



## Capital Budgeting

Developed

By

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### MODULE 01 UNIT 00

### OVERVIEW

#### Overview

Capital budgeting, also known as capital investment decision, plays a vital role in every organization. The investment and financial managers shoulder the responsibility of making crucial investment decisions, as these decisions can have a significant impact on the long-term survival and success of the business. This module aims to provide a comprehensive understanding of capital budgeting by exploring various techniques and methodologies, emphasizing the analytical aspects through the use of Excel.

#### Capital Budgeting and its Significance:

Capital budgeting involves the allocation of funds for a specific period within a business, with the expectation of generating future benefits. The process requires careful consideration of financial details, particularly for businesses that rely on debt financing. Investors, both internal and external, seek adequate returns on their investments, and therefore, capital budgeting becomes a critical aspect of financial management.

#### Importance of Sound Investment Decisions:

In any business venture, the investment decision is irreversible, highlighting its significance in determining the long-term prospects of an organization. Therefore, investment and financial managers diligently analyze every financial aspect concerning the business, recognizing the potential implications of their decisions on the overall survival and growth of the company. A comprehensive understanding of finance is necessary to make sound investment decisions, regardless of whether the business is a sole proprietorship or an enterprise.

#### Course Objectives:

The primary objective of this course is to provide students with a solid foundation in project assessment and appraisal. By exploring various sub-topics presented as units, students will develop the necessary skills and knowledge required to effectively evaluate and analyze

investment opportunities. A powerful analytical tool, known as Excel, will be integrated throughout the course to facilitate the implementation of findings and enhance the decision-making process.

This course aims to equip students with the necessary knowledge and skills to make informed and effective investment decisions through capital budgeting. By exploring various techniques and methodologies, and employing Excel as an analytical tool, students will gain a comprehensive understanding of project assessment and appraisal. Understanding the fundamentals of capital budgeting is essential for financial managers and investors, as it ensures the optimal allocation of resources and maximizes the long-term profitability of a business. Below are the sub-topics that will be presented in this section which are in form of units;

## **MODULE 01 UNIT 01     Capital Budgeting**

**Modules 01 Unit 00:** Overview on how to study this Module.

**Modules 01 Unit 01:** This module discusses and explains what capital budgeting is and highlights different method used in capital budgeting.

**Modules 01 Unit 02:** Explains Pay Back Period (PBP) with relevant example.

**Modules 01 Unit 03:** Accounting Rate of Return (ARR) with relevant illustrations.

**Modules 01 Unit 04:** Sensitivity Analysis (SA) explicitly explained with illustrations.

**Modules 01 Unit 05:** Captures Net Present Value (NPV) and its implication in the business world

**Modules 01 Unit 06:** Explains Internal Rate of Return (IRR) with examples

**Modules 01 Unit 07:** Captures Profitability Index (PI) with explanations

**Modules 01 Unit 08:** Grading and General Assessment

**Modules 01 Unit 09:** Assignment and links

**Modules 01 Unit 10:** References (*Text Book and Journal Article*)

**Note:** Relevant analysis in this module were calculated using excel, kindly find attached excel sheet named according to the technique analyzed

### **Implication**

This course will help both business people and prospective business people make sound financial decisions that relate to their continuous existence in business (*Going Concern*). It will also cover how to satisfy shareholders' wealth, which ultimately maximizes shareholders' profit and how to survive in a competitive society.

### **Learning Objectives:**

In this module, capital budgeting is discussed in detail. The module covers the types and forms of capital, classification of projects, and various methods used in capital budgeting.

### **Module Highlights:**

1. Students should be able to understand and explain what capital budgeting is and the different types of project classification
2. Student should be able to appraise any project using the discounted and non-discounted methods that will be discussed under capital budgeting technique

### **How to Study this Module**

- Carefully read the overview provided above in this section.
- Make sure to have a handy dictionary and internet access available to look up unfamiliar words that you may come across, and take note of them where appropriate.
- It is essential for the student/reader to have a reliable calculator at their disposal.
- In order to have a clearer understanding of the subject matter, go back to each of the sub-units and formulate questions that are likely to be asked. Carefully answer those questions at the end of each sub-section.
- For further understanding, students/readers can visit any of the links provided in the module, as this will enhance their understanding.
- Discuss your new discoveries with your fellow coursemates and try to create valid arguments with supporting evidence where necessary.

## 1.1 Capital Budgeting

This term is a combination of two words: "capital" and "budgeting." Let's break it down by understanding the meanings of each component word.

### 1.1.1 Capital

Let's examine the concept of capital, as understanding it is crucial for everyone. From one perspective, capital can be defined as the resources a business owner possesses to start a business. Primarily, capital is associated with money, as it represents financial resources. However, capital can also be viewed from a managerial perspective, where it encompasses the skills, expertise, and human resources that individuals contribute to a company.

Every business requires capital not only for its initial establishment but also for expansion and diversification into other market sectors. The effective allocation of capital to long-term assets is one of the most important financial functions for a firm. This allocation plays a critical role in determining the firm's value, profitability, and long-term growth (Pandey, 2008).

### 1.1.2 Forms of Capital:

- i. **Shares:** There are different types of shares, including preference shares, ordinary shares, and debentures. These forms of capital are sold in the capital market, which is a market where long-term securities are traded. This includes the sale of stocks and bonds.
- ii. **Loan:** Capital can also be raised through loans obtained from financial institutions and non-financial institutions.
- iii. **Personal Savings:** Another source of capital is personal savings, which can be used to start up a business. Many small-scale businesses rely on this form of capital for their initial funding.
- iv. **Reserves:** Reserves refer to the money that is set aside from the business for future use within the business. It serves as a form of internal capital that can be used for various purposes.

## 1.2 Budgeting:

Alero, a mother of three children, follows a weekly routine with her kids. From Monday to Friday, she takes them to school, and on their way back, they visit Lix restaurant for a meal. On Wednesdays, she goes to the market to purchase food items and beverages. On Saturdays, the entire family, including her husband, visits WIMS amusement park for leisure, and on Sundays, they go to church.

From this illustration, it is evident that Alero has a planned schedule with her children for the week. However, these plans can only be executed with the involvement of cash. Money is required for fueling the car for school drop-offs, dining at the restaurant, buying groceries at the market, visiting the amusement park, and attending church. In order to effectively manage this spending, a feasible plan needs to be laid out, which is known as a budget.

**Budget** can be defined as a predetermined plan on how money is to be spent in order to achieve specific tasks. One aspect of budgeting is the cash budget, which provides a summary of the expected inflow and outflow of cash over a projected time period. According to Pandey (2008), a cash budget is a statement that outlines a firm's anticipated cash inflow and outflow.

Every establishment requires a viable plan for implementing sound financial investments, which involves committing capital for a certain period of time to earn future payment or interest. This plan aims to yield desirable returns for the capital employed. Joe, Arthur, and Thomas (1995) define a budget as a plan for spending and saving earned income, including general categories for allocating funds.

**Budgeting** is a systematic, step-by-step procedure employed by individuals, companies, institutions, organizations, and governments to prepare a detailed plan for allocating available funds. It involves developing strategies and tactics to ensure that the plan pays off within a short period of time. Budgeting includes analyzing income and expenditure, as well as setting short-term spending and saving goals (Joe et al., 1995). It helps mitigate the problems that may arise from fund misappropriation and prevents issues caused by excessive spending. When planning a budget, it is important to consider other macroeconomic factors that may impact the budgeted figures. Failure to account for these factors can lead to overestimation or underestimation in forecasting.

For a practical example, an Excel format is provided. By clicking on the Excel icon and selecting the "Personal Monthly Budget" bookmark on the front page, users can access different types of budgets and choose the one that suits their needs.

### 1.3 Capital Budgeting:

Taking the two words together, "Capital Budgeting," it refers to one of the functions of a financial manager. This process involves evaluating qualitative factors such as how a project aligns with the company's mission and vision, its long-term sustainability, and the potential competitive advantage it can provide. The goal is to determine the best allocation of capital that will yield maximum returns for the company.

Capital budgeting entails estimating the economic return of a project in comparison to other similar projects, considering the available capital for its execution. These projects typically have a long-term duration. The company or financial manager compares the results of two or three projects to make an informed decision, using various methods that will be discussed later in the module.

Capital budgeting is a technique used by companies to rank and evaluate investments and expenditures. These expenditures can include research and development projects, construction, equipment and machinery purchases, new plant establishment, and other long-term investments. These techniques assist management in assessing and maximizing future returns. According to Pandey (2008), capital budgeting is the firm's decision to invest its current funds efficiently in long-term assets, anticipating a flow of benefits over a series of years. Stephen, Randolph, and Jeffrey (2005) define capital budgeting as the process of managing expenditures on long-lived assets, with a focus on the left-hand side of the balance sheet, which represents the asset side.

#### 1.3.1 Project Classification: Projects are Classified into:

1. Maintenance of Business
2. Replacement of Project
3. Expansion into New Product or Market
4. Expansion of Existing Business

#### Brief Explanation

**Maintenance of Business:** This type of project involves the upkeep of an existing business. Every business needs to ensure that its equipment is in good condition for smooth production. Maintenance or replacement may be necessary for worn-out machines. This project focuses on spending on business equipment required for ongoing production of goods and services.

**Replacement of Project:** These projects involve the implementation of stand-by measures to replace obsolete machines or equipment. The aim is to reduce the use of outdated equipment, lower current and operating expenses, and improve efficiency.

**Expansion into New Product or Market:** Businesses, whether sole proprietorships or limited liability companies, provide either tangible (products) or intangible (services) offerings to customers. In order to increase revenue, companies need to expand their customer base. Customer patronage is crucial for the business to continue operating, so expanding into new products or untapped markets becomes necessary.

**Expansion of Existing Business:** Business expansion and diversification are essential for long-term sustainability. To ensure continuous growth, a certain percentage of retained revenue should be set aside for expansion purposes. However, this decision is complex and requires careful investigation into the specific project to be undertaken.

**Advantages:**

- i. Facilitates rational decision-making by helping decision makers evaluate and select the most viable investment options.
- ii. Enables shareholders to explore alternative investment opportunities that offer higher returns on their capital.
- iii. Allows investment managers to increase shareholders' wealth and exercise proper control over expenditures.

**Disadvantages:**

- i. Implementation of capital budgeting decisions often takes a significant amount of time, sometimes spanning years.
- ii. The results of the analysis should not be immediately implemented as capital budgeting decisions involve substantial investments that require careful consideration.
- iii. Incorrect decisions in capital budgeting can negatively impact the business's longevity and overall success.

#### 1.4 Project Evaluation Analysis:

These analyses serve as benchmarks for making rational and prudent business decisions. There are two main methods used to evaluate projects: the discounted cash flow method and the non-discounted method. Each method has its own advantages and disadvantages. The following are some of the advantages, which will be further explained with the help of the tutor. Students should be able to discuss each of them and provide reasons to support their viewpoints. These techniques can also be used to evaluate mutually exclusive projects.

1. **Non-discounted method includes;**
  - a) Pay Back Period (PBP)
  - b) Accounting Rate of Return (ARR)
2. **Discounted method includes;**
  - a) Sensitivity Analysis (SA)
  - b) Net Present Value (NPV)
  - c) Internal Rate of Return (IRR)
  - d) Profitability Index (PI)

**In Summary:** Capital Budgeting entails a critical investigation into revenue sources, expenditure and ways in which different funds employed to execute a project will be paid back selecting the best project that fits into the organizations structure.

## MODULE 01 UNIT 02 Pay Back Period

### 1A. Pay Back Period (PBP)

As the name suggests, the payback period method is used to determine the exact number of years, months, and days required for a project or business to recover its initial cash outlay. It provides valuable information to the financial manager or business owner regarding the breakeven point of the project or business. The breakeven point refers to the stage at which the business is no longer in debt and starts generating profits.

#### Formula

$$\text{Pay Back Period (PBP)} = \frac{\text{Number of Years Before Recovery of Original Investment} + \text{Amount of Investment Remaining to Be Recaptured}}{\text{Total Cash Flow During Year of Payback}}$$

#### Criteria Decision

Accept the project if Payback, PB < some number of years set by the firm.

#### Advantages of Pay Back Period Analysis

- i. It is simple to calculate, making it accessible and easy to understand for decision-makers.
- ii. It is less time-consuming compared to other capital budgeting techniques, allowing for quick assessments and comparisons of different investment options.
- iii. The payback period provides the exact date when the initial investment will be recovered, giving the business owner a clear understanding of when they can expect to break even.

#### Disadvantages/Problems associated with Payback Period Analysis:

- i. It does not consider the time value of money, such as inflation and interest rates, which can impact the value of future cash flows. This omission can lead to inaccurate assessments of the profitability and viability of a project.
- ii. It focuses solely on cash flows and ignores other important factors like depreciation and obsolescence of assets. By disregarding these factors, the payback period analysis may not provide a comprehensive picture of the project's financial performance.
- iii. The emphasis on short payback periods may result in the neglect of viable long-term projects. If the payback period becomes the primary criterion for decision-making, projects with longer payback periods but potentially higher returns may be overlooked, limiting the potential for long-term growth and profitability.
- iv. In conclusion, while the payback period analysis offers simplicity and a clear breakeven date, it is important to consider its limitations, such as its disregard for the time value of money and other relevant factors. A comprehensive evaluation that incorporates other capital budgeting techniques is necessary to make informed investment decisions.

### Illustration 1

**A. Payback Period:** This is method is used to calculate the exact number of years and months required for a business under investigation to recover its initial investment and reach the breakeven point. It also provides information about the resulting profit or loss after the debt has been repaid.

#### Solution

**Table 1**

<u>Year</u>	<u>Cash Flow</u>	<u>Cumulative CF</u>
0	₹ (12,000)	₹ (12,000)
1	1,700	(10,300)
2	1,200	(9,100)
3	2,100	(7,000)
4	4,200	(2,800)
5	3,200	400

**Source:** Authors Compilation

**Pay Back Period (PBP) =**

$$\text{Pay Back Period (PBP)} = \frac{\text{Number of Years Before Recovery of Original Investment} + \text{Amount of Investment Remaining to Be Recaptured}}{\text{Total Cash Flow During Year of Payback}}$$

#### Criteria Decision

Accept the project if Payback, PB < some number of years set by the firm.

#### Key:

- Number of Years Before Recovery of Original Investment = 4
- Amount of Investment Remaining to Be Recaptured= 2,800
- Total Cash Flow During Year of Payback= 3,200

#### Interpretation

$$\text{PBP} = 4 + \frac{2800}{3,200} \times 12 \text{ months}$$

$$\text{PBP} = 4 + 10.5$$

$$\text{PBP} = 4, 10.5 \text{ years.}$$

This means within the space of **4 Years, 10 Month and 5 Days** the project will be able to pay back its debt.



**Illustration 2**

Mr., Dolor, is an engineer who is currently working on a project which requires a cash outlay of ₦62,500 and yields an annual cash inflow of ₦12,500 for 7yrs. The payback period for the project will be: In this case we have two different method we can use to solve the illustration above which will rightly discussed below:

**Formula:**

$$\text{Payback Period (PBP)} = \frac{\text{Initial Investment}}{\text{Annual Cash Inflow}}$$

**Solution Option 1:**

$$\text{PBP} = \frac{₦62,500}{₦12,500} = 5, \text{years}$$

**Result Interpretation**

From the above result we can see that the cash flow yields are the same for a period of five years, this made us to apply this formula directly.

**Note:** In this case the cash inflow is even, we just divide the outlay by the inflow, but in a situation when the cash inflow is uneven, we add up the inflow until it totals the outlay.

**Solution Option 2:**

**Table 2. Cash Flow Table**

	<u>Cash Flow</u>	<u>Cumulative CF</u>
0	₦ (62,500)	₦ (62,500)
1	12,500	(50,000)
2	12,500	(37,500)
3	12,500	(25,000)
4	12,500	(12,500)
5	12,500	(12,500)
6	12,500	12,500
7	12,500	12,500

**Source:** Authors Compilation

**Result Interpretation**

It's very clear that in the 5th year the project was able to pay back its debt and profit was incurred to the tune of ₦25,000 was incurred from the project, the benefit of using the tabulated method is that you can easily calculate the profit that the business will be incurring if the project eventually break-even.

**Illustration 3**

Suppose that a project requires a cash outlay of ₦19,500, and generates cash inflows of ₦6,500, ₦8,500, ₦4,000 and ₦3,500 during the next 4 years.

**Solution**

- We add up the inflows from the first year to the third year (₦6,500, ₦8,500 and ₦4,000) in the 3<sup>rd</sup> year, which gives us ₦19,000 of the original outlay.
- In the 4<sup>th</sup> year inflow is ₦3,500 and only ₦500 of the original outlay is remaining to be recovered, we then divide that by the inflow of the 4<sup>th</sup> year.
- This means the capital the project required initially was paid back (break-even) after 3 years but not the entire money was repaid.
- We need to apply the formula below which will help us ascertain the exact date the money is to be repaid.

$$PBP = \frac{₦500}{₦3,500} \times 12 \text{ months}$$

**To Detrminne The Exact Month to be Paid Back = 0.1428571 x 12 months = 1.714**

**PBP= 3 + 1.714 = 3, Years, 1, Month and 7days**

**Applying the above example on Excel**

*Table 3. Cash Flow Table*

		PBP	
N/O	Cash Inflow	C/F	
0	-19,500	-19,500	
1	6,500	-13,000	
2	8,500	-4,500	
3	4,000	-500	
4	3,500	3,000	
Months			
PBP	3	0.142857143	1.714286
PBP	Years		
PBP	<b>3 Years, 1 Month and 7 Days</b>		

*Source:* Compiled from Excel Analysis 2023.

**Interpretation**

From the result above, we can see that the project will pay back its capital within a period of 3 years, 1 month, and 7 day. This method is effective in determining the exact date and month when the project will achieve payback. This implies that a shorter payback period reduces the uncertainty associated with implementing the project. This means that the business or investor can recover their initial investment in a shorter timeframe, which can be beneficial in terms of cash flow and risk management.

On the other hand, a longer payback period implies a slower return on investment and a longer period of uncertainty. Projects with longer payback periods may tie up capital for a significant amount of time, potentially limiting the ability to invest in other projects or activities. Therefore, it is important for businesses and investors to carefully evaluate the payback period in relation to their financial goals and risk tolerance. In summary, while the payback period provides valuable information about the time it takes for a project to recover its initial investment, it is essential to consider both the advantages and disadvantages of this method when making investment decisions.

## **MODULE 01 UNIT 03     Accounting Rate of Return (ARR)**

### **1B) Accounting Rate of Return**

This method is commonly known as the Accounting Rate of Return (ARR). It is an accounting concept that assesses the profitability of a business and serves as a performance metric. The ARR considers two crucial indicators: income and expenditure, as presented in the financial statements. To calculate the ARR, one divides average income by average expenditure. The utilization of accounting information for data analysis is necessary for implementing this method.

#### **Decision Criteria**

The management must establish a benchmark before calculating the rate of return for any investment. This benchmark serves as a reference point for the company to evaluate whether the projected returns from a particular project align with their expectations. It helps them determine whether they should proceed with the project or explore alternative options that can yield the desired return. If the calculated ARR is greater than the targeted return rate, the project can be accepted. Otherwise, if the calculated ARR falls below the targeted return rate, the project will be rejected.

#### **Advantages**

- i. This method relies on readily available information from the company's published reports.
- ii. This method serves as a control tool and performance yardstick utilized by accountants.
- iii. The entire cash flow stream must be incorporated before any of the key indicators can be utilized.

#### **Disadvantages**

- i. Any errors in the accounting data have a negative impact on the resulting outcome.
- ii. The process of compiling the final figures to be used can be quite laborious.
- iii. The decision to utilize this technique as an investment criterion tool can have adverse effects or consequences.

**Illustration 4**

A project with a cost of ₦45,000 is expected to generate a stream of earnings before depreciation, interest, and taxes (EBDIT) over a period of five years: ₦10,000, ₦12,000, ₦14,000, ₦16,000, and ₦20,000. Assuming a 50% tax rate and depreciation on a straight-line basis, the project's Accounting Rate of Return (ARR) can be computed as follows.

**Solution**

**Table 4.** Accounting Rate of Return (ARR) Computation (depreciation on a straight-line basis)

Year	Average Income						Depreciation			
	1	2	3	4	5	Average	Tax 50%	Capital ₦ 45,000.00	Years 5	
EBDIT	₦ 10,000.00	₦ 12,000.00	₦ 14,000.00	₦ 16,000.00	₦ 20,000.00	₦ 14,400.00	Depreciation=	₦ 9,000.00		
Depreciation	₦ 9,000.00	₦ 9,000.00	₦ 9,000.00	₦ 9,000.00	₦ 9,000.00	₦ 9,000.00				
EBIT	₦ 1,000.00	₦ 3,000.00	₦ 5,000.00	₦ 7,000.00	₦ 11,000.00	₦ 5,400.00				
Tax	₦ 500.00	₦ 1,500.00	₦ 2,500.00	₦ 3,500.00	₦ 5,500.00	₦ 2,700.00				
EAIT	₦ 500.00	₦ 1,500.00	₦ 2,500.00	₦ 3,500.00	₦ 5,500.00	₦ 2,700.00				
<b>Average Investment</b>										
Book Value of Investment	45,000									
Year	1	2	3	4	5					
Beginning	₦ 45,000.00	₦ 36,000.00	₦ 27,000.00	₦ 18,000.00	₦ 9,000.00					
Ending	₦ 36,000.00	₦ 27,000.00	₦ 18,000.00	₦ 9,000.00	₦ -					
Average	₦ 40,500.00	₦ 31,500.00	₦ 22,500.00	₦ 13,500.00	₦ 4,500.00	₦ 22,500.00				
ARR=	Average Income / Average Expenditure									
ARR	12									

Source: Authors Compilation from Excel Analysis 2023.

- Step 1: Calculate the average annual earnings before depreciation, interest, and taxes (EBDIT).  
Step 2: Subtract the average annual depreciation expense.  
Step 3: Calculate the average annual after-tax earnings.  
Step 4: Calculate the ARR.

Let's go through each step:

**Step 1:** Calculate the average annual EBDIT.

Add up the earnings for each year and divide by the number of years.

$$\text{Average EBDIT} = (\text{₹}10,000 + \text{₹}12,000 + \text{₹}14,000 + \text{₹}16,000 + \text{₹}20,000) / 5$$

$$\text{Average EBDIT} = \text{₹}72,000 / 5$$

$$\text{Average EBDIT} = \text{₹}14,400$$

**Step 2:** Subtract the average annual depreciation expense.

Depreciation expense is calculated using the straight-line method, which means the cost is evenly spread over the project's life.

Depreciation expense per year = Cost of the project / Number of years

$$\text{Depreciation expense per year} = \text{₹}45,000 / 5$$

$$\text{Depreciation expense per year} = \text{₹}9,000$$

**Step 3:** Calculate the average annual after-tax earnings.

Subtract the average annual depreciation expense from the average annual EBDIT, and then apply the tax rate of 50%.

$$\text{Average after-tax earnings} = (\text{Average EBDIT} - \text{Depreciation expense per year}) * (1 - \text{Tax rate})$$

$$\text{Average after-tax earnings} = (\text{₹}14,400 - \text{₹}9,000) * (1 - 0.5)$$

$$\text{Average after-tax earnings} = \text{₹}5,400 * 0.5$$

$$\text{Average after-tax earnings} = \text{₹}2,700$$

**Step 4:** Calculate the ARR.

ARR is calculated by dividing the average after-tax earnings by the initial cost of the project and multiplying by 100% to get a percentage.

$$\text{ARR} = (\text{Average after-tax earnings} / \text{Cost of the project}) * 100$$

$$\text{ARR} = (\text{₹}2,700 / \text{₹}22,500) * 100$$

$$\text{ARR} = 0.12 * 100$$

$$\text{ARR} = 12\%$$

Therefore, the Accounting Rate of Return (ARR) for the project is 12%.

From the above we can see that the ARR is 12, this means that the business/ investment will yield back an average return of 12%. To compute the Accounting Rate of Return (ARR) for the project, we need to follow these steps:

**Illustration 5**

Applying same scenario as in the case above but including 12% depreciation using reducing balance method to the example above.

**Solution Table 5** Accounting Rate of Return (ARR) Computation (depreciation using reducing balance method)

Depreciation Reducing Balance Method						
Tax 50%		Capital	Years	Percentage		
		₹ 45,000.00	5	12%		
Year	0	1	2	3	4	5
Initial Cost	₹ 45,000.00	₹ 45,000.00	₹ 39,600.00	₹ 34,200.00	₹ 28,800.00	₹ 23,400.00
Depreciation		₹ 5,400.00	₹ 4,752.00	₹ 4,104.00	₹ 3,456.00	₹ 2,808.00
Average Income						
Year	1	2	3	4	5	Average
EBDIT	₹ 10,000.00	₹ 12,000.00	₹ 14,000.00	₹ 16,000.00	₹ 20,000.00	₹ 14,400.00
Depreciation	₹ 5,400.00	₹ 4,752.00	₹ 4,182.72	₹ 3,681.89	₹ 3,233.21	₹ 4,249.96
EBIT	₹ 4,600.00	₹ 7,248.00	₹ 9,817.28	₹ 12,318.11	₹ 16,766.79	₹ 10,150.04
Tax	₹ 2,300.00	₹ 3,624.00	₹ 4,908.64	₹ 6,159.06	₹ 8,383.40	₹ 5,075.02
EAIT	₹ 2,300.00	₹ 3,624.00	₹ 4,908.64	₹ 6,159.06	₹ 8,383.40	₹ 5,075.02
Average Investment						
Book Value of Investment	45,000					
Year	1	2	3	4	5	
Beginning	₹ 45,000.00	₹ 39,600.00	₹ 34,848.00	₹ 30,665.28	₹ 26,983.39	
Ending	₹ 39,600.00	₹ 34,848.00	₹ 30,665.28	₹ 26,983.39	₹ 23,750.18	
Average	₹ 42,300.00	₹ 37,224.00	₹ 32,756.64	₹ 28,824.34	₹ 25,366.79	₹ 33,294.35
ARR=	Average Income /Average Expenditure					
ARR	15.24287963					

**Source:** Authors Compilation from Excel Analysis 2023.

From the above after applying 12% depreciation we can see that the ARR is 15, this means that the business/ investment will yield back an average return of 15%.

**Step 1: Calculate the annual depreciation expense.**

The depreciation is calculated using the reducing balance method. Since the depreciation rate is 12% and the cost of the project is ₦45,000, the annual depreciation expense can be calculated as follows:

$$\text{Year 1: } \text{₦}45,000 * 12\% = \text{₦}5,400$$

$$\text{Year 2: } (\text{₦}45,000 - \text{₦}5,400) * 12\% = \text{₦}4,752$$

$$\text{Year 3: } (\text{₦}45,000 - \text{₦}5,400 - \text{₦}4,752) * 12\% = \text{₦}4,182.72$$

$$\text{Year 4: } (\text{₦}45,000 - \text{₦}5,400 - \text{₦}4,752 - \text{₦}4,182.72) * 12\% = \text{₦}3,681.89$$

$$\text{Year 5: } (\text{₦}45,000 - \text{₦}5,400 - \text{₦}4,752 - \text{₦}4,182.72 - \text{₦}3,681.89) * 12\% = \text{₦}3,233.21$$

**Step 2:** Calculate the earnings before depreciation, interest, and taxes (EBDIT) after accounting for the annual depreciation expense.

EBDIT for each year is given as follows:

$$\text{Year 1: } \text{₦}10,000 - \text{₦}5,400 = \text{₦}4,600$$

$$\text{Year 2: } \text{₦}12,000 - \text{₦}4,752 = \text{₦}7,248$$

$$\text{Year 3: } \text{₦}14,000 - \text{₦}4,182.72 = \text{₦}9,817.28$$

$$\text{Year 4: } \text{₦}16,000 - \text{₦}3,681.89 = \text{₦}12,318.11$$

$$\text{Year 5: } \text{₦}20,000 - \text{₦}3,233.21 = \text{₦}16,766.79$$

**Step 3:** Calculate the earnings before interest and taxes (EBIT) for each year.

EBIT is calculated by deducting the tax expense from the EBDIT. The tax rate is 50%.

$$\text{Year 1: } \text{₦}4,600 * (1 - 50\%) = \text{₦}2,300$$

$$\text{Year 2: } \text{₦}7,248 * (1 - 50\%) = \text{₦}3,624$$

$$\text{Year 3: } \text{₦}9,817.28 * (1 - 50\%) = \text{₦}4,908.64$$

$$\text{Year 4: } \text{₦}12,318.11 * (1 - 50\%) = \text{₦}6,159.05$$

$$\text{Year 5: } \text{₦}16,766.79 * (1 - 50\%) = \text{₦}8,383.39$$

**Step 4:** Calculate the average annual earnings before interest and taxes (EBIT).

Add up the EBIT for each year and divide by the number of years.

$$\text{Average EBIT} = (\text{₦}2,300 + \text{₦}3,624 + \text{₦}4,908.64 + \text{₦}6,159.05 + \text{₦}8,383.39) / 5 = \text{₦}5,075.02$$

**Step 5:** Calculate the Accounting Rate of Return (ARR).

The ARR is calculated by dividing the average EBIT by the initial investment cost and multiplying by 100 to express it as a percentage.

$$\text{ARR} = (\text{₦}5,075.02 / \text{₦}33,294.35)$$

$$\text{ARR} = (\text{₦}5,075.02 / \text{₦}33,294.35) * 100$$

$$\text{ARR} \approx 15.24\%$$

Therefore, the Accounting Rate of Return (ARR) for the project is approximately 15.24%.

The ARR provides a percentage measure of the profitability of the project relative to its initial investment cost. In this case, the ARR indicates that the project is expected to generate an average annual return of 15.24% on the initial investment over the five-year period.

## MODULE 01 UNIT 04 Sensitivity Analysis

### 2A Sensitivity Analysis (SA)

Sensitivity analysis, also known as "What If Analysis," is a technique used in capital budgeting and various fields of study to forecast changes in a subject matter of interest. It is employed by businesses to predict sales, cash flow, investment appraisal, and break-even points. This financial modeling tool examines how different endogenous variables impact an exogenous variable under specific conditions. Sensitivity analysis enables business people and shareholders to prepare for unforeseen circumstances and make informed decisions based on the analysis results. The analysis involves creating multiple scenarios, including the worst-case (pessimistic), expected (most likely), and best-case (optimistic) scenarios. It is important to note that scenario analysis should not be confused with sensitivity analysis. Scenario analysis focuses on specific situations that involve fluctuations influenced by global macroeconomic factors, whereas sensitivity analysis identifies variables that affect the subject matter of interest and comprehensively explores various extremes to address and resolve the specific problem at hand.

#### **Advantages of Carrying out Sensitivity Analysis:**

- i. Sensitivity analysis allows analysts to explore a wider range of possibilities and outcomes for the subject matter of interest. This enhances the credibility of financial models and leads to better decision-making.
- ii. Sensitivity analysis provides flexibility in decision-making by allowing analysts to choose different point intervals that align with their specific business models and risk preferences.
- iii. Decision-makers can derive sound, optimal, and logical conclusions based on the results of sensitivity analysis, enabling informed decision-making.

#### **Disadvantages of Carrying out Sensitivity Analysis:**

- i. The terms "optimistic" and "pessimistic" can be subject to varying interpretations, leading to different perceptions among individuals. This variance in understanding may hinder the ability to make reliable predictions based on the available data.
- ii. Sensitivity analysis does not consider the relationships between relevant variables that influence the subject matter (dependent variable). This limitation may overlook important interactions and dependencies, potentially affecting the accuracy of the analysis.



**Illustration 6**

Mr. Sunday has the following assumptions for forecasting the profit and determining the breakeven point when selling the personal computers (PCs) he assembles at his factory:  
 Selling price of the PC: ₦500, ₦750, ₦1,000, ₦1,250, and ₦1,500.  
 Cost of producing the PC: ₦200, ₦175, ₦150, ₦125, ₦100, and ₦75.  
 Mr. Sunday wants to determine the point at which he will generate a profit or incur a loss based on these assumptions.

**Table 6. Summary of Mr. Sundays Expenditure**

	ITEMS	COST
A	(A) PC Sold	₦1,000.00
B	Price/PC	₦450.00
C	Cost/PC	₦50.00
D	Factory Rent	₦8,000.00
E	Payroll	₦27,000.00

**Table 7. Profit and Loss Account**

	ITEMS		COST
F	Revenue	<b>B*A</b>	₦ 450,000.00
G	Cost of Sales	<b>C*A</b>	₦ 50,000.00
H	Gross Profit	<b>F-G</b>	₦ 400,000.00
I	Stationary/Expenditure	<b>D+E</b>	₦ 35,000.00
J	Operating Profit	<b>H-I</b>	₦ 365,000.00

**Table 8. Result of the Sensitivity Analysis.**

		PC Sold				
		500	750	1,000	1250	1500
Price	₦ 365,000.00					
	₦ 200.00	40000	77500	115000	152500	190000
	₦ 175.00	27500	58750	90000	121250	152500
	₦ 150.00	15000	40000	65000	90000	115000
	₦ 125.00	2500	21250	40000	58750	77500
	₦ 100.00	-10000	2500	15000	27500	40000
	₦ 75.00	-22500	-16250	-10000	-3750	2500

**Source:** Authors Computation from Excel Sheet

**Analysis**

The mixture of prices and quantities sold shows the proportion of risk that is to be employed if the business wants to remain in continuity. The table 8, above shows the combination of prices and products that Mr. Sunday intends to use in forecasting his profit and when he will break even. From the above we can see that the total operating profit is ₦365,000.00 after all necessary expenditures have been deducted, from the sensitivity analysis above we can see that there are *six hypothetical situation* (₦200, ₦175, ₦150, ₦125, ₦100 and ₦75) that shows different prices

of PC that can be sold and the quantity that is sold (500, 750, 1,000, 1250 and 1500) it can be seen that the business will be making loss if 500 PCs are been sold for ₦100 but if the quantity increases to ₦750 and still maintain the price of ₦100 it will make a profit of ₦2,500. In another scenario we can see that when the price of the PC is reduced to ₦75 the owner of the business will be making a loss if he sells 500 – 1250 PCs but the business will make profit exactly when the quantity sold increases to 1500. The portion painted **Yellow** in the table 8 above shows the point where the business will be making loss.

#### **Using Manual Calculation to Calculate Sensitivity Analysis.**

This method requires the use of a calculator.

From the example above let's take a hypothetical situation, if the firm makes total sales of 1,000 PCs at a cost price of ₦125 what will be the profit or loss that the business will yield.

#### **Step 1**

Price of PC multiply by total PCs sold = ₦125 x 1,000 = **₦125,000**

#### **Step 2**

Reduce cost of production from the revenue gotten from the sales. The cost of producing one PC stood at ₦50 meanwhile 1,000 PCs where sold, we then multiply total PCs produced by the cost of production.

**Cost of Production** = ₦50 x 1,000 = **₦50,000**

#### **Step 3**

In this stage the gross profit (GP) is needed and this will be ascertained by deducting total PCs sold by total cost of producing the PCs involved in this case.

GP = ₦125,000 - ₦50,000 = **₦75,000**

#### **Step 4**

Ascertain the net profit (NP) this can be done by reducing the total expenditure that might occur as a result of producing PC, the total expenditure in this case includes expenditure on payroll factory (₦8,000) and rent (₦27,000). Add all the expenditures together then subtract it from the gross profit.

Total Expenditure = ₦8,000 + ₦27,000 = **₦35,000**

#### **Step 5**

Net profit, this can be calculated by reducing gross profit from expenditure, step 4 above shows the total expenditure that the business has made

Net Profit = ₦75,000 - ₦35,000 = **₦40,000** (This figure is same as the figure that we got in table 8 above, which has the sensitivity analysis combining different prices of commodity sold and prices together.)

**Note:** All this can be done with the aid of **Microsoft Excel**, which will be accurate and precise instead of doing it manually with the use of calculator.

**Illustration 7**

Mr. Lewis is in charge of selling drinks in Jinx shopping mall, wants to determine the impact of crowd size on sales revenue. The report shows that the average price of one wine is ₦20. In the previous month, Jinx sold 562 wines, resulting in total sales of ₦10,000. Due to production cost increases, the unit price of producing one wine increased by ₦2 in August.

To assess the relationship between crowd size and sales, Lewis conducts a sensitivity analysis. The analysis reveals that a 10% increase in mall traffic would lead to a 5% increase in the total number of wines sold. Based on the provided information, Lewis can predict the potential revenue generated by Jinx if customer traffic increases by 20%, 60%, and 100%. The financial analysis indicates that such increases in customer traffic would result in sales of wine increasing by 7%, 39%, and 51%, respectively.

**Table 9 What if Analysis**

S/N	Mall Traffic Growth	Unit Price	Sales Volume	Revenue	Revenue Increase
Feb	0%	₦ 20.00	562	₦ 11,240.00	0%
Mar	10%	₦ 20.00	590	₦ 11,800.00	5%
Apr	20%	₦ 20.00	600	₦ 12,000.00	7%
May	30%	₦ 20.00	625	₦ 12,500.00	11%
June	40%	₦ 20.00	640	₦ 12,800.00	14%
July	50%	₦ 20.00	675	₦ 13,500.00	20%
Aug	60%	₦ 22.00	710	₦ 15,620.00	39%
Sep	70%	₦ 20.00	745	₦ 14,900.00	33%
Oct	80%	₦ 20.00	780	₦ 15,600.00	39%
Nov	90%	₦ 20.00	815	₦ 16,300.00	45%
Dec	100%	₦ 20.00	850	₦ 17,000.00	51%

**Source:** Compiled Excel Analysis 2023.

**Result Interpretation**

From the analysis above there are some basic assumptions that needs to be established, this analysis is aimed at explaining how the influx of people into the mall have contributed to the revenue of Jinx shopping mall. Let’s take a closer look at the month April, it can be seen that the influx of people increases to 20% as at that month and the price of wine was still kept at ₦20 which result to an increase of 600 in sales volume, the increase in sales volume result to a total revenue of ₦12,000 and an increase of 7% to the total revenue of Jinx shopping mall. Taking a close look at the table 9 above, it can be seen that in August the unit price increased because the demand for the product also increased alongside, making revenue contribution from sales of wine increased to ₦15,620 and a 39% increase was identified in that period.

The same 39% increase in revenue is identified in October when the influx of people into the mall increase to 80% and sales of wine increased to 780 volume, we can deductively conclude that the unit price and sales volume contributed significantly to Jinx shopping malls profit. We can therefore conclude that an increase in the mall traffic leads to an increase in sales and revenue attributed to Jinx shopping mall.

**Step 1**

Establish if an increase or a decrease is attributed to Jinx shopping mall.  
 Traffic increased by 20% which resulted to an increase in sales volume to 600.

**Step 2**

**Total Revenue (TR):** This can be gotten by multiplying unit price and sales volume

$$TR = ₦ 20 \times 600 = ₦ 12,000$$

A total revenue of ₦ 12,000 was added to Jinx shopping mall

**Step 3**

Calculate the percentage increase/decrease to Jinx shopping mall income account, this can be gotten by deducting new revenue from that of old revenue then divide it by old revenue.

**Formula for Percentage Increase (PID) or decrease.**

$$\text{Percentage Increase/Decrease} = \frac{(\text{New Value} - \text{Old Value})}{|\text{Old Value}|} * 100$$

$$PID = \frac{\text{New Revenue} - \text{Old Initial Revenue}}{\text{Old Initial Revenue}} \times 100$$

$$PID = \frac{12,000 - 11,240}{11,240} = 0.07 \times 100 = 7\%$$

Calculating this manually will take a lot of time, it best done using computer applications like Microsoft Excel, SPSS, E-Views, Rat, etc.

**Illustration 8**

Sosoliso is a company that produces a single model of snowboard. The following assumptions were made for the snowboard: Forecasted monthly sales: 520 units. Profit target: ₦50,000. Monthly fixed cost: ₦57,000. Variable cost per unit: ₦57,000. Sales price per unit: ₦450. These assumptions are considered the best-case scenario for forecasting. Now, we need to prepare a cost value model for three different circumstances: Percentage Change in Sales Price: In this case, we want to determine the percentage change when the sales price increases by 10%, assuming the original price is ₦45 per unit. Percentage Change in Sales Volume: In this case, we want to determine the percentage change if there is a decrease in sales volume. Percentage Change in Variable Cost and Fixed Cost: In this case, we want to determine the percentage change when variable cost increases by 10% and fixed cost reduces by 30%.

Please note that the specific calculations for these percentage changes will depend on the actual numbers and formulas used in the cost value model.

**Solution**

To calculate the Cost Value Profit Model for the three different circumstances provided, we will need to adjust based on the given percentage changes. Let's calculate the profit under each scenario.

**Original data:**

Forecasted monthly sales (Q) = 520 units

Profit target (PT) = ₦50,000

Monthly fixed cost (FC) = ₦57,000

Variable cost per unit (VC) = ₦57,000

Sales price per unit (SP) = ₦450

**1. Percentage Change in Sales Price:**

Assuming the original price is ₦45 per unit and it increases by 10%:

New Sales price per unit (SP<sub>new</sub>) = ₦45 \* 1.10 = ₦49.50

Calculating the new profit:

Revenue (R) = SP<sub>new</sub> \* Q = ₦49.50 \* 520 = ₦25,740

Total cost (TC) = (VC \* Q) + FC = (₦57,000 \* 520) + ₦57,000 = ₦29,697,000

Profit (P) = R - TC = ₦25,740 - ₦29,697,000 = -₦29,671,260 (loss)

**2. Percentage Change in Sales Volume:**

Assuming there is a decrease in sales volume by 10%:

New forecasted monthly sales (Q<sub>new</sub>) = Q \* 0.90 = 520 \* 0.90 = 468 units

Calculating the new profit:

Revenue (R) = SP \* Q<sub>new</sub> = ₦450 \* 468 = ₦210,600

Total cost (TC) = (VC \* Q<sub>new</sub>) + FC = (₦57,000 \* 468) + ₦57,000 = ₦26,733,000

Profit (P) = R - TC = ₦210,600 - ₦26,733,000 = -₦26,522,400 (loss)

**3. Percentage Change in Variable Cost and Fixed Cost:**

Assuming variable cost increases by 10% and fixed cost reduces by 30%:

New variable cost per unit (VC<sub>new</sub>) = VC \* 1.10 = ₦57,000 \* 1.10 = ₦62,700

New fixed cost (FC<sub>new</sub>) = FC \* 0.70 = ₦57,000 \* 0.70 = ₦39,900

Calculating the new profit:

Revenue (R) = SP \* Q = ₦450 \* 520 = ₦234,000

Total cost (TC) = (VC<sub>new</sub> \* Q) + FC<sub>new</sub> = (₦62,700 \* 520) + ₦39,900 = ₦32,643,900

Profit (P) = R - TC = ₦234,000 - ₦32,643,900 = -₦32,409,900 (loss)

In all three scenarios, the profit is negative, indicating a loss. The cost value profit model helps evaluate the impact of different circumstances on profitability and aids in decision-making regarding pricing, sales volume, and cost adjustments.

## MODULE 01 UNIT 05 Net Present Value

### 2B Net Present Value (NPV)

The NPV (Net Present Value) is a financial metric used in investment appraisal to determine the worth of a business or investment project. It considers both cash flow and the time value of money. NPV helps in evaluating and deciding whether to accept or reject an investment proposal. This method assists financial managers in assessing the long-term profitability of a business or investment by forecasting future cash inflows. To calculate NPV, the cash flows, whether positive or negative, are discounted to their present value using a discount factor. The present values of the cash flows are then summed, and this total is subtracted from the initial capital investment. The result provides insight into the profitability of the investment over time. The NPV calculation involves adding up the present values of cash flows, applying a discount factor, and deducting the initial capital investment to determine the net worth or profitability of a business or investment project. One major advantage of NPV is that it considers time value of money.

#### Advantages:

- i. It considers all predicted or forecasted cash inflows in the project, unlike Payback Period (PBP) which may not account for all cash flows.
- ii. The method applies the value-added principle through the discounting process, taking into consideration the time value of money.
- iii. NPV aligns with the goal of maximizing shareholders' wealth, as shareholders can assess the future prospects of the company and the net worth of the business.

#### Disadvantages:

- i. Forecasting cash inflows in investments can be challenging, as factors beyond control, such as economic and political risks, can adversely affect the business and its cash flows.
- ii. Caution should be exercised when using NPV analysis with projects of unequal lives (different durations).
- iii. NPV does not consider other constraints or factors that could potentially impact the project negatively, which may limit its overall effectiveness in certain situations.

Formula for NPV;

$$PV = \sum_{t=1}^t \frac{c_t}{(1+r)^t} - c_0$$

#### Where:

$c_t$  = Net Cash Inflow During the Period  $t$

$r$  = Discount Rate

$t$  = Number of Time Period

$c_0$  = Total Initial Investment Cost

#### Decision Rule

The NPV rule states that if the NPV of a project is greater than 0 (positive NPV), then the project can be accepted. However, if the NPV is less than 0 (negative NPV), the project should be rejected.

**Illustration 9**

Mrs. Shangi, an entrepreneur, sells orange fruit juice. She has forecasted the quantity of liters to be sold as follows: ₦2,400, ₦2,640, ₦2,904, ₦3,194.4, and ₦3,523.84, respectively. The business aims to sell a minimum of 800 liters of fruit juice over a five-year period. The initial cost of the project is ₦8,000,000.00 The cash flows of the project will increase by approximately 10% each year to match the increasing demand. A discount rate of 10% is applied. The NPV analysis, as shown below, will determine the profitability of the project.

**Solution**

**Table 10 Cash Flow Table**

Year	Quantity (Liters)	Unit cost (₦)	Cash flow(₦)	
1.			2,400	800
	1,920,000			
2.			2,640	800
	2,112,000			
3.			2,904	800
	2,323,200			
4.			3,194.4	800
	2,555,520			
5.			3,513.84	800
	2,811,072			

**Table 11 NPV Analysis using Table**

Year	CF(N)	DF (10%)	CIF (N)
<b>0</b>	<b>8,000,000</b>	<b>1</b>	<b>8,00,000</b>
1	1,920,000	0.9091	1,745,472
2	2,112,000	0.8264	1,745,357
3	2,323,200	0.7513	1,745,420
4	2,555,520	0.6830	1,745,420
5	2,811,072	0.6209	1,745,395
<b>Total</b>			<b>8,727,064</b>

**NPV = SUM of CIF – COST**

**NPV = ₦8,727,064– ₦8,000,000**

**NPV = ₦727,064**

**Criteria for Acceptance and Rejection**

The evaluation criteria or rule for any given project states that **NPV > 0** when we **Accept** the project but if otherwise you **Reject** the project.

**Second Method on NPV Analysis**

$$NPV = \sum_{t=1}^t \frac{c_t}{(1+r)^t} - c_0$$

Where:

$c_t$  = Net Cash Inflow During the Period  $t$

$r$  = Discount Rate

$t$  = Number of Time Period

$c_0$  = Total Initial Investment Cost

**Solution to Same Illustration 10 Applying NPV Formula Above**

**Step 1**

$c_t$  = Net Cash Inflow During the Period  $t$

10% = Discount Rate

$t$  (1-5) = Number of Time Period

8,000,000 = Total Initial Investment Cost

**Step 2**

Insert the figures in the formula above

$$NPV = \frac{1,920,000}{(1+0.1)^1} + \frac{2,112,000}{(1+0.1)^2} + \frac{2,323,200}{(1+0.1)^3} + \frac{2,555,520}{(1+0.1)^4} + \frac{2,811,072}{(1+0.1)^5} - 8,000,000$$

**Step 3** (Apply BODMAS)

$$NPV = \frac{1,920,000}{(1.1)^1} + \frac{2,112,000}{(1.1)^2} + \frac{2,323,200}{(1.1)^3} + \frac{2,555,520}{(1.1)^4} + \frac{2,811,072}{(1.1)^5} - 8,000,000$$

**Step 3** (Use either a calculator or look for the present value table to find the interest rate  $(1+r)^n$  at each point interval).

$$NPV = \frac{¥1,920,000}{(1.1)^1} + \frac{¥2,112,000}{(1.1)^2} + \frac{¥2,323,200}{(1.1)^3} + \frac{¥2,555,520}{(1.1)^4} + \frac{¥2,811,072}{(1.1)^5} - ¥8,000,000$$

**Step 3.1** (let's use the calculator to calculate this before using the present value table)

$$NPV = \frac{1,920,000}{1.1} + \frac{2,112,000}{1.21} + \frac{2,323,200}{1.331} + \frac{2,555,520}{1.4641} + \frac{2,811,072}{1.61051} - ¥8,000,000$$

**Step 4** (Divide the value above still following the BODMAS rule).

$$NPV = ¥1,745,454.5 + ¥1,745,454.5 + ¥1,745,454.5 + ¥1,745,454.5 + ¥1,745,454.5 - ¥8,000,000$$

**Step 5**

$$NPV = ¥8,727,272.5 - ¥8,000,000 = ¥727,272.4$$

$$NPV = ¥727,272.4$$

Following the decision criterion earlier stated, we therefore accept the project since the NPV is greater than 1.



**Interpretation**

From the above calculations, the NPV is positive which signifies that the project will be profitable over the five-year period. It is believed that the project will produce a profit of at least ₦727,272.4 over the five period. In this scenario we accept the project because the present value is positive and as such it will add value to owner/shareholders.

## MODULE 01 UNIT 06 Internal Rate of Return

### 2C Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) is a financial metric also known as the yield of investment or time-adjusted rate of return. It considers the time value of money and is relatively easy to comprehend. Similar to NPV, the IRR method considers the cash flows over time.

The decision rule for IRR is as follows: If the IRR (r) is greater than the opportunity cost of capital (K), then the project should be accepted. Conversely, if the IRR (r) is less than the opportunity cost of capital (K), the project should be rejected.

The IRR method evaluates the profitability of an investment by considering the time-adjusted rate of return. The decision rule compares the IRR to the opportunity cost of capital to determine whether the project is acceptable or not.

#### First Method

This method basically dwells on initial capital and the future proceed from the initial capital.

#### Illustration 11 (scenario of one-year period)

Mr. Zoel deposits 23,000 and will be getting back 32,400 after one-year period, you are required to compute the rate of return on the investment:

#### Solution:

$$\text{Rate of Return: (IRR)} = \frac{\text{Future Benefit} - \text{Principal}}{\text{Principal}}$$

$$\text{Rate of Return: (IRR)} = \frac{32,400 - 23,000}{23,000}$$

$$\text{Rate of Return: (IRR)} = \frac{9,400}{23,000} = 0.4087$$

$$\text{Rate of Return: (IRR)} = 0.4087 \times 100 = 40.8696$$

$$\text{Rate of Return: (IRR)} = 41\%$$

**To cross check the result** we can use the exact rate (IRR= 0.4087) gotten to multiply the initial capital and then adding the initial capital back, we should be getting back the future proceed which is 32,400.

➤ **Initial Capital:**  $\text{IRR (0.4087)} \times \text{Principal (23,000)} = 9,400.1$

➤ **Initial Capital:**  $9,400.1 + 23,000 = 32,400.1$

➤ **32,400.** It can be seen to be same as the proceed gotten from investment

The rate at which the net present value of investment is equal to zero (0), the rate at which he presents value of cash flow equals present value of cash outflow. The word internal rate is used because it depends solely on profits connected with the investment and not on any other rate determined outside the investment.

**Second Method**

This method is a Trial and Error method for calculating the Internal Rate of Return (IRR). In this method, two different rates are tested to determine the rate at which the present value of cash inflows equals the initial investment or has a net present value (NPV) of zero.

The process involves calculating the NPV of cash inflows using one rate (initially assumed) and comparing it to the initial investment. If the NPV is positive, a higher rate is tried, while if the NPV is negative, a lower rate is attempted. The goal is to find the rate at which the NPV becomes zero, indicating that the cash inflows are exactly equal to the initial investment.

Once the rates resulting in positive and negative NPVs are identified, they are substituted into the formula to determine the exact IRR. The IRR is the rate at which the cash flows yield a zero NPV.

To summarize, the Trial and Error method for calculating IRR involves iteratively testing different rates until the NPV becomes zero, enabling determination of the rate of return on the investment.

**Applying the Formula Directly.**

**Rate of return: (IRR) =** 
$$W1 + \frac{NPV1}{NPV1 + NPV2} (R2 - R1)$$

**Key**

- R1=                    Rate at which NPV is positive
- R2=                    Rate at which NPV is Negative
- NPV1=                Positive Value of NPV
- NPV2=                Negative Value of NPV

**Illustration 12 (Two year and above period)**

A-Z project has an initial cost of ₦16,000 and is expected to generate cash inflows of ₦8,000, ₦7,000, and ₦6,000 at the end of each year for the next three years. We want to determine the Internal Rate of Return (IRR) of the project, assuming a discount rate of 20%.

**Solution**

1. Determine the net present value of the two closest rates of return, which one must be positive and the second negative.
2. Find the absolute sum of the net present value obtained above
3. Calculate the ratio of the net present value of the smaller discount rate, identified in step 1 above with that of the total sum obtained in step two
4. Add the value obtained with the answer in step 3 with the smallest discount rate.

**Solution**

Using a 20% discount rate, we can calculate the present value of the cash inflows as follows:

Year 1:

$$PV1 = \text{₦}8,000 / (1 + 0.20)^1 = \text{₦}8,000 / 1.20 = \text{₦}6,666.67$$

Year 2:

$$PV2 = \text{₦}7,000 / (1 + 0.20)^2 = \text{₦}7,000 / 1.44 = \text{₦}4,861.11$$

Year 3:

$$PV3 = \text{₦}6,000 / (1 + 0.20)^3 = \text{₦}6,000 / 1.728 = \text{₦}3,472.22$$

Now, we can calculate the NPV by subtracting the initial cost from the sum of the present values:

$$NPV = PV1 + PV2 + PV3 - \text{Initial Cost}$$

$$NPV = \text{₦}6,666.67 + \text{₦}4,861.11 + \text{₦}3,472.22 - \text{₦}16,000$$

$$NPV = \text{₦}-1,000$$

The calculated NPV at a 20% discount rate is -₦1,000.

**Step 1,**

**Table 12.1. IRR Excel Output Assumption 1**

let's start with 20%

**Excel IRR Assumption 1**

S/N	Cash Flow	(1+r) <sup>-1</sup>	PV
0	-16,000.00	1	-16000
1	8,000.00	0.833333	6,666.67
2	7,000.00	0.694444	4,861.11
3	6,000.00	0.5787	3,472.22
			-1,000.00
Rate	20%		

Source: Authors Compilation

Using a 16% discount rate, we can calculate the present value of the cash inflows as follows:

Year 1:

$$PV1 = \text{₦}8,000 / (1 + 0.16)^1 = \text{₦}8,000 / 1.16 = \text{₦}6,896.55$$

Year 2:

$$PV2 = \text{₦}7,000 / (1 + 0.16)^2 = \text{₦}7,000 / 1.3456 = \text{₦}5,202.14$$

Year 3:

$$PV3 = \text{₦}6,000 / (1 + 0.16)^3 = \text{₦}6,000 / 1.5609 = \text{₦}3,843.94$$

Now, we can calculate the NPV by subtracting the initial cost from the sum of the present values:

$$NPV = PV1 + PV2 + PV3 - \text{Initial Cost}$$

$$NPV = \text{₦}6,896.55 + \text{₦}5,202.14 + \text{₦}3,843.94 - \text{₦}16,000$$

$$NPV = \text{₦}-57.36$$

The calculated NPV at a 16% discount rate is ₦-57.36.

**Table 12.2. IRR Excel Output Assumption 2**

S/N	Cash Flow	(1+r) <sup>-1</sup>	PV
0	-16,000.00	1	-16000
1	8,000.00	0.862069	6,896.55
2	7,000.00	0.743163	5,202.14
3	6,000.00	0.640658	3,843.95
			-57.36
<b>Rate</b>	<b>16%</b>		

Source: Authors Compilation

To determine the Net Present Value (NPV) of the A-Z project at a 15% discount rate, we can calculate the present value of the cash inflows and subtract the initial cost.

**Solution:**

Using a 15% discount rate, we can calculate the present value of the cash inflows as follows:

**Year 1:**

$$PV1 = \text{₦}8,000 / (1 + 0.15)^1 = \text{₦}8,000 / 1.15 = \text{₦}6,956.52$$

**Year 2:**

$$PV2 = \text{₦}7,000 / (1 + 0.15)^2 = \text{₦}7,000 / 1.3225 = \text{₦}5,293.00$$

**Year 3:**

$$PV3 = \text{₦}6,000 / (1 + 0.15)^3 = \text{₦}6,000 / 1.520875 = \text{₦}3,945.09$$

Now, we can calculate the NPV by subtracting the initial cost from the sum of the present values:

$$NPV = PV1 + PV2 + PV3 - \text{Initial Cost}$$

$$NPV = \text{₦}6,956.52 + \text{₦}5,293.00 + \text{₦}3,945.09 - \text{₦}16,000$$

$$NPV = \text{₦}194.62$$

The calculated NPV at a 15% discount rate is ₦194.62.

**Table 12.1. IRR Excel Output Assumption 3**

S/N	Cash Flow	(1+r) <sup>-1</sup>	PV
0	-16,000.00	1	-16000
1	8,000.00	0.869565	6956.522
2	7,000.00	0.756144	5293.006
3	6,000.00	0.657516	3945.097
<b>Rate</b>	<b>15%</b>		<b>194.62</b>

Source: Authors Compilation

**Table 13. IRR Compilation**

**Step 2**

<b>STEP 1</b>	<b>NPV</b>	<b>15%</b>	<b>194.6248</b>
	<b>NPV</b>	<b>16%</b>	<b>-57.36</b>
<b>STEP 2</b>		<b>SUM NPV</b>	<b>251.9867</b>
<b>STEP 3</b>		<b>RATIO</b>	<b>0.772361</b>
<b>STEP 4</b>	<b>IRR</b>	<b>Percent</b>	<b>15.77</b>

**Source:** Authors Compilation

**Solution**

Using manual method and applying the second negative value to see if we can still arrive at the same rate. In the manual calculation you provided, the IRR is approximated using the formula:

$$IRR = R1 + (NPV1 / (NPV1 + NPV2)) * (R2 - R1)$$

**Where:**

R1 is the initial discount rate (15%)

R2 is the subsequent discount rate (20%)

NPV1 is the net present value at the initial discount rate

NPV2 is the net present value at the subsequent discount rate

**Based on the calculations:**

NPV1 is 194.62

NPV2 is -1000

Using these values, we can calculate the IRR:

$$IRR = 0.15 + (194.62 / (194.62 - 1000)) * (20 - 15)$$

$$IRR = (194.62 / 1194.62) * 0.05 \approx 0.1625 * 0.05 \approx 0.008125$$

Add the result to 15:

$$IRR = 0.15 + 0.008125 = 0.158125$$

Therefore, the solution to the equation  $IRR = 0.15 + (194.62 / 1194.62) * 0.05$  is approximately 0.158125. Therefore, the IRR for the project, based on the provided calculations, is approximately 15.81%. This means that the project is expected to generate a return of around 15.81% per year, which is higher than the discount rate of 15% used initially.

**Table 14 IRR Formula Compilation Table Using Excel**

			<b>R1+NPV1/NPV1+NPV2 (R2-R1)</b>		
	<b>Manual Calculation</b>				
				<b>(R2-R1)</b>	
<b>IRR</b>	<b>R1</b>	15%		<b>5</b>	
	<b>R2</b>	20%	NPV1+NPV2		NPV1/NPV1+NPV2
	<b>NPV1</b>	194.62	<b>1194.62</b>		<b>0.162917097</b>
	<b>NPV2</b>	-1000			
			<b>NPV1/NPV1+NPV2 (R2-R1)</b>		
			<b>0.814585483</b>		
			<b>R1+NPV1/NPV1+NPV2 (R2-R1)</b>		
			<b>15.815</b>		

Source: IRR Excel Output 2023

Holding the decision rule constant, we accept the project that the initial cost of capital is below the IRR value (**15.815**) which is *assumption 3*.

### Illustration 13

Early next month, Mr. Miller is planning to execute a project with an initial cost of ₦10,000. The projected cash inflows from the project over a span of four (4) years are as follows: ₦2,800, ₦3,000, ₦4,000, and ₦4,000, respectively. The project is subject to a 13% interest rate.

To determine the Net Present Value (NPV), Profitability Index (PI), and Internal Rate of Return (IRR) of the project, we can perform the following calculations:

#### Solution

**Step 1: Calculate the present value of each cash inflow using the formula:**

$$PV = CF / (1 + r)^n$$

**Where:**

PV is the present value

CF is the cash inflow

r is the interest rate

n is the time period.

Using a 13% interest rate, we can calculate the present values as follows:

Year 1:

$$PV1 = ₦2,800 / (1 + 0.13)^1 = ₦2,800 / 1.13 = ₦2,477.88$$

Year 2:

$$PV2 = ₦3,000 / (1 + 0.13)^2 = ₦3,000 / 1.2769 = ₦2,349.44$$

Year 3:

$$PV3 = \text{₦}4,000 / (1 + 0.13)^3 = \text{₦}4,000 / 1.442897 = \text{₦}2,772.20$$

Year 4:

$$PV4 = \text{₦}4,000 / (1 + 0.13)^4 = \text{₦}4,000 / 1.630474 = \text{₦}2,453.27$$

**Step 2: Calculate the NPV by subtracting the initial cost from the sum of the present values:**

$$NPV = PV1 + PV2 + PV3 + PV4 - \text{Initial Cost}$$

$$NPV = \text{₦}2,477.88 + \text{₦}2,349.44 + \text{₦}2,772.20 + \text{₦}2,453.27 - \text{₦}10,000$$

$$NPV = \text{₦}10,052.79 - \text{₦}10,000$$

$$NPV = \text{₦}52.79$$

**Profitability Index (PI):**

The PI is calculated by dividing the present value of future cash inflows by the initial cost.

$$PI = (\text{Present Value of Cash Inflows}) / \text{Initial Cost}$$

Calculate the present value of cash inflows using the discount rate, and then divide it by the initial cost to find the PI.

**Step 3: Calculate the Profitability Index (PI) by dividing the present value of cash inflows by the initial cost:**

$$PI = (PV1 + PV2 + PV3 + PV4) / \text{Initial Cost}$$

$$PI = (\text{₦}2,477.88 + \text{₦}2,349.44 + \text{₦}2,772.20 + \text{₦}2,453.27) / \text{₦}10,000$$

$$PI = \text{₦}10,052.79 / \text{₦}10,000$$

$$PI = 1.01$$

The Net Present Value (NPV) of the project is ₦52.79s, indicating a positive value. The Profitability Index (PI) is 1.005, which is greater than 1. This suggests that the project is financially viable or profitable at the given interest rate.



**Table 15. Excel Compilation**

Project A			Interest rate	13%
Year	Cash Flow	Present Value		
0	-10,000	-10000	13.2367%	
1	2,800	2477.876106		
2	3,000	2349.44005		
3	4,000	2772.200649		
4	4,000	2453.274911		
NPV		₦ 52.79		
NPV	Other Function =	₦ 52.79		
IRR	Internal Rate of Return=	13.23672%	NPV	52.79172

**Source:** Authors Compilation from Excel Analysis.

The Solution above was extracted from Excel analysis, it can be seen that the NPV of the project executed by Love after applying **13%** interest rate is given as **₦ 52.79**, this means the project will only have net present value of **₦ 52.79** kobo after four years, meanwhile the internal rate of return is given as **13.2367%**. The value of the rate at which NPV will equal zero will be **13.2367%**. The application of this technique is more accurate for estimation purpose, applying the manual method used in illustration 10 above we will also arrive at the same NPV result. The Profitability Index is given to be 1.01. The IRR Value (13.236) will be explained and confirmed below with the use of different method in explaining this.  $PI = \frac{10,052.79}{10,000} = 1.01$

**Illustration, 14**

Let's apply the formula directly to the earlier solved, example in **illustration 13** above let's ascertain if the answer gotten above is correct.

**Step 1**

Determine the two rates at which NPV will be positive and when NPV will be negative, secondly determine the rate at which the positive NPV will be negative then substitute the values into the formula.

**Solution**

**Table 16. Analysis on NPV and IRR**

		Scenario A		Scenario B	
Interest Rate		0.13		0.15	
Year	Cash Flow ₦	$(1.13)^{-n}$	Present Value ₦	$(1.15)^{-n}$	Present Value ₦
0	-10,000	1	-10000	1	-10000
1	2,800	0.8850	2477.876	0.86957	2434.782609
2	3,000	0.7831	2349.44	0.75614	2268.431002
3	4,000	0.6931	2772.201	0.65752	2630.06493
4	4,000	0.6133	2453.275	0.57175	2287.012982
			₦ 52.79		₦ (379.71)
	<b>NPV</b>		52.79172		₦ -379.71
Internal Rate of Return=			13.24%		13.24%

*Source: Excel Sheet 9 Attached.*

Use the table 16, above to draft out each component in the formula, then substitute it into the equation given above.

**Solution**

**Table 17. IRR Table**

<b>R1+NPV1/NPV1+NPV2 (R2-R1)</b>					
	Manual Calculation				
				(R2-R1)	
<b>IRR</b>	<b>R1</b>	0.13		<b>0.02</b>	
	<b>R2</b>	0.15	NPV1+NPV2		NPV1/NPV1+NPV2
	<b>NPV1</b>	52.79	<b>432.5</b>		<b>0.122061717</b>
	<b>NPV2</b>	-379.71			
			<b>NPV1/NPV1+NPV2 (R2-R1)</b>		
			<b>0.002441234</b>		
			<b>R1+NPV1/NPV1+NPV2 (R2-R1)</b>		
			0.132		
		<b>IRR=</b>			

Source: Excel Sheet 9 Attached.

**Formula:**  $IRR = R_1 + \frac{Npv_1}{Npv_1 + Npv_2} + (R_2 - R_1)$

**IRR=**  $0.13 + \frac{52.79}{52.79 + 379.71} + (0.15 - 0.13)$

**IRR=**  $0.13 + \frac{52.79}{432.5} + (0.02)$

$$\text{IRR} = 0.13 + 0.1220 (0.02)$$

$$\text{IRR} = 0.13 + 0.1220 (0.02)$$

$$\text{IRR} = 0.13 + 0.002441234$$

$$\text{IRR} = 0.13244$$

From the analysis above we can see that the IRR is given to be 0.132% which is 13%, this means only the project that the cost of capital is less than 13% should be accepted but project that has an NPV above 13% should be rejected.

#### **Advantages**

- i. This method is in acceptance with the company's wealth maximization because investors and business analysis will only decide to invest in business that will yield a higher return and interest rate.
- ii. This method basically points out the rate at which an investment will start to make profit and loss.
- iii. The time value of money is accounted for in this method and the hurdle rate (initial capital) is not required.

#### **Disadvantages**

- i. This method ignores project size, and its discovered that the project with short life span will yield more return on invest than those with long life span.
- ii. Future cost is also ignored in this method
- iii. Difficult to calculate.

## MODULE 01 UNIT 07 Profitability Index (PI)

### 2D Profitability Index (PI)

This is a numerical scale used for comparative analysis between two or more projects. The index is used to rank the variability of a project, the higher the PI the better the project, the number attached to the final value of the PI in an ascending order determines how viable the project is and it will also be used in ranking projects.

PI formula is given as: NPV/Initial Cost:

$$PI = \frac{NPV}{\text{Initial Cost}}$$

If the P.I is above (greater than >1 or 0.01) one (1.0, 0.01) then we can accept the project, in the case of comparative analysis, if the project under study is more than one (1) we accept the project that has the highest P.I. sequentially.

#### Illustration 15

Assuming the total summation of the present value of cash flow is given to be ₦8,727,272.5 and the initial cost (capital) is given to be ₦8,000,000 determine the PI of the investment.

$$PI = \frac{8,727,272.5}{8,000,000} = 1.0909$$

The PI for the project above is given to be 2.0, this method is used to rank acceptance of project its more effective when two projects is involved.

#### Illustration 16

A company is considering an investment in a project that cost ₦10,000, the first project has an expected life of 4 years and the estimated earnings within the period of the four years is given as follows, ₦2,800, ₦3,000, ₦4,000 and ₦4,000 respectively, the second project has an initial

capital investment of ₦30,000 with the following cash flow ₦6,000, ₦10,000, ₦12,000 and ₦16,000 respectively, while the third project initial capital is ₦18,000 with the following cash inflow of ₦6,500 from year one to three and in the fourth year the cash inflow is estimated to be ₦7,000, assuming the interest rate is given as 13%. You are required to calculate the **NPV**, **IRR** and **PI** of each of the project then rank the project and advise the company on which of the project is to be considered.

### Solution

**Table 18. NPV, IRR and PI Table.**

		Project A		Project B		Project C	
Year	(1+r)	Cash Flow	Present Value	Cash Flow	Present Value	Cash Flow	Present Value
<b>0</b>	<b>1</b>	<b>-10,000</b>	<b>-10000</b>	<b>-30,000</b>	<b>-30000</b>	<b>-18,000</b>	<b>-18000</b>
<b>1</b>	2,800	2,800	2477.876106	6,000	5309.734513	6,500	5752.212389
<b>2</b>	3,000	3,000	2349.44005	10,000	7831.466834	6,500	5090.453442
<b>3</b>	4,000	4,000	2772.200649	12,000	8316.601947	6,500	4504.826055
<b>4</b>	4,000	4,000	2453.274911	16,000	9813.099643	7,000	4293.231094
<b>NPV</b>			₦ 52.79		₦ 1270.9		₦ 1640.72
<b>IRR</b>			13.24%		14.74%		17.27%
<b>PI</b>			1.01		1.04		1.09

**Source:** *Spread Sheet 5 in the Excel sheet attached.*

From the result in table 18, above there are 3 different projects named project A, B and C, the three projects have different NPV, IRR and PI. It was discovered that project C has the highest NPV having a value of ₦ 1640.72 followed by project B with ₦ 1270.9 and finally, project A with ₦ 52.79. The three projects also have three different profitability index, project C has the highest index with 1.09, followed by project B then project A. From the two analysis it can logically be seen that the IRR should also follow the same pattern, Project C has the highest IRR of 17.27% followed by project B 14.74% while Project A has the lowest IRR.

Highlights:

**Project Acceptance Based on Net Present Value (NPV):** The project that has the highest NPV is project C with ₦1640.72 followed by project B with ₦1270.9 as the value of NPV followed by project A with ₦52.79 value.

**Project Ranking Based on Profitability Index (PI):** In the same direction Project C is ranked first with (P.I value 1.09), followed by project B (P.I value 1.04) then project A (P.I value 1.01). The method used above makes it easy for the **Internal Rate of Return (IRR)** to be calculated instead of applying the formula in calculating the IRR directly.

**Note:** If the exact value of the IRR gotten is replaced as the interest rate value, we will discover that at that point the value of NPV will be equals to Zero.

## MODULE 01 UNIT 08    **General Assessment**

### General Assessment

Succinctly illustrate the benefit of capital budgeting and select any method known to you and practically illustrate the reason behind the selected method by making use of an hypothetical situation.

### GRADING

**Attendance:** 10% will cover for class attendance.

**Mid-term exam:** (20%) will serve as midterm exam while 10% will be for presentation.

**Final Exam:** (60%) will cover final exams.

## MODULE 01 UNIT 09 Assessment and Links

### Assessment 1

Why is capital budgeting important for the survival of a business? Using a business of your choice, illustrate the classification of projects. How has the chosen business employed capital budgeting to drive up their return on investment, with supporting facts?

**Show Me: External links:**

- <https://youtu.be/QRh0tiG2IVk>
- <https://youtu.be/io72W44UB5U>
- [https://youtu.be/TrKVj\\_wLgUc](https://youtu.be/TrKVj_wLgUc)

**Article:**

- [https://www.researchgate.net/profile/Sivanathan\\_Sivaruban/publication/327357766\\_Capital\\_Budgeting\\_and\\_Cost\\_Evaluation\\_Techniques\\_A\\_Conceptual\\_Analysis/links/5b89e3b092851c1e123f993a/Capital-Budgeting-and-Cost-Evaluation-Techniques-A-Conceptual-Analysis.pdf?origin=publication\\_detail](https://www.researchgate.net/profile/Sivanathan_Sivaruban/publication/327357766_Capital_Budgeting_and_Cost_Evaluation_Techniques_A_Conceptual_Analysis/links/5b89e3b092851c1e123f993a/Capital-Budgeting-and-Cost-Evaluation-Techniques-A-Conceptual-Analysis.pdf?origin=publication_detail)

### Assessment 2

Mr. Praise, a business man needs ₦47,000,000 as capital to start up a business, the money at his disposal is not up to the required capital, he has an equity of ₦23,000 from his personal savings to start up the business. You are required to calculate when exactly he will *pay back the interest free loan* borrowed from First Bank to augment the amount that is to be completed if the cash inflow for the period of five years are as follows.

**Show Me: External links:**

- <https://youtu.be/IW2qvXcrx6k>
- <https://youtu.be/kEsZKO87TIU>
- <https://youtu.be/6Bs8pO0MnKY>

### Assessment 3

A project cost ₦ 80,000 and its streams of earnings before depreciation, interest and tax (EBDIT) during the five period ₦ 20,000, ₦ 24,000 ₦28,000, ₦32,000 and ₦40,000 respectively. Assume a 50% tax rate and depreciation is 10% reducing balance method, compute the project's ARR.

**Show Me: External links:**

- [https://youtu.be/9N\\_NiFHLUZY](https://youtu.be/9N_NiFHLUZY)
- <https://youtu.be/ufyzH8Allsc>
- <https://youtu.be/-E5Z1-0NUMk>

### Assessment 4

Use the company/organization of your choice imagine you are into production of goods, write down the cost that is incurred in the production process use a base line to ascertain the total product produced and assuming 398 of the products were sold out what will be the point at which the company will break even assuming the *price and the product sold* varies with 25% increase in 5 different occasions.

**Show Me:** This link will aid better understanding of how it can be done:

- <https://youtu.be/56-iiZEjqnU>
- <https://youtu.be/x0BflbKIIss>
- <https://youtu.be/peE-Q0IMKk4>



### Assessment 5

Using your knowledge of Financial Management, you are to advise the TRIPLE J a management on the viability of their proposed investment in cement that will cost them ₦60,000. = with a life span of 4yrs, if the cost of capital is 15% and the Cash Inflows for the periods are; YR1). ₦10,000.=. YR2). ₦15,000.=. YR3). ₦30,000.=. and YR4). ₦25,000.=. The Management requires that you use the NPV and PI techniques for the evaluation.

**Show Me: External links:**

- <https://youtu.be/zGRVVSC4UUQ>
- [https://youtu.be/vEDEE\\_h2bMc](https://youtu.be/vEDEE_h2bMc)
- <https://youtu.be/1doVwqAUS4Y>

### Assessment 6

Chisom Mining Corporation, has a cash flow pattern. Calculate the internal rate of return (IRR) of the project #15,000 #2,000 #3,000 #4,000 #5,000 #6,000, if the discount factor is 10%.

**Show Me: This External links explains more about IRR:**

- <https://youtu.be/OSDDrZZaV8E>
- <https://youtu.be/7w-UWuDiofY>
- <https://youtu.be/uMehfB5KRAw>

### Assessment 7

Use Assessment 5 to calculate profitability index

**Show Me: External links:**

- <https://youtu.be/O6cBtHRcGnw>
- <https://youtu.be/34B4hjfM2Rc>
- <https://youtu.be/h0OcPTfoGQw>

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