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SCHOOL OF MANAGEMENT SCIENCES

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COURSE TITLE: Investment Analysis

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UNIT I CONCEPTUAL CLARIFICATION OF INVESTMENT ANALYSIS

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1.0 INTRODUCTION

In this unit, you will be assisted to recapitulate your knowledge of what you were told about project probably in your fundamental stage. Why people go into project and the various projects that one can invest in.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Define a project
- Name the types of project people can go into
- Say the different reasons why people invest
- Explain what you understand by investment analysis

3.0 MAIN CONTENT

3.1 Meaning of Investment Analysis

The study of how an investment is likely to perform and how suitable it is for a given investor. Investment analysis is key to any sound portfolio –management strategy.

Investors not comfortable doing their own professional advice from a financial advisor. An analysis of past investment decisions and the though process of making the investment decision. Key factors should include entry price, expected time horizon, and reasons for making the decision at the time.

For example, in conducting an investment analysis of a mutual fund, the investor could also compare performance to similar funds. Its expense ratio, management stability, sector weighting, style and assist allocation. Investment goals should always be considered when analyzing an investment; one size does not always fit all, and highest returns regardless of risk are not always the goal.

For any beginner investor, investment analysis is essential. Looking back at past decisions and analyzing the mistakes and successes will help fine- tune strategies. Many investors don't even document why they made an investment let alone analyze why they were wrong or right you could make a proper decision, extraordinary events could loose you money, and if you don't analyze it, you would shy away from making the same decision.

3.2 Meaning of a Project

Investment analysis concerns which projects to accept and which to reject; according to the question of what comprises a 'project' is central.

Although, projects form significant proportion of investment decisions, especially manufacturing firms, it would be a mistake to assume that one can define a project more broadly to include any decision that results in using the scare resources of a business. Defined as such, a project would cover strategic decisions (new markets acquisitions), business decisions (building a plant, opening a store), management and tactical decisions and service decisions. Therefore, we could summarized project to be a set of related tasks which have a specific goal, a plan proposal or an undertaken requiring concerted effort, to be executed over a fixed period and within certain cost and other limitations.

3.3 Types of Project

Although projects can be done individually, we recommend that projects be carried out in teams or groups. This does not only reduce the workload for the supervisor but emphasizes the importance of group work in learning, understand and doing of assignment. We have identified three categories of projects that might help you in deciding when and what projects to go into viz: Civil Engineering, Construction, Petrochemical, Mining and Quarrying; Manufacturing Projects and Management Projects.

1. **Civil Engineering, Construction, Petrochemical, Mining and Quarrying:** Projects in this category are those which spring to mind most readily whenever industrial projects are mentioned. One common feature is that the fulfillment phase must be conducted on a site that is exposed to the elements, and usually remote from the contractor's main office.

These projects in air special risks and problems of organization. They often require massive capital investment, and they deserve (but do not always get) rigorous management of progress, finance and quality. For every large industrial project, the funding and resources needed are often too great for one contractor to risk or even find. The organization and communications are therefore likely to be complicated by the participation of many different

specialists and contractors, with the main players possibly acting together as a consortium or joint venture company.

2. **Manufacturing Projects:** Manufacturing projects aim to produce a piece of equipment or machinery, ship, aircraft, land vehicle or some other item of specially designed hardware. The finished product might be purpose –built for a single customer, or the project could be generated and funded from within a company for the design and development of a new product intended for subsequent manufacture and sale in quantity.

Manufacturing projects are usually conducted in a factory or other home based environment, where the company should be able to exercise on –the spot management and provide an optimum environment of course, these ideal conditions do not always apply. Some manufacturing projects can involve work away from the home base, for example in installation, commissioning and start –up, initial customer training and subsequent service and maintenance.

More difficult is the case of a complex product (such as an aircraft) that is developed and manufactured by a consortium of companies, very the possible overlapping international borders, with all the consequent problems of risk, contractual difficulties, communication, coordination, and control.

3. **Management Projects:** This class of projects proves the point that every company, whatever its size, can expect to need project management expertise at least once in lifetime. These are the projects that arise when companies relocate their headquarters, develop and introduce a new computer system, launch a marketing campaign, prepare for a trade exhibition, produce feasibility or other study report, restructure the organization, mount a stage show, or generally engage in any operation that involves the management and co-ordination of activities to produce an end result that is not identifiable principally as an item of hardware or construction.

Although management projects might not result in a visible, tangible creation, much often depends on their successful outcome. There are well –known cases, for instance, where failure to implement a new computer system correctly has caused serious operational breakdown and has exposed the managers responsible to public discredit. Effective project management is at

least as important for these projects as it is for the largest construction or manufacturing projects.

3.4 Reasons for Investment

Many people wonder, why invest? Well, the reasons for investments are very clear and simple investing or investing makes you to prepare for your future. Nobody wants to work their entire life. Investing is one good option that you can secure your future. Well, you can earn money in two ways by working or by having your assets work for you.

One of the main reasons to invest is that if you keep your money with yourself instead if investing it, your money doesn't work for you will only have invest your money and generate more money by earning interest on what you have put away or by buying and selling assets that increase in value.

People may have a different need to invest some people may think that keeping their money in the bank pays them a good interest and why should they bother to find other vehicles for investment? But not all people who invest their it money to gain profits out of it. If you dream of earning a huge sum of money for your future, you need to invest now. It is never too late to invest. The earlier you invest, the better and easier for you to build your nest effective. You may fund a lot of short, intermediate or long term plans. Keep these plans in your mind when you actually think to start investing. Focus on your investment plans and generate more cash for your future. You have many reasons to invest.

SELF ASSESSMENT EXERCISE

1. What is a project
2. Explain what you understand by investment analysis
3. Name the different types of projects you know

4.0 CONCLUSION

Allocating scarce resources among competing uses requires a mechanism or decision rule that separates those investments that are worth making from those that are not. The decision rule chosen to evaluate projects is significant for many reasons, the primary one being that it is a

reflection of the objective function chosen by the firm's decision makers and is often influenced by the way they are rewarded.

5.0 SUMMARY

In this unit, you have been exposed to the meaning of investment analysis, defined a project and the different types of project one can go into. We have also discussed the reasons for investment.

6.0 TUTOR MARKED ASSIGNMENT

How general is the definition of an investment and what are the different types of investment decisions that firms have to make?

ANSWER TO SELF ASSESSMENT EXERCISE

1. See 3.2
2. See 3.1
3. See 3.3

7.0 REFERENCES/FURTHER READINGS

Damodaran A. (1997): Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.

UNIT 2 INVESTMENT DECISION RULES

CONTENTS

1.0 INTRODUCTION

Every business has three basic decisions to make (1) which projects to take (investment decisions) (2) how to finance these projects (financing decisions) and (3) how much of return to investors (dividend decisions). Even though that some of these decisions are dependent, but the process starts not withstanding. Provided, there is the recognition that a good investment opportunity exists. In this unit, efforts will be placed on the different areas of investment – decision making process.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Understand how to analyze a project that is a prerequisite for another project.
- Explain how hurdle rates can be used to qualify different projects under the same or different conditions.

- Explain the possibility of a business succeeding without a formal investment analysis process.
- Explain what type of projects is payback most useful.
- Explain that a firm that takes a positive not present value, should see its value go up.

3.0 MAIN CONTENT

3.1 Types of Investment Decision

Investment decisions can be grouped on a number of ways. The first relates on how the project affects other project the firm is considering and analyzing. Although some projects are not dependent on any other projects, and can therefore be analyzed separately, other projects are mutually exclusive that is taking one project will mean, rejecting other projects; in this case, all of the projects will have to be considered together. At the other end, some projects can be categorized as falling somewhere on the continuum between prerequisites and mutually exclusive.

The second dimension that can be used to classify projects is the ability of the project to generate revenues or reduce costs. The decision rules that analyze revenue –generating projects attempt to evaluate whether earnings or cash flows from the project attempt evaluate whether the earnings or cash flows from the projects justify the investment needed to implement them. When it comes to cost reduction projects, the decision rules examine whether the reduction in costs justifies the up –front investment needed for the projects.

A group of projects is said to be mutually exclusive, when acceptance of one of the projects implies that the rest have to be rejected.

3.2 Approaches to Investment Decision Making

There are two major approaches to investment decision making. The first is the equity approach. It focuses on the equity investor in the project and asks the question: Are the returns to equity investor high enough to justify taking this project? the expands the analysis to include all investors in the firm –equity investors, lenders and preference shareholders. This approach asks a broader question: Are the total returns made by this project for all the investor groups high enough to justify taking it on?

Equity Approach: This is an analysis done purely from the perspective of the equity investor in a firm.

Firm Approach: This is an analysis done from the perspective of all investors in the firm.

Common to these approaches is a hurdle rate which a project has to cross before it can be deemed acceptable. The hurdle rate in the equity approach is the rate of return equity investors demand on their investment that is the cost of equity. The rate typically depends on the perceived risk of the investment and is higher for riskier projects and lower for safer projects. In the firm approach, the hurdle rate is the rate of return demanded collectively by all investors in the firm –that is, the cost of capital. This rate depends not only on the perceived risk of the project but on the mix of debt and equity used to finance it as well.

Common to these approaches is the measurement of the return on the project. some investment decision rules measure returns on projects by estimating the expected accounting operating income they will have, whereas others focus on the cash –flow contribution the projects will make to the business that takes them. Thus, the return to equity can be calculated using to net income or the cash flows that are expected to these investors, after meeting all debt obligations. The return to the firm, in turn, can be calculated by looking at operating income, after taxes, or the cash flows that are expected to accrue to all investors in the firm – debt as well as equity.

3.3 Investment Decision Rules

Firms utilize a number of investment decision rules in analyzing projects. Some are based on accounting net incomes while others are based on cash flows; some are scaled for the size of the project, white others are not. All of these rules attempt to allocate the firm's resources in the most efficient way possible, although they sometimes disagree on the right choices to make. The business world is partly made up of hundreds of successful businesses that have grown overtime without any formal investment decision rules, depending largely on the intuitive feel of their founders for investment opportunities. In every successful business, however, the need to adopt a uniform investment decision rule increases for a number of reasons. First, as business get larger and decision making becomes less centralized, different decision – making units adopt a range of decision rules; as a result, similar projects come to

be treated differently within the same organization. By contract, adopting one decision rule results in standardization and a common language across the decision –making units. Second, the decisions rules used in investment analysis are linked to the over all objectives of the firm. When different units adopt different rules, they may end up working at cross purposes, and the firm's overall objectives may not be met. Third, the reward and punishment mechanisms within the business for individuals making decisions will arbitrary and difficult to enforce if each individual is allowed to adopt his or her own decision rules.

Many small and successful business are therefore faced with a moment of choice as they reach this stage in their expansion. In some cases, the owners of these business refuse to change their management styles and fight the need for formal decision rules. As a result, many businesses fail, or they are forced out ingeniously from their positions of power.

3.4 Categories of Decision Rules

Investment decision rules can be classified broadly into three groups. The first set of rule is based on accounting income and includes a number of the profitability measures, such as return on equity and return on assets. The second set of measures is based on cash flows and reflects the differences that often arise between accounting income and cash flows and factor in both the time value of money and the uncertainty associated with the cash flows.

Accounting Income –Based Decision Rules: Many of the oldest and most established investment decision rules have been drawn from the accounting statements and, in particular, from accounting measures of income. Some of these rules are based on income to equity (i.e net income), whereas others are based on pre –debt operating income.

a. Return on capital: The expected return on capital on a project is a function of both the total investment required on the project and its capacity to generate operating income.

$$\text{Return on capital (Before tax)} = \frac{\textbf{Earnings before Interest \& taxes}}{\text{Average book value of total investment}}$$

$$\text{Return on capital (After tax)} = \frac{\textbf{Earnings before Interest \& taxes (1-tax rate)}}{\text{Average book value of total investment}}$$

The decision rule for return on capital for independent projects are:

A. If the after –tax return or capital > cost of capital → Accept the project

B. If the after –tax return on capital < cost of capital → Reject the project

In using return on capital in decision making, there should be adherence to accounting measures of income and investment which poses some serious problems:

- The measure of works better for projects that fit the conventional pattern (i.e have a large up –front investment and generate income over time). For projects that require a significant initial investment, the return on capital has less meaning. For instance, a retail firm that leases space for a new store will not have a significant initial investment and may have a very high return on capital as a consequence.

- The focus on operating income rather than cash flows exposes this measure to potential problems when the operating income either lags or is very different from the cash flows generated by the project. furthermore, changing depreciation methods and inventing costing may lead to changes in operating income and the return on capital, even though the underlying cash flows might be unaffected.

- The book value of assets may not be very good measure of the investment in the project, especially over time. Because depreciation on capital will generally increase over time.

- Finally, the average return on capital does not differentiate between profits made in the early years of a project and profits made in later years. Thus, N1000 in operating income in year 4.

b. Return on Equity: The return on equity looks at the return to equity investors, using the accounting net income as a measure of this return. Again, defined generally:

$$\text{Return on Equity} = \frac{\textbf{Net Income}}{\text{Average book value of Equity Investment}}$$

In a project

Like the return on capital, the return on equity tends to increase over the life of the project, as the book value of equity in the project is depreciated. Just as the appropriate comparison for the return on capital is the cost of capital, the appropriate comparison for the return on equity is the cost of equity which is the rate of return equity investment demand.

Decision Rule for Return on Equity for Independent Projects

A. If the return on equity > cost of equity → Accept the project.
B. If the return on equity < cost of equity → Reject the project.

Cost of equity should reflect the riskiness of the project being considered and the financial leverage taken on by the firm. When choosing between mutually exclusive projects of similar risk, the project with higher return on equity will be viewed as the better project.

In using return on equity measure suffers from many of the same biases and limitations like the return on capital measure. First, it is much too dependent on accounting measures of income and investment and, according, is susceptible to changes in accounting methods. Second, it tends to increase over time, as the book value depreciated, and to provide unrealistically high values when the project does not require a significant initial investment. Finally, the gap between net income and cash flow may be large on many projects which can cause significant problems for the company.

Cash flow based decision rules: The accounting income on a project may be very different from cash flows generated by that project, for many reasons. First, a number of non cash expenses, such as depreciation and amortization, reduce net income but not cash flow. Second, an income statement contains significant cash outflows that are not expenses, such as capital expenditures and working capital needs. In particular, increases in working capital (such as inventory and accounts receivable) are cash outflows that are not reflected in the net income. The cash flows estimated on a project can be to either all investors in the firm or to just the equity investors.

a. **Cash flow to the firm:** The cash flow to the firm measures the cash flows generated for all investors in the firm. It is a predebt, but after –tax, cash flows, and it can be estimated from the after –tax operating income as follows:

Free cash flow to firm = EBIT (1-tax rate)
+ Depreciation and Non cash changes
- Change in Noncash Working Capital

On individual projects, the capital expenditures after the initial investment will take the form of capital maintenance expenditures or new investments needed to keep the project going. The changes in working capital can either increases in which case there is a cast outflow –or decreases – in which case there is a cash inflow.

b. **Cash Flow to Equity:** The cash flow to equity investors can be similarly estimated from the net income by adjusting for the equity investment needed for net capital expenditures (capital expenditures depreciation) and working capital changes. The general definition or free cash flow to equity therefore considers any new debt financing that creates cash inflows, and any debt repayments that creates cash outflows:

Free cash flow to Equity = Net income
+ Depreciation and Amortization
- Capital Expenditures
- Change in Working Capital
- Principal Repayments
+ Proceeds From New Debt Issues

If the debt ratio used to finance net capital expenditures and working capital needs in stable, the free cash flow to equity can be simplified as:

Free cash flow to equity = Net Income
-(Capital Expenditures –Depreciation)
(I- Debt Ratio)
-Change in Working Capital (I-Debt Ratio)

In most projects, the cash flow to Equity will be different from net income and will be affected by the debt financing mix used by the firm.

SELF ASSESSMENT EXERCISE

1. Will the cash flow to the firm always be greater than the accounting income? Why or why not?
2. Can you think of an example of a project that is a prerequisite for a firm to use the same hurdle rate for all projects with it is faced?

4.0 CONCLUSION

In this unit, we have examined the scope of investment analysis, and a range of investment analysis techniques, raying from investment decisions, two basic approaches to investment analysis and accounting rate of return investment analysis and accounting rate of return measures and cash flows measures.

5.0 SUMMARY

Investment analysis can be said to be the most important part of corporate financial analysis. We have discussed that any decision that requires the use of resources is an investment decision. There are two basic approaches to investment analysis. The equity approach and firm approach. And the measures used for projects i.e the accounting rate and the cash flow.

6.0 TUTOR MARKED ASSIGNMENT

A firm in porfflarcourt is considering an investment project that needs an initial investment capital of N500,000. The project is to last 10 years with no salvage value. The EBIT is estimated to be N120,000 per year. What is the after –tax return on capital if the marginal tax rate is 34%.

7.0 REFERENCES/FURTHER READINGS

Damodaram A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley and Sons Inc.

UNIT 3 INVESTMENT APPRAISAL 1

CONTENTS

1.0 INTRODUCTION

In unit 4, you have the concept of capital budgeting. In this unit, techniques of investment appraisal shall be discussed. We shall look at the traditional method now and discounted cash flow methods in unit 6.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- Identify types of projects
- States traditional method of investment appraisal and its computational process
- Offer advice on the choice of investments based on the analyzed data.

3.0 MAIN CONTENT

3.1 Definition of Investment

Investment is the commitment of capital to project or venture with a view for profit. Examples includes: the purchase of stocks, shares or bound, building, purchase of cars, taking a life insurance, bank deposit, etc. its basic feature is that, its usually involves initial large outflow of cash and streams of income thereafter over the useful life of the project or venture.

3.2 Types of Investment

Investment can be classified variously, but the common criteria are:

i. Variability of income

ii. Relationship of the investments

a. Classification Based on Variability of Income

Under this, investment can be classified as fixed income or variable income investments.

i. Variability of income

Investments that fall under this category are those streams of income are fixed irrespective of performance of the issuing institution.

The expected rate of return is constant and is computed on the value of funds committed. Example is investment in corporate debenture stock.

ii. Relationship of the investment

Under this classification, the return of income depends on the fortunes of the issuing institutions. Where the performance is high the investor earns higher return and vice versa.

b. Classification Based On Relationship Of /Between The Investments

Under this, investments can be classified into:

i. Mutually Exclusive Investments

Mutually exclusive investments are those that serve the same purpose and compete with each other. If a firm accepts one, other have to be ruled out. An example of this kind of project would be the need to transport supplies from a loading dock to the warehouse. The firm may be considering two proposals: a conveyor belt connecting the dock and warehouse, or forklifts

to pick up the goods and move them. If the firm accepts one proposal it precludes the acceptance of the other.

ii. Independent Projects

Independent projects are projects that serve different purposes and do not compete with each other. For example; a firm having surplus resources for investment may decide to expand its existing facilities to enlarge its market for the existing products or it may decide to diversify into another line of business entirely different from its current market or products. Depending on feasibility profitability and availability of funds, the firm can undertake both projects.

iii. Contingent or Dependent Project

Dependent or contingent projects are projects whose choice of one project necessitates undertaking one or more other projects. For example if a firm decides to buy a new machine like computer it has to buy other peripheral devices that are compatible with that model of computer machine such as the cursor, the printer etc.

3.3 Objectives of Investment Appraisal

Investment appraisal serves three main objectives and there are as follows:

- To present important facts on returns and risk.
- To arrive at a conclusion on safety and attractiveness of a given investment.
- To determine the extent to which the investments meet the objective of a firm/investors.

3.4 Investment Appraisal Techniques

Once the necessary information has been collected there, is need to evaluate the attractiveness of the various investment proposals under consideration. Several evaluation techniques had been developed or used in assessing economic worth of projects. These techniques can be classified into two categories as follows:

1. Traditional Techniques or Non –discounted cash flow criteria, under which we have two methods:

(i) Pay Back Period (PBP), and

(ii) Accounting (or Average) Rate of Return (ARR)

2. Modern techniques or Discounted Cash flow criteria, under which we have four methods:

(i) Net Present Value (NPV),

(ii) Internal Rate of Return (IRR),

(iii) Profitability Index (PI), and

(iv) Discounted Payback Period (DPBP).

In this unit we shall discuss the first classification –Traditional or non –discounted cash flow techniques, and the second classification –Modern techniques or Discounted cash flow techniques – in the next unit.

3.5 Traditional Methods of Investment Appraisal

Traditional investment appraisal techniques are referred to as such because they do not incorporate the concept of time value of money in their analysis. They assume that the value of money remains constant all the time; as such they treat future and past flows as the same with the present value of cash flows. The traditional methods of investment appraisal are basically two:

i. The pay back period (PBP) and

ii. Accounting rate of return (ARR)

3.5.1 Payback Period

The payback period is the length of time required to recover the cost of investment from the net cash flows it generates; thus, it is the period needed for an investment to pay for itself. Payback is commonly used as a screening method for evaluating projects as a rough measure of liquidity and that of profitability.

PBP is given by = $\frac{\text{Initial Cost of Investment}}{\text{Annual net cash flows.}}$

The above formula for PBP is only applicable where the annual net cash flows are uniform.

Example One

Bellan Ltd. is considering investing in a project that requires an initial outlay of N300,000 with 5 years life span and promises net cash inflows of N115,000 per annum, and the required rate of return or cost of capital for the firm is 10 percent.

Required

Determine the PBP of the project for the firm.

Suggested Solution

$$PBP = \frac{300,000}{115,000} = 2.61 \text{ Years}$$

But when the annual cash flows are not uniform, we determine the PBP by cumulating the cash inflows unit we reach the initial outlay (i.e., the cost of the investment).

Example Two

Consider the following data pertaining to an investment opportunity Nigeria Com Ltd

(a) Initial cost of investment N150, 000.

(b) Expected net cash flows:

Year	**Amount**
1	N30,000
2	N40,000
3	N40,000
4	N50,000
5	N60,000

c. Corporation's cost of capital: 13 percent.

Required

Determine the PBP of the investment opportunity for the corporation.

Solution

Year	Cash Flows	Cumulative Inflows
0	(N150,000) (a)	
1	30,000	30,000
2	40,000	70,000
3(b)	40,000	110,000(C)
4	50,000(d)	160,000
5	60,000	220,000

Note: PBP =b+ $\frac{(a-c)}{d}$ =3.8 years

Where

a=Initial Cost of Investment

b=Common

c=

d=

=3+$\frac{(150,000-110,000)}{N50,000}$

=3+$\frac{40,000}{50,000}$ =3+0.8 =3.8

PBP = 3.8years or 3 years 10months approx

Steps:

1. Accumulate the cash flows occurring after the initial outlay in cumulative inflows' column.
2. Look at the cumulative in flows' column and note the last year (a whole figure) for which the cumulative total does not exceed but is closer to the initial outlay. In our example that would be year 3.

3. Compute the fraction of the following year's cash in flow needed to 'payback' the cumulative total from step 2, and then divide this amount by the following year's cash inflow. For our example, we have (150,000- N110,000)
4. To get the payback period in years, take the whole figure determined in step 2, and add to it the fraction of a year determined in step 3. Thus, our payback period is 3 plus 0.8 or 3.8 years.

Decision Rule for PBP

If the calculated payback period is less than an organization's target payback period, the proposal is accepted; if not, it is rejected. For mutually exclusive projects, the project with the shorter payback period will be selected provided the payback period of that project is less than an organization's targeted payback period.

Advantages of PBP

i. It is simple to operate and easy to understand.
ii. It shows how soon the cost of purchasing an asset will be delivered.
iii. Because the method considers only the years in which cost is secured, estimates are not based on very long periods of time and so tend to be relatively more accurate than other methods in which the total life of the asset is considered.
iv. This short term approach reduces loss through obsolescence.
v. It is a measure of liquidity and very appropriate when there is shortage of cash.

Disadvantages

i. It does not measure profitability; rather it measures the break even point.
ii. It stresses the importance of converting capital into cash, which may be unimportant in assets with a long working life.
iii. There is no consideration of the time value of money.
iv. It does not consider the return on capital investment.
v. It does not consider the fact that profits from different projects may accrue uneven rate.
vi. It is subjective in determining the company's target payback period.

3.5.2 Accounting Rate of Return (ARR)

ARR is the ratio of average annual profits after depreciation of the capital invested. The profits may be before or after tax. ARR shows the relative profitability in individual projects.

There are several definitions of ARR, but the most widely used definition is:

$$\text{ARR} = \frac{\text{Average Annual Profits}}{\text{Average Investment}} \times 100$$

There are variations as to what constitutes average annual profits in practice. Some firms show average annual profit after deduction of tax, whereas some firms show theirs before deducting tax. For out illustrations in this course material, we will show both ARR before tax we will take average annual profits over the duration of the project and then divide by the number of years of the project's life.

With regards to the average investment, the most widely used definition is the average of the opening investment (cost of the project) and closing investment (residual value). Mathematically it can be stated as:

Average Investment =1/2 (Opening Investment + Closing Investment).

Example Three

Sauki (Nigeria) Limited is considering an investment proposal that has the following data available:

a. Initial cost of investment: N140,000
b. Life span: 5 years
c. Residual value: N15,000
d. Estimated future profits before depreciation and tax are as follows.

		Amount N
Year	1	30,000
	2	35,000
	3	40,000
	4	50,000
	5	60,000

(e) Assuming a straight line method of depreciation, a tax rate of 40% and the company's required rate of return of 15%.

Required

Determine the ARR of the Proposal, and advice the management of the company appropriately.

Suggested solution

Annual depreciation = N140,000- 15000 = N25,000 p.a
5 years

	Years				
	1	2	3	4	5
	₦	₦	₦	₦	₦
Net profit before deprec. & tax	30,000	35,000	40,000	50,000	60,000
Less depreciation	25,000	25,000	25000	25000	25000
Profit before Tax (PBT)	5000	10,000	15,000	25,000	35,000
Tax @ 40%	(2000)	(4000)	(6000)	(10000)	(14000)
Profit after tax (PAT)	3000	6000	7000	15000	18000

Therefore:

Average annual profit after tax = 3000 + 6000 + 7000+15000+18000 = 5 years

N49000 =N9, 800
5

Average investment = N140,000 +15,000 =N155,000 =N77,500
2 2

ARR =N9800 x 100% = 12.65%
77,500 1

The management of the company is advised to reject the proposal because it will promise them an ARR of 12.65% after tax, which is less than their required rate of return of 15%.
However to determine the ARR before tax, we will take the total profit after depreciation before taxation and divide by the number of years for the project life span to get the average annual profits after depreciation; then we will divide that by the average investment to get our ARR. This can be illustrated as follows:

Average annual profits after depreciation = (N90,000/5) = N18,000
Average investment over 5 years = (N155,000) /2 N77,500
ARR = (N18,000) /77,500 x 100 =23.2258%

The management of the company should accept the proposal because the ARR before taxation is even greater than the company's required rate of return of 15%.

Decision Rule for ARR

This method will accept all those projects whose Projects whose ARR is higher than company's required rate of return or cost of capital. And for mutually exclusive projects, the one with the higher ARR would be selected provided the project has an ARR higher than the company's required rate of return.

Advantages of ARR

1. It is simple to use and easy to understand.
2. It is determined using accounting information, which is always available.
3. It considers the total profits of a project throughout its operating life.
4. It is consistent with the return on investment measure used to compare divisional performance in many companies.
5. It provides a conservative measure of profitability.

Disadvantages of ARR

1. It ignores time value
2. It is based on accounting information rather than cash flows.
3. There is no universally accepted method of calculating ARR.
4. It fails to consider the fact that money can further be reinvested.
5. It is in line with the traditional view of maximization of profit as the overall objective of business enterprises thereby forgetting about an important measure, which is that of wealth maximization.
6. It does not consider that projects may have different life span.
7. It does not consider the size of the investment.
8. It ignores the fact that profits from different projects may accrue at an uneven rate.

4.0 CONCLUSION

A traditional method of investment appraisal: The Pay Back Period (PBP) and Accounting rate of return (ARR), was discussed and their computational processes explained. The techniques have been identified as among the tools that could be used to determine the choice of project to undertaken, despite identified limitations.

5.0 SUMMARY

In this, unit, attempt have been made to describe how payback period (PBP) and Accounting rate of return (ARR), could be applied to viability of projects proposed to be undertaken. Other techniques shall be discussed in unit 6.

6.0 TUTOR –MARKED ASSIGNMENT

Sa'achi enterprises are considering investment in projects with the following data.

a. Initial cost Project A: N500,000, Project B: N450,000

b. Expected net cash flows:

Year	Project A	Project B
	Amount (N)	Amount (N)
1	130,000	120,000
2	140,000	230,000

3	210,000	110,000
4	150,000	100,000
5	100,000	120,000
6	120,000	110,000

c. Cost of capital of the company is 12% and tax rate of 25%

Required:

Advice the management of Sa'achi Enterprises which Project it should accept using:

1. Pay back period (PBP)
2. Accounting /average rate of return (ARR)

7.0 REFERENCES/FURTHER READINGS

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UNIT 4 INVESTMENT APPRAISAL II

CONTENTS

1.0 INTRODUCTION

You have learnt how to appraise investment proposals using pay back period (PBP) and Accounting rate of return (ARR) –The traditional techniques in unit 5. This unit is a continuation and in it, we shall demonstrate how investments can be appraised using discounted cash flow (DCF) techniques.

2.0 OBJECTIVES

By the end of this Unit, you should be able to understand:

- Explain discounted cash flow techniques of investment appraisal and the computational process.
- Advice on the choice of investment based on the computations made.

3.0 MAIN CONTENT

3.1 Discounted Cash Flow Techniques (DCF) of Investment Appraisal

These are referred to as modern techniques because they do incorporate the modern concept of time value of money. They assume that money does not have the same value all the time. They postulate that cash –flows arising at different time periods differ in value and are comparable only when their equivalents present values are found out.

3.1.1 Net Present Value (NPV)

The NPV method involves calculating the present values of expected cash inflows and outflows (i.e., the process of discounting) and establishing whether in total the present value of cash inflows from a given project is greater than the present value of cash outflows of the project. The NPV is the value obtained by first discounting all future cash –flows from a capital investment project at a chosen discount rate which is normally the cost of capital or required rate of return of a Mathematically, the Net Present Value (NPV) is given as follows:

$$NPV = \sum_{n=1}^{n} \frac{Ai}{(1+r)^i} - Io$$

Where:

Ai = Annual cash inflow

Io = Initial investment

r = Discount factor

Example One

Kawu Ltd. Is considering a capital investment proposal costing N1,500,000. The corporation's cost of capital is 12%. And the estimated cash flows from the Proposal are given as follows:

Years 1 = N400,000

2 = N600,000

3 = N900,000

4 = N800,000

5 = N200,000

$$NPV = \frac{400,000}{1.12} + \frac{600,000}{1.12^2} + \frac{900,000}{1.12^3} + \frac{800,000}{1.12^4} + \frac{200,000}{1.12^5} - 1,500,000$$

= 357142.86+478316.33+640602.22+508414.46+113485.37

= 2097961.24-150000

= N597,961.24

Alternatively the solution could be presented in tabular form, and slight modification can be made to the NPV formula with 't' starting from year negative cash flows, whereas cash inflows represent positive cash flows.

$$NPV = \sum_{n=1}^{n} \frac{Ai}{(1+r)^{i}} - Io$$

Solution in Tabular Form

Year	Cash flow	DCEat 12%	Present Value
0	(1500,000)	1.0000	(N1,500,000)
1	400,000	0.8929	357160
2	600,000	0.7972	478320
3	900,000	0.7118	640620
4	800,000	0.6355	508400
5	200,000	0.5674	113480
		NPV	= 597980

The difference of N18.76 compared with the first solution is due to an approximation of the discount factors. But this alternative presentation is best recommended.

Decision Rule in NPV

- If the NPV is positive, the project should be accepted.
- If the NPV is negative, the project should be rejected.
- If the NPV is exactly zero the project will be just worth undertaking. Or mutually exclusive projects, we select a project that has the highest NPV.

Advantages of NPV

1. It takes appropriate care of time value of money and timing of cash flows.
2. It is based on the modern business objective namely maximization of shareholder's wealth.
3. It employs the use of cash flows rather than profit, cash flows are much more objective than profits which is very much subjective because of certain elements such as depreciation.
4. It is very crucial in ranking projects.

Disadvantages of NPV

1. Discounting cash flows in not as easy as thought especially to some of our laymen investors who are in majority in our society.
2. It is based on the modern business objective namely maximization of shareholders' wealth.
3. It employs the use of cash flows rather than profit, cash flows are much more objective than profits which is very much subjective because of certain elements such as depreciation.
4. It is very crucial in ranking projects.

Disadvantages of NPV

1. Discounting cash flows is not as easy as thought especially to some of our laymen investors who are in majority in our society.
2. It necessarily calls for the calculation of the cost of capital, which is not easy, and so enhancing more uncertainty in the method.
3. It wrongly assumes that all shareholders are much more concerned with cash flows than with high profits which may not be true in all cases.
4. It has problems in ranking projects that have different costs and different benefits.
5. To simplify the calculations involved we incorporate some impractical assumptions such as doing away with inflations and taxation.

3.12 Internal Rate of Return (IRR)

The IRR is defined as the discount rate used to make the discounted cash inflows equal to its initial cash outflows (that is, the NPV is equal to zero). IRR can be found using the following formula.

$$IRR = LR + (HR - LR) \times \frac{NPV\ LR}{NPVHR - NPVLR}$$

Where: LR = Lower discount rate that gives positive NPV

HR = Higher discount rate that gives negative NPV

NPV LR= Net present value at lower discount rate

NPV HR= NPV at higher discount rate

Example Two

Doko Limited is considering a capital investment project costing N560,000. The project will generate future cash flows as follows.

Year	Cash flow
1	N170,000
2	N180,000
3	N200,000
4	N250,000
5	N160,000

Doko's cost of capital is 15%.

Required

Advice the management of Doko Limited appropriately on whether to under the project or not, using IRR techniques.

Solution

Let us first find the NPV of the project by using the company's cost of capital 15%.

Year	Cash flow	DCF At 15%	PV
0	(560,000)	1.0000	(560,000)
1	N170,000	0.8696	N147,832
2	N180,000	0.7561	N136,098
3	N200,000	0.6575	N142,950
4	N250,000	0.5718	N79,552
		NPV	=N77.932

As the NPV is positive at 15%, the IRR must be higher than 15%

Let us try 24% to get a negative NPV:

Year	Cash flow	DCF At 24%	PV
0	(N560,000)	1.0000	(N560,000)
1	N170,000	0.8065	N137J05
2	N180,000	0.6504	Nil 7,072
3	N200,000	0.5245	N104,900
4	N250,000	0.4230	N105,750
5	N160.000	0.3411	N54.576
		NPV =	(40597)

With DCF of 24% the NPV is negative. This means that the IRR of the project lies between 15% -24%. Going by the formula, we can calculate the IRR as follows (we have to follow the rule of BODMAS in our calculations).

$$\text{IRR} = 15 + (24-15)\left[\frac{77{,}932}{77932-(-40597)}\right]$$

$$= 15 + (9)\ (0.6575) = 20.92\%$$

The management of Doko Limited is advised to accept the project because it has an IRR of 20.92% which is greater than the company's required rate of return or cost of capital.

Decision Rule for IRR

If the IRR exceeds the firm's cost of capital or required rate of return, the project will be accepted.

If the IRR is less than the cost of capital, the project should be rejected. If the IRR is equal to the firm's cost of capital, the project will just be worth undertaking.

For mutually exclusive projects, we select a project with a higher IRR provided the IRR of that project is higher the firm's cost of capital.

Advantages of IRR

1. It is easy to be appreciated by a layman.
2. It makes a provision for a margin of error, which is not well taken care of by even NPV.
3. It enjoys almost all the advantages of an NPV method.

Disadvantages of IRR

1. An investment may have more than one IRR.
2. It is by no means easy to be calculated or determined.
3. It is very difficult and sometimes impossible to choose between alternative investments projects using IRR.

3.1.3 PROFIT ABILITY INDEX (PI)

When the NPV method is used to evaluate capital expenditures, all projects with positive NPVs are acceptable. Managers, however, usually face two conditions that complicate the evaluation of NPV results:

1. The various project proposals being considered have different costs and of course different benefits; and.
2. The firm does not have sufficient funds to invest in all the projects available

Therefore, an extension of the NPV method, called profitability index (PI) be used to ensure that a firm uses its limited resources for investments with the highest returns possible. That is,

it is used to prioritize investment opportunities in terms of their expected profitability. The PI method is not normally used appraising projects because it will yield the same decision with the method. However, PI is more useful in a situation of capital rationing, which will discuss in the next segment of this unit.

Profitability Index (PI), which is also called benefit cost ratio, is determined dividing the net present value of future cash flows by the initial outlay.

Mathematically PI is written as follows:

Profitability Index (PI) =NPV

10

Where NPV = Net present value of investment

10 = Initial investment/cash outlay

Example Three

Kpanje Ltd is contemplating investing in a project proposal that requires an initial outlay of N400,000, which promises the following cash flows for the next five years.

Year	Cash flow
1	N100,000
2	N120,000
3	N110,000
4	N110,000
5	N100.000

The corporation's required rate of return or cost of capital is 10%;

Required

Determine the profitability index of the project and advice the management of Maslaha appropriately.

Solution

First we have to calculate the NPV of the project:

Year	Cash flow	DCF At 10%	Present value (P)
0	(N400,000)	1.0000	(N400,000)
1	N100,000	0.9091	N90910
2	N120,000	0.8264	N99168
3	N110,000	0.7513	N82643
4	N1110000	0.6830	N75130
5	N100000	0.6209	N62090
			NPV =N9941

Profitability Index (PI) =NPV =$\frac{9941}{400,000}$ =0.02486

Io

The management of Kpanje is advised to accept the proposal because it has a positive PI (0.02486).

Decision Rule for PI

If the PI is positive which means the NPV is positive the project should be accepted, but when the NPV is negative which means the PI is less than zero, the project should be rejected.

In ranking projects and for selection among mutually exclusive projects the project with the highest PI should be ranked first, and it should be the one to be selected.

Advantages of PI

1. Almost all the advantages of NPV method could be ascribed to PI method.
2. It is more useful in ranking projects and for capital rationing.
3. It is easily appreciable by a layman.

Disadvantages of PI

1. Almost all the disadvantages of NPV method could be ascribed to it.
2. It cannot be used for project appraisal without the NPV rule.

3.1.4 Discounted Cash Flow Techniques of Investment Appraisal

It was pointed out earlier that the traditional payback method is a breakeven concept. But such a breakeven period is not accurate because the cost of capital is ignored. If we borrowed money to invest in a project, then the interest paid on the loan is ignored by the traditional payback method. Another drawback pointed out was the isolation of the time value of money. The discounted payback method overcomes these two shortcomings by incorporating discounting into the payback calculation. It is the discounted into cash flows which is used in calculating the payback period.

Example Four

Rakiya Limited is considering an investment opportunity that requires an initial outlay of N250, 000 and it promises the following cash flows:

Cash flow

N80,0000

N100,000

N90,000

N80,000

N70,000

The company's cost of capital is 12%.

Required

Calculate the discounted payback period of the project and advice the management of the company accordingly.

Solution

Year	Cash flow N	DCF at 12%	PV	Cumulative PV (N)
0	(250,000)a			
1	80,000	0.8929	71,432	71,432
2	100,000	0.7972	79,720	151,152
3(b)	90,000	0.7118	64,062	215,214(c)
4	80,000	0.6355	50,840(d)	266,054
5	70,000	0.567	39,718	305,772

Note: DPBP = b+ $\frac{a-c}{d}$

=3+[(N250.000-215,214)]/50, 840

=3+0.68

DPBP =3.68 years or 3 years 8 months approx

Depending on the targeted payback period of the company, for instance if the target payback period of the company is 4 years, the management should accept the projects that will payback itself in less than 4 years (i.e., 3.68 years).

Note: The decisions rules for DPBP are the same with the non discounted PBP, and also all the advantages and disadvantages of the non –discounted PBP could be ascribed to the DPBP. But one more advantage of DPBP is the incorporation of the time value of money into the analysis. And generally the DPBP takes longer time to payback than the non –discounted PBP because of the smaller values of the discounted future cash flows compared to the non-discounted future cash flows:

SELF ASSESSMENT EXERCISE

1. Discuss the merits and demerits of various discounted cash flow techniques.
2. Enock Ltd is considering the selection of one of the pair of mutually exclusive investment projects. Both would involve purchases of machinery with a life of five years.
   Project A would generate annual cash flows (receipts less payments) of =N=200,000, the machinery would cost =N=600,000.

Project B would generate annual cash flows of =N=500,000, the machinery would cost =N=1,600,000.

Enock Ltd uses straight –line method for providing depreciation. Its cost of capital is 15% per annum., Assume that annual cash flows arise on the anniversaries of the initial outlay, that there will be no price changes over the project lives and that acceptance of one of the project will not alter the required amount of working capital.

You are required to:

a. Calculate for each project

i. The payback period in one decimal place.

ii. The accounting rate of return (ARR)

iii. The net present value (NPV)

iv. The internal rate of return (IRR) to the nearest percent

c. State which project you would select for acceptance

4.0 CONCLUSION

Discounted cash flow methods of investments were explained. NPV, DPBP and PI computational process were demonstrated as well as the criteria of their use in the choice of the projects to undertake.

5.0 SUMMARY

This unit is a continuation of unit 5 and discussed the discounted cash flow techniques of investment appraisal. We assumed also in this unit that cash flows are certain and this may not

be obtainable in practice. In unit 7 we shall discuss the impact of risk and uncertainty on investment appraisal.

6.0 TUTOR MARKED ASSIGNMENT

Mohammed plc is considering two mutually exclusive project which have the following cash flow profile:

	Project A =N=	**Project B=N=**
Initial Outlay	2,000,000	2,050,000
Estimated future cash flows		
Year 1	800,000	750,000
Year 2	820,000	780,000
Year 3	850,000	900,000
Year 4	860,000	950,000

The company's cost of capital is 15%

Required: Advise the company on the project to select using.

(1) NPV (2) IRR (3) Profitability Index

7.0. REFERENCES/FURTHER READINGS

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UNIT 5 INVESTMENT APPRAISAL III

CONTENTS

1.0 INTRODUCTION

Units 2 and 3 discussed traditional and discounted cash flow techniques of investment appraisal, which we expect that you have understood. This unit would discuss capital rationing and risk analysis in investment appraisal. Issues discussed in unit 5 and 6 assume consistency in risk in and sufficiency of fund for investments, that in practice is not always applicable.

2.0 OBJECTIVES

By the end of this unit, you should able to:

- Explain best ways of rationing limited investible fund among viable investments
- Explain the technique of estimating risk in investments
- State the implication of risks on investment appraisal

3.0 MAIN CONTENT

3.1 Capital Rationing

Ordinarily firms take on investments to the point where the marginal returns from the investments are just equal to their estimated marginal cost of capital. However, firms may

have to choose among profitable investment opportunities because of their limited financial resources. Capital rationing refers to a situation where a firm is constrained for external or internal reasons to obtain necessary funds to invest in all available investment projects that have positive net present values. It is a situation in which a firm is unable to undertake all projects, which are apparently profitable because of a limited amount of funds, as such projects have to be prioritized and ranked in order of benefit or maximum returns possible from each. External capital rationing mainly occurs on accounts of the imperfections in the capital market, such as deficiencies in market information or rigidities of attitude that hamper the free flow of capital. External capital rationing is caused by factors outside the control of management of an enterprise. Such factors include:

- Depreciation of share price in the stock market making, it impossible to raise money through the stock market.
- Restrictions on bank lending due to government controls
- High floatation costs in the stock market making it expensive to make issues of capital.
- Attitude of the capital market about providing funds beyond a specific amount because it would lead to increased risks of high be adequate compensation. For instance, a bank might consider a firm too risky to be given any more loan capital even at a very high interest rate (Olowe, 1997).

Internal capital rationing is caused normally by self –imposed restrictions by the management. The management may decide not to obtained additional funds by incurring debt or not issuing additional stocks for the fear of dilution of ownership. Also management may fix a limit to the amount of funds to be invested by divisional managers for control reasons or other reasons. And sometimes management may resort to capital rationing by requiring a minimum rate of return higher than the cost of capital.

Example One

Assume a firm that is having 20% as its required rate of return is faced with the following investment opportunities:

Project	**Initial cash Outflow**	**IRR**	**NPV**	**PI**
A	N150,000	23%	N27,000	0.18
B	N300,000	25%	N50,000	0.17

C	N450,000	21%	N175,000	0.39
D	N150,000	29%	N35,000	0.23
E	N200,000	18%	N(28,000)	(0.14)
F	Nil 0,000	30%	N27,500	0.25
G	N100,000	27%	N25,000	0.25
H	N65,000	24%	N19,300	0.30
I	N350,000	19%	(N21,000)	(0.06)
J	N90,000	28%	N18,700	0.21
K	N210,000	17%	(N22,250)	(0.11)

The budget ceiling for initial cash outlays during the period is N965,000 and proposals are independent of cash other, you would want to select the combination of proposals that provides the greater increase in the firm value that 35,000 (or less) can provide. But automatically excluding proposals E,I and because their IRRs are less than the hurdle rate of the firm, i.e., 20%, which the required rate of return; and that is why they are having negative NPVs and therefore, selecting projects in descending order of profitability according to the various discounted cash flows methods we discussed unit N965,000 budget is exhausted reveals the following.

Using IRR Criteria

Project	**IRR**	**NPV**	**Initial outflow**
F	30%	N27,500	N110,000
D	29%	35,000	150,000
J	28%	18,700	90,000
G	27%	25,000	100,000
B	25%	50,000	300,000
H	24%	19,300	65,500
A	23%	27.000	150.000

Using NPV criteria

Project	IRR	Initial outflow
C	N175,000	N450,000
B	50,000	300,000
D	35,000	150,000
H	19,300	65,000
	N202.500	N965.000

Using PI criteria

Project	IRR	NPV	Initial outflow
C	0.39	N175,000	N450,000
H	0.30	19,300	65,000
F	0.25	27,500	110,000
G	0.25	25,000	100,000
D	0.23	35,000	150,000
J	0.21	18,700	90,000
		N300,500	N965,000

With capital rationing, you would accept projects C, D, F, G, H and J, totaling N965,000 in initial out flows. No other mix of available projects will provide J greater total net present value than the N300.500 that these projects provide. This has buttressed the superiority of PI in ranking of projects in terms profitability. And because of budget constraint, you cannot necessarily invest all proposals that increase the net present value of the firm; you invest in acceptable proposal only if the budget constraint allows such an investment.

3.2 Risk Analysis in Capital Budgeting

Uncertainty is a major factor to be considered in all types of decision making. It is of particular important in investment appraisal because of the long time scale and amount of resources involved in a typical investment decision.

Risk is generally defined as the possibility of suffering, damage or loss. Certainty is a situation where one has full knowledge of future occurrence of an event; while uncertainty is

the reverse. Thus, the riskiness of an asset is defined in terms of likely variability of future returns of the asset. The more variable the expected future returns, the more risky the investment In general, risky or uncertain projects are those whose future cash flows, and hence the returns on the projects, are likely to be variable the greater the variability, the greater the risk. Unfortunately, elements of uncertainty can exist even if future cash flows are know with certainty. For example, if a lease is being appraised the future cash flows are known and fixed but their value may vary because of changes in the rate inflation. The greater risk of a proposed project then greater the required rate of return or cost of capital. There are three stages of the overall appraisal and decision process in which risk and uncertainty merit special attention:

a. The risk and uncertainty associated with the individual project.
b. The effect on the overall risk and uncertainty of the firm when the project being considered is combined with the rest of the firm's operation.
c. The decision maker's attitude to risk and its effect on the financial decision.

The following are the most common measures of risk of individual projects.

1. Standard Deviation

The traditional approach utilizes the measure of the tightness of the probability distribution of a project returns to determine the risk of the project. This measure of tightness that is used is the standard deviation. The tighter the probability distribution, the smaller the standard deviation and the less risky the project.

2. Coefficient of Variation

When we divide the standard deviation by the mean, or the expected value of net cash flow, we obtain the co-efficient of variation. Coefficient of variation is a relative measure of risk. The co-efficient of variation is a useful measure of risk when we are considering projects that have same standard deviations but different expected values, different standard deviations but same expected values, or different standard deviations and different expected values.

Whether a project should be accepted will depend upon the investor's attitude towards risk. An investor can accept a project, which has higher monetary value if he is ready to assume more risk. If he has a great aversion to risk, he would accept projects with less risk but low monetary value. This is true because of the popular slogan in business finance, which says the

higher the return. Other techniques of measuring variability, which are also useful, include sensitivity analysis and decision tree.

a. Sensitivity Analysis

This is a method of analyzing changes in the projects NPV for a given period in one of the variables. It forces the decision maker to identify underlying variables (e.g. factors of production), indicates critical variables and helps in strengthening the project by pointing out its weak links. Its limitations are that it cannot handle a large number of interdependent variables and some times it falls to give unambiguous results.

b. The Decision Tree Analysis

A decision tree is a graphic display of the relationship between a present decision and future events, future decisions and their consequences. The sequence of events is mapped out over time in a format similar to the branches of a tree. In decision tree, after the investment proposal has been defined each alternative will have different consequences. The decision tree would be graphed indicating the decision points, changes, events, and other data. The relevant data such as the projected cash flows, probability distributions, the expected present values etc should be located on the decision tree branches. And finally the results would be analyzed and the best alternative would be selected. But for now we shall be more concerned with the first two measures of risk, i.e., standard deviation and coefficient of variation as they are the most popular tools of risk analysis.

Example Two

Suppose 2 investment proposals have the following probability distribution of expected cash flows:

Proposal A		Proposal B	
Probability (p)	Cash flow (X) N	Probability (P)	Cash flow (X) N
0.10	7,000	0.20	3,000
0.15	6,000	0.30	4,000
0.25	5,000	0.25	5,000
0.30	4,000	0.15	5,500
0.20	3,000	0.15	6,500

Required

a. Calculate the expected value of the cash flows of each.
b. Find the standard deviation of each
c. Find the coefficient of variation of variation of each.
d. Advice a prospective investor on which of the two proposals he should go for and why?

Solution

a. Expected value of cash flow: $At = \sum_{t=1}^{n} Axt\ Pxt$

b. Standard deviation: $\sigma = \sqrt{\sum_{t=1}^{n} (Axt-At)^2\ Pxt}$

c. Coefficient of variation: CV = $\frac{\sigma}{}$

At

Proposal A

Probability Px (I)	**Cash flow A x (2)**	**E.V 1 x 2=(3)**	**(2)-A, Dev (4)**	**$(4)^2$ =5 Sq. Dev**	**$(Ax-A_t)^2$ Px (5X1) =6**
	₦	₦	₦	₦	₦
0.10	7000	700	2350	5522500	552250
0.15	6000	900	1350	1822500	273375
0.25	5000	1250	350	122500	30625
0.30	4000	1200	(650)	422500	126750
0.20	3000 -	600	(1650)	2722500	544500
	A_t =	₦4650		$\square^2$ =	1527500
				$\square$	₦1235.920

Coefficient of variation (CV) = $\square$ ₦1066.247 =0.24

A_t ₦4525

Thus, if investor is a risk averse, he should go for proposal B, because of its lower standard deviation and smaller coefficient of variation (i.e., lower return). On the other hand, if he is a risk lover, he would prefer proposal A, because it has a higher expected value of cash flow (i.e, higher return) but also has higher standard deviation and higher coefficient of variation as such more riskier.

In determining standard deviation of the net annual cash flows for a whole project life span, the standard deviation of the expected net present value has to be calculated. There are two formulae for calculating the standard deviation of the expected net present value; however, this depends on whether cash flows in each year are mutually independent or dependent.

4.0 CONCLUSION

The impact of capital limitation and risk and uncertainties on project appraisal was demonstrated, computed and explained.

5.0 SUMMARY

We have said that a business plan is a document that sets out what a business seeks to achieve and how it wants to do it. The management plan is a key aspect of a business and examines the management aspects of the business. It focuses attention on the staffing of an organization to enable it meet organization needs.

6.0 TUTOR –MARKED ASSIGNMENT

1. What do you understand by the term ‘’Capital rationing’’ as it relate to capital budgeting.
2. Discuss the common measure of risk in capital budgeting
3. Chechen Inc. that currently has a capital budget of N700,000 is considering the following projects that are independent.

Project	**Cost (N’000)**	**Annual cash flow (N’000)**
A	300	100
B	180	80
C	100	48
D	400	150
E	250	85

All project have a 5 year life with nil residual value. The company’s cost of capital is 18%.

Required:

Advice the company on the project to select assuming:

i Projects are divisible ii Projects are not divisible

4. XYZ Ltd is considering an investment project costing N350,0000.

The company has determined the following discrete probabilities for cash flows generated by contemplated projects.

Year 1		**Year 2**		**Year 3**	
Cash flows (N)	Probabilities	Cash flows (N)	Probabilities	Cash flows (N)	Probabilities
80,000	0.3	90,000	0.2	100,000	0.3
160,000	0.5	150,000	0.5	120,000	0.6

Assume a risk free rate of 10%, determine: a) The Expected NPV and b) Standard deviation of the project.

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MODULE II ESTIMATING CASHFLOWS AND PROJECT DECISIONS

UNIT I CASH–FLOW INGRENDIENTS FOR A PROJECT

CONTENTS

1.0 INTRODUCTION

As we ware discussed in the first module, discounted cash flows rules such as net present value and internal rate of return and non –discounted cash flows rules such as pay back period, annual rate of return are driven by estimates of cash flows. In order for these rules to accomplish their purpose, the cash –flows have to be estimated correctly.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Ascertain the effects of taxes on cash flows
- Explain how a firm's tax status does – whether it making or loosing money
- Explain what are the non –cash charges, and how they affect the cash flows on a project

3.0 MAIN CONTENT

3.1 Principles of Cash Flow Estimation

In a conventional project, cash flows can be categorized in three different ways:

1. The outlay in the project is called the initial investment. The word initial'' may be a misnomer because the outlay could either occur right now (in an instant) as in the case of the purchase of equipment, or take several periods as is the case of building a new factory.

Initial investment is the cash outlay needed to get a project operational. While it is often assumed to occur at the start of a project's life, it could occur at any time during its life.

2. The cash flows generated during the life of the project are called operating cash flows. Although they are generally positive for most conventional revenue –generating projects, there are some cost minimization projects whereby all of these cash flows can be negative. This would be the case, for instance, for a firm considering whether to buy or lease a phone system for use in the business.

3. At the end of the project life, the remaining assets in the project, both fixed and current, are assumed to be liquidated: the cash flow generated by this liquidation is called the salvage value.

Salvage value is the expected cash flow from liquidating the assets invested in a project, at the end of its life. The following are the three principles that should be adhered to when cash flows are estimated for the purposes of analyzing a project.

1. **Cash flows should be after taxes:** All investment should be done in an after –tax terms. This implies that all items that affect taxes, even non cash items such as depreciation, should be considered in the analysis.

2. **Cash flows should be incremental:** Consideration should only be made on the incremental cash flow in project analysis. This means that any cash inflow or outflow that can be directly traced to a project has to be attributed to the project, for purposes of analysis. It also implies that any reduction in cash inflows and outflows that occurs as a consequence of a project should be considered in the course of the analysis.

3. Cash Flows and Discount Rates should be consistent As emphasized in the previous chapter, cash flows and discount rates must be matched up in terms of the investor group that is being analyzed if the discount rate is a cost of equity, the cash flow has to be a cash flow to equity investors; if the discount rate is the cost of capital, the cash flow has to be a cash flow to the firm. Cash flows and discount rates should also be consistent in terms of how they deal with inflation – if cash flows are nominal, discount rates should be too.

3.2 Effects of Taxes on Cash Flow

When a project is expected to generate income, it can be expected to create a tax liability. The questions of what tax rate to use in assessing this tax liability and how to deal with losses are central to assessing the impact of taxes.

Tax Rate

Let us begin by laying out the choices in terms of tax rates . The average or effective is the total tax paid as a proportion of the total income generated by a business. The marginal tax rate is the tax rate on the next naira in income that will be generated by a business; it will generally be higher than the average tax rate because of the progressivity in tax schedules. The statutory tax rate is the rate specified in the tax rate schedules for a given level of income.

Marginal Tax Rate

The marginal tax rate is the tax rate that the firm will face on the next dollar of taxable from a project is marginal; that is, it is additional to other income generated by the firm's existing assets and projects. The correct rate to use in estimating tax liability is therefore the marginal tax rate for the firm, which should include taxes at every level –federal, state and local on the marginal naira of income generated.

Dealing with Different Tax Rates

Some businesses operate in multiple locales with different tax rates. For instance, multinational companies generate income in a number of countries, with very different marginal tax rates. Even when they can claim a tax credit in the united states for taxes paid in

other countries, the different marginal tax rates raises a question: which if any, of the marginal tax rates should be used to compute the tax liability in each period?
The answer is an average of the marginal tax rates of the different countries in which the project will generate profits, weighted by the profits in each country.

Effect of Non cash changes

One consequence of dealing with cash flows after taxes is that non cash charges can have a significant impact on cash flows, if they affect tax liability. Some non cash charges reduce the taxable income and taxes paid by a business. The most important of such charges is depreciation, which while reducing taxable and net income, does not cause a cash outflow. Consequently, depreciation is added back to net income to arrive at the cash flows on a project.

Non cash charges is an accounting expense that reduces is an accounting expense that reduces income but does not create a cash outflow for the firm. For projects that generate large depreciation charges, a significant portion of the net present value can be attributed to the tax benefits of depreciation, which can be written as follows:
Tax Benefit of Depreciation = Depreciation x Marginal Tax Rate
While depreciation is similar to other tax deductible expenses in terms of the tax benefit it generates, its impact is more positive because it does not generate a concurrent cash outflow.

Depreciation Methods

The many different depreciation methods used by firms can be classified broadly into two groups. The first is straight – line depreciation, whereby equal amounts of depreciation are claimed each period for the life of the asset. The second group includes accelerated depreciation methods, such as double – declining balance depreciation, which results in more depreciation early in the asset life and less in the later years. Because the nominal cumulative depreciation claimed under both methods is the same, the effect of switching from straight line to accelerated depreciation, or vice versa, is generally seen only when the present value of the tax savings is considered. Accelerated depreciation methods provide the tax benefits earlier than straight – line methods, and so the net present value will usually increase with the use of the former.

SELF ASSESSMENT EXERCISE

1. What is a non cash charge and give example of a non cash charge?
2. What do you understand by a marginal tax rate?
3. State the three principles that must be followed in a cash flow estimate when analyzing a project.

4.0 CONCLUSION

Cash flows should be estimated after taxes. The effect of non cash charges such as depreciation, which are tax deductible can be calculated in terms of the tax benefits they create for the business.

5.0 SUMMARY

This unit examines the nuts and bolts of estimating cash flows and emphasizing three principles. It discusses the effects of taxes on cash flows and the non cash or a project.

6.0 TUTOR MARKED ASSIGNMENT

Explain how businesses deal with different tax rates

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.

UNIT 2 INCREMENTAL CASH FLOW

CONTENTS

1.0 INTRODUCTION

The most important rule governing the estimation of cash flow is that only incremental cash flows belong to investment analysis. An incremental cash flow includes any cash inflow or outflow that is direct or indirect consequence of taking a project. although a number of techniques can be used to assess whether an item of cash flow is incremental, one of the most effective ones is to ask the question: what will happen to this item of cash flow if this project is not taken? If the answer is that the cash flow will remain unaffected, it is not an incremental cash flow and does not belong in the investment analysis. If the answer is that it will change, the amount, the amount of the change should than become part of the analysis.

The incremental cash flow principle is useful in dealing with a number of different factors that may rise in the context of capital budgeting, including sunk costs, working capital opportunity costs, allocated costs and product cannibalization.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- State what an incremental cash flow is
- State why do incremental cash flow matter
- Explain the meaning of sunk costs and how they should be considered in capital budgeting
- Explain the effect of working capital on cash flows
- Explain how you do price in project resources that may already be owned by a firm

3.0 MAIN CONTENT

3.1 Sunk Cost

In a project, some expenses are incurred before the project analysis is done. An example of such expenses is that associated with a test market done to assess the potential market for a product before conducting investment analysis. Such expenses are called sunk costs. Since

they will not be recovered if the project is rejected, sunk costs are not incremental and so should not be considered as part of the investment analysis. Sunk costs are any expense that has been incurred already, and cannot be recovered if the project is not taken.

An aspect of expenses that falls into the sunk cost category in project analysis is research and development, which occurs before a product is even considered for introduction.

Although sunk cost should not be treated as part of investment analysis, a firm does need to cover its sunk costs over time or it will cease to exist.

3.2 Working Capital

This is one other item that affects cash flow but does not affect accounting income. Working capital is the difference between current assets and current liabilities. Current assets include stock, debtors and cash while current liabilities include creditors, tax payable and current portion of long term liabilities. From the view point of project analysis, we can eliminate the current portion of long term on two grounds. First, it will be considered as part of the overall financing for the project, and considering it as part of working capital will count it twice.

Second, the objective in the analysis is to estimate future working capital needs, and the current portion of long –term debt is generally an unpredictable and highly variable component of working capital. Since we are attempting to estimate the effect of changes on cash from the definition, reducing.

Working capital to

Non cash working capital = (stock + debtors) – (creditors + Tax payable)

Any investment is non cash working capital cannot be used else where and is therefore similar to an investment in land and buildings or equipment.

Thus, it has to be viewed as a cash outflow when it is made. Any increase in the non cash working capital will result in further cash flow since more money is tied up in those assets, whereas a decrease in the non cash working capital can be viewed as a release of cash, or a cash inflow.

3.2.1 Estimating Net Working Capital Needs for a Project

It is important to note that working capital requirements on every project be analyzed and factored into cash flows. In general, working capital requirements on a project is a function on

that project, although the linkage varies from business to business. Some businesses such as retailing will require high working capital while service businesses might be able to sustain themselves with very little. The following factors are used to determine working capital requirements:

a. Credit policy
b. Pricing policy
c. Product choice
d. Size and credit standing of the business

3.2.2 Building Working Capital Changes into Cash Flows

Some working capital investments may need to be made initially, before the project starts generating cash flows. For instance, a retail business has to invest in an inventory before it opens its doors for business. This is the initial working capital investment, and it creates a negative cash flow. The working capital requirement may change over time, for a number of reasons – the project may get larger over time, or the working capital needs may shift as the project matures. Any increases in working capital generate cash inflows. Lastly, the entire working capital investment over the life of the project will have to be evaluated for potential salvage value at the end of the project's life, creating a positive cash flow.

3.2.3 The Consequences of Ignoring Working Capital Needs

Investment analysis, not considering the needs of working capital can result into the following consequences:

- Since working capital tends to increase during the initial years of growth on a project, and these increase cause cash outflows, not including working capital needs in an analysis will lead to an over estimation of the after –tax cash flows during these years.
- Even if working capital is salvaged fully at the end of the project lifetime, the present value of the cash flows created by working capital changes will be negative. Consequently, the net present value of a project will be overstated if working capital is not included in the analysis. Some projects that show positive net present values when working is ignored may become negative net present values projects when working capital needs are incorporated.

3.3 Opportunity Costs

In project analysis, it is assumed that the resources used for the project are newly acquired. This is not always true as some of the resources are just already in the business but transferred into the new project. When a business uses such into the new project, such resources, there is the potential for an opportunity cost. Opportunity cost is the cost assigned to a project resource that is already owned by the firm. It is based on the next best alternative use.

The general framework for analyzing opportunity costs begins by asking the question, ‘’ Is there any other use for this resource right now? For many resources, there will be an alternative use if the project being analyzed is not taken.

- The resource might be rented out, in which case the rental revenue is the opportunity lost by taking the project.
- The resource could be sold, in which case the sales price, net of any tax liability and lost depreciation tax benefits, would be the opportunity cost from taking this project.
- The resource might be used else where in the firm, in which case the cost replacing the resource is considered the opportunity cost.
- Thus, the transfer of experienced employees from established divisions to a new project creates a cost to these divisions, which has to be factored into the decision making.

3.4 Excess Capacity

This is the difference between the capacity available on a resource and the capacity in use. New capacities will bought or built when capacity runs out, in which case the opportunity cost will be higher cost in present value terms of doing this earlier than later. Production will have to be cut back on one of the product lines, leading to a loss in cash flows that would have been generated by the lost sales. Frameworks for pricing excess capacity for purpose of investment analysis are:

If the new project is not taken, when will the firm run out of capacity on the equipment or space that is being evaluated?

If the new project is taken, when will the firm run out of capacity on the equipment or space that is being evaluated? What will the firm do when it does run out of capacity?

3.5 Allocated Cost

Another accounting device created to ensure that every part of a business bears its fair share of costs is allocation. Whereby costs that are not directly traceable to revenues generated by individual products or divisions are charged across these unit based on revenues, profits, or assets. Allocated cost is a cost that cannot be directly traced to business units based on other observable measures. Any increase in administrative or staff costs that can be traced to the project is an incremental cost and belongs in the analysis. A way of estimating this is by breaking these cost town into fixed and variable cost.

3.6 Product Cannibalization

This refers to the act of a new product introduced by a firm competes with and reduces the sales of the firm's existing products. On one aspect, one can say that this is a negative incremental effect of the new product, and the lost cash flows or profits from existing products should be treated as costs in analyzing whether or not to introduce the product. Doing so introduces the possibility that the new product will be rejected, however. If this happens and a competition now exploits the opening to introduce a product that fills the niche that the new product would have and consequently erodes the sales of the firm's existing products, the worst of all scenarios is created –the firm looses sales to a competitor rather than to itself. Product cannibalization are sales generated by one product, which come at the expense of other products manufactured by the same firm. Thus, the decision whether or not to build in the lost sales created by product cannibalization will depend on the potential for a competitor to introduce a close substitute to the new product being considered. These extreme possibilities exist: the first is that close substitutes will be offered almost instantaneously by competitors; the second is that substitutes cannot be offered.

SELF ASSESSMENT EXERCISE

1. What will happen to the net present value of a project if working capital needs are factored into the cash flows but salvage value of working capital is ignored?
2. What is a sunk cost
3. Explain in your own understand, opportunity costs, excess capacity, allocated cost and product cannibalization as they relate to incremental cash flow.

4.0 CONCLUSION

We have discussed in this unit that cash flows should be incremental as it is only such inflows or out outflows that can be considered in project analysis.

5.0 SUMMARY

In this unit, effort has been made using these principles to explain that flow should be incremental. They are sunk cost, working capital opportunity cost, and allocation cost and product cannibalization.

6.0 TUTOR MARKED ASSIGNMENT

What are the general frameworks for analyzing?

a. Opportunity cost
b. Excess capacity
c. Allocated cost
d. Product cannibalization

7.0 REFERENCES/FURTHER READINGS

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UNIT 3 CONSISTENT CASH FLOWS

CONTENTS

1.0 INTRODUCTION

You have learnt in the previous unit that cash flow should be incremental in order to be considered in project analysis. This unit is a continuation and we shall look at cash flows to be estimated consistently, in terms of both the investors group being analyzed and inflation.

2.0 OBJECTIVES

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

- Understand that cash flows to equity should be discounted at the cost of equity.
- Understand that cash flows to the firm should be discounted at the cost of capital.
- Understand that nominal cash flows should be discounted at nominal discount rate while real cash flows should be discounted at a real cash flow should be discounted at a real rate.

3.0 MAIN CONTENT

3.1 Dealing with Leverage

There are two basic approaches that can be used to deal with leverage. First is to estimate the cash flows associated with debt financing –interest expenses and principal payments –and to calculate the residual cash flows left over for equity investors. The residual cash flow, which is the cash flow to equity, has to be discounted at a return that reflects the expectations of the equity investors (the cost of equity). The resulting present value is compared to the equity investment in the project, resulting in net present value or internal rate of return. The second approach is to calculate the cumulated cash flows to both equity investors and lenders in the firm – that is, the cash flows prior to the cash flows associated with debt financing and to discount these cash flows at the cost of capital, which is the weighted average the after –tax cost of borrowing. The resulting present value is compared to the total investment required in the project to calculate net present value or internal rate of return.

Cash flow Discount Rate Investment Yields

Cash flow to Equity	Cost of Equity	Equity Investment	NPV to Equity IRR to Equity
Cash flow to Firm	Cost of Capital	Total Investment	NPV to firm IRR to firm

With consistent assumptions about growth, and debt that is correctly priced, the net present value computed using the equity approach. If the cash flows and the discount rates are mismatched, however, the net present value is meaningless. In particular, if cash flows to equity are discounted at the cost of capital, the net present value will be overstated, since cost of capital, the net present value is generally much lower than the cost of equity. If the cash flows to the firm are at the cost of equity, the net present value will be understand, and a good project might end up being rejected.

For illustration, assume you have a project that requires N100 million investment and produces after tax cash flows to the firm of N20 million forever. Also assume that you borrow

N50 million using perpetual bonds with an internal funds; the cost of equity is 15% finally, assume that the tax rate is 40%. The project can be evaluated in one of two ways.
In the equity approach, the cash flows to equity have to be estimated first. Because the bonds are perpetual, there is no principal repaid in any time period, leading to the following cash flow to equity each year:

Cash flows to Equity =Cash Flows to Firm – Interest (1-tax rate – Principal repaid)
=20 million -4 million (1-0.4) -0 = N17.6 million

PV of Cash Flows to Equity = Cash flows to Equity
= Cost of Equity
=17.6:0.15 = N117.33

NPV of Project = PV of Cash flows to Equity – Equity Investment
=117.33 -50 =N67.33

In the firm approach, the first step in computing the present value using firm approach is to compute the cost of capital, based on the market values of debt and equity. The market value of debt is N50 million, and the market value of equity is assumed to be the present value of the cash flows to equity which is N177.33 million

Weighted Average cost of capital (WACC) =
(117.33/167.33) (15%)+(50/167.33) (8%) (1-0.4)
=0.1195
PV of cash flows to firm = Cash flows to the firm /cost of capital
=20 million /0.1195
=N167.33

The net present values are equivalent under both approaches. It is therefore difficult to ensure that the assumptions in both approaches are consistent since doing so requires that growth rates be estimated identically and that changes in leverage are reflected in the cost of capital over time.

3.2 Dealing with Inflation

In dealing with inflation, the analyst has two choices the first is to incorporate expected inflation into the estimates of future cash flows resulting in nominal cash flows for the project, and to discount these cash flows, resulting in nominal cash flows for the project and to discount these cash flows at a discount rate that also incorporates expected inflation (i.e, the nominal discount rate). The second is to estimate cash flows in real dollars, without building in inflationary effects, and to discount these real cash flows at a real discount rate. The relationship between nominal and real cash flows is determined entirely by the expected inflationary rate.

Real Cash Flow = Nominal Cash Flow/(1+ Expected Inflation Rate)

1+ Nominal Discount Rate =(1+Real Discount Rate)

The consistency principle then suggests the following match up of cash flows and discount rates.

Cash Flow	Discount Rate	Yields
Nominal Cash Flow	Nominal Rate	PV in Nominal terms
Real Cash Flow	Real Rate	PV in Real terms

The consequences of a mismatch can be dire if nominal cash flows are discounted at the real rate, the resulting net present value will be overstated. If real cash flows are discounted at the nominal rate, the resulting net present value will be understand. Done consistently, however, the net present value will be identical under both approaches.

A question may be asked, do increase in inflation increase, decrease or leave unchanged the net present value of a project? many analysts believe that firms that can index their prices and costs to inflation are protected against changes in inflation.

This is not a sufficient condition, however, depreciation tax benefits might not be indexed to inflation in particular, in –low –inflation economies like the united states, depreciation is based on the original price paid on asset, and the tax benefits are therefore fixed and not a function of the inflation rate. As the inflation rate increases, the depreciation tax benefits become less valuable in present value terms, resulting in a loss of value on projects

3.3 Dealing with Hyperinflation

To deal with inflation in investment analysis is straight forward but uncertainty about future inflation is what creates additional risk factors in capital budgeting. There is a relationship between level of inflation and uncertainty about inflation, and because of this, investment analysis in high –inflation economies in much more difficult than investment analysis with a stable inflation. From a practical point of view, these difficulties exist whether nominal cash flows are discounted at the nominal discount rate or real cash flows are discounted at the real rate. The expected inflation rate is incorporated in either analysis, and uncertainty about the rate will therefore affect both. An alternative is to estimate the cash flows for the project in a more stable currency and to calculate net present values based on these cash flows. If this is done, the consistency principle requires that the discount rates also be estimated in that currency. The additional uncertainty associated with high inflation can home real consequences. Projects that would have been accepted with low and stable inflation might be rejected in a high inflation scenario. Because the uncertainty about inflation compounds over time, long –term projects will be penalized more than short term projects and firms will be much less willing to make commitments for extended periods of time.

SELF ASSESSMENT EXERCISE

1. Name the two approaches that can be used in dealing with leverage.
2. What do you understand by inflation?
3. How do analyst access investment analysis of project in stable and unstable economies.

4.0 CONCLUSION

In this unit, we have discussed that cash flows to equity should be discounted to cost of equity, and cash flows to the firm, at the cost of capital. Nominal cash flows should be discounted at a nominal discount rate whereas real cash flows get discounted at a real rate.

5.0 SUMMARY

You have been taught how cash flows can be estimated consistently using leverage, inflation and hyper inflation.

6.0 TUTOR MARKED ASSIGNMENT

How do you deal with inflation and leverage in estimating cash flows?

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.

UNIT 4 PROCESS OF PROJECT CHOICE I

CONTENTS

1.0 INTRODUCTION

In the last unit, we have laid ground work for analyzing investment decisions by developing basic rules and the process of estimating cash flows. In this unit, we will be looking at the process by which firms pick between mutually exclusive projects, especially when the projects have unequal lives.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Explain how to choose between mutually exclusive projects.
- Explain how to choose between projects with different lives.

3.0 MAIN CONTENT

3.1 Mutually Exclusive Projects

A set of projects is said to be mutually exclusive when a firm can accept only one of the set. Projects may be mutually exclusive for different reasons. They may each provide the needed service, but any one of them is sufficient for the service. An example would mean choosing

among a number of different air –conditioning or heating systems for a building. Or, they may provide alternative approaches to the future of a firm; a firm that has to choose between a'high –margin, low –volume'' strategy and a '' low- margin, high –volume'' strategy for a product, can choose only one of the two. In choosing among mutually exclusive projects, many of the principles that concern independent projects continue to apply. The business should choose the project that adds the most to its value. This concept, though relatively straight forward when the projects have the same lives, can become more complicated when the projects have different lives.

3.2 Projects with Equal Lives

When comparing projects with the same lives, a business can make its decision in one of two ways. It can compute the net present value of each project and choose the one with the highest positive net present value (if the projects are revenue generating) or the one with the lowest negative net present value (if the projects are cost minimizing), or it can compute the differential cash flow between two projects and base its decision on the net present differential cash flow.

Comparing Net Present Values

The simplest way of choosing among mutually exclusive projects with equal lives is to compute the net present values of the projects and choose the one with the highest net present value. The decision rule is consistent with firm value maximization. If the firm faces a capital rationing constraint, however, the profitability index or the internal rate of return of each of the project can be computed instead.

Differential cash flows

An alternative approach to picking between mutually exclusive projects is to compute the difference in cash flows each period between the two investments being compared. Thus, if a and b are mutually exclusive projects with estimated cash flows can be computed. In computing the differential cash flows, the projects with the larger initial investment becomes index project against which the comparison is made. In practical terms, this means that the cash flow B-A is computed if B has a higher initial investment than A, and the cash flow A – B is computed if A has a higher initial investment than B. if more than two projects are being

compared, comparisons are still made between projects, two at a time, and the less attractive project is dropped at each stage.

3.3 Projects with Different Lives

Most times, firms have to choose among projects with different lives. In doing so, the firms cannot rely soley on just the net present value, since it is a naira a figure and it is likely to be higher for longer time projects. For instance, assume that you are choosing between a 5- year and a 10 – year project, that a discount rate of 12% applies to each. The net present value of the first project is N442 whereas the net present value of the second project is N478. On the basis of net present value alone, the second project is better but this analysis fails to factor in the additional net present value of the firm that could make from 6 years -10 years in the project with a five year life. In comparing a project with a shorter life to one with a longer life, the firm must consider the fact that it will get a chance to invest again sooner with shorter term project. two conventional approaches – project ends, the firm will be able to invest the same project or a very similar one. We will also consider an alternative approach that allows for changes in project characteristics over time.

Project Replication

One way of getting around the problem of different lives is to assume that projects can be replicated until they have the same lives. Thus, instead of comparing a 5 year – a 10 –year project, an estimate of the net present value of the 10- year project.

This approach has met with criticism, however, on a practical level, it can become tedious to use when the number of projects increases and the lives do not fit neatly into multiples of each other. For example, an analyst using this approach to compare a 7 –year, a 9 – year, and a 13 – year project would have to replicate these projects 819 years to arrive at an equivalent life of all three projects. Therefore, it is difficult to argue that a firm's project choice will essentially remain uncharged over time, especially if the projects being compared are very attractive in terms of net present value.

Equivalent Annuities

The net present values of projects with different lives can be made comparable in another way. They can be converted into an equivalent annuity, which can be considered the

annualized net present value; because the NPV is annualized, it can be compared legitimately across projects with different lives. The net present value of any project can be converted into an annuity using the following calculation:

Equivalent Annuity =Net Present Value X [A (PV,r,n)] where

r =Project discount rate

n= project lifetime

A (PV, r,n) =annuity factor

Note that the net present value of each project is converted into an annuity using that projects life and discount rate. Thus, this approach is flexible enough to deal with projects with different discount rates and lifetimes.

This approach does not explicitly make the assumption of project replication rather it does so implicitly. Consequently, it will always lead to the same decision rules as the replication approach. The advantage is that the equivalent annuity approach is less tedious and will continue to work even in the presence of projects with infinite lives.

SELF ASSESSMENT EXERCISE

1. What project is said to be mutually exclusive?
2. What principles can be use in choosing mutually exclusive projects?

4.0 CONCLUSION

We have discussed that when choosing projects the net present values can be compared only if the projects have the same lives when comparing projects with different lives, the net present value has to be converted into an annuity or replicating the projects unit they have equal lives.

5.0 SUMMARY

In this unit, you have be taught about the process of selecting projects by firms when such projects are mutually exclusive, two principles were employed in doing this – when the projects have the same lives and when the projects have different lives.

6.0 TUTOR MARKED ASSIGNMENT

1. Name the two conventional approaches used in explaining:

a. Projects with the same lives

b. Projects with different lives

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.

UNIT 5 PROCESS OF PROJECT CHOICE II

CONTENTS

1.0 INTRODUCTION

In this unit, we will explore other important areas of investment decisions. We will consider replacement decision that has to do with replacing existing equipment with new one; the expansion decision, whereby an existing facility is expanded to meet increasing demand, and tinning decision that has to do with the decision maker deciding when to take or terminate a project.

2.0 OBJECTIVES

- After studying this unit, you should be able to:
- Explain how you can analyze replacement or expansion decisions.
- Understand the decision rules that can be used to determine the optimal tinning of a project.

3.0 MAIN CONTENT

3.1 Replacement Decision

A replacement decision involves replacing an existing investment with a new one, may be because the investment has aged or less efficient. In a typical replacement decision, the following takes place.

a. The replacement of old equipment with new equipment will involve a cash outflow because the money spent on the new equipment will exceed any proceeds obtained from the sale of old equipment.
b. There will be cash inflows during the life of the new machine as a consequence of either the lower costs of operation arising from the newer equipment or the higher revenues flowing from the decision.

These cash inflows will be augmented by the tax benefits accruing from the additional depreciation that will arise from the new investment.

c. The salvage value at the end of the life of the new equipment will be the differential value that is, the excess of the salvage value on the new equipment over the salvage value that would have been obtained if the old equipment had been kept for the entire period and not replaced at the beginning.

This approach has to be modified if the old equipment has a remaining life that is much shorter than the life of the new equipment replacing it. To illustrate, suppose a mail order company is considering replacing on antiquated packaging system with a new one. The old system has a book value of N50,000 and a remaining life of 10years and could be sold for N15,000, net of capital gains taxes right now. It would be replaced with a new machine that cost N150, 000 and has a depreciable life of 10 years and annual operating costs N40,000 lower than with the new machine. Assuming straight – line depreciation for both the old and the new system, a 40% tax rate, and no salvage value on either machine in 10 years, the replacement decision cash flows can be estimated as follows:

Net initial investment in New machine		=N150, 000
		N15, 000 = N135, 000
Depreciation on the old system	=	N5, 000
Depreciation on the new system	=	N15, 000

Annual Tax Savings from Additional Depreciation on New

Machine =(N15,000-N5,000) x0.4 =N4,000

Annual After –tax Savings in Operating costs =N40, 000(1-0.4) =N24, 000

The cost of capital for the company is 12%, resulting in a net present value from the replacement decision of:

Net present value of Replacement Decision =N135, 000 –N28, 000 x PV (A, 12%, 10 years)

=N23, 206

This suggest that replacing the old packaging machine with a new one will have a net present value of N23,206 and would be a wise more to make.

3.2 Expansion Decision

An expansion decision involves considering an additional investment in order to expand an existing facility, generally because it is at or near capacity. The cash flows in such a decision can be grouped as follows:

a. The expansion itself will create a cash outflow as the facility is expanded an new equipment is acquired to facilitate the expansion.
b. As a result of the expansion, additional revenue will be generated in periods whereby the new capacity enables the firm to meet demand it could not have met with the existing facility. These revenues will provide cash inflows in future periods and will be augmented by the tax benefits from the increment depreciation.
c. At the end of the project life, the incremental salvage value from the expansion will have to be considered as a cash inflow.

3.3 Timing Decision

This is a decision of when to act or take on a project. a tinning decision allows one to decide when to take an action. For instance, an owner of a rubber plantation, can decide when to harvest rubber. Similarly, the owner of a product patent may have to decide when to introduce the product. In this type of decision, there is generally both cost and benefit to waiting. By waiting, the firm may be able to get better information on the market or get a higher price for its product, or it may have time to improve on the product itself. These advantages have to be weighed against the time value of waiting an extra period as well as the

risk of a competitor entering the market first. In addition, the costs may increase over time. If the benefits of waiting exceed the costs, it pays to wait. Another way of thinking about the tinning decision is in terms of net present value. If the net present value is a function of when an action is taken, the optimal time to take the action is the one that maximizes the net present value.

SELF ASSESSMENT EXERCISE

Explain what you understand by these three investment decisions.

a. Replacement decision
b. Expansion decision
c. Tinning decision

4.0 CONCLUSION

In our discussion, we have learnt that replacement and expansion decision can be made looking at the incremental cash flows from these decisions to the business. Also, that projects that create benefits or costs for other parts of the business have to be considered on an after tax basis, when these projects are evaluated.

5.0 SUMMARY

In this unit, you have been taught some issues in capital budgeting, how choices could be made in selecting project. How you can analyze replacement and expansion decisions. And the rules governing the optimal tinning of a project.

6.0 TUTOR MARKED ASSIGNMENT

You have been approached by a magazine with an offer to renew your subscription. You can renew for one year at N20, two years at N36 or three years at N45. Assume that opportunity cost is 20% and the cost of subscription will not change over time, which of these three options should you choose?

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons In

MODULE III RISK AND UNCERTAINTY ANALYSIS

UNIT 1 BASIC PROBABILITIES APPROACHES WITH RISK AND UNCERTAINTY

CONTENTS

1.0 INTRODUCTION

In this unit, we will be looking at decisions on projects involving uncertainty and risk. We will discuss the approaches to use in dealing with uncertainty, which attempts to examine the effect of changing assumptions on investment decisions.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Understand the difference between the terms 'risk' and 'uncertainty' despite the fact that they are used under changeably.
- Understand the need for the incorporation of risk and uncertainty in our everyday activities in life.

3.0 MAIN CONTENT

3.1 Meaning or Risk and Uncertainty

Risk occurs where it is not known what future outcome will be but where the various possible outcomes may be expected with some degree of confidence from knowledge of past or existing events. In other words probabilities of alternative outcomes can be estimated.

Uncertainty occurs where the future outcome cannot be predicted with any degree of confidence from knowledge of past or existing events, so that no probability estimates are available. There is a world of difference between risk and uncertainty even though they are used interchangeably here. For instance, a man that wishes to run across the express road need not be told that he is trying to take a risk, because in the past, some people had done what they wished to do and got knocked down dead, some maimed while some other people successfully ran across. It happened in the past and will still be happening in the future.

Let us also cast our minds back to the emergence of the new generation banks due to the structural adjustment programme (SAP) introduced with effect from that Monday morning of 29th September, 1986 by the General Ibrahim Badamosi Babangida's administration.

It got to a point that one would come across friends known to be employed by banks (now known as old generation banks) who upon the exchange of complimentary cards would be discovered to be in the employment of the new banks. The question usually asked then was ‘’friend, why did you leave certainty for uncertainty? Reason being that Nigerians never experienced such emergence of new banks. Today, if there is the emergence of new banks, people will only (if need be) be asking ‘’ Friend, why taking the risk’’ because it had been recorded that some of the new banks collapsed while some others are doing well.

3.2 Basic Approval to Dealing with Uncertainty

There are two basic approaches to dealing with uncertainty. In the first approach, the robustness of the analysis tested by changing the assumptions and examining the effects of these changes on the conclusions. The information is then used to make a final decision on a project. Typical examples of this approach includes sensitivity analysis, scenario analysis, breakdown analysis, simulation analysis, decision trees. In all these approaches, the analysis adds information to that provided by the base case analysis. But it is still up to the decision maker to weigh this information intelligently and make the final decision. The subjective judgment of analyst and their tolerance for uncertainty will therefore affect their decisions. The same sensitivity analysis, for example might result in one analyst rejecting a project and another analyst accepting the same project.

The second approach to dealing with risk adjusts for it either in the discount rate used in the base case analysis or in the expected cash flows used to measure the project’s viability. The advantage of this approach is that it yields one measure (i.e. a base case net present value or internal rate of return) that already reflects the riskiness of the project. For the most part, it takes out the subjective element from the risk analysis.

At the same time, this approach puts a larger onus on the analyst to estimate and adjust for risk correctly. This approach is examined in the next chapter.

This is the project analysis done with the most likely values used for the inputs.

3.3 Probabilistic Approaches to Dealing with Risk

In the traditional investment analysis described in the last few units of this book, the investment decision has been based on NPV or IRR, which, in turn, is based on a set of assumptions made about the future prospects of the project. Each of these assumptions by

itself may be reasonable and justifiable, but each also represents a single estimate, often drawn from a range of possible outcomes. In the approaches described here, risk is assessed by estimating the net present value or the internal rate of return for a range of outcomes for the underlying variables.

SELF ASSESSMENT EXERCISE

1. What is risk?
2. What is uncertainty?
3. Differentiate between risk and uncertainly.

4.0 CONCLUSION

This unit provides overview of the meaning of risk and uncertainty, it shows the difference between them, though that they can be used interchangeably. It is also provides the various basic approaches to dealing with uncertainty and probabilistic approaches to dealing with risk

5.0 SUMMARY

This unit has given a guide or propositions designed to provide a decision maker with additional information to make better decisions. It has discussed the meaning of risk and uncertainty, and the approaches that can be used in dealing with them for investment decision.

6.0 TUTOR MARKED ASSIGNMENT

1. Name the basic approaches to dealing with uncertainty.
2. What are the probabilistic approaches to dealing with risk.

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.

UNIT 2 METHODS OF TREATING RISK AND UNCERTAINTY

CONTENTS

1.0 INTRODUCTION

This unit breaks down the various approaches as explained in the previous unit of dealing with risk and uncertainty. It provides introduction to the five basic approaches – sensitivity analysis, breakeven analysis, scenario analysis, simulations and decision trees, and summarizes the advantages and limitations of each approach. But for our learning, we will limit ourselves to only four of the approaches.

2.0 OBJECTIVES

After careful study of this unit, you should be able to:

- Explain how sensitive are the conclusions to charges in basic assumptions underlying investment analysis.
- Explain how investment analysis can be do under different scenario for the future.
- Explain how breakeven analysis can be done from the view point of present value analysis, different from traditional breakeven analysis

- Explain the conditions that simulation can be used to analyses projects and how the result of these simulations be used in decision making .
- Explain some common errors made by firms when analyzing the riskiness of projects.

3.0 MAIN CONTENT

3.1 Sensitivity Analysis

Sensitivity analysis is an analysis that examines the sensitivity of the decision rule (NPC, IRR etc) to changes in the assumptions underlying a project. sensitivity are conducted for the following reasons:

- Expected for the future, the earnings and cash flows are estimated for a base case analysis.
- So that related variables such as tax rates and overall economic growth, which though not under the control of the firm may still have a major impact on the cash flows and conclusions of the analysis.
- To illustrate project involving product sales, the number of units sold will vary while the price, costs and discount rate will remain fixed.
- To illustrate information that is used in conjunction with the base case analysis to decide whether or not to take the project.

However, we will examine sensitivity analysis based on these assumptions:

1. The level of revenues, 2. The expected growth rate 3. The operating margin 4. The working capital as a percentage of revenues.

The final decision on whether or not to take the project will be based on both the base case analysis and the additional information generated by the sensitivity analysis. It is entirely feasible that a decision maker, when faced with the result from the sensitivity analysis, might decide to over ride the base case and reject the project. As a rationale, he or she might point out that small drops in the operating margin make the project unacceptable and there is substantial in operating margins across time.

Limitations associated with the use of sensitivity analysis are:

- The analysis presents results for a range of values without providing any sense of the likelihood of these values occurring.

- Only one variable can be changed at a time, revenues may be lower precisely the same cases that growth rates are low.
- It leads one decision maker to reject a project that might be used by another to accept it, and the differences may be traceable to the risk preferences of the decision makers.

3.2 Break Even Analysis

Breakeven analysis attempts to estimate the revenues that will be needed in order for a project or a company to break even in accounting terms that is, to make net income of zero. In this section, we examine an alternative to accounting breakeven by asking how much revenue will be needed for a project or a company to break even in financial terms – that is, to make the net present value zero. As a general rule of thumb, the financial break even is a higher hurdle because it requires the firm to make sufficient returns to cover the hurdle rate on the funds invested in the project.

The break down analysis is calculated in terms of units sold and revenues. It can also be done using any assumption in the analysis. We fund out that there is a margin of error and is in the difference between the base case assumption and the breakeven point. Therefore, break even analysis does not answer the question of whether a point should be accepted or rejected, but it does provide additional information to use in making that decision.

Accounting Breakeven

This is the number of units a firm has to sell to ensure that it does not have an accounting loss (or make accounting profit zero).

If the cost on the project can be broken up into fixed and variable costs and the contribution margin per unit is the difference between the sales price per unit and the variable cost per unit, then the accounting breakeven can be calculated as follows.

$$\text{Breakeven unit (accounting)} = \frac{\text{Fixed costs}}{\text{Sales price /unit – variable cost /unit}}$$

The number will change from year to year as the fixed costs and the contribution margin per unit change.

The financial breakeven is computed by first estimating the annual cash flow needed to make the net present value zero, then backing out the revenues needed to generate this annual cash flow, and finally estimating the number of units that have to be sold to create.

3.3 Scenario Analysis

Scenario Analysis is an analysis of the NPV or IRR of a project under a series of specified scenarios, based on macro economic, industry, and firm specific factors. Scenario analysis is a version of sensitivity analysis whereby specific scenario are developed for the future, and the viability of the investment is considered under each scenario. The scenarios can be based on macro economic factors, relating to over all economic growth, interest rates, or inflation, industry specific factors, relating to competitive dynamics: or firm- specific factors, such as working capital policies or operating margins.

There are steps involved in scenario analysis and they are as follows:

1. One of the factors in which scenario analysis is built is based on the type of business the firm is in and the source of uncertainty for the future success of the project.
2. The values to be taken by the variables used in investment analysis are estimated.
3. The net present value (NPV) and the internal rate of return (IRR) are estimated.
4. A decision is made on the project based on the net present values under all the scenarios.

Limitations of Scenario Analysis

Scenario analysis is shown on the assumption that there are clearly delineated scenario under which outcomes will differ. In many cases this is not time, because no economy cannot take one of three discrete state –boom, recession, or stability but, can lie any where between the extremes. You should know that scenario analysis more likely work in cases of discrete outcomes. For instance, pharmaceutical company may analyze a new product under two scenarios – either the competitors will come up with substitute or they will not.

There is no dear roadmap to in dictate how the decision maker will use result of the investment analysis. The fact that the net present value is much lower – even negative under economic recession scenario should come as no surprise to a firm and should not be an automatic basic for rejecting a project.

Finally, in a scenario analysis, there is always a best case and worst case analysis. Whatever ever form a project may take, it bothers on you as the decision maker to take the case that involves setting all the assumptions at the optimistic end of the spectrum and calculating the net present value and the internal rate of return in order to compute a best –case return on the project. The analysis is then repeated, setting the assumption at the pessimistic end of the spectrum to compute the worst –case return. The best –case result is always high than the worst –case.

3.4 Simulations

In investment analysis, simulation is an attempt to utilize the information in the entire distribution rather than the expected value, to arrive at a decision of either to accept or reject a project. in simulation, outcomes of the variables are drawn from the distribution for these variables and the NPV and IRR are computed on these outcomes.

The steps involved in a simulation are the following:

1. First is choosing those variables whose expected values will be replaced by distributions.
2. Choosing the correct distribution of the variables.
3. The parameters of the chosen variables are estimated.
4. An outcome is drawn from each distribution; the variable is assumed to take on the value for that particular simulation.
5. The investment statistics (NPV), IRR, R01) are computed for the set of outcomes drawn in step 4
6. Step 4 and 5 are repeated until sufficient number of simulations have been conducted.
7. The summary statistics for the investment statistics across all the simulations run are reported and used by decision makers in investment statistics across all the simulations run are reported and used by decision makers in investment analysis.

ILLUSTRATION: SIMULATION ANALYSIS FOR A FIRM

Steps 1-3 In the firm, assume the distributions for each of the key variables to be as shown in the below table.

	PROBABILITY DISTRIBUTIONS FOR KEY VARIABLES IN A FIRM			
	Variable	**Distribution**	**Expected value**	**Characterizes of the Distr.**
1	Revenues	General	N30,000	Value Probability
				N20m 0.125
				N25m 0.1875
				N30m 0.375
				N35m 0.1875
				N40m 0.125
2	Growth Rate	Nominal	5.00%	Standard Deviation =2.00%
3	Operating Margin	Uniform	10.00%	Minimum of % maximum of 20.00%
4	WC as % of Revenue	Nominal	10.00%	Standard Deviation =2.50%

Step 4 Draw one outcome from each distribution. In the firm example, assume the following outcomes on the first simulation:

	Variable	**Drawn Outcome**
1	Revenues	N25m
2	Growth Rate	6.35%
3	Operating Margin	10.00%
4	Wc as % of Revenue	9.16%

Step 5 Estimate a net present value, based on the outcomes drawn. In the firm example, calculate the net present value based on the outcomes drawn in step 3

Net present value from simulated outcome =N13,423

Internal Rate of Return for Simulated Outcomes =12.48%

Step 6 Repeat step 4 and 5, a sufficient number of times. In the firm example, the simulation were repeated several number of times and large number was chosen for two reasons: the distribution were complex, and four variables were charging in the project.

Compute the summary statistics of the net present value across all the simulations (expected value, standard deviation, minimum, maximum, percentage of time under zero) and plot the net present values on a graph if need be.

Example

Net present value	Internal Rate of Return
Expected value =N1,067,150	Expected value =13.84%
Standard Deviation =N451,335	Standard Deviation =0.55%
CV of NPV = $\frac{\text{N451,335}}{\text{N1,067,150}}$	CV of IRR $\frac{=0.55\%}{13.84\%}$
Minimum =N9,504,201	Minimum = -1.21%
Maximum =N31,013,450	Maximum=47.95%
% of time below zero =20.16%	% of time below Discount rate =20.16%

Step 7 Use the distribution of the net present values rather than just the base case net present value to make your decision.

Limitations of Simulation Analysis

The main limitation of simulation is that it requires information for it to work. it is really difficult to choose both the right distribution to describe a variable and the parameters of that distribution when these choices are made carelessly or randomly, the out put from the simulation may look impressive but actually convey no valuable information.

Traditional simulation does not permit interaction between variables and it can be overcome by building linkages that take these interactions into account. Lastly, no clear decision rule emerges from simulation analysis. Instead, the subjective judgments and risk preferences of the person using the simulation will determine whether the project will end up being accepted or rejected.

SELF ASSESSMENT EXERCISE

1. What are the conditions that simulations can be used to analyses projects?
2. What are the reasons for conducting sanctity analysis?
3. What do you understand by scenario analysis?
4. What is a breakeven analysis?

4.0 CONCLUSION

This unit has expounded our knowledge on four out of the five basic approaches that can be used to evaluate risk in projects. The approaches are designed to provide a decision maker with additional information to make better decisions.

Sensitivity analysis and breakeven analysis attempt to vary one variable at a time, keeping all other variables fixed, which is an unrealistic assumption. Simulation provides valuable output about the uncertainty in the project, but it requires substantial new information that may not always be readily available.

Common Errors in Project Risk Assessment

Some of the common errors made in project risk assessment are as follows:

1. **Failure to Consider risk entirely:** Any firm that completely ignores risk in its decision making is bound to have trouble. Decision makers, if they are not penalized for the riskiness, of the projects they take on, will consider and take on riskier and riskier projects, betting on the higher returns.
2. **Counting the same risk more than once:** When firms use more than one risk – adjustment technique, they might end up counting the same risk more than once. This will end up rejecting some good risking projects.
3. **Applying the firm's risk profile to a project with different risk characteristics:** Many firms continue to use one risk premium (and one cost of equity) across projects. Doing so will clearly tilt the scale toward the riskier projects, resulting in overinvestment in these projects. Conversely, it will be unfair to safer projects (and divisions), leading to underinvestment in these projects.

4. **Considering ‘’diversifiable’’ risk in project analysis:** When a decision maker at a large publicly traded firm considers diversifiable risk in project analysis, he or she increases the likelihood that the project will be rejected for the wrong reasons.

5.0 SUMMARY

We have discussed in this unit the basic probabilistic approaches that can be used in project risk evaluation. We did this using sensitivity analysis, breakeven analysis, scenario analysis and simulations. The approaches share some advantages and disadvantages. Their strength lies in their intuitive appeal; all decision makers exercise subjective judgments because they like answers to questions about assumptions and can use information relating to best –case and worst case. This also helps reject or accept the projects because of part knowledge accumulated in making similar decision rather than trusting a mechanical rule.

6.0 TUTOR MARKED ASSIGNMENT

Explain how investment analysis can be used under different scenarios for the future.

Explain some common mistakes made by firms when analyzing the riskiness of a project.

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.

UNIT 3 ANALYZING AND MEASURING PROJECT RISK

CONTENTS

1.0 INTRODUCTION

This unit explores the second approach to dealing with uncertainty, which is to take in the risk into either the discount rate or the expected cash flows and calculate performance measures, such as net present value and internal rate of return, with these risk adjusted measures.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- State the types of risk a typical project carry.
- Explain the portion of risk that is relevant
- Explain how this risk can be factored into discount rates and expected cash flows

3.0 MAIN CONTENT

3.1 Analyzing Project Risk

In dealing with project risk, one approach that involves requires adjusting discount rates and cash flows for the risk. In so doing we have to:

1. Examine the sources of risk in a project and differentiate between risk that matters and risk that matters and risk that does not.
2. Measure the risk that matters and estimate the effect on discount rates or cash flows

The risk in a project comes from a number of sources including the project itself, competition, shifts in the industry, international considerations and macroeconomic factors.

Project Specific Risk: Project risk is risk that affects only the project under consideration and arise from factors specific to the project or estimation error. This is the first source of project risk; an individual project may have higher or lower cash flows for that project or because of factors specific to that project. When firms take a large number of similar projects, it can be argued that much of this project risk should be diversified away in the normal course of business store, such as its location and the quality of its personnel. For instance, some of the project risk is embedded in the projections of revenue, operating margins, and working capital. On the other hand, firms that take on relatively few projects will be unable to diversify across projects.

Competitive Risk: The second source of risk is competitive risk, whereby the earnings and cash flows on a project are affected by the actions of competitors. A good project may factor in the reactions of competitors into estimate of profit margin and may differ from these gain the action of competitions expectations. In some cases, this component of risk will affect more than one project and is therefore more difficult to diversity away in the normal course of business by the firm. Firms cannot diversify away much of their competitive risk, but their stock holders can, if they have the capacity and willingness to hold stock in their competitors.

Industry –Specific Risk: These are unanticipated effects on project cash flows of industry wide shifts in technology or changes in laws or in the price of a commodity. This is the third source of risk. This risk can be been in factors that primarily impact the earnings and cash

flows of a specific industry. The risks within the industry risk are technology risk which reflects effects of technologies in ways different from those expected when project was originally analyzed. Another is legal risk which reflects the effect of changing laws and regulations. Lastly, the commodity risk which reflects the effects of price changes in commodities and services that are used or produced disproportionately by a specific industry.

International Risk: The fourth source of risk is international risk. A firm faces this type of risk when it takes on projects outside its domestic market. In such cases, the earnings and cash flows exchange rate movements or political risk. Some of this risk may be diversified away by the firm in the normal course of business by taking on projects in different countries whose currencies may not all move in the same direction.

Market Risk: This is the final source of project risk. It refers to the unanticipated changes in project cash flows created by changes in interest rates, inflation rates, and the economy. For example, changes in interest rates will affect the value of projects already taken and those yet to be taken both directly, through the discount rates, and indirectly through the cash flows. Other factors that affect all investments include the term structure (difference between short and long term rates), the risk preferences of investors (as investors become more risk averse, more risky investments will loose value), inflation, and economic growth.

3.2 Measured Project Risk

In estimating project risk, one of two approaches can be used: the firm's risk measures can be applied to the project, or the project's own risk characteristics can be estimated.

When Project Risk is Constant: One way of estimating market risk parameters for a specific project is to assume that its exposure to market risk is similar to the firm's overall exposure to the same risk. It means, the firm would use its over all cost of equity as the cost of equity of the project. The advantage of this approach is that it does not require risk estimation prior to every project, providing managers with a fixed benchmark for their project investments. The approach is useful to companies that are in one line of business and take on homogenous projects.

When Project Risk Varies: When firms operate in more than one line of business or take on projects that are different in their risk characteristics, they should estimate market risk

parameters. If not for each individual project, at least for divisions or classes of projects. These market risk parameters will be higher than those of the firm (leading to higher cost of equity) for riskier divisions and projects, and lower than those of the firm for safer divisions and projects. Imposing the same market risk parameters across projects with different risk characteristics will lead to overinvesting in the riskiest projects and under investing in the riskiest projects and under investing in the safest projects (since the cost of equity will be too high, relative to the risk in these projects).

3.3 Risk –Adjusted Investment Analyses

After all the relevant risks have been identified and measured, the next is to adjust the discount rates to reflect the risk: the cost of equity will be adjusted to reflect risk if cash flows being discounted are cash flows to equity and the cost of capital will be changed to reflect risk if cash flow are those to the firm. The other approach is to adjust the cash flows to reflect the risk and to use a riskless rate as the discount rate.

1. **Adjusting Discount Rates:** Discount rates can be adjusted to reflect its riskiness. The adjustment will depend on whether the discount rate is cost of equity or the cost of capital; this will be determined depending on whether the cash flows being discounted are cash flows to equity or cash flows to the firm.
2. **Adjusting the Cost of Equity:** The adjustment to the cost of equity will depend on the risk model being used and the proceeding analysis of which types of risk matter and which do not. If the only risk that matters is market risk, and the capital asset pricing model is used, the cost of equity for the project will be:

Project cost of Equity = Risk free Rate + Project Beta (Market Risk Premium)

The cost of equity will be understand, however, if other sources of risk that investors in the company care about are not reflected. For instance, if the investors who consider currency risk to be priced risk (rather than a diversifiable risk), an additional premium will have to be added on for projects taken on in currencies other than the company's domestic currency.

3. **Adjusting Expected Cash Flows:** Another way to adjust for risk is to adjust the expected cash flows to show their riskiness. The more risky cash flows will be adjusted down than will less risky cash flows. The extent of the adjustment will vary depending on the

subjective used, and the approach used, and the adjustments can either be subjective or based on a risk /return model.

Subjective Estimates: Risk can be built into cash flow estimates by reducing expected cash flows if they are riskier by an analyst. This approach has some merits but they also have some demerits such as:

1. The way analyst (decision makers) deal with risk varies, even within the same organization.
2. There is always the danger that the analyst may adjust for risk, which may be divisible, either at the firm level or at the level of the investor in the firm.
3. The decision maker may lower the cash flows when they get to him to further adjust for same risk, unaware that the adjustment has already been made.
4. Firms also adjust the discount rates to reflect the risk. It can be argued that this will result in double counting of the same risk.

3.4 Risk-Adjusted Practices

Most firms consider risk in the process of investment analyses but the techniques used vary widely. The majority of the firms adjusted for risk 'subjectively' and a significant number use risk –adjusted discount rates. A large number do not adjust for risk at all in investment analysis. In examining risk –adjustment techniques over time, the following conclusive emerge:

1. Firms are much more likely to adjust discount rates to reflect risk today than they were some years ago. Most times, the adjustment is made using a risk /return model like the capital asset pricing model.
2. As firms enter diverse businesses, they are at least recognizing the need for different risk adjustments in different lines.
3. Many firms also continue to use the probabilities techniques, such as break –even and sensitivity analyses, to provide decision makers with more information on which to base their decisions.

SELF ASSESSMENT EXERCISE

1. State the different types of risk in a typical project.
2. How can risk be measured?

4.0 CONCLUSION

In analyzing and measuring risk, when once the relevant is identified, it has to be measured using a specified risk and built in model and then built into either the cash flows or discount rates in the analysis. In the process the risk of a project that has a very different risk profile than the firm that takes it might have to be assessed separately, based on either comparable firms, accounting data or cross sectional regressions.

5.0 SUMMARY

In this unit, we have discussed, some of the risk that are likely to be seen in a typical project, their relevance, how they can be measured and adjusted. In the following unit we will be looking at the sources of good projects.

6.0 TUTOR MARKED ASSIGNMENT

Which are the various approaches that can be used in adjustment of risk in investment analyses, after the relevant risk has been identified and measured?

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.

UNIT 4 IDENTIFYING GOOD PROJECTS

CONTENTS

1.0 INTRODUCTION

In this unit, we will discuss both the sources of good projects and the process by which they can be analyzed.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Explain the determinate of project success
- Explain why some firms have more good projects than others.
- Explain how a business can increase its likelihood of finding and exploiting good projects.

3.0 MAIN CONTENT

3.1 Competitive Product Market and Project Quality

In the course of analyzing new projects in the previous units, we examined some of the characteristics of good projects. Depending on the investment criteria used, good projects will.

- Have a positive net present value
- Earn an internal rate of return greater than the hurdle rate
- Have an accounting rate of return greater than the hurdle rate.

It is true that these criteria reliable from a measurement stand point, but they fail to address these following questions about good projects.

- What is it that make project good?
- Why do some businesses have more good projects available to them than others?
- How can businesses that do not have a ready supply of good projects maintain their status?

What then is a good project? A good project is one that earns a return is greater than that earned on investments or equivalent risk is the existence of super –normal returns to the business considering the project. In a competitive market for real investments, the existence of these returns should form a basis for attracting competitors to take on similar investments. In the process, the excess return should dissipate over time; this may depend on the ease with which competition enter the market and provide close substitutes and on the magnitude of any differential advantages that the business with good projects might possess.

An extreme scenario is where the business with good projects has no differential advantage in cost or product quality over its competitors and new competitors can enter the market easily and at low cost to provide substitutes. In this case, the super –normal returns on these projects would disappear very quickly.

3.2 Barriers to Entry and Project Quality

The basis for the existence of a good project is the creation and maintenance of barriers to new or existing competitors taking on equivalent or similar projects. These barriers could be economies of scales cost advantages, capital requirements, product differentiation, access to distribution channels and legal and government barriers.

Economics of Scale: Some projects earn high returns only if they are done on a large scale. This is because, it restrict competition from smaller companies. In that wise, most large companies continue to enjoy super profit on their projects because smaller competitors will not be able to replicate them.

Cost Advantages: A business might work at establishing a cost advantage over its competitors, either by being more efficient or by taking advantage of arrangements than its competitors cannot use.

Capital Requirement: Starting some businesses require huge capital outlay which discourages competitors from entering, even though such projects may earn above market returns. When there are relatively few firms competing in a business, and the capital requirements for new entrants are prohibitive, the chances of collusion among these firms to keep their returns high will increase, because they do not have to fear the threat of new competitors.

Product Differentiation: Some businesses continue to earn excess returns by differentiating their products from those of their competitors, leading to either higher profit margin or high sales.

This differentiation can be created in a number of ways:

- Extensive advertising and promotion
- Technical expertise
- Responsiveness to customer needs

Access to Distribution Channels: Those firms that have better access to the distribution channels for their products than their competitors are better able to earn excess returns. Sometimes, the restricted access to outsiders is due to tradition or loyalty to existing competitors. The firms may actually own the distribution channel, and competitors may not be able to develop their own distribution channels because the costs are prohibitive.

Legal and Government Barriers: A firm may be able to exploit investment opportunities without worrying about competition because of restrictions on competitors, from product patents the firm may own or from government restrictions.

3.3 Quality of Management and Project Quality

There are factors that determine the attractiveness of the projects a firm will face that can be largely influenced by management. It could be then said that a good management team can increase both the number of and the returns on available projects by:

- Taking projects that exploit and economics of scale that the firm may possess: In addition management can look for ways it can create economies of scale in the firm's existing operations.
- Establishing and nurturing cost advantages over its competitors: Some cost advantages may arise from labour negotiations, whereas others may result from long –term strategic decisions made by the firm.
- Taking actions that increase the initial cost for new entrants into the business: One of the primary reasons while Microsoft was able to dominate the computer software market in the early 1990s was its ability to increase the investment needed to develop and market software programs.
- Increasing brand name recognition and value through advertising and by delivering superior products to customers.
- Nurturing markets in which the company's differentiation advantage is greatest, in terms of either cost of delivery or brand –name value.
- Improving the firm's reputation for customer service and product delivery.
- Developing distribution channels that are unique and cannot be easily accessed by competitors.
- Getting patents on products or technologies that keep out the competition and earn high returns.

The quality of management is typically related to the quality of projects a firm possesses, and yet a good management team does not guarantee the existence of a good project. In fact, a rather large element of chance is involved in the process; even the best laid plans of the management team to create project opportunities may come to naught if circumstances conspire against them – a recession may cause a retailer to loose money.

3.4 Role of Acquisition

As firms nature and increase in size, they are faced with a quandary. Instead of being cash poor and project rich, they find that their existing projects generate for more in cash than they have available projects in which to invest. This can be partly attributed to size or to competition. As they face up to their new status as cash – rich companies, with limited investment opportunities, acquiring other firms with a ready supply of high –return projects looks like an attractive option, but there is a catch. If these firms are publicly traded, the market price already reflects the expected higher returns not only on existing projects but also on expected future projects. In terms of present value, the value of a firm can be written as:

Value of firm = Present Value of Cash Flows From Existing Projects
+Net Present Value of Cash Flows from Expected Future Projects

Thus, firms that are earning super – normal profit on their existing projects are expected to maintain this status in the future will sell at prices that reflect these expectations. An acquisition will earn super –normal profit for the acquirer if, and only if, one of the following conditions holds:

The acquisition is done at price below the fair price.

The acquisition is done at a price that reflects the expectation that the firm will earn 25%, but the acquirer manages to earn an even higher return say 30% on future projects.

The acquisition enables the firm to take on projects that it would not have taken on as an independent firm; the net present value of these additional projects will then be a bonus that is earned by the acquiring firm.

SELF ASSESSMENT EXERCISE

In a perfectly competitive product market.

1. What type of projects should firm expect to have?
2. What type of returns should they expect to make?

4.0 CONCLUSION

We have discussed in this unit that the capacity to generate good projects depends on a firm's ability to differentiate itself from its competition, either by creating a cost advantage or a better product or both, and from barriers to entry that it creates to keep existing competitors and new entrants from imitating it and driving down these high returns.

5.0 SUMMARY

This unit have taught us identification of good projects using competitive product market and project quality, barriers to entry and product quality, quality of management and project quality; and the role of acquisition. In the next unit, we will be looking at following up on investment analysis.

6.0 TUTOR MARKED ASSIGNMENT

1. List barriers a country may impose on foreign competitors to protect their domestic industries.
2. Explain why capitalist often argue that economies of scale leads to monopoly.
3. Why would patents lead to higher returns on equity and capital?
4. What was the differential advantage that Microsoft offered that allowed it to overtake lotus?

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.

UNIT 5 ORGANIZING AND FOLLOWING UP ON INVESTMENT ANALYSIS

CONTENTS

1.0 INTRODUCTION

In this unit, we will discuss the critical aspect for analyzing projects and deciding whether they should be accepted or rejected. In organizing for investment analysis, firms attempt to know the available projects and then analyze which of the projects are viable. In following up, firms try to know if they are still on track and whether their should be continuity in such investment.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Enumerate some of the constraints firms add to investment.
- Explain the rationale for these constraints
- Explain some of the negative consequences
- Understand how firms organize for best effect in investment analysis
- Understand how firms follow up on investment analysis

3.0 MAIN CONTENT

3.1 Organizing for Investment Analysis

Investment analysis is the most sensitive aspect of managing any business. Firms often times create a formal process for analyzing projects and deciding whether they should be accepted or rejected. Large firms have more capital projects than do smaller ones for these reasons:

a. They have more projects to analyze
b. To ensure uniformity in how projects are analyzed
c. To maintain control

Though this may a times prove difficult to generalize, most firms use a combination of top – down and bottom –up analysis to pick projects.

a. Top –Down Budgeting: In top –down budgeting, capital allocations are made by a central entity at the firm level for divisions of the firm.

b. Bottom – Up Budgeting: In bottom –up budgeting, individuals and divisions within a firm make requests for capital authorizations for projects, and back up their requests with financial analyses showing the viability of these projects. In some firms, the decision to accept or reject these projects is made at the divisional level by local managers, subject to the overall budget constraints set at the corporate level. In other firms, decisions concerning at least the large projects are made at the corporate level, in order to keep control over the investment process. Capital allocations are based on request that flow from individuals or divisions to the firm.

If the authorization exceeds the budget, one possible solution is to create the capital budget to allow more projects to be taken. Second is to select a subset of the projects, using the capital rationing criteria developed in the earlier units. Smaller firms tend to get away with less formal processes by centralizing investment decisions with one or a few individuals because they have far fewer projects to analyze. As they grow, however, the stress on this centralized decision process tends to increase. In fact, the failure of many firms on a growth path can be attributed to the in ability of owner – managers to delegate this authority.

Organizing for Best Effect in Investment Analysis

Investment analysis should start with an overview of the available projects, followed by thorough analysis of the viability of these projects, and with an assessment of the financing options available for these projects. Practically, the competition among divisional managers for limited resources often results in biased project analysis. Corporate headquarters react by constraining resource allocations, even though they risk rejecting good projects. Firms attempt to exercise control over the investment process by adding more constraints on project decisions, including size constraints (e.g. projects costing more than a certain amount will have to be run past corporate headquarters) and payback requirement (e.g. only projects that pay off within 10 years can be accepted). These constraints may protect the firm against decision makers at lower levels committing the firm's funds to projects that are long them, risky and often poor investments but they also create several costs:

- Good projects may be rejected because they do not meet one or more of the arbitrary constraints created to control the process.
- Decision makers may spend considerable time and resources figuring out way to get around the constraints and end up accentuating the problems. For instance, investment requests in firms with size constraints are often broken up into smaller components to enable divisions to preserve their decision – making authority on these projects.
- The process may be delayed, allowing competitors to preempt the firm and introduce similar products.

Thus, investment analysis must be organized in such a way that it not only minimize the bias inherent in investment analysis but also holds decision makers responsible for the forecasts they use to justify their decisions. Although the first objective can be accomplished by separating the forecasting from the evaluation decisions, the second can be accomplished only if the firm follows up project decisions with post audits whereby the actual numbers on projects are measured up against their forecast and the forecasters are held responsible for deviations.

3.2 Following up on Investment Analysis

Many firms follow up project acceptance with post and its, which allow them to keep tabs on the actual cash flows of projects, for two reasons. First, post audits enable the firm to evaluate

the investment process and hold forecasters responsible when the actual deviate from the forecasts. Second, post audits help the firm decide whether projects in place should be continued, divested, or terminated. You should not forget that post audits means the process by which firm decide whether projects taken un place has performed up to expectations.

Measuring up Actual: Investments analyses are based on forecasts of revenues and expenses. Before now we talked about the prevalence of estimation errors and bias in there forecasts. Once a project has been accepted and implemented, the firm can and should compare the implemented; the firm can and should compare the actual revenues and expenses to the forecasted revenues and expenses. They are expected to be equal, but if there is any difference, that then provide an insight to a number of critical issues.

Measuring Error and Bias in Forecast: The actual cash flows and earnings may be above or below the forecasts on a project for a number of reasons. First, the economy might have taken a turn for the worse or the better after the project was accepted, affecting earnings and cash flows. Second, the forecaster might have erred in his or her forecast on the basis of one or more incorrect assumptions. If this is the case, the errors should average out across projects – some projects will have earnings that exceed forecasts, whereas others will might have been overly optimistic in his or her forecasts. In this case, the errors will not average out, and the actual earnings will, on average, be less than forecast across projects.

Holding Forecasters Responsible: The post audit introduces some responsibility into the forecasting process by making sure that the forecast are measured up against actual. Note that the failure of earnings to measure up to forecast on any one project should not be used as a measure of the basis or the skills of a forecaster. Consistent failures, however, would reflect unfavourably on the analyst making these forecasts.

Project Follow –Up: Measuring the actual earnings against forecast enables managers to take corrective action to rescue projects that might be in trouble and to provide additional resources for projects that might be in trouble and to provide additional resources for projects that might be doing better than expected. For instance, if the actual revenues on a project are coming in 20% below expectations, the firm may shift its marketing strategy or its target market to increase revenues. Similarly, if actual revenues are coming in 50% above expectations, the firm may have to make arrangements to increase its production capacity and its working capital investment to accommodate the higher growth. Measuring up forecast

against actual is only one part of the evaluation. The actual return on a project must be measured against the required return in order to evaluate whether or not the project added value to the firm during the period of the evaluation.

Analyzing Existing Projects: Many of the technique used for analyzing new projects can be used to analyze existing projects to decide whether they should be continued or terminated. There are some differences between the analysis of an existing project and that of a new project, however:

Most of the investment cost for new project is still to be made and hence, has to be factored into the analysis as a cash outflow. By contrast much of the investment for an existing project has already been made and is a sunk cost and should not be considered in the project analysis. In the same vein, operating cash flows that might have already been incurred for an existing project will have to be ignored.

The estimates of revenues and cash flows for a new project are based entirely on projections. If the project involves a new product in a new market, considerable uncertainty characterizes the estimates. By contrast, the firm has much more information on both the product and precise estimates of future earnings and cash flows.

The discount rate used on an existing project may be different from that used to analyze the same project at initiation and will reflect the new information the has collected on the project.

The cash flows on an existing project have to be evaluated entirely on an incremental basis. Thus, if there is an option to terminate the project, the incremental cash flow the firm can expect from continuing the project and the cash flow it could loose if the project is terminated. If the firm is pre-committed to the expenses on the project in contract, firms have far fewer commitments on new projects, and most cash flows are therefore incremental.

SELF ASSESSMENT EXERCISE

1. Think of some of the constraints corporate headquarters add to investment analysis.
2. What is the rationale for these constraints?
3. What are some of the negative consequences?

4.0 CONCLUSION

Investment analysis by its nature is filled with uncertainly and estimation error. Evidence has shown that investment analysis reflects an optimistic bias that can be countered by holding analysts visible for their forecast and also separating forecasting from decision making. Once a project is accepted, it has to be followed by to evaluate, examine and estimate whether the project has added value to the firm during its existence. At the level of the firm, the quality of investment analysis can be judged by comparing the firm's actual returns to forecasted returns, required, and peer – groups returns, either on an equity or a firm basis.

5.0 SUMMARY

In this unit, we have discussed how projects can be organized the ensure uniformity and maintain control. Also that when once there is acceptance to a project that would be carried out, the net action that follows is, follow – up, because this will determine the viability of such a project and if it should be continued.

6.0 TUTOR MARKED ASSIGNMENT

1. What are the various post audits carried out by firms before accepting a project?
2. Enumerate the ways by which existing projects could be analysed.
3. What are the cost created by projects that are of long term and risky nature?

7.0 REFERENCES/FURTHER READINGS

Damodran A. (1997), Corporate Finance: Theory and Practice, USA: John Wiley & Sons Inc.