “serial bond” has a series of different maturity dates, perhaps as many as 15 to 20 within a single issue. For example, a 20-year term bond issued in 1995 has a single maturity date of 2015, but that same issue as a serial bond might have 20 annual maturity dates that extend from 1996 through 2015. At each of these annual maturity dates, a certain portion of the issue would come due and be paid off.

Maturity is also used to distinguish a note from a bond. That is, a debt security that is originally issued with maturity of 2 to 10 years is known as a note, whereas a bond technically has an initial term of maturity of more than 10 years. In practice, notes are often issued with maturities of 5 to 7 years, whereas bonds normally carry maturities of 20 to 30 years or more.

3.3.2 Call Features – Let the Buyer Beware

Consider the following situation: You have just made an investment in a high-yielding, 25-year bond. Now all you have to do is sit back and let the cash flow-in. Well, perhaps that may happen for a few years. However, if market interest rates drop, it is also likely that you will receive a notice from the issuer that the bond is being called. This means that the issue is being retired before its maturity date. There is really nothing you can do but to turn in the bond and to invest your money elsewhere. The practice is all perfectly legal because every bond is issued with a call feature which stipulates whether and under what conditions a bond can be called-in for retirement prior to maturity. Basically, there are three types of call features:

- (1) A bond can be “freely callable” which means that the issuer can prematurely retire the bond at any time.
- (2) A bond can be “non-callable” which means that the issuer is prohibited from retiring the bond prior to maturity.
- (3) The issue could carry a “deferred call” which means that the issue cannot be called until after a certain length of time has passed from the date of issue. In essence, the issue is non-callable during the deferment period and then becomes freely callable thereafter.

Call features are placed on bonds for the benefit of the issuers. They are used most often to replace one issue with another that carries a lower coupon payment, and the issuer benefits by realizing a reduction in annual interest cost. Thus, when market interest rates undergo a sharp decline, bond issuers retire their high-yielding bonds and replace them with lower-yielding obligations.

The net result is that the investor is left with a much lower rate of return than anticipated.

In an attempt to compensate investors who have lost some earnings as a result of bond call, a “call premium” is tacked onto a bond and paid to investors along with the issue’s par value at the time the bond is called. Thus, the sum of the par value plus call premium represents the issue’s “call price” which becomes the amount the issuer must pay to retire the bond prematurely.

4.0 CONCLUSION

Under this unit, we noted that most big firms finance their operations through the issuance of long-term debt instrument. The issuance of corporate bonds is one of the most popular debt instruments. Investors in bonds are confident that they will get their money back when investing in well-established company like Mobil oil and others. Investors in bonds are paid fixed interest usually annually and the return of their capital at maturity.

5.0 SUMMARY

No business organization can have enough capital for all its operational needs. What companies do is to borrow money from lenders. What well-established companies do is to issue long-term bond to investors and make money available for their operations. Bonds are publicly traded long-term debt securities. They are issued in convenient denominations to investors. Bonds are exposed to many kinds of risks including interest rate risk, purchasing power risk, business risk, liquidity risk and call risk.

6.0 TUTOR-MARKED ASSIGNMENT

- What benefit does an investor in long-term corporation bond derive?
- Discuss two types of risk to which a bond instrument is exposed

7.0 REFERENCES/FURTHER READING

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MODULE 3: Asset pricing,

UNIT 1: Asset pricing

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1.0 INTRODUCTION

The capital asset pricing model (CAPM) is a model that describes the relationship between risk and expected return and that is used in the pricing of risky securities.

2.0 OBJECTIVES

- Definition of CAPM

3.0 MAIN CONTENTS

3.1 Capital Asset Pricing

The CAPM was introduced by Jack Treynor (1961, 1962), William F. Sharpe (1964), John Lintner (1965a,b) and Jan Mossin (1966) independently, building on the earlier work of Harry Markowitz on diversification and modern portfolio theory. Sharpe, Markowitz and Merton Miller jointly received the 1990 Nobel Memorial Prize in Economics for this

contribution to the field of financial economics. Fischer Black (1972) developed another version of CAPM, called Black CAPM or zero-beta CAPM, that does not assume the existence of a riskless asset. This version was more robust against empirical testing and was influential in the widespread adoption of the CAPM.

The CAPM says that the expected return of a security or a portfolio equals the rate on a risk-free security plus a risk premium. If this expected return does not meet or beat the required return, then the investment should not be undertaken. The security market line plots the results of the CAPM for all different risks (betas).

The CAPM is a model for pricing an individual security or portfolio. For individual securities, we make use of the security market line (SML) and its relation to expected return and systematic risk (beta) to show how the market must price individual securities in relation to their security risk class. The SML enables us to calculate the reward-to-risk ratio for any security in relation to that of the overall market. Therefore, when the expected rate of return for any security is deflated by its beta coefficient, the reward-to-risk ratio for any individual security in the market is equal to the market reward-to-risk ratio, thus:

$$\frac{E(R_i) - R_f}{\beta_i} = E(R_m) - R_f$$

The market reward-to-risk ratio is effectively the market risk premium and by rearranging the above equation and solving for $E(R_i)$, we obtain the capital asset pricing model (CAPM).

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

where:

- $E(R_i)$ is the expected return on the capital asset
- R_f is the risk-free rate of interest such as interest arising from government bonds
- β_i (the *beta*) is the sensitivity of the expected excess asset returns to the expected excess market returns, or also

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)},$$
- $E(R_m)$ is the expected return of the market

- $E(R_m) - R_{f\text{is}}$ sometimes known as the *market premium* (the difference between the expected market rate of return and the risk-free rate of return).
- $E(R_i) - R_{f\text{is}}$ is also known as the *risk premium*

Restated, in terms of risk premium, we find that:

$$E(R_i) - R_f = \beta_i(E(R_m) - R_f)$$

which states that the *individual risk premium* equals the *market premium* times β .

The expected market rate of return is usually estimated by measuring the arithmetic average of the historical returns on a market portfolio (e.g. S&P 500).

The risk free rate of return used for determining the risk premium is usually the arithmetic average of historical risk free rates of return and not the current risk free rate of return.

CAPM can be modified to include size premium and specific risk. This is important for investors in privately held companies who often do not hold a well-diversified portfolio. The equation is similar to the traditional CAPM equation “with the market risk premium replaced by the product of beta times the market risk premium.”

$$E(R_i) = R_f + \beta(RP_m) + RP_s + RP_u$$

"where:

$E(R_i)$ is required return on security i

R_f is risk-free rate

RP_m is general market risk premium

RP_s is risk premium for small size

RP_u is risk premium due to company-specific risk factor

Using the CAPM model and the following assumptions, we can compute the expected return of a stock in this CAPM example: if the risk-free rate is 3%, the beta (risk measure) of the stock is 2 and the expected market return over the period is 10%, the stock is expected to return 17% ($3\% + 2(10\% - 3\%)$).

3.1.1 Systematic risk and specific risk

Specific risk is the risk associated with individual assets - within a portfolio these risks can be reduced through diversification (specific risks "cancel out"). Specific risk is also called diversifiable, unique, unsystematic, or idiosyncratic risk. Systematic risk (a.k.a. portfolio risk or market risk) refers to the risk common to all securities except for selling short as noted below, systematic risk cannot be diversified away (within one market). Within the market portfolio, asset specific risk will be diversified away to the extent possible. Systematic risk is therefore equated with the risk (standard deviation) of the market portfolio.

Since a security will be purchased only if it improves the risk-expected return characteristics of the market portfolio, the relevant measure of the risk of a security is the risk it adds to the market portfolio, and not its risk in isolation. In this context, the volatility of the asset, and its correlation with the market portfolio, are historically observed and are therefore given. (There are several approaches to asset pricing that attempt to price assets by modelling the stochastic properties of the moments of assets' returns - these are broadly referred to as conditional asset pricing models.)

Systematic risks within one market can be managed through a strategy of using both long and short positions within one portfolio, creating a "market neutral" portfolio. Market neutral portfolios, therefore will have a correlations of zero.

3.2 Asset specific required return

The CAPM returns the asset-appropriate required return or discount rate i.e. the rate at which future cash flows produced by the asset should be discounted given that asset's relative riskiness. Betas exceeding one signify more than average "riskiness"; betas below one indicate lower than average. Thus, a more risky stock will have a higher beta and will be discounted at a higher rate; less sensitive stocks will have lower betas and be discounted at a lower rate. Given the accepted concave utility function, the CAPM is consistent with intuition investors (should) require a higher return for holding a more risky asset.

Since beta reflects asset-specific sensitivity to non-diversifiable, i.e. market risk, the market as a whole, by definition, has a beta of one. Stock market indices are frequently used as local proxies for the market and in that case (by definition) have a beta of one. An investor in a

large, diversified portfolio (such as a mutual fund), therefore, expects performance in line with the market.

3.3 Risk and Diversification

The risk of a portfolio comprises systematic risk, also known as undiversifiable risk, and unsystematic risk which is also known as idiosyncratic risk or diversifiable risk. Systematic risk refers to the risk common to all securities i.e. market risk. Unsystematic risk is the risk associated with individual assets. Unsystematic risk can be diversified away to smaller levels by including a greater number of assets in the portfolio (specific risks "average out"). The same is not possible for systematic risk within one market. Depending on the market, a portfolio of approximately 30–40 securities in developed markets such as the UK or US will render the portfolio sufficiently diversified such that risk exposure is limited to systematic risk only. In developing markets a larger number is required, due to the higher asset volatilities.

A rational investor should not take on any diversifiable risk, as only non-diversifiable risks are rewarded within the scope of this model. Therefore, the required return on an asset, that is, the return that compensates for risk taken, must be linked to its riskiness in a portfolio context i.e. its contribution to overall portfolio riskiness as opposed to its "stand alone risk." In the CAPM context, portfolio risk is represented by higher variance i.e. less predictability. In other words, the beta of the portfolio is the defining factor in rewarding the systematic exposure taken by an investor.

3.3 Assumptions of CAPM

The CAPM is often criticised as being unrealistic because of the assumptions on which it is based, so it is important to be aware of these assumptions and the reasons why they are criticised.

1. Investors hold diversified portfolios

This assumption means that investors will only require a return for the systematic risk of their portfolios, since unsystematic risk has been removed and can be ignored.

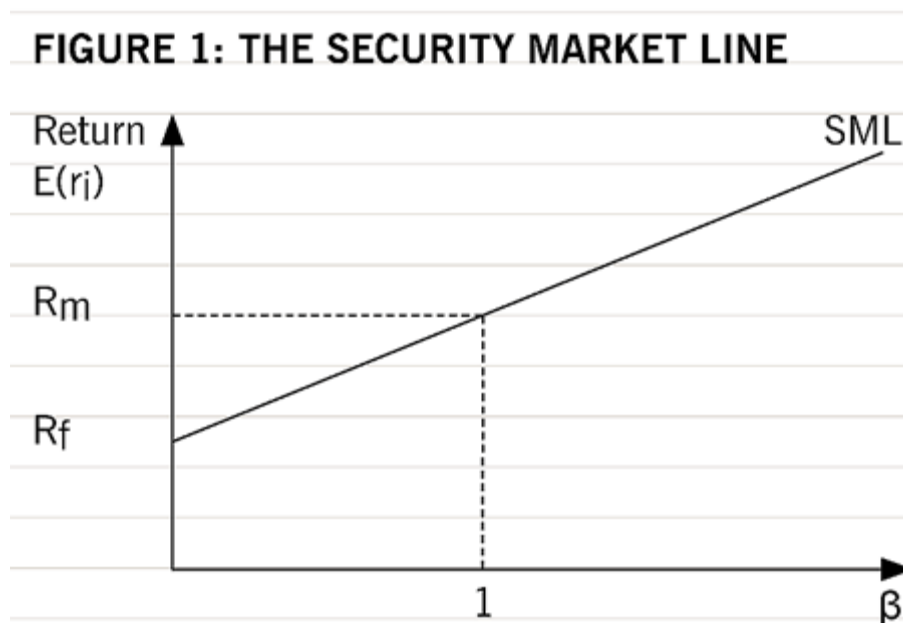
2. Single-period transaction horizon

A standardised holding period is assumed by the CAPM in order to make comparable the returns on different securities. A return over six months, for example, cannot be compared to a return over 12 months. A holding period of one year is usually used.

3. Investors can borrow and lend at the risk-free rate of return

This is an assumption made by portfolio theory, from which the CAPM was developed, and provides a minimum level of return required by investors. The risk-free rate of return corresponds to the intersection of the security market line (SML) and the y-axis.

(see Figure 1). The SML is a graphical representation of the CAPM formula.



4. Perfect capital market

This assumption means that all securities are valued correctly and that their returns will plot on to the SML. A perfect capital market requires the following: that there are no taxes or transaction costs; that perfect information is freely available to all investors who, as a result, have the same expectations; that all investors are risk averse, rational and desire to maximise their own utility; and that there are a large number of buyers and sellers in the market.

Problems of CAPM

1. The model assumes that the variance of returns is an adequate measurement of risk. This would be implied by the assumption that returns are normally distributed, or

indeed are distributed in any two-parameter way, but for general return distributions other risk measures (like coherent risk measures) will reflect the active and potential shareholders' preferences more adequately. Indeed, risk in financial investments is not variance in itself, rather it is the probability of losing: it is asymmetric in nature. Barclays Wealth have published some research on asset allocation with non-normal returns which shows that investors with very low risk tolerances should hold more cash than CAPM suggests.

2. The model assumes that all active and potential shareholders have access to the same information and agree about the risk and expected return of all assets (homogeneous expectations assumption).
3. The model assumes that the probability beliefs of active and potential shareholders match the true distribution of returns. A different possibility is that active and potential shareholders' expectations are biased, causing market prices to be informationally inefficient.
4. The model does not appear to adequately explain the variation in stock returns. Empirical studies show that low beta stocks may offer higher returns than the model would predict. The model assumes that given a certain expected return, active and potential shareholders will prefer lower risk (lower variance) to higher risk and conversely given a certain level of risk will prefer higher returns to lower ones. It does not allow for active and potential shareholders who will accept lower returns for higher risk.
5. The model assumes that there are no taxes or transaction costs, although this assumption may be relaxed with more complicated versions of the model.
6. The market portfolio consists of all assets in all markets, where each asset is weighted by its market capitalization. This assumes no preference between markets and assets for individual active and potential shareholders, and that active and potential shareholders choose assets solely as a function of their risk-return profile. It also assumes that all assets are infinitely divisible as to the amount which may be held or transacted.
7. The market portfolio should in theory include all types of assets that are held by anyone as an investment (including works of art, real estate, human capital). In practice, such a market portfolio is unobservable and people usually substitute a stock index as a proxy for the true market portfolio. Unfortunately, it has been shown that this substitution is not innocuous and can lead to false inferences as to the validity of

the CAPM, and it has been said that due to the in observability of the true market portfolio, the CAPM might not be empirically testable.

8. The model assumes economic agents optimise over a short-term horizon, and in fact investors with longer-term outlooks would optimally choose long-term inflation-linked bonds instead of short-term rates as this would be more risk-free asset to such an agent.
9. The model assumes just two dates, so that there is no opportunity to consume and rebalance portfolios repeatedly over time. The basic insights of the model are extended and generalized in the intertemporal CAPM (ICAPM) of Robert Merton, and the consumption CAPM (CCAPM) of Douglas Breeden and Mark Rubinstein.
10. CAPM assumes that all active and potential shareholders will consider all of their assets and optimize one portfolio. This is in sharp contradiction with portfolios that are held by individual shareholders: humans tend to have fragmented portfolios or, rather, multiple portfolios.
11. Empirical tests show market anomalies like the size and value effect that cannot be explained by the CAPM.

3.6 Drawbacks of CAPM

Like many scientific models, the CAPM has its drawbacks. The primary drawbacks are reflected in the model's inputs and assumptions.

- Risk-free Rate (R_f): The commonly accepted rate used as the R_f is the yield on short-term government securities. The issue with using this input is that the yield changes daily, creating volatility.
- Return on the Market (R_m): The return on the market can be described as the sum of the capital gains and dividends for the market. A problem arises when at any given time, the market return can be negative. As a result, a long-term market return is utilized to smooth the return. Another issue is that these returns are backward-looking and may not be representative of future market returns.
- Ability to Borrow at a Risk-free Rate: CAPM is built on four major assumptions, including one that reflects an unrealistic real-world picture. This assumption, that investors can borrow and lend at a risk-free rate, is unattainable in reality. Individual investors are unable to borrow (or lend) at the rate the US government can borrow at.

Therefore, the minimum required return line might actually be less steep (provide a lower return) than the model calculates.

- **Determination of Project Proxy Beta:** Businesses that use CAPM to assess an investment need to find a beta reflective to the project or investment. Often a proxy beta is necessary. However, accurately determining one to properly assess the project is difficult and can affect the reliability of the outcome.

3.7 Advantages and Disadvantages of CAPM

Despite the aforementioned drawbacks, there are numerous advantages to the application of CAPM.

Advantages

1. **Ease-of-use:** CAPM is a simplistic calculation that can be easily stress-tested to derive a range of possible outcomes to provide confidence around the required rates of return.
2. **Diversified Portfolio:** The assumption that investors hold a diversified portfolio, similar to the market portfolio, eliminates unsystematic (specific) risk.
3. **Systematic Risk (beta):** CAPM takes into account systematic risk, which is left out of other return models, such as the dividend discount model (DDM). Systematic or market risk is an important variable because it is unforeseen and often cannot be completely mitigated because it is often not fully expected.
4. **Business and Financial Risk Variability:** When businesses investigate opportunities, if the business mix and financing differ from the current business, then other required return calculations, like weighted average cost of capital (WACC) cannot be used.

Disadvantages

The CAPM suffers from a number of disadvantages and limitations that should be noted in a balanced discussion of this important theoretical model.

a. Assigning values to CAPM variables

In order to use the CAPM, values need to be assigned to the risk-free rate of return, the return on the market, or the equity risk premium (ERP), and the equity beta. The yield on short-term Government debt, which is used as a substitute for the risk-free rate of return, is not fixed but changes on a daily basis according to economic circumstances. A

short-term average value can be used in order to smooth out this volatility. Finding a value for the ERP is more difficult. The return on a stock market is the sum of the average capital gain and the average dividend yield. In the short term, a stock market can provide a negative rather than a positive return if the effect of falling share prices outweighs the dividend yield. It is therefore usual to use a long-term average value for the ERP, taken from empirical research, but it has been found that the ERP is not stable over time. In the UK, an ERP value of between 2% and 5% is currently seen as reasonable. However, uncertainty about the exact ERP value introduces uncertainty into the calculated value for the required return.

Beta values are now calculated and published regularly for all stock exchange-listed companies. The problem here is that uncertainty arises in the value of the expected return because the value of beta is not constant, but changes over time.

b. Using the CAPM in investment appraisal

Problems can arise when using the CAPM to calculate a project-specific discount rate. For example, one common difficulty is finding suitable proxy betas, since proxy companies very rarely undertake only one business activity. The proxy beta for a proposed investment project must be disentangled from the company's equity beta. One way to do this is to treat the equity beta as an average of the betas of several different areas of proxy company activity, weighted by the relative share of the proxy company market value arising from each activity. However, information about relative shares of proxy company market value may be quite difficult to obtain.

A similar difficulty is that the ungearing of proxy company betas uses capital structure information that may not be readily available. Some companies have complex capital structures with many different sources of finance. Other companies may have debt that is not traded, or use complex sources of finance such as convertible bonds. The simplifying assumption that the beta of debt is zero will also lead to inaccuracy in the calculated value of the project-specific discount rate.

One disadvantage in using the CAPM in investment appraisal is that the assumption of a single-period time horizon is at odds with the multi-period nature of investment appraisal. While CAPM variables can be assumed constant in successive future periods, experience indicates that this is not true in reality.

3.8 WACC AND CAPM

The weighted average cost of capital (WACC) can be used as the discount rate in investment appraisal provided that a number of restrictive assumptions are met. These assumptions are that:

- the investment project is small compared to the investing organisation
- the business activities of the investment project are similar to the business activities currently undertaken by the investing organisation
- the financing mix used to undertake the investment project is similar to the current financing mix (or capital structure) of the investing company.
- existing finance providers of the investing company do not change their required rates of return as a result of the investment project being undertaken.

These assumptions essentially state that WACC can be used as the discount rate provided that the investment project does not change either the business risk or the financial risk of the investing organisation.

If the business risk of the investment project is different to that of the investing organisation, the CAPM can be used to calculate a project-specific discount rate. The procedure for this calculation was covered in the second article in this series (Project-specific discount rates, Student Accountant, April 2008).

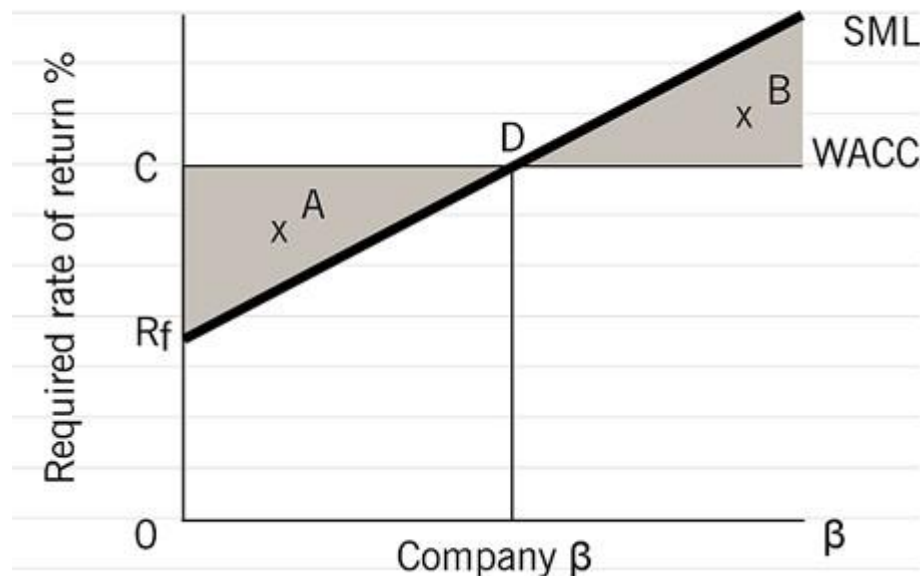
The benefit of using a CAPM-derived project - specific discount rate is illustrated in Figure 2. Using the CAPM will lead to better investment decisions than using the WACC in the two shaded areas, which can be represented by projects A and B.

Project A would be rejected if WACC was used as the discount rate, because the internal rate of return (IRR) of the project is less than that of the WACC. This investment decision is incorrect, however, since project A would be accepted if a CAPM - derived project-specific discount rate were used because the project IRR lies above the SML. The project offers a return greater than that needed to compensate for its level of systematic risk, and accepting it will increase the wealth of shareholders.

Project B would be accepted if WACC was used as the discount rate because its IRR is greater than the WACC.

This investment decision is also incorrect, however, since project B would be rejected if using a CAPM-derived project-specific discount rate, because the project IRR offers insufficient compensation for its level of systematic risk (Watson and Head).

FIGURE 2: WACC OR CAPM?



4.0 CONCLUSION

Research has shown the CAPM to stand up well to criticism, although attacks against it have been increasing in recent years. Until something better presents itself, however, the CAPM remains a very useful item in the financial management toolkit.

5.0 SUMMARY

The study of portfolio theory provides us with theoretical knowledge that guides investors in the selection of securities that make up their portfolio holding.

6.0 TUTOR MARKED ASSIGNMENT

- Capital Asset Pricing
- Discuss Asset specific required return
- What are the Assumptions of CAPM

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MODULE 3: Portfolio Optimisation

UNIT 2: Portfolio Optimization

1.0 INTRODUCTION

2.0 OBJECTIVES

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3.1 History of portfolio Optimization

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1.0 INTRODUCTION

Portfolio optimization is the process of choosing the proportions of various assets to be held in a portfolio, in such a way as to make the portfolio better than any other according to some criterion. The criterion will combine, directly or indirectly, considerations of the expected value of the portfolio's rate of return as well as of the return's dispersion and possibly other measures of financial risk.

2.0 OBJECTIVES

- History of Portfolio Optimization
- What are the method of portfolio optimization
- Tools used in portfolio optimization

3.0 MAIN CONTENTS

3.1 History of portfolio Optimization

Portfolio optimization was first developed in the 1950s, but a number of practical and theoretical problems have limited its use by investment managers. For example, it is often difficult to obtain sufficient high-quality historical data for thorough analysis. In addition, the

efficient frontier where optimal portfolios lie tends to shift over time, quickly making these portfolios suboptimal.

Modern portfolio theory, fathered by Harry Markowitz in the 1950s, assumes that an investor wants to maximize a portfolio's expected return contingent on any given amount of risk, with risk measured by the standard deviation of the portfolio's rate of return. For portfolios that meet this criterion, known as efficient portfolios, achieving a higher expected return requires taking on more risk, so investors are faced with a trade-off between risk and expected return. This risk-expected return relationship of efficient portfolios is graphically represented by a curve known as the efficient frontier. All efficient portfolios, each represented by a point on the efficient frontier, are well-diversified.

3.2 Methods of portfolio optimization

Different approaches to portfolio optimization measure risk differently. In addition to the traditional measure, standard deviation, or its square (variance), which are not robust risk measures, other measures include the Sortino ratio and the CVaR (Conditional Value at Risk).

Often, portfolio optimization takes place in two stages: optimizing weights of asset classes to hold, and optimizing weights of assets within the same asset class. An example of the former would be choosing the proportions placed in equities versus bonds, while an example of the latter would be choosing the proportions of the stock sub-portfolio placed in stocks X, Y, and Z. Equities and bonds have fundamentally different financial characteristics and have different systematic risk and hence can be viewed as separate asset classes; holding some of the portfolio in each class provides some diversification, and holding various specific assets within each class affords further diversification. By using such a two-step procedure one eliminates non-systematic risks both on the individual asset and the asset class level.

One approach to portfolio optimization is to specify a von Neumann-Morgenstern utility function defined over final portfolio wealth; the expected value of utility is to be maximized. To reflect a preference for higher rather than lower returns, this objective function is increasing in wealth, and to reflect risk aversion it is concave. For realistic utility functions in the presence of many assets that can be held, this approach, while theoretically the most defensible, can be computationally intensive.

3.3 Optimization Constraints

Often portfolio optimization is done subject to constraints, which may be regulatory constraints, the lack of a liquid market, or any of many others. These constraints can lead to extreme weights being applied in the portfolio optimization process leading to portfolio weights that focus on a small sub-sample of assets within the portfolio. When the portfolio optimization process is subject to other constraints such as taxes, transaction costs, and management fees, the optimization process may result in an under-diversified portfolio.

a. Regulation and taxes

Investors may be forbidden by law to hold some assets. In some cases, unconstrained portfolio optimization would lead to short-selling of some assets. However short-selling can be forbidden. Sometimes it is impractical to hold an asset because the associated tax cost is too high. In such cases appropriate constraints must be imposed on the optimization process.

b. Transaction costs

Transaction costs are the costs of trading in order to change the portfolio weights. Since the optimal portfolio changes with time, there is an incentive to re-optimize frequently. However, too frequent trading would incur too-frequent transactions costs; so the optimal strategy is to find the frequency of re-optimization and trading that appropriately trades off the avoidance of transaction costs with the avoidance of sticking with an out-of-date set of portfolio proportions. This is related to the topic of tracking error, by which stock proportions deviate over time from some benchmark in the absence of re-balancing.

3.4 Mathematical tools used in portfolio optimization

The complexity and scale of optimizing all but the simplest portfolio requires that the work be done by computer. Central to this optimization is the construction of the covariance matrix for the rates of return on the assets in the portfolio.

Techniques include:

- Quadratic programming
- Nonlinear programming
- Mixed integer programming

- Meta-Heuristic Methods
- Stochastic programming for multistage portfolio optimization

3.5 Improving portfolio optimization

Investment is a forward looking activity, and thus the covariances of returns and risk levels must be forecast rather than observed. Portfolio optimization assumes the investor may have some risk aversion and the stock prices may exhibit significant differences between their historical or forecast values and what is experienced. In particular, financial crises are characterized by a significant increase in correlation of stock price movements which may seriously degrade the benefits of diversification.

In a mean-variance optimization framework, accurate estimation of the Variance Covariance matrix is paramount. Quantitative techniques that use Monte-Carlo simulation with the Gaussian copula and well-specified marginal distributions are effective. Allowing the modeling process to allow for empirical characteristics in stock returns such as auto-regression, asymmetric volatility, skewness, and kurtosis is important. Not accounting for these attributes lead to severe estimation error in the correlation and Variance Covariance that have negative biases (as much as 70% of the true values). Other optimization strategies that focus on minimizing tail-risk (e.g., Value-at-Risk, Conditional Value-at-Risk) in investment portfolios are popular amongst risk averse investors. To minimize exposure to tail risk, forecasts of asset returns using Monte-Carlo simulation with vine copulas to allow for lower (left) tail dependence (e.g., Clayton, Rotated Gumbel) across large portfolios of assets are most suitable

MODULE 3: ASSET PRICING, PORTFOLIO OPTIMISATION AND RISK MANAGEMENT

UNIT 3: RISK MANAGEMENT

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1.0 INTRODUCTION

The investment coin has two sides like any other coin. One side represents the earning of returns and the other side embodies the risks and dangers of not realizing our investment expectations. In essence, we cannot consider return without also looking at risk, the chance that the actual return from an investment may differ from what is expected. In this unit, we shall consider the various types of risks in different investment instruments.

2.0 OBJECTIVES

After studying this unit, the student will be familiar with:

- The relationship between risk and return called the “Risk-Return Trade-off”
- Various risks associated with different investment instruments

3.0 MAIN CONTENT

3.1 The Concept of Risk

As earlier mentioned, we cannot consider return without also looking at risk, the chance that the actual return from our investment may differ from our expectation. The risk associated with a given investment is directly related to its expected return. In general, the broader the range of possible returns associated with a given investment, the greater its risk, and vice versa.

Expressed in another way, riskier investments tend to provide higher levels of return or the higher the risk the higher the reward. Otherwise, why would an investor risk his capital?

In general, investors attempt to minimize risk for a given level of return or to maximize return for a given level of risk. This relationship between risk and return is usually referred to as the “risk-return trade-off.”

3.1.1 Sources of Risk

The risk associated with certain investment instrument may result from a combination of a variety of possible sources. A Prudent investor considers how the major sources of risk might affect potential investment instruments. Of course, currency exchange rate should also be considered when investing internationally.

3.1.2 Business Risk

In general, business risk is concerned with the degree of uncertainty associated with the earnings of an investment and the ability of that investment to pay interest, principal, dividends, and any other returns owed investors. For example, a business firm may experience poor earnings and, as a result fail to pay investors fully. In this case, business owners may receive no return if earnings are not adequate to meet obligations. Debt holders, on the other hand, are likely to receive some, but not necessarily all, of the amount owed them, because of the preferential treatment legally accorded to debt instrument holders.

Much of the business risk associated with a given investment instrument is related to its kind of business. For example, the business risk of a public utility common stock differs from that of a high-fashion clothing manufacturer. Generally, investments in similar kinds of firms have similar risk although differences in management, costs, and location.

3.1.3 Financial Risk

The degree of uncertainty of payment attributable to the mix of debt and equity used to finance a firm or property is financial risk. The larger the proportion of debt used to finance a firm or property, the greater its financial risk. Debt financing obligates the firm to make interest payments as well as to repay the debts, thus increasing the firm's risk. These fixed-payment obligations must be met before the distribution of any earnings to the owners of such firms or properties. Inability to meet obligations associated with the use of debt could result in business failure and in loss for bond-holders as well as for stock-holders.

3.1.4 Investment Return over Multiple Period

The holding period return is a simple and unambiguous measure of investment return over a single period. But often you will be interested in average returns over longer periods of time. For example, you might want to measure how well a mutual fund has performed over the preceding five-year period. In this case, return measurement is more ambiguous.

Consider, for example a fund that starts with one million Naira at the beginning of the year. The fund then receives additional funds to invest from new and existing shareholders and also receives requests for redemptions from existing shareholders. Its net cash inflow can be positive or negative. Suppose its quarterly results are as given in the table below, with negative numbers enclosed in parenthesis:

| | 1 st Quarter | 2 nd Quarter | 3 rd Quarter | 4 th Quarter |
|--|-------------------------|-------------------------|-------------------------|-------------------------|
| Asset under management at the start of quarter (N Million) | 1.0 | 1.2 | 2.0 | 0.8 |
| Holding period Return (%) | 10.0 | 25.0 | (20.0) | 25.0 |
| Total assets before net inflows | 1.1 | 1.5 | 1.6 | 1.0 |
| Net Inflow (N Million) | 0.1 | 0.5 | (0.8) | 0.0 |
| Assets under management at the end of quarter (N Million) | 1.2 | 2.0 | 0.8 | 1.0 |

The story behind the figures given above is that, when the firm is doing well (that is reporting good HPR), it attracts new funds, otherwise it may suffer a net outflow.

For example, the 10% return in the first quarter by itself increased assets under management by $0.10 \times N_i$ million = N100,000; it also elicited new investments of N100,000 thus bringing assets under management to N1.2 million by the end of the quarter. An even better HPR in the second quarter elicited a larger net inflow, and the second quarter ended with N2 million under management. However, HPR in third quarter was negative and net inflows were negative.

3.1.5 Risk Premiums and Risk Aversion

Every investment involves some degree of uncertainty about future holding period returns, and in most cases that uncertainty is significant. Sources of investment risk range from microeconomic fluctuations, to the changing fortunes of various industries, to asset-specific unexpected developments.

How much, if anything, should you invest in the common stock of a blue-chip company? First, you must ask how much of an expected reward is offered to compensate for the risk involved in investing money in the stocks.

We measure the reward as the difference between the expected HPR on the stock and the risk-free rate, that is, the rate you can earn by leaving money in risk-free assets such as Treasury bills, money market funds or in the bank. We call this difference, the risk premium on common stocks. For example, if the risk-free rate of return is 6% per year, and the expected return from the common stock is 14%, then the risk premium on stocks is 8% per annum. The degree to which investors are willing to commit funds to stocks depends on risk aversion. It seems obvious that investors are risk averse in the sense that, if the risk premium were zero, people would not be willing to invest any money in stocks. In theory then, there must always be a positive risk premium on stocks in order to induce risk-averse investors to hold the existing supply of stocks instead of placing all their money in risk-free assets.

3.2 Purchasing Power Risk

The chance that changing price levels within the economy (inflation or deflation) will adversely affect investment returns is purchasing power risk. Specifically, this risk is the chance that generally rising prices (inflation) will reduce purchasing power, that is, the amount of a given commodity that can be purchased with Naira. For example, if last year one Naira could buy ten oranges. This year, if orange sellers start selling ten oranges for N2,

it means that N1 can buy only five oranges this year. In period of rising price levels, the purchasing power of the Naira decreases and vice versa.

In general, investments whose values move with general price levels have low purchasing power risk and are most profitable during periods of rising prices. Those that provide fixed returns have high purchasing power risk and are most profitable during periods of declining price levels or low inflation. The returns on real and tangible personal property investments, for example, tend to move with the general price level, whereas returns from deposit accounts and bonds do not.

3.2.1 Interest Rate Risk

Securities are especially affected by interest rate risk. This is particularly true for those securities that offer purchasers a fixed periodic return. Interest rate risk is the chance that changes in interest rates will adversely affect the value of a security. The interest rate changes themselves result from changes in the general relationship between the supply of and the demand for money. As interest rates change, the prices of many securities fluctuate. They decrease with increasing interest rates, and increase with decreasing interest rates. The price of fixed income securities, such as, bonds and preferred stock drop when interest rates rise. They thus provide purchasers with the same rate of return that would be available at prevailing rates. The reverse is the case when interest rates fall.

The other aspect of interest rate risk is related to investing in short-term securities such as Treasury bills, certificates of deposit, commercial paper, and bankers' acceptances.

Some investors include these securities in their portfolios rather than investing in long-term securities. Investors face the risk that when short-term securities mature, their proceeds may have to be invested in lower yielding, new short-term securities. By initially making a long-term investment, you can lock-in a return for a period of years rather than face the risk of declining the returns from a short-term security investment strategy are adversely affected. Most investment instruments are subject to interest rate risk. However, fixed-income securities are most directly affected by interest rate movements followed by other long-term securities such as common stock and property.

3.2.2 Liquidity Risk

Liquidity risk is the risk of not being able to liquidate an investment conveniently and at a reasonable price. The liquidity of a given investment instrument is an important consideration

for an investor. In general, investment instruments traded in a thin market, where demand and supply are small, tend to be less liquid than those traded in broad markets.

One can generally sell an investment instrument merely by significantly reducing its price. However, to be liquid, an investment instrument must be easily sold at a reasonable price.

3.2.3 Tax Risk

The chance that the Federal Government will make unfavourable changes in tax laws , driving down the after-tax returns and market values of certain investments. The greater the chance that such changes will drive down the after –tax returns and market values of certain investments, the greater the tax risk. Undesirable changes in tax laws include elimination of tax exemptions, limitation of deductions, and increase in tax rates. Virtually all investments are vulnerable to increases in tax rates, certain investments, such as municipal and other bonds, real estate, and natural resources generally have greater tax risk.

3.2.4 Risky Assets

When we shift wealth from the risky portfolio (P) to risk-free portfolio (F), we do not change the relative proportions of the various risky assets within the risky portfolio. What we do is to reduce the relative weight of the risky portfolio as a whole in favour of risk-free assets.

Let us use a simple example to demonstrate the procedure. Assume the total market value of an investor's portfolio is N300,000. Out of that, N90,000 is invested in the money market funds, a risk-free asset. The remaining N210,000 is in risky securities, say, N113,000 is invested in Vanguard Trust Fund and N96,000 in Fidelity Investment Bond Fund.

The Vanguard Trust Fund (V) is passive equity fund, and the Fidelity Investment Bond Fund (F) invests primarily in corporate bonds with high safety ratings and also in Treasury bonds. We choose these two funds for the risky portfolio in the spirit of low cost, well diversified portfolio.

The holdings in Vanguard and Fidelity make up the risky portfolio, with 54% in V and 46% in F.

We use “W” below to denote “Weight” so we have:

$$M(V) = 113,400/210,000 = 0.54 \text{ (Vanguard)}$$

$$W(F) = 96,600/210,000 = 0.46 \text{ (Fidelity)}$$

The weight of the risky portfolio, P in the complete portfolio (that is, including risky and riskfree investments) is denoted by Y andn so the weight of the money market fund is P in

$$1 - Y$$

$Y = 210,000/300,000 = 0.7$ (risky assets, portfolio P)

$1 - Y = 90,000/300,000 = 0.3$ (risk-free assets)

The weights of the individual assets in the complete portfolio © are:

| | | |
|---------------|-------------------|-----------|
| Vanguard | $113,400/300,000$ | $= 0.378$ |
| Fidelity | $96,600/300,000$ | $= 0.322$ |
| ----- | ----- | ----- |
| Portfolio P | $210,000/300,000$ | $= 0.700$ |
| Ready Asset F | $90,000/300,000$ | $= 0.300$ |
| ----- | ----- | ----- |
| Portfolio C | $300,000/300,000$ | $= 1.000$ |

3.3 Market Risk

Market risk is the risk of a decline in investment returns because of market factors independent of the given security or property investment. Examples of market risk include political, economic, and social events as well as changes in investor tastes and preferences.

Market risk actually embodies a number of different risks; purchasing power risk, interest rate risk, and tax risk.

The impact of market factors on investment returns is not uniform. Both the degree and the direction of change in turn differ among investment instruments. For example, legislation placing restrictive import quotas on foreign automobiles and electronic goods may result in a significant increase in the value of domestic automobiles and electronics. Essentially, market risk is expressed in the price volatility of a security. The more volatile the price of a security, the greater its perceived market risk.

3.3.1 Event Risk

Event risk implies the risk that comes from a largely (or totally) unexpected event that has a significant and usually immediate effect on the underlying value of an investment. This risk occurs when something happens to a company or property that has a sudden and substantial impact on its financial condition. Event risk goes beyond business and financial risk. It does not necessarily mean the company or market is doing poorly. Instead, it involves a largely unexpected event that has a significant and usually immediate effect on the underlying value

of an investment. Event risk can take many forms and can affect all types of investment instruments.

3.3.2 Components of Risk

The risk of an investment consists of two components. Diversifiable and Non-diversifiable risks.

Diversifiable risk, sometimes called unsystematic risk, results from uncontrollable or random events, such as labour strikes, lawsuits, and regulatory actions. Such risk affects various investment vehicles instruments differently. It represents the portion of an investment's risk that can be eliminated through diversification.

Non-diversifiable risk, also called systematic risk, is attributed to forces such as war, inflation, and political events that affect all investments and therefore are not unique to a given instrument. The sum of non-diversifiable risk and diversifiable risk is called total risk.

4.0 CONCLUSION

Under this unit, we discussed risk, that is the chance that the actual return from an investment may differ from what is expected. We made the point that, the risk associated with a given Investment is directly related to its expected return. We have many types of risk and they include; business risk, financial risk, purchasing risk, interest rate risk, etc.

4.0 SUMMARY

The issue of risk is important to every investor because risk affects the returns on investment. It is sometimes the assumption in investment studies that, the higher the risk in a particular investment instrument, the higher the returns, but that is not always the case. A wise investor thoroughly weighs the risk and returns in each investment move he makes.

6.0 TUTOR-MARKED ASSIGNMENT

- What do you understand by risk and how does it affect return?
- Explain what you understand by "Event Risk"?

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