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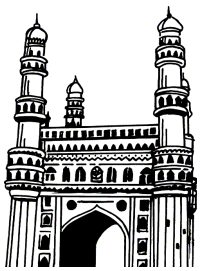

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FINANCIAL ANALYTICS

STUDY MANUAL

SOLVED MODEL PAPERS

SOLVED PREVIOUS QUESTION PAPER

SYLLABUS

UNIT - I

Techniques of Financial Statement : Horizontal, Vertical Analysis, Trend Analysis, Ratio Analysis, Liquidity, Profitability, Solvency and Turnover Ratio, Valuation of Ratios, Statement of Cash Flow, Classification of Cash Flow, Computing Net Cash Flow: Operating, Investing and Financing Activities. Reporting and Interpretation using Spreadsheet.

UNIT - II

(a) **Time Value of Money: Future Value:** Simple, Compound Interest and Annuity, Present Value: Discounted, Annuity, Equated Loan Amortization, Perpetuity using Spreadsheets.

(b) **Risk and Return:** Holding Period Returns, Arithmetic Mean vs Geometric Mean, Risk: Standard Deviation, Coefficient of Variation, Beta, Covariance of Stock.

UNIT - III

Capital Budgeting Techniques: Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Profitability Index, Decision Tree, Cash Flow in Capital Budgeting, Cost of Capital, Advance Capital Budgeting Techniques, Adjusted Present Value Approach, Competing Project Risk using Spreadsheets.

UNIT - IV

Equity Valuation: Calculation of Portfolio Mean and Variance, Capital Asset Pricing Model (CAPM), Variance: Covariance Matrix, Estimating Beta and Security Market Line. Industry Analysis, Economic Analysis and Technical Analysis in Stock, Real Option in Capital Budgeting.

UNIT - V

Bond Valuation: Duration, Duration of Bond with Uneven Payments, Immunization Strategies, Modeling the Term Structure, Calculating Expecting Bond Return in a Single and Multi-period Framework, Semi-annual Transition Matrix, Computation of Bond Beta.

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Important Questions

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2. Discuss about horizontal analysis in financial statement analysis.

Ans :

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3. What is vertical financial statement analysis ? Describe the benefits of financial statement analysis.

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4. What is meant by ratio analysis? Explain the importance and uses of ratio analysis?

Ans :

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5. Discuss about various types of ratio analysis.

Ans :

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6. What is cash flow statement? Explain its advantages/utility and limitations.

Ans :

Refer Unit-I, Page No. 15, Q.No. 17

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7. From the following balance sheet, calculate :

(a) Current ratio

(b) Debt - equity ratio

(c) Fixed assets turnover ratio

(d) Return on capital employed and give your comments

Balance sheet as on 31.12.2014

Liabilities	Amount (`)	Assets	Amount (`)
Equity share capital	12,00,000	Fixed Assets	17,00,000
Reserves and surplus	3,00,000	Stock	3,00,000
9% Debentures	7,00,000	Debtors	2,80,000
Creditors	2,80,000	Marketable securities	2,00,000
Bills Payable	50,000	Cash	50,000
	25,30,000		25,30,000

Profit before interest and tax for the year are ` 50 lakhs and sales are ` 50 lakhs.

Sol :

Refer Unit-I, Page No. 14, Prob. 2

8. Discuss are the norms created by accounting standard - 3 for cash flow statement.

Ans :

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9. What is a three-statement model? Explain steps in building a three statement model.

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Ans :

Refer Unit-II, Page No. 39, Q.No. 1

2. If you deposit ` 5000 today at 12 percent rate of interest in how many years (roughly) will this amount grow to ` 1,60,000 ? Work this problem using the rule of 72.

Sol :

Refer Unit-II, Page No. 47, Prob. 2

3. Explain the difference between future value and present value with an example.

Ans :

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4. What is meant by Equated Loan Amortization? How does it work ? Explain the working mechanism of equated Loan Amortization.

Ans :

Refer Unit-II, Page No. 50, Q.No. 13

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Ans :

Refer Unit-II, Page No. 52, Q.No. 16

6. Define Systematic Risk and Unsystematic Risk?

Ans :

Refer Unit-II, Page No. 55, Q.No. 20

7. Define Holding Period Returns and how are they calculated?

Ans :

Refer Unit-II, Page No. 57, Q.No. 22

8. Explain how to calculate standard deviation in MS Excel?

Ans :

Refer Unit-II, Page No. 59, Q.No. 26

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1. Define capital budgeting. Explain the characteristics of capital budgeting.

Ans :

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2. Discuss the techniques of capital budgeting in detail with advantages and disadvantages of each technique.

Ans :

Refer Unit-III, Page No. 69, Q.No. 2

3. Explain the techniques of capital budgeting with formulas calculated in spreadsheets.

Ans :

Refer Unit-III, Page No. 71, Q.No. 3

4. What is Decision Tree? Explain in detail how to construct a decision tree.

Ans :

Refer Unit-III, Page No. 85, Q.No. 6

5. A firm is contemplating the following projects. Which one is better according to you?

Year	Project A	Project B
0	–1,00,000	–1,00,000
1	25,000	35,000
2	24,000	20,000
3	23,000	24,000
4	20,000	23,000
5	15,000	18,000

Closing NPV, PI and payback period evaluate the projects assuming a 10% discount rate.

Sol :

Refer Unit-III, Page No. 79, Prob. 2

6. What are the relevant cash flows used in the capital budgeting ?

Ans :

Refer Unit-III, Page No. 87, Q.No. 9

7. Explain the purpose of a cash flow statement in capital budgeting,discuss the methods of cash flow statements applied in capital budgeting

Ans :

Refer Unit-III, Page No. 88, Q.No. 10

8. Explain the concept of competing using spreadsheets project risk in detail with an example.

Ans :

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Ans :

Refer Unit-IV, Page No. 109, Q.No. 1

2. Explain how to calculate the mean return of a portfolio.

Ans :

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Ans :

Refer Unit-IV, Page No. 112 , Q.No. 6

4. Discuss the components of capital asset Pricing Model?

Ans :

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5. Explain briefly about Variance and Covariance matrix in CAPM with an example?

Ans :

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Ans :

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Refer Unit-IV, Page No. 130, Q.No. 16

10. What is an economic analysis ? Write about the factor analyzed in economic analysis.

Ans :

Refer Unit-IV, Page No. 136, Q.No. 18

11. Describe the industry life cycle. What are its implications for the investor?

Ans :

Refer Unit-IV, Page No. 137, Q.No. 20

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Ans :

Refer Unit-IV, Page No. 138, Q.No. 22

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Ans :

Refer Unit-V, Page No. 151, Q.No. 1

2. Explain the duration of bond with, Even, uneven payments?

Ans :

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Ans :

Refer Unit-V, Page No. 158, Q.No. 5

4. Immunization is an investment strategy used to minimize the impact of interest rate changes on a bond portfolio Explain ?

Ans :

Refer Unit-V, Page No. 161, Q.No. 7

5. Discuss about various immunization strategies in a spreadsheet?

Ans :

Refer Unit-V, Page No. 162, Q.No. 8

6. Explain the Modeling the term Structure of bonds in MS Excel?

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Ans :

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UNIT I

Techniques of Financial Statement : Horizontal, Vertical Analysis, Trend Analysis, Ratio Analysis, Liquidity, Profitability, Solvency and Turnover Ratio, Valuation of Ratios, Statement of Cash Flow, Classification of Cash Flow, Computing Net Cash Flow: Operating, Investing and Financing Activities. Reporting and Interpretation using Spreadsheet.

1.1 Techniques of Financial Statement

Q1. What is financial statement analysis? What are the steps involved in financial statement analysis ?

Ans :

Definition

(i) According to Myers, is largely a study of relationship among the various financial factors in a business as disclosed by a single set of statements and a study of the trends of these factors as shown in a series of statements.

The financial statements provide a rich information about the operational results of a business unit and much can be learn from a careful examination of these statements. A forecast of future earnings of a business can also be prepared based on the analysis and interpretation of financial statements.

Steps :

There are three steps involved in the financial statement analysis and they are,

1. Selection

2. Classification

3. Interpretation

1. Selection

The first step involved refers to the selection of information relevant to the purpose of evaluation from the total information contained in the financial statements.

2. Classification

The second step involved is the classification or grouping of information in such a manner to focus on the significant relationship.

3. Interpretation

The final step is the interpretation which includes drawing of interferences and conclusions. The analysis and interpretation are closely interlinked since interpretation is impossible without a proper analysis and any analysis which is not followed by interpretation becomes a meaningless exercise. Thus, interpretation precedes a proper analysis.

Q2. Discuss the techniques of financial statement analysis.

Ans :

The following are the commonly used techniques of Financial Statement analysis :

Financial statement analysis involves using various techniques to assess a company's financial performance and position.

1. Horizontal Analysis

It is also known as trend analysis, this technique compares financial data over different periods to identify trends and changes in performance.

2. Vertical Analysis

Also known as common-size analysis, this technique compares each line item on a financial statement to a base item to evaluate the relative proportion of each component.

3. Ratio Analysis

This involves calculating and interpreting various ratios that provide insights into different aspects of a company's financial performance, such as liquidity, profitability, efficiency, and solvency.

4. Common Size Statements

This technique involves converting each line item in the financial statements to a percentage of a base item, typically total assets for the balance sheet and total revenue for the income statement.

5. DuPont Analysis

This technique breaks down the return on equity (ROE) into three components: profitability, efficiency, and leverage, to provide a more detailed analysis of a company's financial performance.

6. Cash Flow Analysis

This involves analyzing a company's cash flow statement to assess its ability to generate cash from its operations, investments, and financing activities.

7. Comparative Analysis

This technique involves comparing a company's financial performance and position with that of its competitors or industry benchmarks to identify strengths, weaknesses, and areas for improvement.

8. Benchmarking

This involves comparing a company's financial ratios and performance metrics with those of industry peers or best-in-class companies to identify areas where the company can improve.

9. Regression Analysis

This statistical technique can be used to identify relationships between different financial variables and to predict future financial performance based on historical data.

10. Qualitative Analysis

This involves considering non-financial factors, such as management quality, market conditions, and industry trends, to supplement the quantitative analysis of financial statements.

These techniques can be used individually or in combination to gain a comprehensive understanding of a company's financial health and performance.

Q3. On what basis the financial Statements are classified.

Ans :

Listed techniques can be classified on the following basis:

A. On the basis of Comparison

1. Inter-firm Comparison

(a) Comparative Statement (Balance Sheet, Profit and Loss Account)

(b) Common size Statement (of the same period)

(c) Ratio of two or more Competitive Firms (of the same period)

(d) Cash Flow Statement of two or more Competitive firms

(e) Polygon, Bar Diagram

2. Intra-firm Comparison

(a) Comparative Statement (Balance Sheet, Profit and Loss Account)

(b) Common size Statement (of the same period)

(c) Ratio of two or more Competitive Firms (of the same period)

(d) Cash Flow Statement of two or more Competitive firms

(e) Polygon, Bar Diagram

3. Horizontal Comparison

4. Vertical Comparison

B. On the basis of Time

1. Inter-period Comparison

(a) Comparative statement (two or more periods)

(b) Cash Flow statement (two or more period) etc.

2. Cross Sectional (Intra-period) Comparison

(a) Common size statement

(b) Ratio Analysis

C. Horizontal Analysis

1. Time series

2. Bar Diagram
3. Polygon
4. Comparative statement
5. Ratio Analysis

D. Vertical Analysis

1. Common size statement
2. Pie Diagram

1.2 HORIZONTAL ANALYSIS

Q4. Discuss about horizontal analysis in financial statement analysis.

Ans : **(Imp.)**

Meaning

Horizontal analysis is an approach used to analyze financial statements by comparing specific financial information for a certain accounting period with information from other periods. Analysts use such an approach to analyze historical trends.

Trends or changes are measured by comparing the current year's values against those of the base year. The goal is to determine any increase or decline in specific values. A percentage or an absolute comparison may be used in horizontal analysis.

Horizontal analysis can also be compared with vertical analysis. Whereas vertical analysis analyzes a particular financial statement using only one base financial statement of the reporting period, horizontal analysis compares a specific financial statement with other periods or the cross-sectional analysis of a company against another company.

Formula

To calculate the percentage change, first select the base year and comparison year. Subsequently, calculate the dollar change by subtracting the value in the base year from that in the comparison year and divide by the base year. The result is then multiplied by 100.

$$\text{Horizontal Analysis (\%)} = \frac{\text{Amount in Comparison Year-Amount in Base Year}}{\text{Amount in Base Year}}$$

Horizontal Analysis (Dollar) = Amount in Comparison Year – Amount in Base Year

Q5. Explain the draw backs of Horizontal Statement analysis.

Ans :

Horizontal statement analysis, which involves comparing financial data over different periods, has several drawbacks:

1. Limited to Historical Data

It relies solely on historical data and does not take into account external factors or future projections, limiting its predictive ability.

2. Missing Context

It can be challenging to understand the reasons behind changes in financial numbers without additional context or explanations from management.

3. Comparability Issues

Comparing data over time can be misleading if there have been significant changes in the business, such as acquisitions, divestitures, or changes in accounting policies.

4. Time-consuming

Analyzing multiple periods of financial statements can be time-consuming, especially for large companies with complex financial.

5. Doesn't Capture Industry Trends

It may not reflect industry trends or benchmarks, making it difficult to assess a company's performance relative to its peers.

6. Limited to Financial Metrics

It focuses primarily on financial metrics and may not capture non-financial factors that can impact a company's performance, such as changes in market dynamics or regulatory environment.

7. Subject to Manipulation

Financial statements can be manipulated or misinterpreted, leading to inaccurate conclusions about a company's financial health.

While, Horizontal statement analysis can provide valuable insights into a company's performance over time, it should be used in conjunction with other analytical tools and considerations to gain a comprehensive understanding of a company's financial health.

1.3 VERTICAL ANALYSIS

Q6. What is vertical financial statement analysis ? Describe the benefits of financial statement analysis.

Ans : **(Imp.)**

Meaning

Vertical financial statement analysis, also known as common-size financial statement analysis, involves expressing each line item of a financial statement as a percentage of a base item. This base item is typically total revenue for the income statement and total assets for the balance sheet. Vertical analysis helps in understanding the relative proportions of different items within a single period.

Benefits

Here are some benefits of the vertical financial statement analysis :

1. Comparability

It allows for easy comparison of different companies, as the analysis is based on percentages rather than absolute values.

2. Trend Analysis

It helps in identifying trends within a company's financial performance over time, especially in terms of changes in the relative proportions of different line items.

3. Identifying Financial Ratios

Vertical analysis provides the data needed to calculate key financial ratios, such as gross profit margin, net profit margin, and return on assets, which can provide deeper insights into a company's financial health.

4. Identifying Areas of Strength and Weakness

By comparing the proportions of different line items to industry averages or benchmarks, vertical analysis can help identify areas where a company is performing well or needs improvement.

Q7. Explain the disadvantages of vertical financial statement analysis.

Ans :

Here are some disadvantages of vertical financial statement analysis:

Disadvantages

1. Lack of Context

Like horizontal analysis, vertical analysis lacks context and does not take into account external factors or non-financial aspects of a company's performance.

2. Limited to Single Period

It provides insights into a company's financial position for a single period and does not consider trends or changes over time.

3. Manipulation

Similar to horizontal analysis, vertical analysis can be manipulated if line items are misclassified or if accounting policies are changed.

4. Varied Base Item

Different analysts may use different base items for their analysis, which can lead to inconsistent comparisons.

Despite these drawbacks, vertical financial statement analysis is a useful tool for gaining insights into a company's financial structure and performance, especially when used in conjunction with other analytical tools and considerations.

Q8. Compare and contrast Horizontal analysis and Vertical analysis.

Ans :

S.No.	Nature	Horizontal Analysis	Vertical Analysis
1.	Need	Comparative Financial statement is needed to prepare horizontal analysis	Financial statements of one accounting period are needed to prepare vertical analysis
2.	Items	It includes same items of different periods.	It includes different items of same period.
3.	Calculation	In this analysis, both absolute and percentage changes are computed.	In this analysis, only percentage change is computed.
4.	Application	It is applicable to time series analysis.	It is applicable to cross-section analysis.

1.4 TREND ANALYSIS

Q9. Define trend analysis. Explain the importance, advantages and disadvantages of trend analysis.

Ans :

Meaning

Trend Analysis in financial statement analysis involves evaluating data over time to identify any consistent patterns or trends. It helps analysts and investors understand how a company's financial performance is changing and allows for better forecasting and decision-making.

Importance

1. Identifying Patterns

Trend analysis helps in identifying patterns or trends in a company's financial performance, such as consistent growth or decline in revenues or profitability.

2. Forecasting

It can be used to forecast future performance based on historical trends, providing valuable insights for investors and management.

3. Comparative Analysis

Trend analysis allows for comparative analysis with industry averages or competitors, helping to assess a company's performance relative to its peers.

4. Detecting Financial Irregularities

It can help in detecting financial irregularities or anomalies that may require further investigation.

Advantages

1. Better Decision-Making

Trend analysis provides a clearer picture of a company's financial health, enabling better decision-making by management and investors.

2. Long-Term Planning

It helps in long-term planning by identifying areas of strength and weakness that may impact future performance.

3. Performance Evaluation

Trend analysis allows for the evaluation of past performance against established goals or benchmarks, helping in performance assessment.

Disadvantages

1. Limited Predictive Power

While trend analysis can provide insights into past performance, it may not always accurately predict future performance, as external factors can impact a company's financial.

2. Data Quality

The accuracy of trend analysis depends on the quality of the underlying data. Inaccurate or incomplete data can lead to misleading conclusions.

3. Influence of Outliner

Extreme values or outliner in the data can skew trend analysis results, leading to inaccurate interpretations.

Q10. Explain the Trend Analysis in financial statement analysis using a suitable formula?

Ans :

Trend analysis in financial statement analysis involves evaluating data over time to identify any consistent patterns or trends. It helps analysts and investors understand how a company's financial performance is changing and allows for better forecasting and decision-making.

Formula: The formula for calculating the trend percentage is:

$$\text{Trend Percentage} = \frac{(\text{Current Year Amount} - \text{Base Year Amount})}{\text{Base Year Amount}} \times 100$$

1.5 RATIO ANALYSIS

Q11. What is meant by ratio analysis? Explain the importance and uses of ratio analysis?

Ans : **(Imp.)**

Meaning

Ratio analysis is a quantitative method of gaining insight into a company's liquidity, operational efficiency, and profitability by studying its financial statements such as the balance sheet and income statement.

Importance

(i) Investors and analysts employ ratio analysis to evaluate the financial health of companies by scrutinizing past and current financial statements.

(ii) Comparative data can demonstrate how a company is performing over time and can be used to estimate likely future performance.

(iii) This data can also compare a company's financial standing with industry averages while measuring how a company stacks up against others within the same sector.

(iv) Investors can use ratio analysis easily, and every figure needed to calculate the ratios is found on a company's financial statements. Ratios are comparison points for companies.

(v) They evaluate stocks within an industry. Likewise, they measure a company today against its historical numbers.

(vi) it is also important to understand the variables driving ratios as management has the flexibility to, at times, alter its strategy to make it's stock and company ratios more attractive.

Generally, ratios are typically not used in isolation but rather in combination with other ratios.

Uses of Ratio Analysis

Ratio analysis serves several important purposes in financial analysis:

1. Performance Evaluation

Ratios help assess a company's financial performance over time by comparing key financial metrics across different periods.

2. Comparative Analysis

Ratios allow for comparison with industry averages, competitors, or benchmarks, providing insights into a company's relative performance.

3. Financial Health Assessment

Ratios provide a snapshot of a company's financial health, indicating its ability to meet short-term and long-term obligations, manage its assets efficiently, and generate profits.

4. Identifying Trends

Ratios help identify trends in a company's financial performance, highlighting areas of improvement or concern and assisting in forecasting future performance.

5. Strengths and Weaknesses Identification

Ratios help identify a company's strengths and weaknesses in terms of liquidity, profitability, efficiency, and solvency, providing valuable insights for strategic planning and decision-making.

6. Forecasting

Ratios can be used to forecast future financial performance based on historical trends and industry benchmarks, aiding in budgeting and financial planning.

7. Investment Analysis

Ratios are commonly used by investors to evaluate investment opportunities, assess the financial health and growth potential of companies, and make informed investment decisions.

8. Credit Analysis

Lenders and creditors use ratios to assess the creditworthiness of companies, evaluate their ability to repay debts, and determine lending terms and conditions.

9. Management Tool

Ratios serve as management tools for monitoring financial performance, setting performance targets, and identifying areas for operational improvement.

Ratio Analysis is a versatile tool that provides valuable insights into a company's financial condition, performance, and prospects, making it essential for financial analysis and decision-making across various stakeholders.

Q12. Discuss about various types of ratio analysis.

Ans : **(Imp.)**

The various kinds of financial ratios available may be broadly grouped into the following six silos, based on the sets of data they provide:

1. Liquidity Ratios

Liquidity ratios measure a company's ability to pay off its short-term debts as they become due, using the company's current or quick assets. Liquidity ratios include the current ratio, quick ratio, and working capital ratio.

2. Solvency Ratios

It is a called financial leverage ratios, solvency ratios compare a company's debt levels with its assets, equity, and earnings, to evaluate the likelihood of a company staying afloat over the long haul, by paying off its long-term debt as well as the interest on its debt. Examples of solvency ratios include: debt-equity ratios, debt-assets ratios, and interest coverage ratios.

3. Profitability Ratios

These ratios convey how well a company can generate profits from its operations. Profit margin, return on assets, return on equity, return on capital employed, and gross margin ratios are all examples of profitability ratios.

4. Efficiency Ratios

It is also called activity ratios, efficiency ratios evaluate how efficiently a company uses its assets and liabilities to generate sales and maximize profits. Key efficiency ratios include: turnover ratio, inventory turnover, and days' sales in inventory.

5. Coverage Ratios

Coverage ratios measure a company's ability to make the interest payments and other obligations associated with its debts. Examples include the times interest earned ratio and the debt-service coverage ratio.

6. Market Prospect Ratios

These are the most commonly used ratios in fundamental analysis. They include dividend yield, P/E ratio, earnings per share (EPS), and dividend payout ratio. Investors use these metrics to predict earnings and future performance.

For example, if the average P/E ratio of all companies in the S&P 500 index is 20, and the majority of companies have P/Es between 15 and 25, a stock with a P/E ratio of seven would be considered undervalued. In contrast, one with a P/E ratio of 50 would be considered overvalued. The former may trend upwards in the future, while the latter may trend downwards until each aligns with its intrinsic value.

Q13. Discuss the different users of ratio analysis.

Ans :

Ratio analysis plays a significant role in ascertaining the financial performance of a concern. The following are the various users of ratio analysis.

1. Management

Ratio analysis helps a management to reap many managerial uses from it. They are,

(i) Ratio analysis helps a management assess the financial position of the firm and making necessary decisions from the information available in the financial statement.

(ii) It facilitates in financial forecasting and financial planning.

(iii) It helps in communicating the financial strength and weakness of a firm in a more easy and understandable form.

(iv) It helps in the coordination of activities which is the most important functions of business management.

(v) It facilitates in effective control of the business by revealing the loop holes in it.

(vi) Ratio analysis also serves many other purposes to the management by becoming an essential part in budgetary control and standard costing.

2. Investors/Shareholders

Ratio analysis helps an investors or a shareholder to assess the financial position of the concern in which he is going to invest. It warns him in making up his mind whether the present financial position of the concern warrants him for further investment or not.

3. Creditors/Suppliers

Ratio analysis helps the creditors or suppliers who extend short-term credit to the concern, to know whether the financial position of the concern warrants their payment at a specified time or not.

4. Employees

Ratio analysis also helps the employees who are interested in knowing the financial position of the concern. Various profitability ratios facilitate them to know for the increase of their wages and other benefits.

Q14. Describe the advantages of ratio analysis.

Ans :

Ratio analysis is crucial in financial analysis for several reasons:

1. Performance Evaluation

Ratios help assess a company's financial performance over time, highlighting trends and areas of improvement or concern.

2. Comparative Analysis

Ratios allow for comparison with industry averages, competitors, or historical data, providing insights into a company's relative performance.

3. Financial Health

Ratios provide a snapshot of a company's financial health, indicating its ability to meet short-term and long-term obligations.

4. Identifying Strengths and Weaknesses

Ratios help identify a company's strengths and weaknesses in terms of liquidity, profitability, efficiency, and solvency.

5. Forecasting

Ratios can be used to forecast future financial performance based on historical trends and industry benchmarks.

6. Decision-Making

Ratios assist in decision-making by providing quantitative data that can support strategic and operational decisions.

7. Communication

Ratios simplify complex financial information into meaningful metrics that can be easily communicated to stakeholders.

Ratio analysis is essential for understanding a company's financial position, performance, and prospects, making it a fundamental tool in financial analysis and decision-making.

Q15. Discuss the Limitations of Ratio Analysis?

Ans :

Ratio analysis, while a valuable tool in financial analysis, has several limitations:

1. Dependence on Historical Data

Ratio analysis relies on historical financial data, which may not reflect current or future market conditions, industry trends, or changes in the company's operating environment.

2. Limited Comparability

Ratios may not be directly comparable across companies or industries due to differences in accounting methods, business models, and industry norms.

3. Manipulation

Financial ratios can be manipulated through creative accounting practices, such as income smoothing or off-balance-sheet financing, leading to inaccurate interpretations of a company's financial health.

4. Lack of Context

Ratios provide quantitative metrics but do not always capture qualitative factors that may impact a company's performance, such as management quality, brand reputation, or market position.

5. Varied Definitions

Different analysts or companies may use different definitions or calculations for the same ratios, leading to inconsistencies and confusion in interpretation.

6. Limited Scope

Ratio analysis focuses primarily on financial metrics and may not capture non-financial factors that are equally important for assessing a company's overall performance, such as innovation, customer satisfaction, or employee engagement.

7. Inflation Effects

Inflation can distort financial ratios, particularly those involving historical cost accounting methods, leading to inaccurate assessments of a company's financial position and performance.

8. Seasonality and Cyclical Trends

Ratios may be influenced by seasonal or cyclical factors that can distort short-term performance metrics, making it challenging to assess long-term trends accurately.

9. Risk of Over generalization

Relying solely on ratios for financial analysis can lead to oversimplification and overlook unique aspects of a company's business model, industry dynamics, or strategic direction.

While ratio analysis is a valuable tool for assessing a company's financial health and performance, it should be used cautiously and in conjunction with other analytical methods and considerations to gain a comprehensive understanding of the company's overall situation.

Q16. Explain different types of ratio analysis.

Ans :

Ratio analysis can be categorized into several types, each providing different insights into a company's financial performance and condition. Here are some common types of ratio analysis along with their formulas:

Ratio analysis is a key tool in financial analysis that helps assess a company's financial performance and health. Here are some common types of ratios used in ratio analysis along with their formulas:

I) Liquidity Ratios:

(i) Current Ratio:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

(ii) Quick Ratio (or Acid-Test Ratio):

$$\text{Quick Ratio} = \frac{\text{Current Assets-Inventory}}{\text{Current Liabilities}}$$

II) Profitability Ratios:

(i) Gross Profit Margin:

$$\text{Gross Profit Margin} = \frac{\text{Gross Profit}}{\text{Revenue}} \times 100$$

(ii) Net Profit Margin:

$$\text{Net Profit Margin} = \frac{\text{Net Income}}{\text{Revenue}} \times 100\%$$

(iii) Return on Assets (ROA):

$$\text{ROA} = \frac{\text{Net IncomeAverage}}{\text{Total Assets}} \times 100\%$$

(iv) Return on Equity (ROE):

$$\text{ROE} = \frac{\text{Net Income}}{\text{Average Shareholders} \vdash \text{Equity}} \times 100$$

III) Efficiency Ratios:

(i) Asset Turnover Ratio:

$$\text{Asset Turnover Ratio} = \frac{\text{Revenue Average}}{\text{Total Assets}}$$

(ii) Inventory Turnover Ratio:

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

IV) Solvency Ratios:

(i) Debt-to-Equity Ratio:

$$\text{Debt-to-Equity Ratio} = \frac{\text{Total Debt}}{\text{Shareholders} - \text{Equity}}$$

(ii) Interest Coverage Ratio:

$$\text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Expense}}$$

V) Market Value Ratios:

(i) Price-to-Earnings (P/E) Ratio:

$$\text{P/E Ratio} = \frac{\text{Market Price per Share}}{\text{Earnings per Share}}$$

(ii) Dividend Yield:

$$\text{Dividend Yield} = \frac{\text{Dividend per Share}}{\text{Market Price per Share}} \times 100\%$$

These ratios provide insights into different aspects of a company's financial performance, helping investors, analysts, and managers make informed decisions.

PROBLEMS

1. The following is the balance sheet of X company Ltd. as on March 31, 2015. You are required to calculate the relevant ratios and comment on the short-term and long -term solvency of the company.

Balance sheet of X Company Ltd., as on 31.3.2015

Liabilities	Amount (`)	Assets	Amount (`)
Share capital	20,000	Buildings	20,000
Reserves and surplus	16,000	Plant and machinery	10,000
Debentures	10,000	Stock	8,000
Sundry Creditors	11,000	Sundry debtors	7,000
Bank overdraft	1,000	Prepaid expenses	2,000
Bills payable	2,000	Securities	12,000
Provision for taxation	1,000	bank	2,000
Outstanding expenses	1,000	Cash	1,000
	62,000		62,000

Sol :

Calculation of short term solvency of the company

(i) $$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

Current assets = Stock + Sundry debtors + Prepaid expenses + Securities + Bank + Cash

Current liabilities = Share capital + Reserves and surplus + Debentures + Sundry creditors + Bank overdraft + Bills payable + Provision for taxation + Outstanding expenses

$$\therefore \text{Current Ratio} = \frac{8000 + 7000 + 2000 + 12000 + 2000 + 1000}{20{,}000 + 16000 + 10000 + 11000 + 1000 + 2000 + 1000 + 1000}$$

$$= \frac{32000}{62000}$$

$$= 0.5161$$

(ii) $$\text{Liquid ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

Liquid assets = Current assets - Stock

Current assets - Stock

$$\text{Liquid Ratio} = \frac{\text{Current assets - Stock}}{\text{Current liabilities}}$$

$$= \frac{24000 - 8000}{62000}$$

$$= \frac{16000}{62000}$$

$$= 0.2580$$

Comments

In short term company doesnot possess enough current assets then the current liabilities as the ratios are less then 2.

Calculation of Long Term Solvency of Company

(a) Debt equity ratio

(b) Ratio of proprietors funds to total assets

(c) Ratio of fixed assets to proprietors funds

(d) Ratio of current assets to proprietors funds.

(a) Debt Equity Ratio

$$\text{Debt equity ratio} = \frac{\text{Debt}}{\text{Equity}}$$

(OR)

$$\frac{\text{Longterm loans/Outsiders funds}}{\text{Shareholders funds/insiders funds}}$$

D.E.R = Debt = Debentures (10,000)

Equity = 20,000 + 16000 = 36000

$$= \frac{10,000}{36,000}$$

D.E.R = 0.277

(b) Ratio of Proprietors Funds to Total Assets

$$\text{R.O.P.F.T.S} = \left(\frac{\text{Proprietors funds}}{\text{Total assets}}\right) \times 100$$

$$= \frac{36000}{62000} \times 100$$

$$= 58.064\%$$

(c) Ratio of Fixed Assets to Proprietors Funds

$$\text{R.O.F.A.P.F} = \left(\frac{\text{Fixed assets}}{\text{proprietors funds}}\right) \times 100$$

$$= \frac{20000+10000}{36000} \times 100$$

$$= 0.8333 \times 100$$

$$= 83.333\%$$

(d) Ratio of Fixed Assets to Proprietors Funds

$$R.O.C.A.P.F = \left(\frac{\text{Current assets}}{\text{Proprietors funds}}\right) \times 100$$

$$= \frac{32000}{36000} \times 100$$

$$= 0.888 \times 100$$

$$= 88.888$$

Comments

(i) Dept Equity

Debt equity ratio is 1 : 3, it means that for every one rupee of equity there is a debt of 3 which is not satisfactory in long run.

(ii) Ratio of Proprietors Funds

Shows that more than (58.064%) is financed by proprietors funds in total assets and (83.33%) in fixed assets and (88.88%) in current assets, the remaining balance is financed by the outsiders funds.

2. From the following balance sheet, calculate :

(a) Current ratio

(b) Debt - equity ratio

(c) Fixed assets turnover ratio

(d) Return on capital employed and give your comments

Balance sheet as on 31.12.2014

Liabilities	Amount (`)	Assets	Amount (`)
Equity share capital	12,00,000	Fixed Assets	17,00,000
Reserves and surplus	3,00,000	Stock	3,00,000
9% Debentures	7,00,000	Debtors	2,80,000
Creditors	2,80,000	Marketable securities	2,00,000
Bills Payable	50,000	Cash	50,000
	25,30,000		25,30,000

Profit before interest and tax for the year are ` 50 lakhs and sales are ` 50 lakhs.

Sol :

Calculation of Current Ratio

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

Current assets = Cash + Marketable securities + Debtors + Stock

= 50,000 + 2,00,000 + 2, 80,000 + 3,00,000

= ` 8,30,000

Current liabilities = Bills payable + Creditors

= 50,000 + 2, 80,000

= 3,30,000

$$= \frac{8,30,000}{3,30,000} = 2.5$$

Comments

The standard current ratio is 2 : 1 but in this case it is 2.5. It indicates that company have sufficient funds to meet its working capital requirements.

Debt – Equity ratio – Calculation

$$\text{Debt equity ratio} = \frac{\text{Outsider's funds}}{\text{Sharesholder's funds}}$$

$$= \frac{\text{Debentures} + \text{Creditors} + \text{Bills payable}}{\text{Equity shares} + \text{Reserves and surplus}}$$

$$= \frac{7,00,000 + 2,80,000 + 50,000}{12,00,000 + 3,00,000}$$

$$= \frac{10,30,000}{15,00,000}$$

= 0.68

Comments

The ideal debt - equity rule for ratio is 2 : 1 but, in this case, it is only 0.68 which is very less this indicates that shareholders are not satisfied as the firm has not utilized the outsider's funds efficiently to enhance their earnings.

Calculation of Fixed Assets Turnover Ratio

$$\text{Fixed assets turnover ratio} = \frac{\text{Net sales}}{\text{Fixed assets}}$$

$$= \frac{30,00,000}{17,00,000}$$

= 1.76

Comments

This ratio is not satisfactory as the firm did not make use of its fixed assets effectively.

$$\text{Return on capital employed} = \frac{\text{Net profit before interest and tax}}{\text{Capital employed}} \times 100$$

$$= \frac{50,00,000}{22,00,000} \times 100$$

$$= 2.27 \times 100$$

$$= ` 227.27$$

Working Notes

Capital employed = Equity capital + Reserves + Debentures

= 12,00,000 + 3,00,000 + 7,00,000

Capital employed = ` 22,00,000

Comment

This ratio indicates that the firm has the ability of generating profits efficiently.

1.6 STATEMENT OF CASH FLOWS

Q17. What is cash flow statement? Explain its advantages/utility and limitations.

Ans : **(Imp.)**

Meaning

A cash flow statement explains the inflows and outflows of cash and cash equivalents during a specified period of time. Such inflows and outflows are classified into operating investing and financing activities during a particular period of time.

Cash flow statement identifies the impact of different business transactions on cash and its equivalents and considers the receipts and payments of cash. A cash flow statement is used to identify all the factors which lead to changes in the cash position of a business enterprise between the opening and closing dates of a balance sheets. Usually, cash flow statement is referred to as a "postmortem exercise" or a method of historical financial analysis.

Advantages

Cash flow statement plays an important role in financial management. It is mainly used for short-term planning and acts as an important tool of financial analysis.

The main advantages of cash flow statement are as follows,

(i) As cash flow statement is prepared on cash basis of accounting, it is useful in ascertaining the cash position of a firm.

(ii) Analysis can be done by comparing the historical cash flows with the projected cash flows to identify the variations and deficiency in the performance so that firm can take effective measures to avoid it.

(iii) Cash flow statement is prepared in a standard format prescribed by AS-3 (Revised) which can be effectively used for making comparisons with other firms.

(iv) In order to identify whether the firm's liquidity position is improving or deteriorating a series of intra-firm and interfirm cash flow statements are prepared for specific period of time.

(v) Cash flow statement is an effective tool which helps in planning the repayment of loans, replacement fixed assets and it is also useful in capital budgeting decisions.

Limitations

Apart from its advantages it is also associated with several limitations such as,

(i) Cash flow statement is prepared on cash basis of accounting which makes the firm to neglect the accrual basis of accounting.

(ii) As working capital is a wider concept of funds than cash, funds flow statement represents a complete financial picture of a firm which is not possible through the cash flow statement.

(iii) A cash flow statement is not a replacement of an income statement, it is referred to as complementary statement to it.

(iv) Usually, a comparative study of cash flow statement gives fallacious (false) results.

Q18. What are the features of cash flow statement?

Ans :

The important features of cash flow statement are as follows,

1. Cash flow statement acts as an important device which is being used in the financial planning.

2. Cash flow statement basically relies upon the past information i.e., the actual cash receipts and cash payments for a specified time period.

3. Cash flows comprise of both cash inflows and cash outflows and the information derived out of the CFS is useful in preparing the cash budget.

4. Cash flow statement is prepared yearly once as it is drawn from income statement and balance sheet of two successive years.

5. It is prepared and introduced by the listing companies.

6. Cash flow statement helps/assists in evaluating the ability of an enterprise to achieve its future obligations with the use of cash inflows out of the future operations.

7. It is necessary to understand the movement of cash flows in a precise manner with an aim to avoid short-comings of the financial liquidity of an enterprise. It is well-known that cash is a blood of any business for which it is essential to take proper actions to make optimum utilization of it.

1.6.1 Classification of Cash flow

1.6.1.1Operating, Investing and financing Activities

Q19. Write the procedure for preparing cash flow statement.

(OR)

Discuss are the norms created by accounting standard - 3 for cash flow statement.

Ans : **(Imp.)**

The main aim of Accounting Standard 3 is to help the users of financial statements by providing them a basis for analyzing the capability of the firm to produce cash and cash equivalents and the requirement of the firm

to use those cash flows. As a result this information helps the users of financial statements to analyses the liquidity and solvency of the firm.

Accounting standard-3 has created the following norms which are applicable for the cash flows obtained from operating, investing and financing activities and extraordinary items in cash flow statement.

1. Operating Activities

Operating activities constitutes the primary revenue generating activities of a firm. So, they mainly deals with the transactions and events which ascertains the net profit and loss for the period.

The operating activities are presented either by direct method or indirect method. In the direct method, the principal classes of gross cash receipts and gross cash payments are calculated by adjusting sales, cost of sales and other items in the profit and loss account. These adjustments are related to the changes occurred during an accounting for the items such as inventories, operating receivables and payables or changes in other noncash items and changes in the items for which the cash effects the investing or financing cash flows.

In the indirect method, the net cash flow from operating activity is ascertained by adjusting the net profit or loss for the effects of changes during the period in inventory and operating receivables and payables, non-cash items such as depreciation, provisions, deferred taxes, unrealized foreign exchange gains or losses and all the other items for which cash effects the investing or financing cash flows. This method is used by most of the Indian companies for presenting their cash flows from operations.

2. Investing Activities

Investing activities denotes the degree to which expenditures have been made for planned resources for producing future income and cash flows.

It is very much essential for a firm to report separately, the primary classes of gross cash receipts and payments. But reporting must be done on net basis in the following cases,

(a) When the receipts or payments are made in place of customers and where the cash flow denotes the activities of the customer instead of the firm.

Example : Collection of rent in place of customers and payment made to the owners of a property.

(b) When the receipts or payments for items in which the turnover is quick, amounts are large and maturities are short.

Example : Short-term borrowing which have a maturity of less than or equal to 3 months.

3. Financing Activities

Financing activities leads to the changes in the size and composition of shareholder's funds and borrowings of the firm.

4. Extraordinary Items

After classifying operating, investing and financing activities, a separate disclosure has to be made for extraordinary items. A cash flow statement must reveals the amount of significant cash or cash equivalent balances which are considered as the extraordinary items held by the firms.

Q20. Show the format of cash flow statement as per Accounting Standard-3 (AS-3)

Ans :

The formats of cash flow statement given by Accounting Standard No-3 is shown below,

Format of Cash Flow Statement as per AS-3 (Direct Method)

Particulars	Amount (`)	Amount (`)
Cash Flows from Operating Activities:		
Cash receipts from customers	xxx	
Cash paid to suppliers and employees	(xxx)	
Cash generated from operations	xxx	
Income taxes paid	(xxx)	
Cash flow before extraordinary item	xxx	
Proceeds from earth quakedisaster settlement	xxx	
Net cash from operating activities (A)	**xxx**	**xxx**
Cash Flows from Investing Activities :		
Purchase of fixed assets	(xxx)	
Proceeds from sale of equipment	xxx	
Interest received	xxx	
Dividend received	xxx	
Net cash from investing activities (B)	**xxx**	**xxx**
Cash Flows from Financing Activities :		
Proceeds from issue of share capital	xxx	
Proceeds from long-term borrowings	xxx	
Repayment of long-term borrowings	(xxx)	
Interest paid	(xxx)	
Dividend paid	(xxx)	
Net cash used in financing activities (C)	**(xxx)**	**(xxx)**
Net increase in cash and cash equivalents (A + B + C)		xxx
Add : Cash and cash equivalents at the beginning of the period		xxx
Cash and cash equivalents at the end of the period		**xxx**

Revised Format of Cash Flow Statement as per AS-3 (Indirect Method)

Particulars	Amount (`)	Amount (`)
Net profit before taxation (excluding extraordinary profit/loss)	xxx	
Add: Depreciation	xxx	
Goodwill written off	xxx	
Preliminary expenses written off	xxx	
Interest expenses (for long -term loan/debentures)	xxx	
Loss on sale of assets, long-term investments	xxx	
Proposed dividends	xxx	
	xxx	
Less: Profit on sale of investment, assets etc	xxx	
Interest income (from long - term investments)	xxx	
Dividend income (from long-term investments)	xxx	
Operating profit/Cash Generated from Operations		
Before W.C Changes	**xxx**	
Decrease in Debtors /(Increase in Debtors)	xxx	
Decrease in Stocks/(Increase in Stocks)	xxx	
Decrease in Bills Receivable /(Increase in Bills Receivable)	xxx	
Decrease in Prepaid Expenses/(Increase in Prepaid Expenses)	xxx	
Increase in Creditors /(Decrease in Creditors)	xxx	
Increase in Bills Payable / (Decrease in Bills Payable)	xxx	
Increase in Outstanding Expenses/(Decrease in Outstanding Expenses)	xxx	
Cash Generated from Operations	**xxx**	
Less : Income taxes paid	xxx	
Net Cash from Operating Activities (A)	**xxx**	
Cash Flows from Investing Activities		
Purchase of Fixed Assets	xxx	
Purchase of Investments	xxx	
Proceeds from Sale of Fixed Assets	xxx	
Proceeds from Sale of Investments	xxx	
Interest Received	xxx	
Dividend Received	xxx	xxx
Net Cash from Investing Activities (B)		**xxx**
Cash Flows from Financing Activities		
Proceeds from Issue of Share Capital	xxx	
Proceeds from Long-term Loans	xxx	
Proceeds from Issue of Debentures	xxx	
Redemption of Preference Shares	xxx	
Redemption of Debentures	xxx	
Interest paid	xxx	
Repayment of Long -term Loans/Borrowing	(xxx)	
Dividends paid	(xxx)	
Interim dividends paid	(xxx)	
Net Cash from Financing Activities (C)		**xxx**
Net Increase in Cash and Cash Equivalents (A + B + C)		xxx
Add : Cash and Cash Equivalents at the Beginning of the Period		xxx
Cash and Cash Equivalents at the End of triod		**xxx**

Q21. Explain the difference between the direct & indirect methods of calculating the operating in the cash flow statement.

Ans :

Differences between the direct and indirect methods

The operating section of the statement of cash flows can be shown using either the direct method or the indirect method. With either method, the investing and financing sections are identical; the only difference is in the operating section.

The direct method shows the major classes of gross cash receipts and gross cash payments.

Regardless of the method, the cash flows from the operating section will give the same result. However, the presentation will differ. Below is an illustrative comparison of the two approaches.

The operating section of the statement of cash flows can be calculated using either the direct method or the indirect method. Here's a brief overview of each method:

Direct Method

(i) The direct method calculates cash flows from operating activities by directly reporting cash receipts and cash payments.

(ii) It involves listing all cash inflows from operating activities (e.g., cash received from customers) and cash outflows from operating activities (e.g., cash paid to suppliers) separately.

(iii) The direct method provides a more detailed and transparent view of how cash is generated and used in operations.

(iv) However, the direct method requires additional effort and cost to gather and report the necessary information.

Indirect Method:

(i) The indirect method calculates cash flows from operating activities by starting with net income and making adjustments for non-cash items and changes in working capital.

(ii) It begins with net income from the income statement and adjusts for items such as depreciation, amortization, changes in inventory, accounts receivable, and accounts payable to arrive at cash flows from operating activities.

(iii) The indirect method is more commonly used than the direct method because it is easier and less costly to prepare, as it starts with net income, which is readily available from the income statement.

(iv) However, the indirect method provides less detailed information about cash receipts and payments compared to the direct method.

In summary, both the direct and indirect methods can be used to calculate the operating section of the statement of cash flows. The direct method provides a more detailed and transparent view of cash flows from operating activities, while the indirect method is simpler and more widely used.

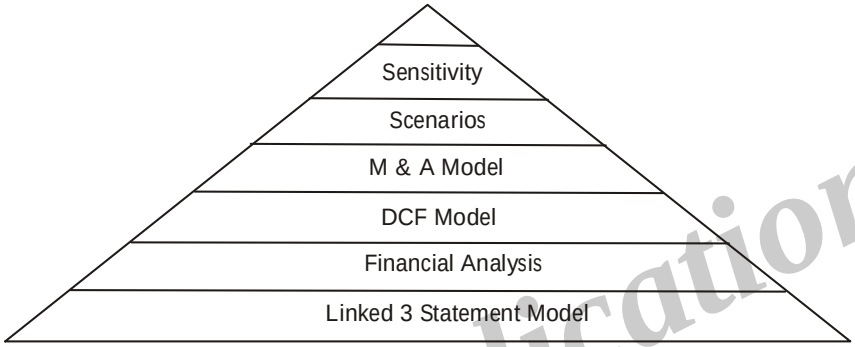
Q22. What is a three-statement model? Explain steps in building a three statement model.

Ans : **(Imp.)**

Meaning

A three-statement model links the income statement, balance sheet, and cash flow statement into one dynamically connected financial model. Three-statement models are the foundation on which more advanced financial models are built, such as discounted cash flow (DCF) models, merger models, leveraged buyout (LBO) models, and various other types of financial models.

The linked statements are the basis for all other models



Steps to build three -statement model

There are several steps required to build a three-statement model, including:

1. Input historical financial information into Excel
2. Determine the assumptions that will drive the forecast
3. Forecast the income statement
4. Forecast long-term, capital assets
5. Forecast financing activity (e.g., debt and equity)
6. Complete the income statement
7. Complete the balance sheet (excluding cash)
8. Complete the cash flow statement and cash on the balance sheet

1.7 REPORTING AND INTERPRETATION USING SPREAD SHEET

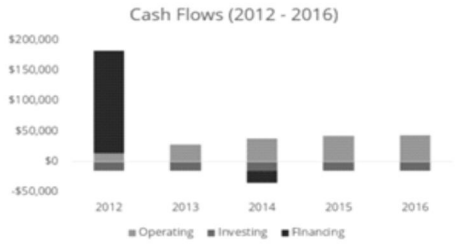
Q23. Explain how Input Historical Information into Excel.

Ans :

Input historical information into Excel

In this step, we take the historical financial information of the company and either download, type or paste it into Excel. Once the information is in Excel, you'll need to do some basic formatting to make the information easy to read and to make it follow the structure you want your model to take. As you can see in the below, the historical information is entered in a font under the historical time periods..

FINANCIAL STATEMENTS	Historical Results					Forecast Period				
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Balance Sheet Check	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Cash Flow Statement										
Operating Cash Flow										
Net Earnings	2,474	11,791	21,075	26,713	28,227	35,156	38,389	44,071	43,823	49,852
Plus: Depreciation & Amortization	19,500	18,150	17,205	16,544	16,080	15,008	15,005	13,003	17,802	14,681
Less: Changes in Working Capital	9,003	1,702	775	903	827	375	611	398	511	272
Cash from Operations	**12,971**	**28,239**	**37,505**	**42,354**	**43,480**	**49,789**	**52,783**	**56,676**	**61,114**	**64,261**
Investing Cash Flow										
Investments in Property & Equipment	15,000	15,000	15,000	15,000	15,000	15,000	10,000	25,000	10,000	15,000
Cash from Investing	**15,000**	**15,000**	**15,000**	**15,000**	**15,000**	**15,000**	**10,000**	**25,000**	**10,000**	**15,000**
Financing Cash Flow										
Issuance (repayment) of debt	-	-	(20,000)	-	-	-	-	(20,000)	-	-
Issuance (repayment) of equity	170,000	-	-	-	-	-	-	-	(150,000)	-
Cash from Financing	**170,000**	**-**	**(20,000)**	**-**	**-**	**-**	**-**	**(20,000)**	**(150,000)**	**-**
Net Increase (decrease) in Cash	167,971	13,239	2,505	27,354	28,480	34,789	42,783	11,676	(98,886)	49,261
Opening Cash Balance	-	167,971	181,210	183,715	211,069	239,550	274,339	317,122	328,798	229,912
Closing Cash Balance	**167,971**	**181,210**	**183,715**	**211,069**	**239,550**	**274,339**	**317,122**	**328,798**	**229,912**	**279,174**
Check	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Supporting Schedules										
Charts and Graphs										



Q24. How to calculate net cash flows using excel ?

Ans : **(Imp.)**

Financial analysis has been the best approach in every business that is dependent on keeping track of incoming and outgoing transactions during the project, quarterly, biannually, or yearly basis. Initial investment, resource management costs, maintenance expenditures, anticipated budget scheduling, employees' wages, return on investment, and profit & loss are all included in monetary transactions.

To manage all these cash inflows and outflows, project & business managers exploit the cash flow diagram not only to highlight economic vicissitudes but also to track overall business progress. This article will impart insight into how you can create cash flow charts in Excel without investing extraordinary time & effort.

1. Overview of The Cash Flow Graph Excel

Cash flow charts Excel are the diagrams visually representing the influx and out flux of money in a business realm, whether evaluating the cash flow in project management & execution, analyzing the past-year financial performance, or calculating the overall revenue. Such diagrams are also instrumental in establishing a well-organized financial future action plan to estimate the cost of various resources involved, equipment salvage, and the expected output from the project.

Formation Rules

Creating a cash flow diagram necessitates following some general rules that assist the viewers in understanding its mechanizing patterns. Here are some salient attributes essential to mention in a cash flow chart Excel:

(i) The first attribute which is mandatory to mention in a cash flow diagram is the magnitude of the transaction; it is further dependent on two factors: cash flow orientation and the value of the US Dollar in that particular interval.

(ii) The next parameter exploited in a cash flow chart is the time involved in that transaction; the time interval can be mentioned via exact date, or with monthly, quarterly, semi-annual, or annual frequency.

(iii) Time is represented along a horizontal axis, and the unit of time interval involved decides the nature of the project or transaction.

(iv) The financial gains, such as profit, resale values, and return on investment, are represented in positive values (Upward arrows), whereas financial losses, such as disbursements, expenditures, or losses, are represented in negative values (Downward arrows).

(v) The horizontal thickness of an arrow represents the timing of that specific cash flow; for example, a thicker arrow will denote a cash flow for a longer duration.

2. To Draw a Cash Flow Chart in Excel.

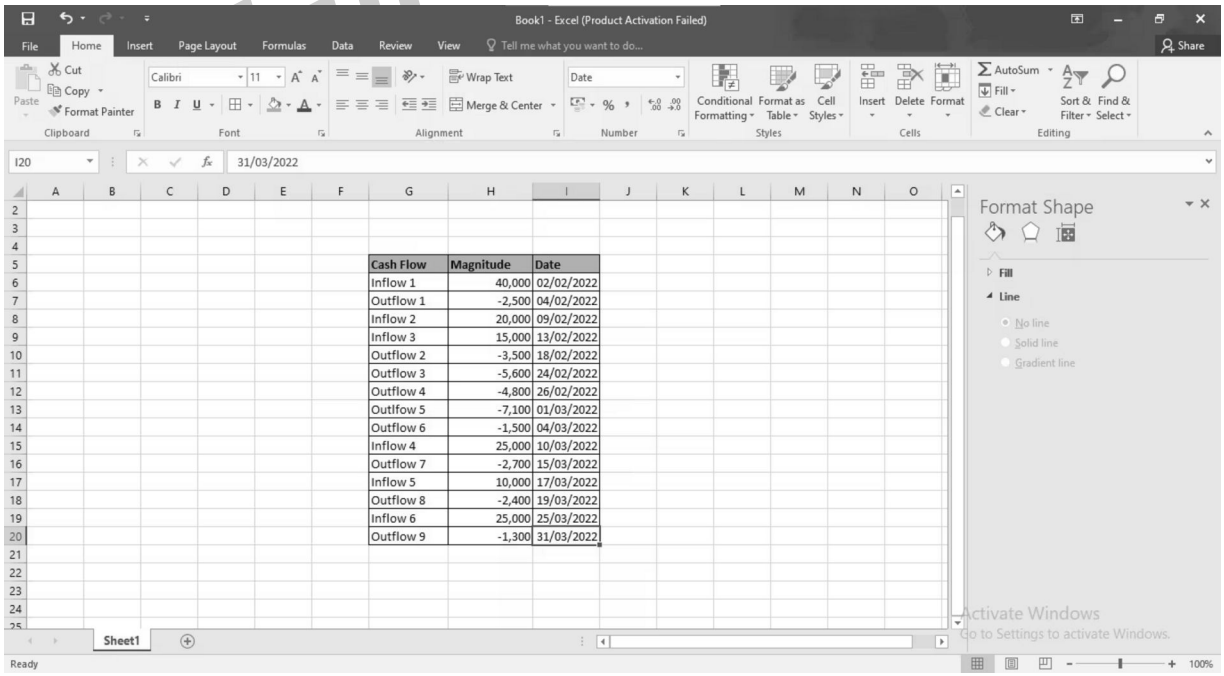
Microsoft Excel is a powerful platform that is now firmly entrenched in today's digital business world, assisting in evaluating stocks, budgeting, formulating workable financial plans, managing client sale lists, and more. Organizing and sorting data into allusive categories, MS Excel helps business professionals identify commercial trends, computing complex data, and converting it into meaningful worksheets & charts.

Cash flow graph Excel creation is incredibly straightforward, with a little effort involved in making and organizing your dataset. The detailed procedure for employing MS Excel to make the cash flow diagram is illustrated below:

STEP 1

Create a proper dataset containing a company or project's transaction-related information by adding the expense magnitude. Also, mention the time span in which the cash flow was made.

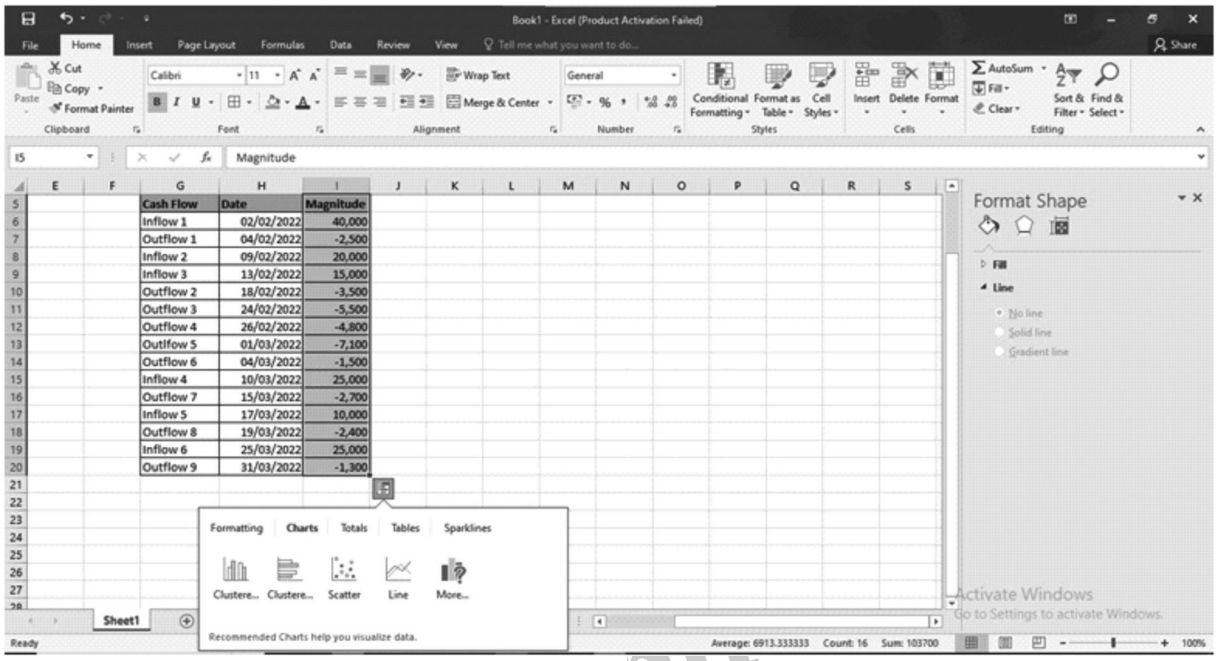
Also, mention the time span in which the cash flow was made.



Cash Flow	Magnitude	Date
Inflow 1	40,000	02/02/2022
Outflow 1	-2,500	04/02/2022
Inflow 2	20,000	09/02/2022
Inflow 3	15,000	13/02/2022
Outflow 2	-3,500	18/02/2022
Outflow 3	-5,600	24/02/2022
Outflow 4	-4,800	26/02/2022
Outlfow 5	-7,100	01/03/2022
Outflow 6	-1,500	04/03/2022
Inflow 4	25,000	10/03/2022
Outflow 7	-2,700	15/03/2022
Inflow 5	10,000	17/03/2022
Outflow 8	-2,400	19/03/2022
Inflow 6	25,000	25/03/2022
Outflow 9	-1,300	31/03/2022

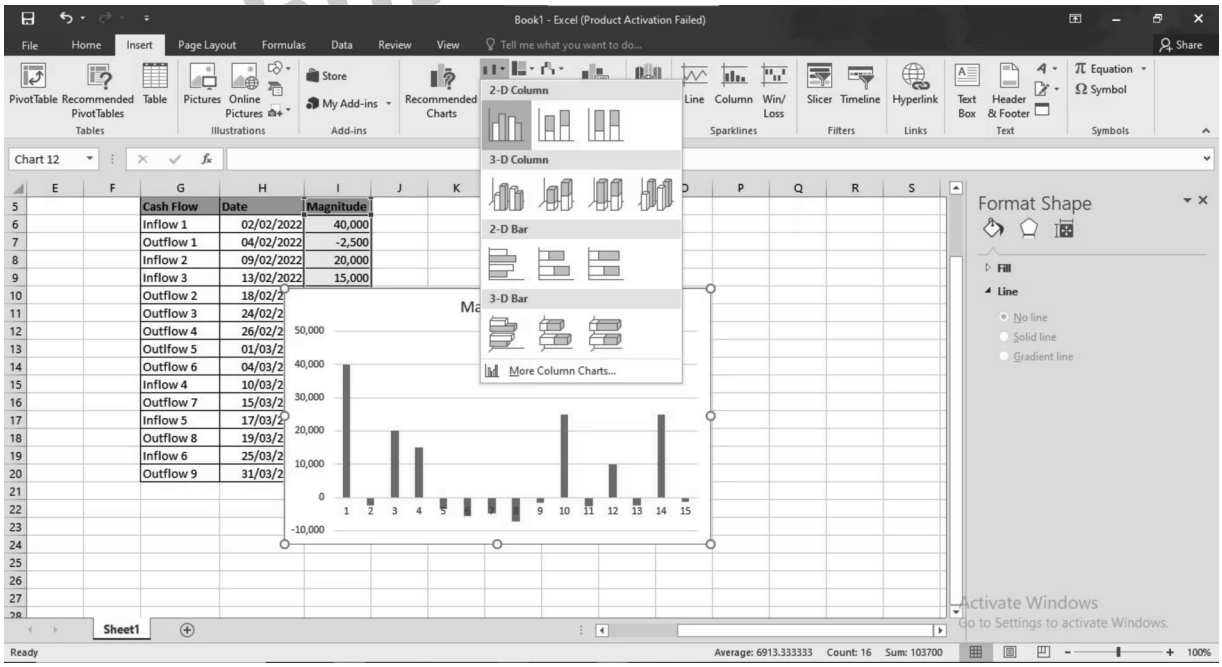
STEP 2

Select the cash flow amount column, click the "Quick Analysis" icon, and choose the "Chart" tab from the menu; select and apply your favorite chart type.



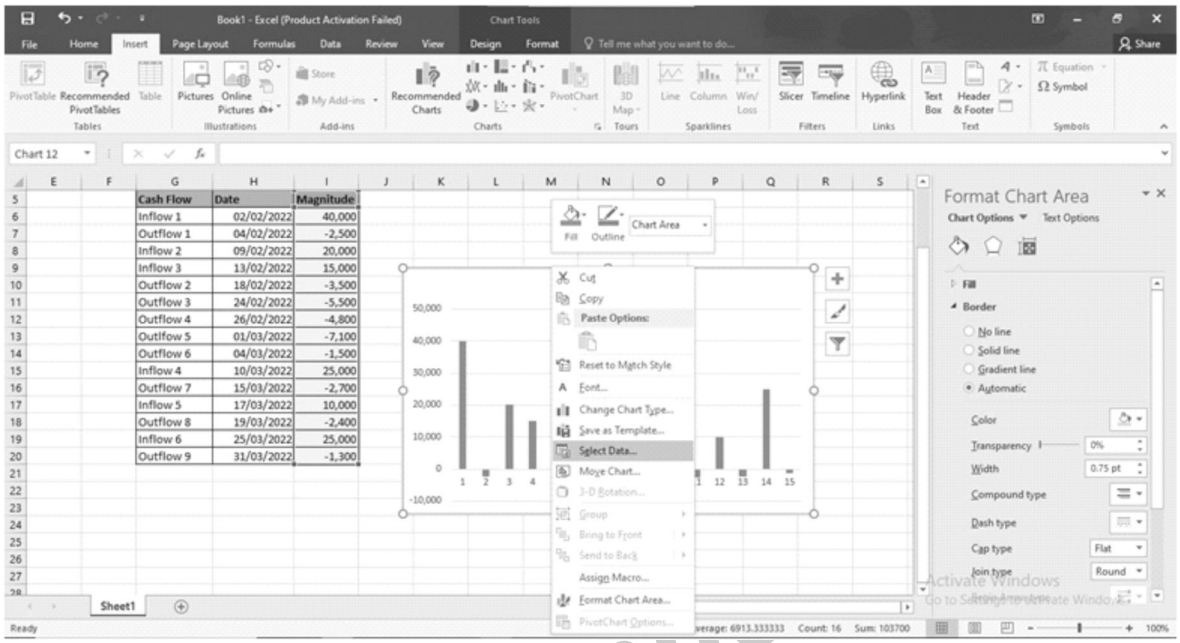
STEP 3

Another way to create the chart from the given data is to select the data, navigate to the "Insert" option, and choose the preferred chart type from the "Recommended Charts" option.



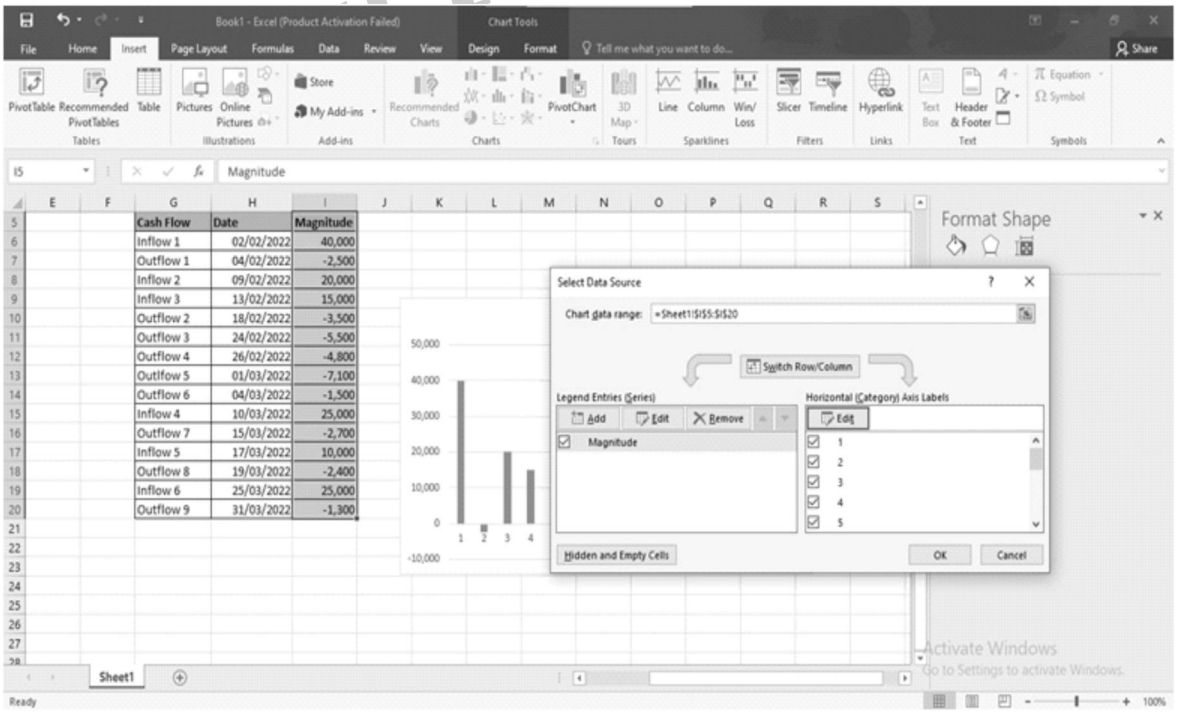
STEP 4

The next step is to add the date to the x-axis; right-click the chart, and pick the "Select Data" option from the dropdown.



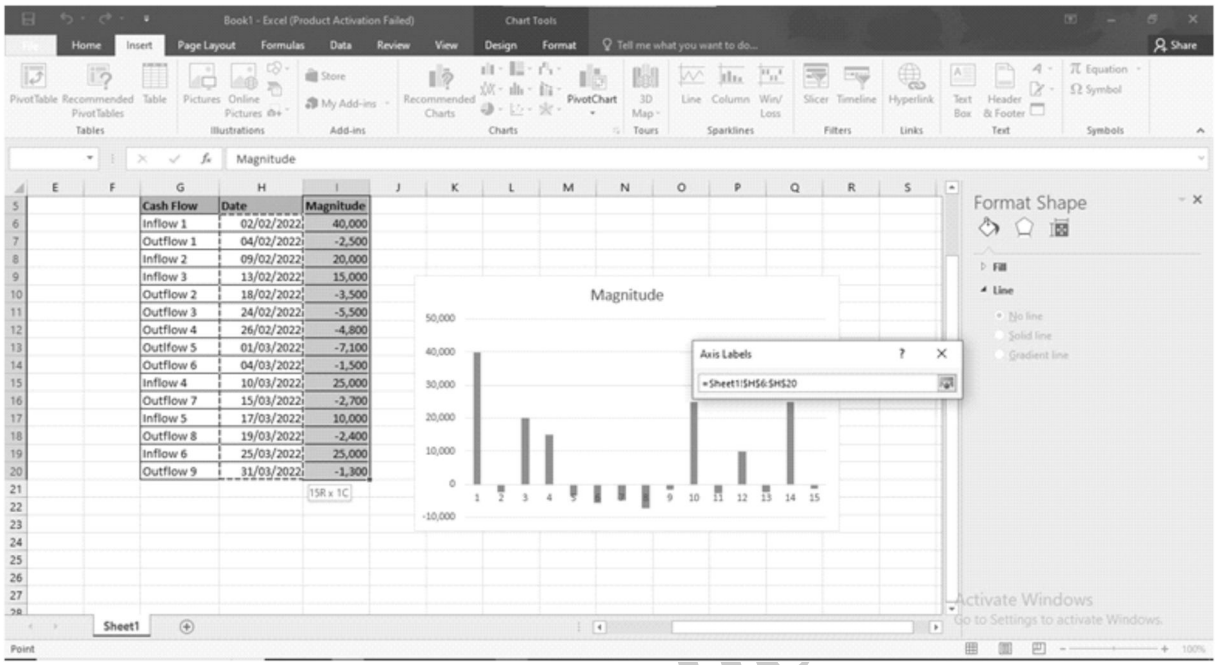
STEP 5

Now, navigate to the "Horizontal Axis Labels" option and click the "Edit" button.



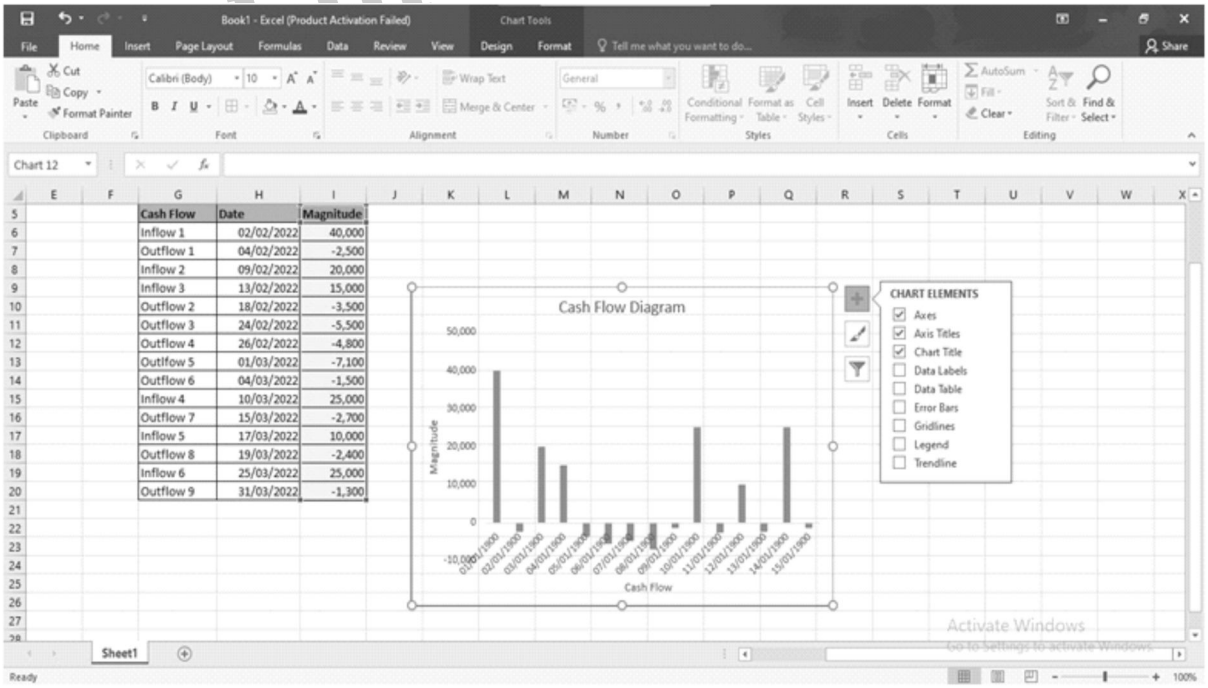
STEP 6

Select the Date column to add it to the chart's horizontal axis, and click "OK."



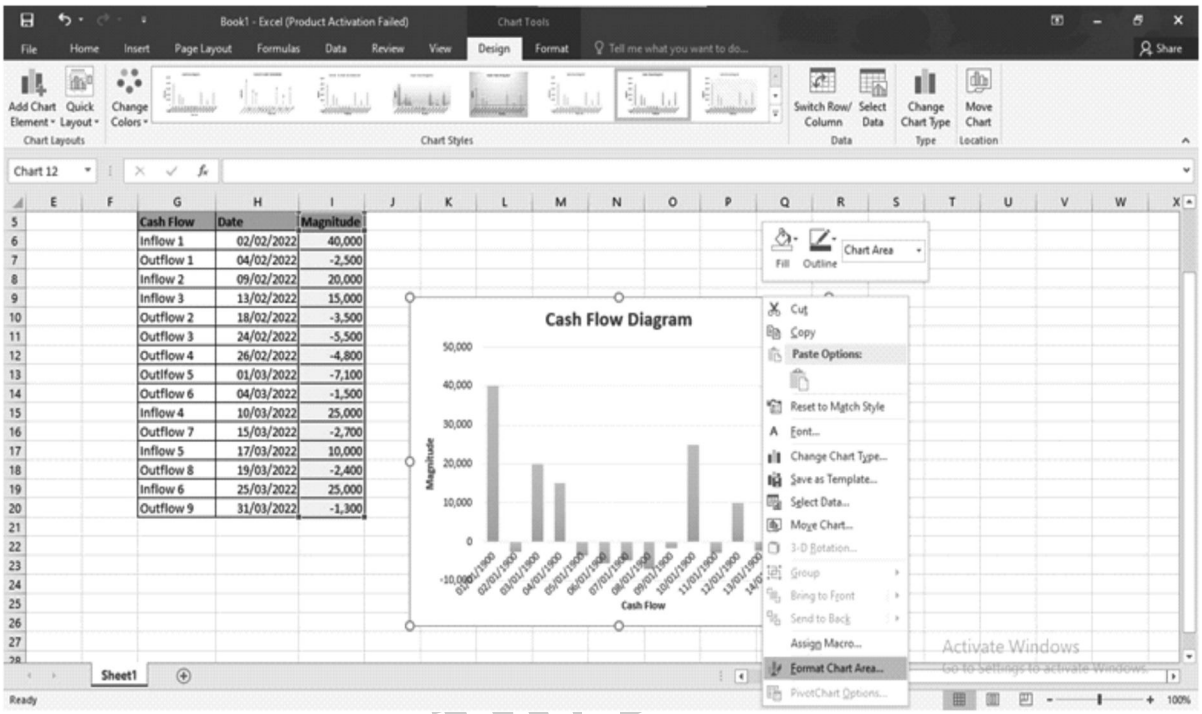
STEP 7

The next step after completing the chart formation is to format the chart elements; to do so, click the " + " button at the top right and tick the elements you want to include.



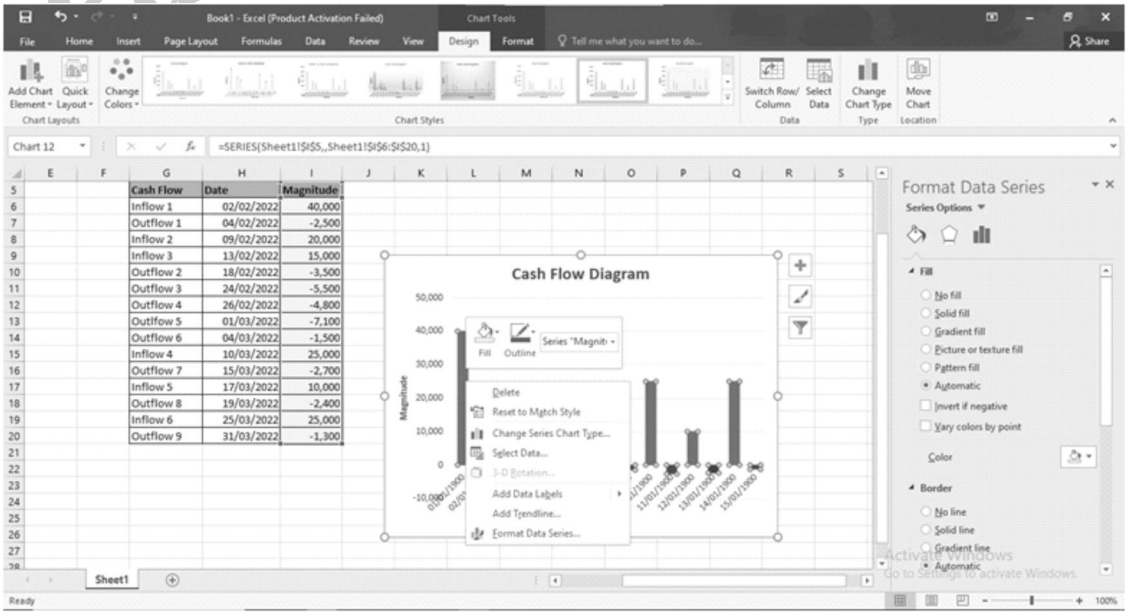
STEP 8

For Excel cash flow chart personalization, navigate to the "Design" option in the main menu, and perform your desirable layout customization.



STEP 9

If you want to customize the chart elements individually, right-click the chart, and choose the "Format Data Series" option. Now, select and customize your target element by employing the customization options in the right panel.



Q25. Describe how excel is used for data interpretation and reporting.

Ans : **(Imp.)**

Microsoft Excel lets you store and manipulate data for business or personal purposes. The tools within Excel give you the ability to interpret data sets, similar to the kinds of interpretation you might expect when using a database. Such interpretations can give insights into business performance, inform management decisions and ultimately aid future planning. Data interpretation in Microsoft Excel can potentially involve a variety of activities facilitated by the features of the software, including collating, processing, filtering and visualizing data values.

Reporting and interpretation using spreadsheets involve summarizing and analyzing data to draw meaningful insights. Here's a basic guide on how to do this:

(i) Import Data

Start by importing your data into a spreadsheet program like Microsoft Excel or Google Sheets. Ensure your data is organized into rows and columns, with each row representing a data record and each column representing a data attribute.

(ii) Clean and Prepare Data

Clean your data by removing any duplicates, errors, or irrelevant information. You may also need to format your data to ensure consistency (e.g., date formats, numeric formats).

(iii) Create Summary Statistics

Use functions like SUM, AVERAGE, COUNT, MIN, and MAX to calculate summary statistics for your data. These can provide an overview of your data's distribution and central tendencies.

(iv) Create Charts and Graphs

Visualize your data using charts and graphs to identify trends, patterns, and outliers. Common types of charts include bar graphs, line graphs, pie charts, and scatter plots.

(v) Perform Data Analysis

Use tools like pivot tables and data filters to analyze your data further. Pivot tables can help you summarize and cross-tabulate data, while filters can help you focus on specific subsets of your data.

(vi) Interpret Results

Once you have summarized and analyzed your data, interpret the results to draw meaningful conclusions. Look for patterns, trends, and relationships that can inform your decision-making process.

(vii) Create Reports

Finally, create reports that communicate your findings clearly and concisely. Use tables, charts, and graphs to present your data in an easy-to-understand format.

By following these steps, you can effectively report and interpret data using spreadsheet software.

PROBLEMS

3. From the following information prepare a Cash Flow Statement.

Liabilities	2012 (`)	2013 (`)	Assets	2012 (`)	2013 (`)
Capital	15,00,000	16,00,000	Goodwill	4,00,000	3,00,000
Reserves	1,00,000	1,20,000	Machinery	10,00,000	11,00,000
Debentures	4,00,000	2,80,000	Furniture	4,00,000	6,00,000
Bank Loan	1,00,000	–	Stock	3,00,000	1,00,000
Current Liabilities	50,000	60,000	Debtors	50,000	1,00,000
Provision for Tax	50,000	1,40,000	Cash	50,000	20,000
Provision for Dividend	20,000	20,000	Preliminary expenses	20,000	–
	22,20,000	22,20,000		22,20,000	22,20,000

Additional Information :

During 2013 depreciation written off on machinery and furniture was `1,00,000 and ` 1,50,000 respectively.

Sol :

Cash Flow Statement for the Year ended 2013

Particulars		Amount (`)	Amount (`)
Cash Flows from Operating Activities:			
Net Profit for the year (1,20,000 – 1, 00,000)			20,000
Add :	Depreciation on Machinery	1,00,000	
	Depreciation on Furniture	1,50,000	
	Preliminary Expenses. (written off)	20,000	
	Provision for Taxation	90,000	
	Goodwill (written off)	1,00,000	4,60,000
	Cash Generated from Operating Activities before working capital changes		**4,80,000**
Add :	Decrease in stock	2,00,000	
	Increase in Debtors	(50,000)	
	Increase in Current Liabilities	10,000	1,60,000
	Net Cash from Operating Activities (A)		**6,40,000**
Cash flow from Investing Activities :			
	Purchase of Machinery	(2,00,000)	
	Purchase of Furniture	(3,50,000)	(5,50,000)
	Net Cash from Investing Activities (B)		**90,000**
Cash Flow from Financing Activities :			
	Cash proceeds from Issue of share capital	1,00,000	
	Repayment of loan	(1,00,000)	
	Redemption of Debentures	(1,20,000)	(1,20,000)
	Net Cash from Financing Activities (C)		**(1,20,000)**
	Net decrease in cash equivalents (A + B + C)		(30,000)
Add : Cash at Beginning			50,000
	Net Cash at End		**20,000**

Machinery A/c

Particulars		Amount (`)	Particulars		Amount (`)
To	Balance b/d	10,00,000	By	Depreciation	1,00,000
To	Bank Purchases (Bal. fig)	2,00,000	By	Balance c/d	11,00,000
		12,00,000			**12,00,000**

Furniture A/c

Particulars		Amount (`)	Particulars		Amount (`)
To	Balance b/d	4,00,000	By	Depreciation	1,50,000
To	Bank Purchases (Bal. fig)	3,50,000	By	Balance c/d	6,00,000
		7,50,000			**7,50,000**

4. From the following information prepare a Cash Flow Statement.

Liabilities and Capital	31-3-2010 (`)	31-3-2009 (`)	Assets	31-3-2010 (`)	31-3-2009 (`)
Share Capital	25,00,000	20,00,000	Fixed Assets	15,50,000	15,00,000
Reserves & Surplus	7,50,000	2,50,000	Investments	75,000	–
Secured Loans	17,50,000	20,00,000	Cash & Bank Balance	1,25,000	62,500
Current liabilities	25,00,000	30,00,000	Stocks, Stores, Work in	37,50,000	39,37,500
			Sundry Debtors	20,00,000	17,50,000
	75,00,000	72,50,000		75,00,000	72,50,000

(i) The profit for the year after adjustment in respect of provisions for dividends and taxation was `5,00,000.

(ii) There was addition to fixed assets during the year amounting to `2,00,000 and depreciation for the year was `1,50,000.

Sol :

Cash Flow Statement

Particulars	Amount (`)	Amount (`)
Cash Flows from Operating Activities		
Net Profit	—	—
Add: Non-Operating or Non-Cash Item (Debited to P & L A/c)		
Depreciation	1,50,000	
Transfer to general reserve (Reserve & Surplus)	5,00,000	
	6,50,000	
Less :		
Decrease in Current Liabilities	(5,00,000)	
Increase in Sundry Debtors	(2,50,000)	
Decrease in stock, stores & work in progress	1,87,500	
Cash from Operating Activities (A)	87,500	**87,500**
Cash Flow from Investing Activities		
Purchase of fixed assets	(2,00,000)	
Purchase of Investments	(75,000)	
Cash flow from Investing Activities (B)	(2,75,000)	**(2,75,000)**
Cash Flow from Financing Activities		
Increase in share capital	5,00,000	
Repayment of secured loans	(2,50,000)	
Cash from Financing Activities (C)	2,50,000	**2,50,000**
Net Increase in cash equivalents (A + B + C)		62,500
Add : Cash at Beginning		62,500
Cash at end		**1,25,000**

5. From the following information calculate cash flow from business operations:

Particulars	Purchase (`)	Sold (`)
Investment	**2,30,000**	**1,40,000**
Goodwill	**1,75,000**	**–**
Machinery	**5,30,000**	**2,10,000**
Patents	**–**	**75,000**

Interest received on debentures held as an investment ` 18,000. Dividend received on shares held as investments ` 25,000. A part of building was purchased out of surplus funds for investment purposes, which earned ` 75,000 by way of rent.

Sol :

Calculation of Cash Flow from Investing Activities

Particulars	Amount (`)	Amount (`)
Purchase of Investments	(2,30,000)	
Sale of Investments	1,40,000	
Purchase of Goodwill	(1,75,000)	
Purchase of Machinery	(5,30,000)	
Sale of Machinery	2,10,000	
Sale of Patents	75,000	
Interest received on debentures	18,000	
Dividend received on shares	25,000	
Rent received	75,000	(3,92,000)
Net Cash Flow from Investing Activities		**(3,92,000)**

Short Questions and Answers

1. Financial statement analysis.

Ans :

Definition

(i) According to Myers, is largely a study of relationship among the various financial factors in a business as disclosed by a single set of statements and a study of the trends of these factors as shown in a series of statements.

2. Horizontal analysis.

Ans :

Horizontal analysis is an approach used to analyze financial statements by comparing specific financial information for a certain accounting period with information from other periods. Analysts use such an approach to analyze historical trends.

Trends or changes are measured by comparing the current year's values against those of the base year. The goal is to determine any increase or decline in specific values. A percentage or an absolute comparison may be used in horizontal analysis.

3. Certical analysis.

Ans :

Vertical financial statement analysis, also known as common-size financial statement analysis, involves expressing each line item of a financial statement as a percentage of a base item. This base item is typically total revenue for the income statement and total assets for the balance sheet. Vertical analysis helps in understanding the relative proportions of different items within a single period.

4. Disadvantages of vertical financial statement analysis.

Ans :

Disadvantages

(i) Lack of Context

Like horizontal analysis, vertical analysis lacks context and does not take into account external factors or non-financial aspects of a company's performance.

(ii) Limited to Single Period

It provides insights into a company's financial position for a single period and does not consider trends or changes over time.

(iii) Manipulation

Similar to horizontal analysis, vertical analysis can be manipulated if line items are misclassified or if accounting policies are changed.

5. Define trend analysis.

Ans :

Trend Analysis in financial statement analysis involves evaluating data over time to identify any consistent patterns or trends. It helps analysts and investors understand how a company's financial performance is changing and allows for better forecasting and decision-making.

6. Ratio Analysis.

Ans :

Ratio analysis is a quantitative method of gaining insight into a company's liquidity, operational efficiency, and profitability by studying its financial statements such as the balance sheet and income statement.

7. Uses of Ratio Analysis.

Ans :

Ratio analysis serves several important purposes in financial analysis:

(i) Performance Evaluation

Ratios help assess a company's financial performance over time by comparing key financial metrics across different periods.

(ii) Comparative Analysis

Ratios allow for comparison with industry averages, competitors, or benchmarks, providing insights into a company's relative performance.

(iii) Financial Health Assessment

Ratios provide a snapshot of a company's financial health, indicating its ability to meet short-term and long-term obligations, manage its assets efficiently, and generate profits.

8. Advantages of ratio analysis.

Ans :

Ratio analysis is crucial in financial analysis for several reasons:

(i) Performance Evaluation

Ratios help assess a company's financial performance over time, highlighting trends and areas of improvement or concern.

(ii) Comparative Analysis

Ratios allow for comparison with industry averages, competitors, or historical data, providing insights into a company's relative performance.

(iii) Financial Health

Ratios provide a snapshot of a company's financial health, indicating its ability to meet short-term and long-term obligations.

9. What is cash flow statement ?

Ans :

A cash flow statement explains the inflows and outflows of cash and cash equivalents during a specified period of time. Such inflows and outflows are classified into operating investing and financing activities during a particular period of time.

10. Features of cash flow statement.

Ans :

The important features of cash flow statement are as follows,

1. Cash flow statement acts as an important device which is being used in the financial planning.

2. Cash flow statement basically relies upon the past information i.e., the actual cash receipts and cash payments for a specified time period.

3. Cash flows comprise of both cash inflows and cash outflows and the information derived out of the CFS is useful in preparing the cash budget.

Exercise Problems

1. The following Trading and Profit and Loss Account of Fantasy Ltd. for the year 31-3-2000 is given below:

Particular	Rs.	Particular	Rs.
To Opening Stock	76,250	By Sales	5,00,000
To Purchases	3,15,250	By Closing stock	98,500
To Carriage and Freight	2,000		
To Wages	5,000		
To Gross Profit b/d	2,00,000		
	5,98,500		5,98,500
To Administration expenses	1,01,000	By Gross Profit b/d	2,00,000
To Selling and Dist. expenses	12,000	By Non-operating incomes:	
To Non-operating expenses	2,000	By Interest on Securities	1,500
To Financial Expenses	7,000	By Dividend on shares	3,750
Net Profit c/d	84,000	By Profit on sale of shares	750
	2,06,000		2,06,000

Calculate:

1. Gross Profit Ratio 2. Expenses Ratio 3. Operating Ratio
4. Net Profit Ratio 5. Operating (Net) Profit Ratio 6. Stock Turnover Ratio.

[Ans : 40%, 22.60%, 82.60%, 16.8%, 17.40%, 3.43 times]

2. The Balance Sheet of Punjab Auto Limited as on 31-12-2002 was as follows:

Particular	Rs.	Particular	Rs.
Equity Share Capital	40,000	Plant and Machinery	24,000
Capital Reserve	8,000	Land and Buildings	40,000
8% Loan on Mortgage	32,000	Furniture & Fixtures	16,000
Creditors	16,000	Stock	12,000
Bank overdraft	4,000	Debtors	12,000
Taxation:		Investments (Short-term)	4,000
Current	4,000	Cash in hand	12,000
Future	4,000		
Profit and Loss A/c	12,000		
	1,20,000		1,20,000

From the above, compute (a) the Current Ratio, (b) Quick Ratio, (c) Debt-Equity Ratio, and (d Proprietary Ratio.

[Ans : 1.43, 1.40, 0.53, 0.5]

3. The summarized balance sheet of Bhadresh Ltd. as on 31.12.05 and 31.12.2006 are as follows:

Liabilitie	2005	2006	Assets	2005	2006
Share capital	4,50,000	4,50,000	Fixed asset	4,00,000	3,20,000
General Reserve	3,00,000	3,10,000	Investment	50,000	60,000
P & 1 a/c	56,000	68,000	Stock	2,40,000	2,10,000
Creditors	168,000	1,34,000	Debtor	2,10,000	4,55,000
Tax provision	75,000	10,000	Bank	1,49,000	1,97,000
Mortgage loan	10,49,000	12,42,000		10,49,000	12,42,000

Additional Details:

1. Investment costing Rs. 8,000 were sold for Rs. 8,500
2. Tax provision made during the year was Rs. 9,000
3. During the year part of fixed assets costing Rs 10,000 was sold for Rs 12,000 and the profit was included in P & L A/c. You are required to prepare cash flow statement for 2006.

[Ans : 1,49,000]

4. Prepare cash flow statement of Satyam ltd. From the following:

Liabilities	1.1.06	31.12.06	Assets	1.1.06	31.12.06
Share capital	1,00,000	4,00,000	Goodwill	–	20,000
8% debenture	–	2,00,000	Machinery	1,25,000	4,75,000
Retained earning	60,000	90,000	Stock	20,000	80,000
Creditors	40,000	1,00,000	Debtor	30,000	1,00,000
Bills payable	20,000	40,000	Bank	50,000	1,50,000
Tax provision	30,000	40,000	Cash	25,000	45,000
	2,50000	8,70,000		2,50,000	8,70,000

Additional Details:

1. During 2006 the business of a sole trader was purchased by issuing share for Rs. 2,00,000. The assets acquired from him were:

   Goodwill Rs. 20,000, machinery Rs. 1,00,000 , stock Rs. 50,000 and Debtors Rs.30,000
2. Provision for tax charged in 2006 was Rs. 35,000
3. The debenture was issued at a premium of 5% which is included in the retained earnings.
4. Depreciation charged on machinery was Rs.30,000.

[Ans : 75,000]

Choose the Correct Answers

1. Profitability ratios are based on _____. [c]

   (a) Sales (b) Investment

   (c) Both (a) and (b) (d) Purchases

2. According to modus operandi, analysis are divided into _____. [d]

   (a) Horizontal analysis (b) Vertical analysis

   (c) Internal analysis (d) Both (a) and (b)

3. Following are the methods used in analyzing financial statements are _____. [d]

   (a) Trend ratios (b) Ratio analysis

   (c) Comparative analysis (d) All the above

4. Ratio analysis is useful to _____. [b]

   (a) Management (b) Both (a) and (c)

   (c) Government (d) Students

5. The ratio which measures the relationship between operating cost and net sales is_____, [a]

   (a) Operating ratio (b) Gross profit ratio

   (c) Net profit ratio (d) Operating profit ratio

6. Dividend coverage ratio = [c]

   (a) $\frac{\text{PBIT}}{\text{Interest}}$ (b) $\frac{\text{PAT}}{\text{Interest}}$

   (c) $\frac{\text{PAT}}{\text{Dividend}}$ (d) $\frac{\text{PBIT}}{\text{Dividend}}$

7. The net cash flow are classified into operating, financing and investing activities in _____. [a]

   (a) Cash flow statement (b) Funds flow statement

   (c) Balance sheet (d) None

8. Cash flows from _____ activities result from the major revenue producing activities of a firm [c]

   (a) Financing (b) Investing

   (c) Operating (d) Both (a) and (b)

9. As per Accounting Standard-3, Cash Flow is classified into _____. [d]

(a) Operating activities and investing activities

(b) Investing activities and financing activities

(c) Operating activities and financing activities

(d) Operating activities, financing activities and investing activities

10. Cash Flow Statement is also known as _____. [c]

(a) Statement of Changes in Financial Position on Cash basis

(b) Statement accounting for variation in cash

(c) Both a and b

(d) None of the above

Fill in the blanks

1. _____ is a collection of data which is organized according to the logical and consistent accounting procedures.
2. _____ is a major tool used for analyzing the financial statements.
3. _____ ratio facilitates to identify whether the company has enough capability to meet its short term obligations/requirements.
4. The ratio which measures the relationship between gross profit and net sales is _____.
5. _____ reveals the effects of transactions involving the changes in cash or cash equivalents.
6. Cash flow statement is useful for _____.
7. Cash flows are _____and _____ of cash and cash equivalents.
8. Cash flow statement (based on AS-3) indicates change in _____.
9. Cash payments to supplies for goods and services is an example of _____.
10. _____ refers to the cash a business requires for day-to-day operations, (or) specifically.

ANSWERS

1. Financial statements
2. Ratio analysis
3. Liquidity
4. Gross profit ratio
5. Cash flow statement
6. Short-term financial analysis
7. Inflows and outflows
8. Cash and cash equivalents
9. Operating activity
10. Working Capital

UNIT II

(a) Time Value of Money: Future Value: Simple, Compound Interest and Annuity, Present Value: Discounted, Annuity, Equated Loan Amortization, Perpetuity using Spreadsheets.

(b) Risk and Return: Holding Period Returns, Arithmetic Mean vs Geometric Mean, Risk: Standard Deviation, Coefficient of Variation, Beta, Covariance of Stock.

2.1 Time Value of Money

2.1.1 Definition

Q1. Explain the concept of time value of money.

Ans : **(Imp.)**

Meaning

The time value of money (TVM) is the concept that a sum of money is worth more now than the same sum will be at a future date due to its earnings potential in the interim. The time value of money is a core principle of finance. A sum of money in the hand has greater value than the same sum to be paid in the future. The time value of money is also referred to as the present discounted value.

Investors prefer to receive money today rather than the same amount of money in the future because a sum of money, once invested, grows over time. For example, money deposited into a savings account earns interest. Over time, the interest is added to the principal, earning more interest. That's the power of compounding interest.

If it is not invested, the value of the money erodes over time. If you hide Rs.1,000 in a mattress for three years, you will lose the additional money it could have earned over that time if invested. It will have even less buying power when you retrieve it because inflation reduces its value.

As another example, say you have the option of receiving Rs. 10,000 now or Rs.10,000 two years from now. Despite the equal face value, Rs.10,000 today has more value and utility than it will two years from now due to the opportunity costs associated with the delay. In other words, a delayed payment is a missed opportunity.

The time value of money has a negative relationship with inflation. Remember that inflation is an increase in the prices of goods and services. As such, the value of a single dollar goes down when prices rise, which means you can't purchase as much as you were able to in the past.

Formula

The most fundamental formula for the time value of money takes into account the following: the future value of money, the present value of money, the interest rate, the number of compounding periods per year, and the number of years.

Based on these variables, the formula for Time value of money is:

$$FV = PV\left(1+\frac{i}{n}\right)^{n\times t}$$

Where,

FV = Future Value of Money

PV = Present Value of Money

i = Interest Rate

n = No.of compounding periods per year

t = Number of Years

The TVM formula may change slightly depending on the situation. For example, in the case of annuity or perpetuity payments, the generalized formula has additional or fewer factors.

Q2. Explain the importance of time value of money. How does the time value of money relate to opportunity cost?

Ans :

The time value of money is a fundamental concept in finance that recognizes the idea that a dollar today is worth more than a dollar in the future.

This concept is important for several reasons:

1. Comparing Investments

It allows investors to compare investment opportunities with different cash flow timing. By discounting future cash flows back to the present value, investors can determine which investment is more valuable.

2. Cost of Capital

It helps in determining the cost of capital for a company. The cost of capital represents the minimum return that investors expect from the company's investments, taking into account the time value of money.

3. Budgeting and Planning

It is crucial for budgeting and planning purposes. Companies need to consider the time value of money when making decisions about capital expenditures, budget allocations, and project timelines.

4. Valuing Assets

It is used to value assets and liabilities on the balance sheet. For example, the value of long-term liabilities such as bonds payable is determined by discounting future cash flows.

5. Risk and Uncertainty

It helps in incorporating risk and uncertainty into financial decisions. Cash flows that are further into the future are more uncertain, and the time value of money reflects this uncertainty.

6. Inflation

It considers the impact of inflation on the purchasing power of money. By discounting future cash flows, the time value of money accounts for the fact that inflation reduces the value of money over time.

The time value of money is a fundamental concept in finance that is used in various aspects of financial decision-making, investment analysis, and valuation. Understanding the time value of money is essential for making informed financial decisions and managing risk.

Opportunity cost is key to the concept of the time value of money. Money can grow only if it is invested over time and earns a positive return. Money that is not invested loses value over time. Therefore, a sum of money that is expected to be paid in the future, no matter how confidently it is expected, is losing value in the meantime.

Q3. Explain the uses of Time value of money.

Ans :

Uses of time value of money

1. It would be hard to find a single area of finance where the time value of money does not influence the decision-making process.

2. The time value of money is the central concept in discounted cash flow (DCF) analysis, which is one of the most popular and influential methods for valuing investment opportunities.

3. It is also an integral part of financial planning and risk management activities.

4. Pension fund managers, for instance, consider the time value of money to ensure that their account holders will receive adequate funds in retirement.

5. The value of money changes over time and there are several factors that can affect it.

6. Inflation, which is the general rise in prices of goods and services, has a negative impact on the future value of money.

7. That's because when prices rise, your money only goes so far.

8. Even a slight increase in prices means that your purchasing power drops. So that rupee you earned in 2024 and kept in your piggy bank buys less today than it would have back then.

Q4. What impact does inflation have on the time value of money?

Ans :

The time value of money (TVM) and inflation are closely related concepts in finance. TVM refers to the idea that a sum of money has different values at different times due to its earning potential. Inflation, on the other hand, is the rate at which the general level of prices for goods and services is rising, leading to a decrease in the purchasing power of money over time.

Inflation affects the Time Value of Money

i) Purchasing Power

Inflation reduces the purchasing power of money over time. This means that the same amount of money will buy fewer goods and services in the future than it does today. As a result, the future value of money decreases.

ii) Interest Rates

Inflation affects interest rates, which are a key component of Time Value of Money calculations. Lenders generally require higher interest rates in inflationary environments to compensate for the decrease in purchasing power over time. This means that the cost of borrowing money increases, which can impact the future value of investments and loans.

iii) Discount Rates

In financial analysis, discount rates are used to calculate the present value of future cash flows. Inflation is an important factor in determining the appropriate discount rate to use. Higher inflation rates typically result in higher discount rates, which reduce the present value of future cash flows.

iv) Investment Returns

Inflation erodes the real return on investments. For example, if an investment earns a nominal return of 5% but inflation is 3%, the real return is only 2%. This is important to consider when evaluating the future value of investments.

Overall, understanding the relationship between TVM and inflation is crucial in financial planning, investment analysis, and decision-making.

Q5. State the time values of money in different areas of decision making.

Ans :

I) Personal Financial Decision

1. When an organization or an individual is interested to invest in a CD (commercial deposit) or in money market account then, time value of money helps in computing the future value on the basis of the compound interest.
2. If in case an organisation borrows money installment loan with an aim either to purchase a car or a vehicle. In this regard time value of money helps in ascertaining as the amount of monthly installments by using the present value of loan.
3. When an organisation intends to make an investment in the bond market then, what amount must be paid for a bond can be computed with the help of the present value of the bond using the compounding technique.
4. If an organisation wins the lottery, then is it necessary to make instant payments or after some duration is to be decided upon.

II) Valuation Decisions on the Financial Statements

1. The amount of loan can be computed by using the present value of the loan.
2. Issue price of the bonds is also calculated on the basis of the present value of cashflows.
3. Time value of money is useful in ascertaining the leases on the basis of the present value of the cash flows.
4. For long-term assets, historical cost is calculated but it must not be greater than the present value of the cash flows.
5. For valuation of notes receivable too, the concept of time value of money is used to find the present value of cash flows using compounding technique.

Thus, in almost all the fields of business such investment, marketing and so on, the concept of time value of money is being used. Since, it acts as an important and significant dividend decision making and make experts under business world.

2.2 Future Value: Simple, Compound Interest and Annuity

Q6. What is Future Value? How to calculate future value of money.

Ans :

Meaning

Future value is a value of an investment or asset on a specific date in the future. To put it another way, the future value is the amount of money a given investment will be worth after a certain period, assuming a specific rate of return (interest rate).

Future value (FV) is the value of a current asset at a future date based on an assumed growth rate. Investors and financial planners use it to estimate how much an investment today will be worth in the future. External factors such as inflation can adversely affect an asset's future value. Future value can be contrasted with present value (PV).

Future Value

The future value calculation allows investors to predict the amount of profit that can be generated by assets. The future value of an asset depends on the type of investment.

The future value formula assumes a stable growth rate. If money is placed in a savings account with a guaranteed interest rate, then the future value is easy to determine accurately.

However, investments in the stock market or other securities with a volatile rate of return can yield different results.

I) Simple Annual Interest

The future value formula assumes a constant rate of growth and a single up-front payment left untouched for the duration of the investment. If an investment earns simple interest compounded annually, then the FV formula is:

$$FV = I \times (1 + (R \times T))$$

Where,

FV = Future value

I = Investment amount

R = Interest rate

T = Number of Years

If a Rs.1,000 investment is held for five years in a savings account with 10% simple interest paid annually, the FV of the Rs.1,000 equals Rs.1,000 × [1 + (0.10 × 5)], or Rs.1,500.

II) Compounded Annual Interest

With compounded interest, the rate is applied to each period's cumulative account balance. In the example above, the first year of investment earns 10% × Rs.1,000, or Rs.100, in interest. The following year, however, the account total is Rs. 1,100 rather than Rs.1,000. To compound interest, the 10% interest rate is applied to the full balance for second-year interest earnings of 10% × Rs.1,100, or Rs.110. The formula for the FV of an investment earning compounding interest is:

$$FV = I \times (1 + R)T$$

where

I = Investment amount

R = Interest rate

T = Number of years

Q7. What are the advantages/uses of calculating future value?

Ans :

Advantages of using FV Calculations

Future Value (FV) calculations are used in finance to determine the value of an asset or investment at a specified date in the future, based on a certain rate of return or interest rate. There are several advantages to using Future Value calculations:

1. Planning for the Future

Future Value calculations help individuals and businesses plan for future financial needs by estimating the value of investments over time. This can be useful for retirement planning, saving for major purchases, or estimating future wealth.

2. Comparing Investment Options

Future Value calculations allow investors to compare different investment options by estimating the future value of each option. This can help investors make informed decisions about where to invest their money.

3. Setting Financial Goals

Future Value calculations can help individuals and businesses set financial goals by providing a target value to aim for. This can help motivate individuals to save and invest, knowing the potential future value of their investments.

4. Evaluating Investment Performance

Future Value calculations can be used to evaluate the performance of an investment over time. By comparing the actual future value of an investment to the expected future value, investors can determine whether the investment is meeting their expectations.

5. Understanding the Time Value of Money

Future Value calculations illustrate the concept of the time value of money, which states that a dollar today is worth more than a dollar in the future due to its potential earning capacity. This concept is fundamental to finance and investing.

Hence, Future Value calculations are a powerful tool in finance that can help individuals and businesses make informed decisions about investing and planning for the future.

Q8. What are the limitations/disadvantages of calculating Future Value ?

Ans :

While Future Value (FV) calculations are a useful tool in finance, they also have some limitations:

1. Assumption of Constant Interest Rate

Future Value calculations assume a constant interest rate over the investment period. In reality, interest rates can fluctuate, which can affect the actual future value of an investment.

2. Ignoring Other Factors

Future Value calculations often focus solely on the investment amount and interest rate, ignoring other factors that can affect the value of an investment, such as taxes, fees, and inflation.

3. No Guarantee of Returns

Future Value calculations provide an estimate of the future value of an investment based on certain assumptions. However, there is no guarantee that the actual returns will match the estimated returns.

4. Limited to Certain Types of Investments

Future Value calculations are most commonly used for investments that have a fixed rate of return, such as bonds or savings accounts. They may not be as useful for investments with variable returns, such as stocks.

5. Does Not Account for Risk

Future Value calculations do not account for the risk associated with an investment. Two investments with the same expected future value may have different levels of risk, which can affect an investor's decision.

6. Simplifying Assumptions

Future Value calculations often rely on simplifying assumptions, such as annual compounding, which may not accurately reflect real-world investment scenarios. Future value usually assumes constant growth. Growth may not always be linear or consistent year-over-year.

2.3 PRESENT VALUE DISCOUNTED, ANNUITY

Q9. What is present value? Explain understanding of the present value of money?

Ans :

Meaning

Present value (PV) is the current value of a future sum of money or stream of cash flows given a specified rate of return. Future cash flows are discounted at the discount rate, and the higher the discount rate, the lower the present value of the future cash flows. Determining the appropriate discount rate is the key to properly valuing future cash flows, whether they be earnings or debt obligations.

Understanding Present Value

Present value is the concept that states that an amount of money today is worth more than that same

amount in the future. In other words, money received in the future is not worth as much as an equal amount received today.

Receiving Rs.1,000 today is worth more than Rs.1,000 five years from now. Because an investor can invest that Rs.1,000 today and presumably earn a rate of return over the next five years. Present value takes into account any interest rate an investment might earn.

Q10. How to calculate the Present Value of a money using formulas?

Ans:

The present value formula discounts the future value to today's dollars by factoring in the implied annual rate from either inflation or the investment rate of return.

Present Value Formula and Calculation

$$\text{Present Value} = \frac{FV}{(1+r)^n}$$

Where,

FV = Future Value

r = rate of return

n = number of years

1. Input the future amount that you expect to receive in the numerator of the formula.
2. Determine the interest rate that you expect to receive between now and the future and plug the rate as a decimal in place of "r" in the denominator.
3. Input the time period as the exponent "n" in the denominator. So, if you want to calculate the present value of an amount you expect to receive in three years, you would plug in the number three.
4. A number of online calculators are available, including this present value calculator.

Q11. Describe how to determine discounted rate in present value ?

Ans :

Determining the discount rate for present value calculations involves considering several factors, including the riskiness of the investment, the time value of money, and the opportunity cost of capital. Here are some common methods for determining the discount rate:

1. Risk-Free Rate

The risk-free rate is the return on an investment with no risk of financial loss, such as a government bond. It serves as a baseline for determining the discount rate, with riskier investments requiring a higher discount rate.

2. Market Risk Premium

The market risk premium represents the additional return investors require for taking on the risk of investing in the stock market rather than a risk-free asset. It is often added to the risk-free rate to determine the discount rate for an investment.

3. Beta Coefficient

Beta is a measure of a stock's volatility compared to the overall market. A higher beta indicates higher volatility and, therefore, a higher discount rate to account for the increased risk.

4. Weighted Average Cost of Capital (WACC)

WACC is the average rate of return a company expects to pay to its investors, weighted based on the proportion of debt and equity in its capital structure. It represents the opportunity cost of capital for the company and is often used as the discount rate for investment decisions.

5. Required Rate of Return

The required rate of return is the minimum return an investor expects to achieve on an investment to compensate for the risk and time value of money. It is based on the investor's risk tolerance, investment goals, and market conditions.

6. Cost of Debt

For projects or investments financed with debt, the cost of debt is used as the discount rate to account for the interest payments required on the debt.

7. Company-Specific Factors

In some cases, the discount rate may be adjusted based on company-specific factors, such as industry risk, management quality, and growth prospects.

Q12. Explain the difference between future value and present value with an example.

Ans:

Following are some of the differences between future value and present value,

	Future Value		Present Value
1.	Future value of money refers to the value of present money at specified future date at a specific interest rate.	1.	Present value refers to the value of tomorrow's/ future money at present.
2.	Formula for calculating future value is, Future Value (FV_n) = $V_o(1 + I)^n$	2.	Formula for calculating the present value is, Present Value (PV_o) = $F\left[\frac{1}{(1+i)^r}\right]$
3.	It is the asset value which is determined at the end of the period.	3.	It is the asset value which is determined at the beginning of the period.
4.	It is the nominal value which does not consider inflation.	4.	It is the discounted value which considers inflation.
5.	It comprises of only interest rate.	5.	It comprises of both interest rate and discount rate.
6.	Importance of future value in investment decision making is less.	6.	Importance of present value in investment decision making is more.
7.	It is also known as compounding technique.	7.	It is also known as discounting technique.
8.	The formula to calculate future value of an annuity $FVA_n = \frac{X(1+r)^n - 1)}{r}$	8.	The formula to calculate present value of an annuity, $PVA_n = \frac{X\left[\left\{1-\left(\frac{1}{1+r}\right)^n\right\}\right]}{r}$
9.	**Example:** If a person is investing ` 20,000 for 6 years with an interest rate of 15%per annum, then the future value after 6 years will be, (20,000 × (1 + (0.15 × 6)) = ` 38,000	9.	**Example:** Ifa person is investing ` 10,000 for 8 years with a discount rate of 10% pa then the present value after 8 years will be, $\left(10{,}000\left[\frac{1}{1.10^8}\right]\right)$ = ` 4665.07

PROBLEMS

1. Calculate the value 5 years hence of a deposit of `1,000 made today if the interest rate is,

(a) 8 percent

(b) 10 percent

(c) 12 percent

(d) 15 percent.

Sol :

Given that,

` 1000 is deposited today

The formula for calculating the compound interest/ future value after 5 years when the rate of interest is 8%, 10%, 12% and 15% is,

$$V_n = V_o(1+1)^n$$

Where,

V_n – Future value after n period

V_g – Original sum of money = 1000

I – Interest rate = 8%, 10%, 12% and 15%

n – Number of period-5 years

Future Value After 5 Years at 8% Interest Rate

$V_5 = 1000\ (1 + 0.08)^5$, I = 0.08, V_0 = 1000, n = 5

$= 1000(1.08)^5$

= ` 1,469.3

∴ Future value after 5 years of deposit @ 8% interest rate `1,469.3.

Future Value after 5 years @ 10% Interest Rate

I = 0.10, V_0 = 1000, n = 5

$V_5 = 1000(1 + 0.10)^5$

$= 1000(1.10)^5$

= 1,630.5

= ` 1,611

∴ Future value after 5 years of deposit @ 10% interest rate ` 1,611.

Future Value @ 12% Interest Rate After 5 Years

∴ I = 0.12, V_o = 1000, n = 5

$V_5 = 1000(1 + 0.12)^5$

$= 1000(1.12)^5$

= ` 1,762.3

∴ Future value @ 12% interest after 5 years ` 1,762.3.

Future Value @ 15% Interest Rate After 5 Years

$I = 0.15, V_0 = 1000, n = 5$

$V_s = 1000(1 + 0.15)^5$

$= 1000(1.15)^5$

$= ` 2,011.4$

∴ Future value @ 15% interest rate after 5 years ` 2,011.4.

2. If you deposit ` 5000 today at 12 percent rate of interest in how many years (roughly) will this amount grow to ` 1,60,000 ? Work this problem using the rule of 72.

Sol : **(Imp.)**

Given that,

Interest rate = 12%

Amount deposited = 5,000

Amount growth = 1,60,000

Here, we need to determine the number of years taken for obtaining the growth of ` 1,60,000. As given in the question, using thumb rule of Doubling period is used.

$$\text{Doubling period} = \frac{72}{\text{Rate of interest}}$$

$$= \frac{72}{12} = 6 \text{ years}$$

It takes 6 years to double the original amount 5000 will become 10,000 after 6 years.

Amount growth = 1,60,000

As per the table value of future value interest factor at 12% for obtaining a growth of ` 1,60,000 is 30 years

$= 5000(1.12)^{30}$ (∴ 1 + 0.12)

Where,

n = 30 years

$= 5000(29.960)$

$= ` 1,49,800$

∴ It takes 30 years or above for obtaining growth in amount to 1,60,000.

3. You can save ` 2,000 a year for 5 years, and ` 3,000 a year for 10 years thereafter. What will these savings cumulate to at the end of 15 years, if the rate of interest is 10 percent?

Sol :

(a) 2000 a year for 5 years savings @ 10% interest rate

(b) 3000 a year for 10 years savings @ 10% interest rate.

The formula for determining the sum of amount after 15 years.

$$FVA_n = X[(1+r)^n - 1] / r$$

Where,

x – Constant periodic flow

r – Interest rate per period

n – Duration of the annuity

(a) 2000 a Year for 5 years @ 10% Interest Rate

$FVA_n = 2000\ (1 + 0.10)^5 = 1]/0.10$

X = 2000

r = 0.10

n = 5

$$= \frac{2000(1.10)^5 - 1}{0.10}$$

$$= \frac{2000(0.61051)}{0.10}$$

$$= \frac{1,221.02}{0.10}$$

= `12,210.2

$\therefore$ FVA_n = `12,210.2 after 5 years

(b) Saving 3000 a Year @ 10% interest Rate After 10 Years

$$FVA_0 = \frac{X[(1+r)^n + 1]}{r}$$

X = 3000

i = 0.10

n = 10 years

$$= \frac{3000[(1+0.1)^{10} - 1]}{0.10}$$

$$= \frac{3000[(1.10)^{10} - 1]}{0.10}$$

$$= \frac{3000(1.5937)}{0.10}$$

$$= \frac{4,781.227}{0.10}$$

= `47,812.27

$\therefore$ FVA_n = 47,812.27 after 10 years.

Thus, by adding these two, we get,

= 12,210.2 + 47,812.27

= ` 60,022.47

∴ Savings after fifteen years = ` 60,022.

Thus, by adding these two, we get,

= 12,210.2 + 47,812.27 = ` 60,022.47

∴ Savings after fifteen years = 60.022.

4. Find the present value of ` 10,000 receivable after 8 years if the rate of discount is,

(i) 10 percent

(ii) 12 percent and

(iii) 15 percent.

Sol : **(Imp.)**

P.V after 8 years of ` 10,000 = ?

Given that,

Discount rates 10%, 12%, 15%

$$V_0 = \frac{V_n}{(1+I)^n}$$

Where,

V_n – Future value n period

1 – Discount rate

V_o – Present value

n – Number of period/years

V – 10,000

I – 0.10

(a) At 10% Interest Rate

$$V_0 = \frac{10000}{(1+0.10)^8}$$

$$= \frac{10000}{(1.10)^8}$$

$$= \frac{10000}{2.1435}$$

= `4,665

∴ Present value of ` 10,000 receivable after 8 years a 10% discount fate = ` 4,665.

(b) At 12% Interest Rate

$$V_0 = \frac{V_n}{(1+I)^n}$$

Where,

$I = 0.12$

$V_n = 10,000$

$n = 8$ years

$$= \frac{10000}{(1+0.12)^8}$$

= ` 4,039

∴ Present value of `10,000 receivable after 8 years 12% discount rate = ` 4,039.

(c) At 15% Interest Rate

$$V_n = \frac{V_n}{(1+I)^n}$$

Where,

$I = 0.15$

$V_n = 10,000$

$n = 8$ years

$$= \frac{10000}{(1+0.15)^8}$$

= ` 3.269

∴ Present value of ` 10,000 receivable after 8 years at discount rate `3,269.

2.4 EQUATED LOAN AMORTIZATION AND PERPETUITY

Q13. What is meant by Equated Loan Amortiza-tion? How does it work ? Explain the working mechanism of equated Loan Amortization.

Ans : **(Imp.)**

Definition

The time period to pay off the complete loan as well as the amount to be paid over the period is predetermined and mentioned in the terms and conditions of the loan. Paying off the loan over the scheduled period with equated payments or installments at regular intervals is known as 'Amortization'.

Equated Loan Amortization, also known as Equal Principal Payment, is a method of loan repayment where the principal amount is equally divided over the loan tenure, along with interest calculated on the outstanding principal balance. Each installment consists of a portion that goes towards paying off the principal amount and another portion that covers the interest for that period.

Working Mechanism

1. Equal Principal Payments

In equated loan amortization, the borrower pays a fixed amount towards the principal every period (typically monthly) until the loan is fully repaid. The interest, however, is calculated on the remaining balance, so the interest portion decreases with each payment as the principal balance decreases.

2. Reducing Balance Method

As the principal amount is fixed for each installment, the interest portion decreases over time since it is calculated on the reducing balance (the outstanding principal). This means that the total amount paid each month remains the same, but the ratio of principal to interest changes over time.

3. Loan Schedule

A loan schedule is typically provided at the beginning of the loan, outlining the monthly installments, the amount allocated to principal, the amount allocated to interest, and the outstanding balance after each payment.

'Equated Loan Amortization' is beneficial for borrowers as it helps in managing their budget since the installment amount remains constant, making it easier to plan finances. It also ensures that a larger portion of the initial payments goes towards repaying the principal, which can help reduce the total interest paid over the life of the loan.

Q14. Define perpetuity. Explain the uses and limitation of perpetuity?

Ans :

Meaning

Perpetuity is a financial concept that refers to a series of cash flows that continues indefinitely. It is a type of annuity where the periodic payments continue forever, with no end date. Perpetuity are commonly used in finance for valuation purposes and to model certain types of investments.

Uses

1. Valuation

Perpetuity are used to value certain types of investments, such as preferred stocks or bonds, that pay a fixed dividend or interest payment indefinitely.

2. Growth Stocks

Perpetuity can be used to estimate the value of growth stocks that are expected to pay dividends indefinitely, assuming a stable growth rate.

3. Real Estate

Perpetuity can be used to value certain types of real estate investments, such as properties with long-term leases that provide a stable income stream.

Limitations

1. Inflation

Perpetuities do not account for inflation, which can erode the purchasing power of the cash flows over time. This limitation can be addressed by using a real discount rate that adjusts for inflation.

2. Changing Circumstances

Perpetuities assume that the cash flows will continue indefinitely, which may not always be the case. Changes in the market, economy, or business conditions could affect the ability of the cash flows to continue indefinitely.

3. Interest Rate Changes

Perpetuities are sensitive to changes in interest rates. A change in the discount rate used to value the perpetuity can significantly affect its present value.

4. No Terminal Value

Perpetuities do not have a terminal value, which means that they do not account for any value that may be realized at the end of the perpetuity period. This can be a limitation in certain valuation contexts where a terminal value is expected.

While Perpetuities can be a useful tool for valuation and modeling, it is important to consider their limitations and the specific context in which they are being used.

Q15. Explain in detail how to calculate equated loan amortization and perpetuity using Spreadsheets?

Ans :

To calculate equated loan amortization and perpetuity using spreadsheets, you can use the following steps in Microsoft Excel or Goggle Sheets:

Equated Loan Amortization

1. **Loan Amount**: Enter the loan amount in a cell (e.g., A1) and label it "Loan Amount".
2. **Interest Rate:** Enter the annual interest rate in a cell (e.g., A2) and label it "Interest Rate".
3. **Loan Term:** Enter the loan term in years in a cell (e.g., A3) and label it "Loan Term".
4. **Monthly Payment:** Use the following formula to calculate the equated monthly installment (EMI):

= – PMT(A2/12, A3*12, A1)

This formula calculates the monthly payment required to amortize the loan over the loan term at the given interest rate.

Amortization Schedule

Create a table with columns for Payment Number, Payment Amount, Principal Repayment, Interest Payment, and Remaining Balance. Use the following formulas to fill in the table:

i) Payment Number (starting from 1 to A3*12): = ROW() – 1

ii) Payment Amount (EMI): = ABS(A4)

iii) Principal Repayment: =– PPMT(A2/12, A1, A3*12, A4, A1)

iv) Interest Payment: = – IPMT(A2/12, ROW()–1, A3*12, A1)

v) Remaining Balance: =A1+SUM(C$5:C5)

Perpetuity

1. **Cash Flow:** Enter the cash flow amount in a cell (e.g., A1) and label it "Cash Flow".
2. **Discount Rate:** Enter the discount rate in a cell (e.g., A2) and label it "Discount Rate".
3. **Perpetuity Value:** Use the following formula to calculate the present value of the perpetuity:

= A1/A2

This formula calculates the present value of a perpetuity with a constant cash flow at a constant discount rate.

In both cases, ensure that the formulas reference the correct cells and adjust the formulas as needed based on your specific requirements.

Q16. Explain different methods of spreadsheet formulas for calculating 'Equated Loan Amortization'?

Ans :

To calculate equated loan amortization using spreadsheet formulas, you can use the following formulas in Microsoft Excel or Google Sheets:

I) Calculate Monthly Payment (EMI)

[= – PMT (rate, nper, pv, [fv], [type])]

i) rate: The interest rate per period.

ii) nper: The total number of payment periods.

iii) pv: The present value, or the loan amount.

iv) fv (optional): The future value or a cash balance you want to attain after the last payment is made; it's usually 0.

v) type (optional): When payments are due (0 for end of period, 1 for beginning of period).

II) Calculate Interest Payment for a Specific Period

[= – IPMT(rate, per, nper, pv, [fv], [type])]

i) rate: The interest rate per period.

ii) per: The period for which you want to find the interest payment.

iii) nper: The total number of payment periods.

iv) pv: The present value, or the loan amount.

v) fv (optional): The future value or a cash balance you want to attain after the last payment is made; it's usually 0.

vi) type (optional): When payments are due (0 for end of period, 1 for beginning of period).

III) Calculate Principal Repayment for a Specific Period:

[=-PPMT(rate, per, nper, pv, [fv], [type])]

i) **rate:** The interest rate per period.

ii) **per:** The period for which you want to find the principal repayment.

iii) **nper:** The total number of payment periods.

iv) **pv:** The present value, or the loan amount.

v) **fv (optional):** The future value or a cash balance you want to attain after the last payment is made; it's usually 0.

vi) **type (optional):** When payments are due (0 for end of period, 1 for beginning of period).

IV) Calculate Remaining Balance after a Specific Period:

[=-FV(rate, nper, pmt, [pv], [type])]

i) **rate:** The interest rate per period.

ii) **nper:** The total number of payment periods.

iii) **pmt:** The payment made each period.

iv) **pv (optional):** The present value, or the loan amount.

v) **type (optional):** When payments are due (0 for end of period, 1 for beginning of period).

These formulas can be used to create an amortization schedule for a loan, showing the breakdown of each payment into principal and interest components, as well as the remaining balance after each payment.

Q17. Explain different methods of calculating Present value of perpetuity in cash flows stream in spreadsheet?

Ans : **(Imp.)**

Calculating perpetuity in a spreadsheet involves determining the present value of an infinite series of cash flows that continue indefinitely. There are several ways to calculate perpetuity in a spreadsheet, depending on the specific context and assumptions. Here are some common methods:

Using a Simple Division

If the perpetuity cash flow is constant and starts immediately, you can calculate the present value by dividing the cash flow by the discount rate:

[= Cash Flow / Discount Rate]

For example, if the cash flow is Rs.100 and the discount rate is 5%, the perpetuity value would be Rs.100 / 0.05 = Rs.2,000.

Using the PV Function

i) You can use the PV (Present Value) function in Excel to calculate the present value of a perpetuity:

[= PV(rate, nper, pmt, [fv], [type])]

ii) **'rate'**: The discount rate per period.

iii) **'nper:** The number of periods (since perpetuity has an infinite number of periods, you can use a large number).

iv) **pmt:** The payment amount per period (the perpetuity cash flow).

v) **fv (optional):** The future value; usually 0 for perpetuity.

vi) **type (optional):** When payments are due (0 for end of period, 1 for beginning of period).

Using a Large Number of Periods

i) Since a perpetuity has an infinite number of periods, you can approximate it by using a very large number of periods in the PV function:

[= PV(rate, 1000000, pmt, 0, 0)]

ii) This assumes a very large number of periods (e.g., 1,000,000) to approximate infinity.

Using the Annuity Formula

i) You can also calculate perpetuity using the annuity formula, which is the formula for the present value of an ordinary annuity:

[= Cash Flow / Discount Rate]

iii) This formula is derived from the perpetuity formula by recognizing that an ordinary annuity is a finite version of a perpetuity.

These methods can be used to calculate the present value of a perpetuity in a spreadsheet, allowing you to determine the value of a perpetual cash flow stream.

2.5 Risk and Return

Q18. Define risk ? Explain the nature and scope of risk.

Ans : **(Imp.)**

Meaning

Risk is virtually anything that threatens or limits the ability of a community or nonprofit organization to achieve its mission. It can be unexpected and unpredictable events such as destruction of a building, the wiping of all your computer files, loss of funds through theft or an injury to a member or visitor who trips on a slippery floor and decides to sue.

Nature and Scope of Risk

All organizations deal with risks, though the nature and magnitude may differ for each type of organization. This is especially true for banks / financial institutions, as they deal with money. They act as financial intermediaries in any economic system. They help in mobilizing household / corporate savings and making them available to deficit units. In their role as financial intermediaries, banks and financial institutions are involved in the following activities which results in various types of risks.

(a) Funds mobilization

Funds are mobilized by accepting term deposits as well as by allowing customers to operate their checking accounts by leaving balances in them.

(b) Funds deployment

The funds that are mobilized are first subject to regulatory investment requirements i.e., banks have to invest a specified proportion of their funds in certain instruments, often government securities. The surplus funds are available as loans for various segments of corporate and retail borrowers.

(c) Funds transfer

Banks and financial institutions are key vehicles for moving funds on behalf of their customers. Banks acts as settlement agents for their corporate clients in the realization and payment of their funds.

(d) Risk transfer

Manufacturing and other companies are exposed to a number of risks. Some of the risks are central to their business. The risk that arise from the financial markets should transfer to the Banks, since if is the latter's core competence to handle them.

(e) Transaction services

Banks assist their customers in carrying out various trade transactions, both domestic and international. International transactions involves dealing with multiple currencies. The global network of the banking system and its relationship constitute the backbone of such trade.

(f) Credit enhancement services

In the course of trade, the concerned parties may not be familiar with each other. Therefore, the suppliers of goods often expect the bank's help in evaluating or enhancing the credit worthiness of a customer.

Q19. Explain the various sources of risk.

Ans : **(Imp.)**

The various sources of risk are as follows,

1. Interest Rate Risk

The changes that are brought in the returns of securities due to variability in the interest rates is called as interest rate risk. The interest rate risk is caused when the rate of interest goes up then it decreases the market value of investment. The interest rate risk is tolerated by the bank by choosing it, is not being accepted as unexpectedly.

An organization while offering financial services get ready to face risk, confirms that should manage it without difficulty instead of getting it converted into any other unwanted risk.

2. Market Risk

Firm faces market risk when values fluctuate due to market factors. Market factors include market interest rates, equity prices, foreign exchange rates and commodity prices. Usually, referred to as systematic risk, non diversifiable risk or beta risk.

3. Inflation Risk

This risk is linked with interest rate risk. An increase in inflation lead to an increased in interest rates. So, the inflation risk is caused when the changes in the economy is uncertain.

4. Financial Risk

It arises when firms make use of debt financing as a source of finance. Financial risk involves the aspect of financial leverage. In financial risk, other things being constant, while purchasing assets if the amount borrowed is more, then returns would tend to fluctuate more. .

5. Business Risk

A change in sales affects to the earnings before interest and tax. Due to this, a business enterprise faces the risk of a decrease in firm value. When the value of the firm decreases then it reflects to the shareholders value.

6. Liquidity Risk

When a firm is not able to purchase or sell a particular product within a short span of time, being its value unchanged, then it is referred as liquidity risk. To operate the business smoothly it is very essential for any firm to possess liquidity.

7. Country Risk

Organization faces country risk when it plans to operate its business internationally either by investing or by lending in foreign countries. It is also known as sovereign risk. Country risk includes economic and political factors.

8. Foreign Exchange Risk or Exchange Rate Risk

When business operates internationally then the currency value tend to change in the foreign exchange is called as exchange rate risk. The changes in currency rates occur due to the uncertainties in the global markets. And the firm's value get affected by this changes in currency value.

Q20. Explain various types of risk.

(OR)

Define Systematic Risk and Unsystematic Risk?

Ans :

(I) Systematic Risks

Non diversifiable risk is called systematic risk. It arises on account of economy wide uncertainties & the investor's tendency and is also called as Market Risk. Some examples are Government changes, interest rate policy, corporate tax rate increased etc.

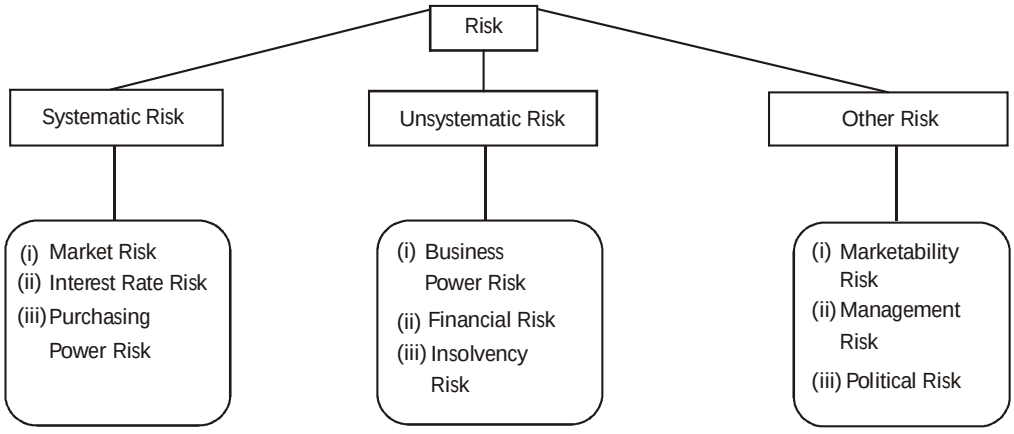


Fig . : Types of risks

(i) Market Risk

Market risk arises out of changes in Demand and Supply of goods and service in the markets. Market risk is unpredictable. It is not controllable. It is uncontrollable factor of the risk. Investors have failure due to lack of knowledge of market.

(ii) Interest Rate Risk

Investment is always expected to return in terms of interest rate. Interest rate changes from time to time. The loan borrowed by companies and stock brokers generally depend on interest rates. When interest rate is changed, the market activity and investor perceptions change with the changes in interest rates. The monetary and fiscal policy that is not controllable by the investor affects the riskiness of investment due to their effects in terms of returns, expectations and total principal amount.

(iii) Purchasing Power Risk

Purchasing power risk is the uncontrollable risk. Inflation means it rises the prices of the commodities and service. Cost push inflation is caused due to wage rise or rise in input prices. Price of the commodities increase due to inadequate supplies and rising demand.

II) Unsystematic Risks

All diversifiable risks are called unsystematic risk. These arises from the unique uncertainties of individual securities. These type of risk can be totally reduced through diversification.

(i) Business Risk

Business risk refers to the variability of the business, sales, income, profits etc. It can depend on the market conditions for the product mix, input supplies, strength of competitors etc. Business risk is internal risk due to fall in production, labour problems, raw material problems or inadequate supply of electricity etc. It leads to fall in revenues and in profit of the company.

(ii) Financial Risk

Financial risk refers to the method of financing adopted by the company, high leverage leading to larger debt servicing problems or short term liquidity problems due to bad debts, delayed receivables and fall in current assets or rise in current liabilities. Financial problems observed are in terms of earnings, profits, dividends.

(iii) Default or Insolvency Risk

The borrower/issuer of securities may become insolvent due to default or delay in the payment in terms of installments or principal repayments.

(III) Other Risks

(i) Political Risks

Political risks refer to changes in the government tax rate, monetary policy, fiscal policy, impositions control and administrative regulations etc.

(ii) Management Risk

Management risk refers to error and inefficiencies of management, causing losses to the company.

(iii) Marketability Risks

It refers to the involved loss of liquidity or loss of value in conversions from one asset to another.

Q21. Distinguish between systematic risk and unsystematic risk.

Ans : **(Imp.)**

S.No.	Systematic Risk	S.No.	Unsystematic Risk
1.	Systematic risk is known as non-diversifiable risk /not diversifiable/ market risk/ macroeconomic risk.	1.	Unsystematic risk is known as diversifiable risk, not systematic risk.
2.	Systematic risk arises on account of the economy with uncertainties and the tendency of individual securities to move together with the change in the market.	2.	Unsystematic risk is that part of risk which arises from the uncertainties and which are unique to individual securities and can be diversifiable.
3.	Directly related with economic system of a country.	3.	Directly not related with economic system, rather it is more about business or company related.
4.	We cannot reduce this type of risk individually.	4.	This type of risk can be reduced
5.	Negatively correlated investment cannot eliminate the risk.	5.	It is possible to eliminate the risk by forming portfolio of negatively correlated investment.
6.	Beta is a measure of systematic risk	6.	Unsystematic risk is the function of may macroeconomic factors related with business.
7.	Basically investors not try to work with systematic risk.	7.	Investors always try to reduce this type of risk through better managing their investment.
8.	Systematic risk can be eliminated through several ways like hedging, asset allocation and diversi-fication.	8.	Unsystematic risk that can be eliminated through portfolio diversification.
9.	Systematic risk is divided into three categories, i.e. Interest risk, market risk and purchasing power risk.	9.	Unsystematic risk, is divided into two broad category business risk and financial risk.

2.5.1 Holding Period Return

Q22. Define Holding Period Returns and how are they calculated?

Ans :

Holding period return (HPR) is the total return earned on an investment over the period it is held. It takes into account both capital appreciation (or depreciation) and any income generated from the investment, such as dividends or interest. HPR is expressed as a percentage and is calculated using the following formula:

$$HPR = \frac{\text{Ending Value} - \text{Beginning Value} + \text{Income}}{\text{Beginning Value}} \times 100\%$$

Where:

i) Ending Value is the value of the investment at the end of the holding period.

ii) Beginning Value is the value of the investment at the beginning of the holding period.

iii) Income is any income generated by the investment, such as dividends or interest.

Example

If you purchased a stock for Rs.1,000, received Rs. 50 in dividends, and sold the stock for Rs.1,200 after one year, the HPR would be:

$$HPR = \left(\frac{1,200 - 1,000 + 50}{1,000}\right) \times 100\% = \left(\frac{250}{1,000}\right) \times 100\% = 25\%$$

So, the holding period return for this investment would be 25%.

2.6 Arithmetic Mean Vs Geometric Mean

Q23. Explain how to calculate arithmetic mean and geometric mean in spreadsheet?

Ans : **(Imp.)**

Arithmetic mean and geometric mean are two different measures of central tendency used in statistics and finance. Here's an explanation of each with procedures and formulas using a spreadsheet:

Arithmetic Mean

i) The arithmetic mean is the average of a set of values, calculated by summing all values and dividing by the number of values.

ii) Formula:

$$\text{Arithmetic Mean} = \frac{\text{Sum of Values}}{\text{Number of Values}}$$

Procedure in Spreadsheet

Enter the values in a column (e.g., A1:A5).

Use the following formula to calculate the sum of values: = SUM(A1:A5).

Use the following formula to calculate the arithmetic mean: = AVERAGE(A1:A5).

Geometric Mean

i) The geometric mean is the nth root of the product of n values, where n is the number of values.

ii) Formula: Geometric Mean = $\sqrt[n]{\text{Value}_1 \times \text{Value}_2 \times ... \times \text{Value}_n}$

Procedure in Spreadsheet

Enter the values in a column (e.g., A1:A5).

Use the following formula to calculate the product of values: = PRODUCT(A1:A5).

Use the following formula to calculate the geometric mean: = GEOMEAN(A1:A5).

Example:

i) Values: 2, 4, 6, 8, 10.

ii) Arithmetic Mean : $\frac{2+4+6+8+10}{5} = \frac{30}{5} = 6.$

iii) Geometric Mean: Q $\sqrt[5]{2 \times 4 \times 6 \times 8 \times 10} = \sqrt[5]{3840} \approx 4.84.$

In this example, the arithmetic mean is 6, while the geometric mean is approximately 4.84. The geometric mean is useful for calculating average growth rates of returns over multiple periods, especially when dealing with investments or financial data.

Q24. Compare and contrast arithmetic mean, and geometric mean?

Ans :

Here is a table representing the difference between arithmetic and geometric mean.

The difference between the arithmetic mean and Geometric mean is given below in the tabulated form.

Sl.No.	Nature	Geometric Mean	Arithmetic Mean
1.	**Meaning**	It is known as the multilicative name.	It is known as additive mean.
2.	**Values**	The geometric mean is always less than the arithmetic mean because of the compounding effect.	The arithemtic mean is always greater than the arithmetic mean because it is computed as a simple average.
3.	**Data Set**	The geometric mean formula applied only on the positive set of numbers.	The arithmetic mean formula can be applied on both the positive set of numbers and the negative sets of numbers
4.	**Uses**	The geometric mean is wiedly used by biologists, economists, and financial analysts. It is most accurate for the dataset that manifests correlation.	The arithmetic mean is used to represent average temperature as well as determine the average speed of a car.
5.	**Effect of outliers**	The effect of the outliers on Geometric is moderate. For example, in the given data set 11.13.17 and 1000. In this case, 1000 is the outlier and the average is 39.5	The effect of the outliers on arithmetic is severe. For example, in the given data set 11.13.17 and 1000. In this case, 1000 is the outlier and the average is 260.25.

2.6.1 Standard Deviation

Q25. Explain how to calculate standard deviation in MS Excel?

Ans : **(Imp.)**

Meaning

Karl Pearson introduced the concept of standard deviation in the year 1823. It is widely used as a method of dispersion and satisfies most of the properties which helps in measuring dispersion. It is also called "root mean square deviation". It is represented by small Greek letter 'σ'. It is useful in measuring the absolute dispersion and judging the representativeness of the mean.

Formula for Standard Deviation:

1. Calculate the mean of the data set.
2. For each data point, subtract the mean and square the result.
3. Calculate the mean of the squared differences.
4. Take the square root of the mean from step 3 to get the standard deviation.

The formula for standard deviation is:

$$\text{Standard Deviation} = \sqrt{\frac{\sum_{i=1}^{N}(X_i - \bar{X})^2}{N}}$$

Where,

x_i = Each Individual Data Point

$\bar{X}$ = Mean of the data Set

N = Total Number of Data Points.

Using a Spreadsheet (Excel or Google Sheets)

Let's assume your data is in cells A1 to A10.

1. Calculate the mean

[=AVERAGE(A1:A10)]

2. Calculate the squared differences from the mean:

[= ARRAY FORMULA ((A1:A10

– AVERAGE (A1 : A10)) 2)]

3. Calculate the standard deviation:

[= SQRT(SUM((A1:A10

– AVERAGE(A1:A10))2)

/COUNT(A1:A10))]

This formula calculates the standard deviation of the data in cells A1 to A10. Adjust the range (A1:A10) to match your data set.

2.6.2 Coefficient of Variation

Q26. Explain how to calculate coefficient of variation in spread-sheet?

Ans : **(Imp.)**

The coefficient of variation (CV) is a measure of relative variability that expresses the standard deviation as a percentage of the mean. It is used to compare the degree of variation relative to the mean between different data sets. Here's how to calculate the coefficient of variation using the formula and in a spreadsheet:

Formula for Coefficient of Variation

Coefficient of Variation (CV)

$$= \left(\frac{\text{Standard Deviation}}{\text{Mean}} \right) \times 100\%$$

Where:

i) Standard Deviation: The measure of the dispersion of data points around the mean.

ii) Mean: The average value of the data set.

Using a Spreadsheet (Excel or Google Sheets):

Assuming your data is in cells A1 to A10:

1. Calculate the mean:

[=AVERAGE(A1:A10)]

2. Calculate the standard deviation:

[=STDEV(A1:A10)]

3. Calculate the coefficient of variation:

[=(STDEV(A1:A10)/AVERAGE(A1:A10))*100]

This formula calculates the coefficient of variation for the data in cells A1 to A10. Adjust the range (A1:A10) to match your data set. The result will be expressed as a percentage.

2.6.3 Beta

Q27. Explain how to calculate 'Beta (β)' in spreadsheet ?

Ans : **(Imp.)**

Beta (β) is a measure of a stock's volatility in relation to the market. It indicates how sensitive the stock's returns are to changes in the market index. Here's how to calculate beta using the formula and in a spreadsheet:

$$\beta = \frac{\text{Covariance}(R_s, R_m)}{\text{Variance}(R_m)}$$

Formula for Beta

Where:

R_s = Returns of the stock

R_m = Returns of the market index (e.g., S&P 500)

Covariance (R_s, R_m) = Covariance between the stock returns and market returns

Variance (R_m) = Variance of the market returns

Using a Spreadsheet (Excel or Google Sheets)

i) Calculate the returns of the stock and the market index for the same time period. Let's assume the stock returns are in cells A2:A11 and the market index returns are in cells B2:B11.

ii) Calculate the average returns for the stock and the market index:

1. **Stock average return**

   [=AVERAGE(A2:A11)]

2. **Market average return:**

   [=AVERAGE(B2:B11)]

3. **Calculate the co-variance between the stock and the market index returns:**

   [=COVARIANCE.P(A2:A11, B2:B11)]

4. **Calculate the variance of the market index returns:**

   [=VAR.P(B2:B11)]

5. **Calculate the beta using the formula:**

   [=COVARIANCE.P(A2:A11, B2:B11)/VAR.P (B2:B11)]

This formula calculates the beta of the stock using the data in cells A2:A11 for stock returns and B2:B11 for market index returns. Adjust the range to match your data set.

A beta value greater than 1 indicates that the stock is more volatile than the market.

While a beta less than 1 indicates that it is less volatile.

2.6.4 Covariance of Stock

Q28. Explain Co-variance of Stock with formula and procedure in spreadsheet ?

Ans :

Co-variance is a measure of how two variables change together. In the context of stocks, co-variance measures the relationship between the returns of a stock and the returns of a market index (such as the S&P 500). A positive co-variance indicates that the two variables move in the same direction, while a negative co-variance indicates that they move in opposite directions.

Formula for Co-variance

The formula for co-variance between two variables X and Y is:

$$\text{Covariance (X, Y)} = \frac{\Sigma_{i=1}^{n}(X_i - \bar{X}) \times (Y_i - \bar{Y})}{n}$$

Where

i) X_i and Y_i are the individual data points for variables X and Y.

ii) $\bar{X}$ and $\bar{Y}$ are the means of variables X and Y, respectively.

iii) n is the total number of data points.

Procedure in Spreadsheet

Calculate the Mean

For stock returns (column A) and market index returns (column B):

Stock average return

= AVERAGE(A2:A11)

Market average return

= AVERAGE(B2:B11)

Calculate the Co-variance

Use the following formula to calculate the co-variance between the stock and market index returns:

= COVARIANCE.P(A2:A11, B2:B11)

Interpretation

i) A positive co-variance indicates a positive relationship (both variables move in the same direction).

ii) A negative co-variance indicates a negative relationship (variables move in opposite directions).

iii) **Note**: The interpretation of co-variance is limited because it does not provide a standardized measure. The correlation coefficient is often used instead, as it standardizes the measure of the relationship between two variables, ranging from -1 to 1.

Short Questions and Answers

1. Time value of money.

Ans :

The time value of money (TVM) is the concept that a sum of money is worth more now than the same sum will be at a future date due to its earnings potential in the interim. The time value of money is a core principle of finance. A sum of money in the hand has greater value than the same sum to be paid in the future. The time value of money is also referred to as the present discounted value.

Investors prefer to receive money today rather than the same amount of money in the future because a sum of money, once invested, grows over time. For example, money deposited into a savings account earns interest. Over time, the interest is added to the principal, earning more interest. That's the power of compounding interest.

2. Uses of time value of money

Ans :

i) It would be hard to find a single area of finance where the time value of money does not influence the decision-making process.

ii) The time value of money is the central concept in discounted cash flow (DCF) analysis, which is one of the most popular and influential methods for valuing investment opportunities.

iii) It is also an integral part of financial planning and risk management activities.

3. What is Future Value?

Ans :

Future value is a value of an investment or asset on a specific date in the future. To put it another way, the future value is the amount of money a given investment will be worth after a certain period, assuming a specific rate of return (interest rate).

Future value (FV) is the value of a current asset at a future date based on an assumed growth rate. Investors and financial planners use it to estimate how much an investment today will be worth in the future. External factors such as inflation can adversely affect an asset's future value. Future value can be contrasted with present value (PV).

4. Advantages of Future value.

Ans :

There are several advantages to using Future Value calculations:

i) Planning for the Future

Future Value calculations help individuals and businesses plan for future financial needs by estimating the value of investments over time. This can be useful for retirement planning, saving for major purchases, or estimating future wealth.

ii) Comparing Investment Options

Future Value calculations allow investors to compare different investment options by estimating the future value of each option. This can help investors make informed decisions about where to invest their money.

iii) Setting Financial Goals

Future Value calculations can help individuals and businesses set financial goals by providing a target value to aim for. This can help motivate individuals to save and invest, knowing the potential future value of their investments.

iv) Evaluating Investment Performance

Future Value calculations can be used to evaluate the performance of an investment over time. By comparing the actual future value of an investment to the expected future value, investors can determine whether the investment is meeting their expectations.

5. What is present value?

Ans :

Present value (PV) is the current value of a future sum of money or stream of cash flows given a specified rate of return. Future cash flows are discounted at the discount rate, and the higher the discount rate, the lower the present value of the future cash flows. Determining the appropriate discount rate is the key to properly valuing future cash flows, whether they be earnings or debt obligations.

6. Equated Loan Amortization

Ans :

The time period to pay off the complete loan as well as the amount to be paid over the period is predetermined and mentioned in the terms and conditions of the loan. Paying off the loan over the scheduled period with equated payments or installments at regular intervals is known as 'Amortization'.

7. Perpetuity

Ans :

Perpetuity is a financial concept that refers to a series of cash flows that continues indefinitely. It is a type of annuity where the periodic payments continue forever, with no end date. Perpetuity are commonly used in finance for valuation purposes and to model certain types of investments.

8. Limitation of perpetuity

Ans :

i) Inflation

Perpetuities do not account for inflation, which can erode the purchasing power of the cash flows over time. This limitation can be addressed by using a real discount rate that adjusts for inflation.

ii) Changing Circumstances

Perpetuities assume that the cash flows will continue indefinitely, which may not always be the case. Changes in the market, economy, or business conditions could affect the ability of the cash flows to continue indefinitely.

iii) Interest Rate Changes

Perpetuities are sensitive to changes in interest rates. A change in the discount rate used to value the perpetuity can significantly affect its present value.

9. Define risk.

Ans :

Risk is virtually anything that threatens or limits the ability of a community or nonprofit organization to achieve its mission. It can be unexpected and unpredictable events such as destruction of a building, the wiping of all your computer files, loss of funds through theft or an injury to a member or visitor who trips on a slippery floor and decides to sue.

10. Holding Period Returns

Ans :

Holding period return (HPR) is the total return earned on an investment over the period it is held. It takes into account both capital appreciation (or depreciation) and any income generated from the investment, such as dividends or interest. HPR is expressed as a percentage and is calculated using the following formula:

$$HPR = \frac{\text{Ending Value} - \text{Beginning Value} + \text{Income}}{\text{Beginning Value}} \times 100\%$$

Where:

i) Ending Value is the value of the investment at the end of the holding period.

ii) Beginning Value is the value of the investment at the beginning of the holding period.

iii) Income is any income generated by the investment, such as dividends or interest.

Exercise Problems

1. Calculate the future value of ` 20,000 invested now for a period of 5 years at a time preference rate of

   (Ans: ` 29,380).

2. A company offers to pay you ` 5,002 annually for 6 years if you deposit ` 20,000 today with the company. What interest rate do you earn on the deposit?

   (Ans: 13%).

3. An investment company pays 12 percent rate of interest and compound it quarterly. If ` 5,000 are deposited initially, how much shall it grow to in 5 years?

   (Ans: ` 9030).

4. Assume the rate of interest is 12 percent. Compute the Annual Percentage/Effective Rate (AP/ER) if interest is paid (a) annually, (b) semi-annually, (c) quarterly and (d) monthly. What are the implications of more frequent payments of interest?

   (Ans: (a) 12%, (b) 12.36 %, (c) 12.55 %, (d) 12,68 %).

Choose the Correct Answers

1. What does the time value of money principle state? [a]
   (a) A dollar today is worth more than a dollar in the future.
   (b) A dollar in the future is worth more than a dollar today.
   (c) A dollar today is worth the same as a dollar in the future.
   (d) The value of money does not change over time.
2. How is the future value of an investment calculated? [c]
   (a) FV = PV × (1 + r) (b) FV = PV / (1 + r)
   (c) FV = PV × (1 + r) ^ n (d) FV = PV / (1 + r) ^ n
3. An annuity is a series of: [c]
   (a) Increasing payments (b) Decreasing payments
   (c) Equal payments (d) Random payments
4. What does the present value represent? [a]
   (a) The value of a future sum of money (b) The value of a current sum of money
   (c) The value of money in the future (d) The value of money over time
5. The concept of the time value of money is important in which of the following financial decisions? [d]
   (a) Borrowing money (b) Saving for retirement
   (c) Investing in stocks (d) All of the above
6. What does the risk-return trade-off suggest? [b]
   (a) Higher risk is always associated with higher returns
   (b) Higher risk is associated with lower returns
   (c) Lower risk is associated with lower returns
   (d) There is no relationship between risk and return
7. Which of the following is a measure of relative variability? [d]
   (a) Mean (b) Standard deviation
   (c) Variance (d) Coefficient of variation
8. Beta is a measure of: [a]
   (a) Stock volatility compared to the market (b) Stock price compared to earnings
   (c) Dividend yield compared to stock price (d) Total return compared to risk-free rate
9. The risk-free rate is used in finance to: [c]
   (a) Determine the maximum amount of risk an investor should take
   (b) Estimate the future value of an investment
   (c) Calculate the expected return of a risky investment
   (d) Measure the volatility of a stock
10. Diversification is a strategy used to: [b]
   (a) Increase the risk of a portfolio (b) Decrease the risk of a portfolio
   (c) Increase the return of a portfolio (d) Guarantee a positive return.

Fill in the Blanks

1. The time value of money is also referred to as the _____.
2. _____ reduces the purchasing power of money over time.
3. The _____ calculation allows investors to predict the amount of profit that can be generated by assets.
4. _____ calculations assume a constant interest rate over the investment period.
5. Paying off the loan over the scheduled period with equated payments or installments at regular intervals is known as _____.
6. Equated Loan Amortization, also known as Equal _____.
7. _____ is a financial concept that refers to a series of cash flows that continues indefinitely.
8. _____ is virtually anything that threatens or limits the ability of a community or nonprofit organization to achieve its mission.
9. Non diversifiable risk is called _____ risk.
10. _____ risks refer to changes in the government tax rate, monetary policy, fiscal policy, impositions control and administrative regulations etc.

ANSWERS

1. Present discounted value
2. Inflation
3. Future value
4. Future Value
5. 'Amortization'
6. Principal Payment
7. Perpetuity
8. Risk
9. Systematic
10. Political

UNIT III

Capital Budgeting Techniques: Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Profitability Index, Decision Tree, Cash Flow in Capital Budgeting, Cost of Capital, Advance Capital Budgeting Techniques, Adjusted Present Value Approach, Competing Project Risk using Spreadsheets.

3.1 Capital Budgeting Techniques

Q1. Define capital budgeting. Explain the characteristics of capital budgeting.

Ans : **(Imp.)**

Meaning

Capital budgeting is the process of evaluating and selecting long-term investment projects or expenditures that involve significant amounts of capital. It is crucial for businesses to make informed decisions about which projects to invest in, as these decisions can have a significant impact on the company's future profitability and growth. Capital budgeting techniques help in assessing the feasibility and potential profitability of investment projects.

Characteristic

Some of the characteristic features of capital budgeting decision are,

(i) Growth

The impact of investment decisions continue in future and must be go through for a long period than the effects of current operating expenditure. Firm may incur heavy operating costs due to useless or loss making expansion of assets. On the other side, insufficient investment in assets may cause difficulty for firm to face competition and continue its market share.

(ii) Risk

If there is long term contract of funds it may change the difficulty involved in the firm's risk. If there is fluctuations in the profit of investment, then it will make the firm more risky. Hence, investment decisions figure out the prime features of risk of the firm.

(iii) Funding

Usually investment decisions consist of huge amount of funds which make it essential for the firm to organize its investment programmes. Investment programmes must be planned very cautiously and arrangement for attaining finances internally or externally must made in advance.

(iv) Irreversibility

Most investment decisions are non-rectifiable or not changeable. Capital items that are obtained, usually do not have any resale market. The firm will experience huge losses if such assets are scrapped.

(v) Complexity

Another important characteristic feature of capital investment decision is that it is the most difficult decision to make. Investment decision helps in evaluating the future events; which are hard to anticipate. It is truly a hard task to correctly determine the future cash flows of an investment. Economic, social, political and technological forces result in cash flow risk.

Q2. Discuss the techniques of capital budgeting in detail with advantages and disadvantages of each technique.

Ans : **(Imp.)**

Techniques of Capital Budgeting

1. Payback Period

The payback period is the time it takes for a project to recover its initial investment.

Merits

(i) This is a method which is simple to understand and equally simple to calculate.

(ii) This method prefers investment is short term periods. Therefore, it reduces the possibility of loss on account of obsolescence.

(iii) This method requires less time and labour and it is economical when compared to other techniques of capital budgeting.

(iv) This method makes it clear that no profits arises till the payback period is over. This inference is very useful for new companies in deciding when they should start paying dividends.

Demerits

(i) The payback period method does not take into account the time value of money. A rupee today is definitely worthy more than a rupee after a year. This basic fact is ignored by this method.

(ii) The payback period method ignores the returns that are generated by a project after its payback period.

(iii) It is not possible for the firm to evaluate true profitability of the project with the help of payback period because it considers only short period of time.

(iv) The cost of capital is also ignored which is a key factor in making good investment decisions.

2. Accounting Rate of Return

Accounting Rate of Return (ARR) is a traditional method of capital budget evaluation and it is also known as average rate of return method. According to this method, the capital investment proposals are judged on the basis of accounting information rather than cash flows.

Accounting rate of return can be calculated as,

(i) $$ARR = \frac{\text{Annual average net earnings}}{\text{Original investment}} \times 100$$

(ii) $$ARR = \frac{\text{Annual average net earnings}}{\text{Average investment}} \times 100$$

The term average annual net earnings is the average of the earnings after depreciation and tax over the whole of the economic life of the project. The amount of average investment is calculated as,

$$\text{Average investment} = \frac{\text{Origignal investment}}{2}$$

(OR)

$$\text{Average investment} = \left(\frac{\text{Origignal investment-Scrap value}}{2}\right) + \text{Net working capital} + \text{Salvage value}$$

It is assumed that depreciation is charged on straight line basis method. So, average investment is 50% of original cost less scrap value.

Merits

(i) Accounting rate of return can be easily understood and implemented.

(ii) It provides a better view of profitability as it uses entire profits of the project in evaluating rate of return.

(iii) As it requires accounting data, it can be easily obtained from financial data.

Demerits

(i) ARR also ignores the time value of money like payback period.

(ii) ARR focuses on accounting profits rather than cash flows which are more significant.

(iii) The firm cannot depend on this method to maximize the market value of shares.

(iv) This method is not suitable for investment proposal in which investment are made in installments.

3. Net Present Value (NPV)

NPV is the difference between the present value of cash inflows and the present value of cash outflows over the life of an investment.

Advantages

(i) It identifies the time value of money, hence can be used in any situation where cash flows are for different periods of time.

(ii) It is useful in calculating the true profitability of the investment proposal.

(iii) It takes into consideration the entire cash flows gained throughout the life of the project.

(iv) It also takes into account the objective of maximum profitability.

Disadvantages

(i) It is difficult to identify an appropriate discount rate.

(ii) This method involves many calculation and it is difficult to use when compared to traditional methods of evaluation.

(iii) The cost of capital is treated as discount rate, but in real life it is difficult to measure cost of capital.

4. Internal Rate of Return (IRR)

IRR is the discount rate that makes the net present value of all cash flows from a particular project equal to zero.

Merits

(i) IRR also take into consideration the time value of money and easily applicable to situations in which even and uneven cash flows exists.

(ii) It helps in calculating true profitability of the project as it consider all profits of the project.

(iii) The ascertainment of cost of capital is not very important as in case of NPV method.

(iv) It is suitable for goal of maximizing profits and it is one of the dependable techniques of capital budgeting.

Demerits

(i) The internal rate of return is one of the difficult method for evaluation of investment proposals.

(ii) If the expected life, size and cash outlays of the projects are not equal then the result of NPV and IRR will also differ.

(iii) When different rates are used it may create confusion.

5. Profitability Index (PI)

PI is the ratio of the present value of future cash flows to the initial investment.

Advantages

Accounts for the time value of money, helps in ranking projects in terms of efficiency.

Disadvantages

Does not provide a clear decision criterion, may not be suitable for projects with different cash flow patterns.

Q3. Explain the techniques of capital budgeting with formulas calculated in spreadsheets.

Ans : **(Imp.)**

Capital budgeting techniques are used to evaluate potential investment projects. Some common techniques include Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period, and Profitability Index.

Here's how to calculate these using formulas and in a spreadsheet (assuming yearly cash flows):

1. Net Present Value (NPV)

(a) Formula

$$NPV = \sum\left(\frac{\text{Cash Flow}}{(1+r)^n}\right) - \text{Initial Investment}$$

(b) Spreadsheet

- Enter cash flows (including initial investment) in column A (A1 to A5).
- Enter years in column B (B1 to B5).
- Use the formula =NPV(r, A1:A5)/(1+r) ^ B1 in cell C1 (assuming discount rate 'r' is in C1).

2. Internal Rate of Return (IRR)

(a) Formula

Calculate IRR where NPV = 0 using Excel's IRR function.

(b) Spreadsheet

(i) Enter cash flows (including initial investment) in column A (A1 to A5).

(ii) Use the formula =IRR(A1:A5) to calculate IRR.

3. Payback Period

(a) Formula

Find the point where cumulative cash flows equal initial investment.

(b) Spreadsheet

(i) Calculate cumulative cash flows in column B (B2 onwards) using =B1 + A2.

(ii) Use the formula =MATCH(TRUE, B:B>=0, 0)+1 to find the payback period.

4. Profitability Index (PI)

(a) Formula

$$PI = \frac{\text{PV of Cash Flows}}{\text{Initial Investment}}$$

5. Spreadsheet

(a) Calculate PV of cash flows in column B using =A1/(1+r) ^ B1.

(b) Use the formula =SUM(B1:B5)/A1 to find PI.

Note :

Remember to adjust the formulas and ranges based on your specific project data.

3.1.1 Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Profitability Index

Q4. Describe the techniques of capital budgeting in a spreadsheet with suitable examples.

Ans : **(Imp.)**

'Capital budgeting technique' is the company's process of analyzing the decision of investment/projects by taking into account the investment to be made and expenditure to be incurred and maximizing the profit by considering following factors like availability of funds, the economic value of the project, taxation, capital return, and accounting methods.

There are five techniques in capital budgeting :

1. Profitability index
2. Payback period
3. Net present value
4. Internal rate of return
5. Modified rate of return

Let us discuss this one by one in detail along with examples :

1. Profitability Index

Profitability Index is one of the essential techniques, and it signifies a relationship between the investment of the project and the payoff of the project.

The formula of profitability index given by :

Profitability Index = PV of future cash flows / PV of initial investment

Where PV is the present value.

It is mainly used for ranking projects. According to the rank of the project, a suitable project is chosen for investment.

2. Payback Period

This method of capital budgeting helps to find a profitable project. The payback period is calculated by dividing the initial investment by the annual cash flows. But the main drawback is it ignores the time value of money. By the time value of money

We mean that money is more today than the same amount in the future. So if we payback to an investor tomorrow, it includes an opportunity cost

As already mentioned, the payback period disregards the time value of money.

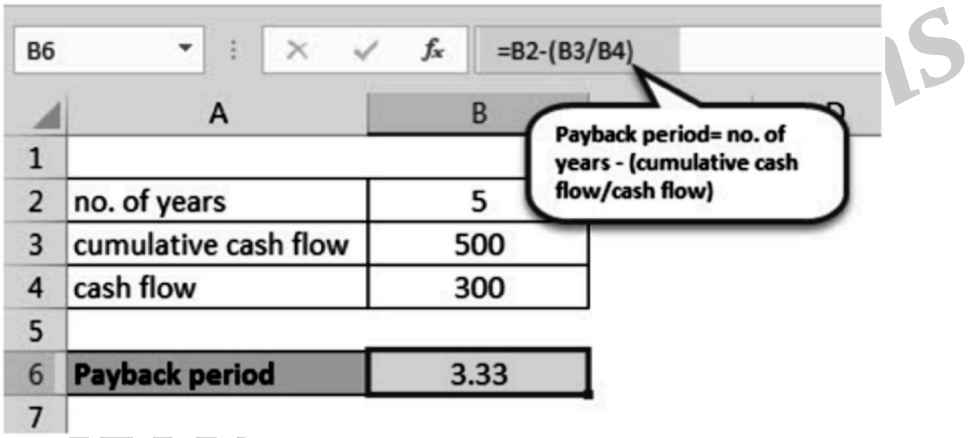
It is calculated by how many years it is required to recover the amount of investment done. Shorter paybacks are more attractive than more extended payback periods. Let's calculate the payback period for the below investment :

Example

For example, there is an initial investment of 1000 in a project, and it generates a cash flow of 300 for the next five years.

Year	0	1	2	3	4	5
Cash flow	–1000	300	300	300	300	300
Cumulative cash flow	–1000	–700	–400	–100	200	500

Therefore the payback period is calculated as below:



Payback period = no. of years – (cumulative cash flow/cash flow)

Payback period = 5 – (500/300)

= 3.33 years

Therefore it will take 3.33 years to recover the investment.

3. Net Present Value

Net Present Value

Is the difference between the present value of incoming cash flow and the outgoing cash flow over a particular time. It is used to analyze the profitability of a project.

The formula for the calculation of NPV is as below :

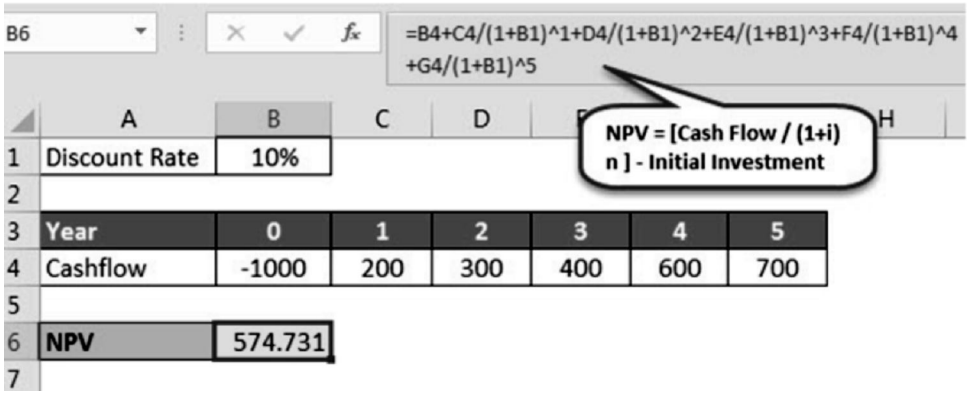
NPV = [Cash Flow / (1 + i)n] – Initial Investment

Here i is the discount rate, and n is the number of years.

Example :

Let us see an example to discuss it.

Let us assume the discount rate is 10%



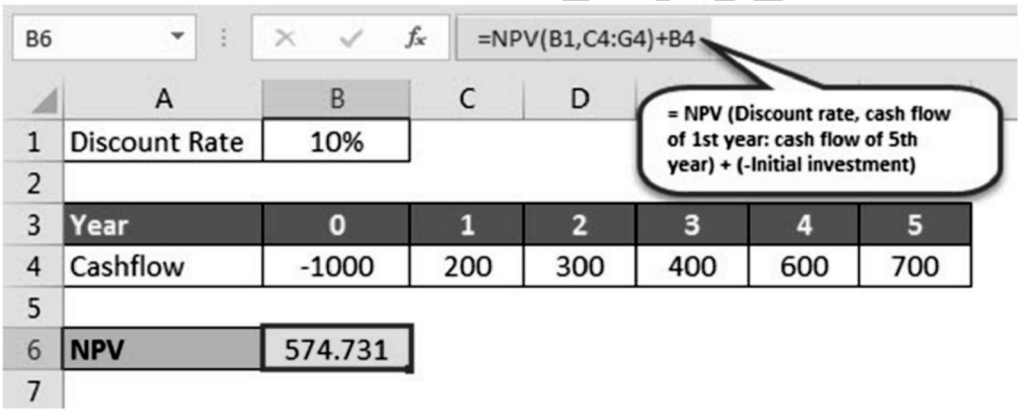
	A	B	C	D			H
1	Discount Rate	10%					
2							
3	Year	0	1	2	3	4	5
4	Cashflow	-1000	200	300	400	600	700
5							
6	NPV	574.731					
7							

NPV = $-1000 + 200/(1+0.1)^1 + 300/(1+0.1)^2 + 400/(1+0.1)^3 + 600/(1+0.1)^4 + 700/(1+0.1)^5$

= 574.731

We can also calculate it by basic excel formulas

There is an in-built excel formula of "NPV" which can be used. The discounting rate and the series of cash flows from the 1st year to the last year are considered arguments. We should not include the year zero cash flow in the formula. We should later subtract it.



	A	B	C	D			
1	Discount Rate	10%					
2							
3	Year	0	1	2	3	4	5
4	Cashflow	-1000	200	300	400	600	700
5							
6	NPV	574.731					
7							

= NPV (Discount rate, cash flow of 1st year: cash flow of 5th year) + (– Initial investment)

= NPV (10%, 200:700) – 1000

= 574.731

As NPV is positive, it is recommended to go ahead with the project. But not only NPV but IRR is also used for determining the profitability of the project.

4. Internal rate of return

The Internal rate of return is also among the top techniques that are used to determine whether the firm should take up the investment or not. It is used together with NPV to determine the profitability of the project.

IRR is the discount rate when all the NPV of all the cash flows is equal to zero.

NPV = [Cash Flow / $(1+i)^2$] – Initial Investment = 0

Here we need to find "i" which is the discount rate.

Example :

Now we shall discuss an example to understand the internal rate of return in a better way.

While calculating, we need to find out the rate at which NPV is zero. This is usually done by error and trial method else we can use excel for the same.

Year	0	1	2	3	4	5
Cashflow	–1000	200	300	400	600	700

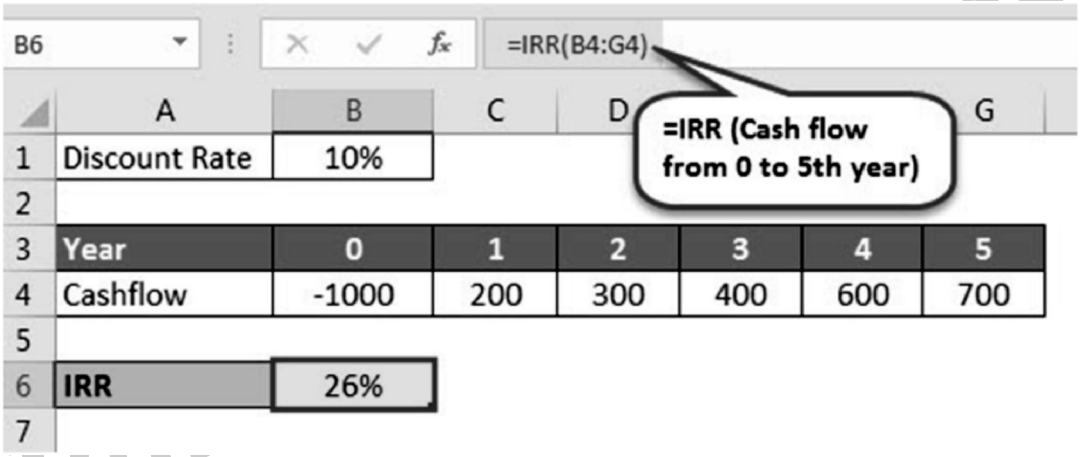
Let us assume the discount rate to be 10%.

NPV at a 10 % discount is 574.730.

So we need to increase the discount percentage to make NPV as 0.

So if we increase the **discount rate to 26.22 %,** the NPV is 0.5, which is almost zero.

There is an in-built excel formula of "IRR," which can be used. The series of cash flows is taken as arguments.



=IRR (Cash flow from 0 to 5th year)

= 26 %

Therefore in both ways, we get 26 % as the internal rate of return.

5. Modified Internal Rate of return

The main drawback of the internal rate of return that it assumes that the amount will be reinvested at the IRR itself, which is not the case. MIRR solves this problem and reflects the profitability in a more accurate manner.

The formula is as below :

MIRR = (FV (Positive cash flows* Cost of capital) / PV(Initial outlays * Financing cost))1/n–1

Where,

N = the number of periods

FVCF = the future value of positive cash flow at the cost of capital

PVCF = the present value of negative cash flows

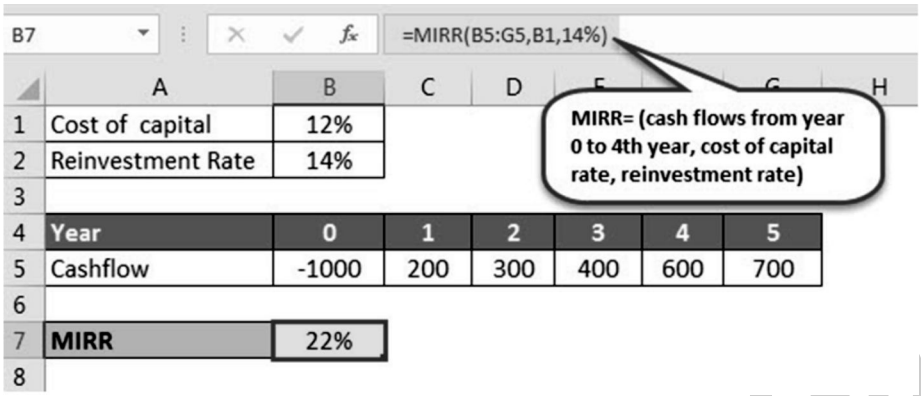
at the financing cost of the company.

Example :

We can calculate MIRR for the below example:

Let us assume the cost of capital

at 12%. In MIRR, we need to consider the reinvested rate, which we assume as 14%. In Excel, we can calculate as the below formulae



	A	B	C	D	E	F	G	H
1	Cost of capital	12%						
2	Reinvestment Rate	14%						
3								
4	Year	0	1	2	3	4	5	
5	Cashflow	-1000	200	300	400	600	700	
6								
7	MIRR	22%						
8								

MIRR = (cash flows from year 0 to 4th year, cost of capital rate, reinvestment rate)

MIRR = (-1000: 600, 12%, 14%)

MIRR = 22%

A MIRR in excel

is a better estimation than an internal rate of return.

Therefore capital budgeting methods help us to decide the profitability of investments that need to be done in a firm. There are different techniques to decide the return of investment.

Q5. What are the advantages and disadvantages of capital budgeting ?

Ans :

Advantages

1. Capital budgeting helps a company understand the various risks involved in an investment opportunity. And how these risks affect the returns of the company.
2. It helps the company to estimate which investment option would yield the best possible return.
3. A company can choose a technique/method from various techniques of capital budgeting to estimate whether it is financially beneficial to take on a project or not.
4. It helps the company to make long-term strategic investments.
5. It helps to make an informed decision about an investment considering all possible options.
6. All the techniques/methods of capital budgeting try to increase shareholders' wealth and give the company an edge in the market.
7. It helps a company in a competitive market to choose its investments wisely.
8. Capital budgeting presents whether an investment would increase the company's value or not.
9. It offers adequate control over expenditure for projects.
10. Also, it allows management to abstain from over-investing and under-investing.

Disadvantages

1. Capital budgeting decisions are for the long term and are majorly irreversible in nature.
2. These techniques are mostly based on estimations and assumptions as the future will always remain uncertain.
3. Capital budgeting still remains introspective as the risk factor, and the discounting factor remains subjective to the manager's perception.
4. A wrong capital budgeting decision can affect the company's long-term durability. And hence it needs to be done judiciously by professionals who understand the project well.

PROBLEMS

1. A choice is to be made between two competing projects which require an equal investment of ` 50,000 and are expected to generate net cash flows as under:

Particulars	Project I	Project II
End of year 1	25,000	10,000
End of year 2	15,000	12,000
End of year 3	10,000	18,000
End of year 4	Nil	25,000
End of year 5	12,000	8,000
End of year 6	6,000	4,000

The cost of capital of the company is 10 percent. Compute the Net Present Value and Internal Rate of Return and suggest which project is acceptable.

Sol :

Calculation of NPV

Year	PV@	Project-I		Project-II	
	10%	Cash flows	PVCF	Cash flows	PVCF
1	0.909	25,000	22,725	10,000	9,090
2	0.826	15,000	12,390	12,000	9,912
3	0.751	10,000	7,510	18,000	13,518
4	0.683	Nil	–	25,000	17,075
5	0.621	12,000	7,452	8,000	4,968
6	0.564	6,000	3,384	4j000	2,256
Total present			53,461		56,819
Less: Initial Investment			50,000		50,000
Net Present Value (NPV)			3,461		6,819

Comment

Since NPV of project-II is higher than project-I, select project-II.

Calculation of IRR for Project -1

Year	Cash flows	PV @ 14%	PVCF	PV@14%	
1	25,000	0.893	22,325	0.877	21,925
2	15,000	0.797	11,955	0.770	11,550
3	10,000	0.712	7,120	0.675	6,750
4	Nil	0.636	–	0.592	
5	12,000	0.567	6,804	0.519	6,228
6	6,000	0.507	3,042	0.456	2,736
			51,246		49,189

From the above calculations it is clear that NPV lies between 12% to 14%

$$IRR = L.R + \frac{NPV@LR - PV_{CO}}{\Delta\Sigma PV_S} \times \Delta R$$

$$= 12 + \frac{51,246 - 50,000}{51,246 - 49,189} \times 2$$

$$= 12 + \frac{1,246}{2,057} \times 2$$

$$= 12 + (0.606 \times 2)$$

$$= 12 + 1.212$$

$$= 13.212$$

Calculation of IRR for Project - II

Year	Cash flows	PV @ 14%	PVCF	PV@ 16%	PVCF
1	10,000	0.877	8,770	0.862	8,620
2	12,000	0.770	9,240	0.743	8,916
3	18,000	0.675	12,150	0.641	11,538
4	25,000	0.592	14,800	0.552	13,800
5	8,000	0.519	4,152	0.476	3,808
6	4,000	0.456	1,824	0.410	1,640
			50,936		78,322

From the above calculations it is clear that NPV lies between 14% to 16% P.V factor

$$IRR = L.R + \frac{NPV@LR - PV_{CO}}{\Delta\Sigma PV_S}$$

$$= 14 + \frac{50,936 - 50,000}{50,936 - 48,322} \times 2$$

$$= \frac{936}{2,614} \times 2$$

= 14 + (0.358 × 2)

= 14 + 0.716

= 14.716

Comment: The IRR of project-I is higher than the project-II

∴ Select project-I.

2. A firm is contemplating the following projects. Which one is better according to you?

Year	Project A	Project B
0	–1,00,000	–1,00,000
1	25,000	35,000
2	24,000	20,000
3	23,000	24,000
4	20,000	23,000
5	15,000	18,000

Closing NPV, PI and payback period evaluate the projects assuming a 10% discount rate.

Sol : **(Imp.)**

Computation of NPV of Project-A and Project-B

Year	Cash Flows Project-A	PV Factor Project-B	PV@ 10%	PVCF (A)	PVCF (B)
1	25,000	35,000	0909	22,725	31,815
2	24,000	20,000	0.826	19,824	16,520
3	23,000	24,000	0.751	17,273	18,024
4	20,000	23,000	0.683	13,660	15,709
5	15,000	18,000	0.621	9,315	11,178
				ΣPVA = 82,797	ΣPVB = 93,246

NPV of A = ΣPV – Initial investment

= 82,797 – 1,00,000

= ` – 17,203

NPV of B = 93,246 – 1,00,000

= ` – 6,754

Calculation of Profitability Index (P.I)

$$PI = \frac{\text{NPV (Net Present Value)}}{\text{Initial Cash Outlay}}$$

Project - A

$$PI = \frac{82,797}{1,00,000} = 0.828 \text{ (or) } 82.8\%$$

Project - B

$$PI = \frac{93,246}{1,00,000} = 0.932 \text{ (or) } 93.2\%$$

Calculation of Pay Back Period (PBP)

	Project - A		Project - B	
Year	**Cash Flow**	**Cumulative Cash Flow**	**Cash Flow**	**Cumulative Cash Flow**
1	25,000	25,000	35,000	35,000
2	24,000	49,000	20,000	55,000
3	23,000	72,000	24,000	79,000
4	20,000	92,000	23,000	1,02,000
5	15,000	1,07,000	18,000	1,20,000

Applying Interpolation Method

Project - A

$$\text{Pay Back Period (PBP)} = 4 \text{ years} + \frac{1,00,000 - 92,000}{1,07,000 - 92,000}$$

$$= 4 \text{ years} + \frac{8,000}{15,000} = 4 \text{ years} + 0.53$$

$$= 4.53 \text{ years}$$

Project - B

$$\text{Pay Back Period (PBP)} = 3 \text{ years} + \frac{1,00,000 - 79,000}{1,02,000 - 79,000}$$

$$= 3 \text{ years} + \frac{21,000}{23,000}$$

$$= 3 \text{ years} + 0.91 = 3.91 \text{ years}$$

Interpretation

From calculated NPV, PI and PBP, we can conclude that project '5' will be more profitable to firm than project 'A'.

3. Following are the details of a project:

Initial outlay ` 80,000
Initial working capital ` 20,000
Cash flows before depreciation and taxes:
1st year ` 35,000
2nd year ` 35,000
3rd year ` 30,000
4th year ` 30,000
Salvage value ` 20,000

The project is depreciable on straight-line basis. If the required rate of return is 10% which is the project acceptable under the NPV and IRR criteria? Tax rate is 50%.

Sol :

$$\text{Initial investment} = \text{Initial outlay} + \text{Initial working capital}$$
$$= 80,000 + 20,000$$
$$= 1,00,000$$

$$\text{Depreciation} = \frac{\text{Initial Investment} - \text{Salvage Value}}{\text{No.of years}}$$

$$= \frac{1,00,000 - 20,000}{4}$$

$$= \frac{80,000}{4}$$

$$= 20,000$$

Calculation of CFAT

Year (1)	EBIT (2)	DEP. (3)	EBT (4) = (2)–(3)	Tax @30% (5) = (4)×0.5	EAT (6)=(4)–(5)	CFAT I (7) = (3) + (6) (Dep + EAT)
1	35,000	20,000	15,000	7,500	7,500	27,500
2	35,000	20,000	15,000	7,500	7,500	27,500
3	30,000	20,000	10,000	5,000	5,000	25,000
4	30,000	20,000	10,000	5,000	5,000	25,000

Calculation of NPV

Year	CFAT	DF @ 10%	Present value
1	27,500	0.909	24,997.5
2	27,500	0.826	22,715
3	25,000	0.751	18,775
4	25,000	0.683	17,075
			83,562.5
	Less: Cash Outflow		1,00,000
	Net Present Value		– 16,437.5

Since, net present value is negative, the proposal must be rejected.

Calculation of IRR

Since NPV at 10% is negative, lower rate of 2% must be taken and calculated.

Year	CFAT	DF @ 10%	Present value
1	27,500	0.980	26,950
2	27,500	0.961	26,427.5
3	25,000	0.942	23,550
4	25,000	0.924	23,100
			1,00,027.5
	Less: Cash Out Flow		1,00,000
	NPV		27.5

$$\text{IRR} - \text{Lower rate} + \frac{\text{NPV at lower rate}}{\text{Change in PVCFs}}$$

$$= 2 + \frac{27.5}{16465} \times 8$$

$$= 2 + 0.01$$

$$= 2.01$$

The project should be rejected as IRR is less than the required rate return.

4. An industry is contemplating to purchase a machine. Two machines A and B are available, each costing ` 5,00,000. In comparing the profitability of machines a discount rate of 10% is used earnings after taxation are expected as follows,

Year	(` in 000's) Machine A	Machine B
1	150	50
2	200	150
3	250	200
4	150	300
5	100	200

Rank the investment proposals using,

(a) Pay-back period

(b) NPV @ 10%

(c) IRR method.

Sol :

(a) Pay-back Period

Machine A

Year	Cash inflows (in '000's)	Cumulative cash inflows	PV @ 10%	Present value of cash inflows
1	150	150	0.909	136.35
2	200	350	0.826	165.20
3	250	600	0.751	187.75
4	150	750	0.683	102.45
5	100	850	0.621	62.10
			Total	653.85

Pay back period = [No.of years in which maximum investment amount is received]

$$+\left(\frac{\text{Amount to be received}}{\text{Cash flows from which the remaining amount to be received}}\right)$$

$$= 2 + \frac{500 - 350}{250}$$

= 2 + 0.60

= 2.60 years

Machine B

Year	Cash inflows (in '000's)	Cumulative cash inflows	PV@10%	Present value of cash inflows
1	50	50	0.909	45.450
2	150	200	0.826	123.900
3	200	400	0.751	150.20
4	300	700	0.683	204.90
5	200	900	0.621	124.20
				648.65

$$\text{Pay back period} = 3 + \frac{500 - 400}{300}$$

$$= 3 + 0.33$$

$$= 3.33 \text{ years}$$

(b) NPV @ 10%

For Machine A

$$\boxed{\text{NPV} = \text{Present value of cash inflows} - \text{Cash outflows}}$$

$$= 6,53,850 - 5,00,000$$

$$= 1,53,850$$

For Machine B

$$\text{NPV} = 6,48,650 - 5,00,000$$

$$= 1,48,650$$

(c) IRR

For Machine A

Calculation of fake pay back period

$$\boxed{\text{FPBP} = \frac{\text{Investment}}{\text{Average yearly inflow}}}$$

$$\text{Average Inflow} = \frac{8,50,000}{5}$$

$$= 1,70,000$$

$$\text{FPBP} = \frac{5,00,000}{1,70,000} = 2.941$$

Present value annuity table indicates that, IRR lies between 20 and 22

Calculation of present values at different rates,

Year	CFAT	PV @ 20%	PVCF	PV@ 22%	PVCF
1	150	0.8333	124.995	0.8196	122.94
2	200	0.6944	138.88	0.6718	134.36
3	250	0.5787	144.675	0.5507	137.675
4	150	0.4822	72.33	0.4514	67.71
5	100	0,4018	40.18	0.3700	37.00
Total: Present Value			521.06		499.685
Less: Cash outflows			500.00		500.00
NPV			21.06		– 0.315

Total cash inflows @ 20% = 521.06

Total cash inflows @ 22% = 499.685

Interpolation

$$\text{IRR} = \text{Lower rate} + \frac{\text{NPV @ LR}}{\Delta\Sigma\text{PVs}} \times \Delta r$$

$$= 20 + \frac{21.06}{521.06 - 499.685} \times (22 - 20)$$

$$= 20 + \frac{21.06}{21.375} \times 2$$

$$= 20 + 1.970$$

$$= 21.970$$

$\therefore$ IRR = 21.970%

For Machine B

Calculation of fake pay back period

$$\text{FPBA} = \frac{\text{Investment}}{\text{Average yearly inflow}}$$

$$\text{Average yearly inflow} = \frac{9,00,000}{5} = 1,80,000$$

$$= \frac{5,00,000}{1,80,000} = 2.778$$

Present value annuity table indicates that IRR lies between 18 and 20

Year	CFAT	PV@ 20%	PVCF	PV@ 22%	PVCF
1	50	0.8474	42.37	0.8333	41.665
2	150	0.7181	107.715	0.6944	104.16
3	200	0.6086	121.72	0.5787	115.74
4	300	0.5157	154.71	0.4822	144.66
5	200	0,4371	87.42	0.4018	80.36
Total: Present Value			513.935		486.585
Less: Cash Outflows			500.000		500.000
NPV			13.935		–13.415

Interpolation

The actual value can be calculated using interpolation.

NPV @ LR

$$IRR = \text{Lower rate} + \frac{NPV@LR}{\Delta\Sigma PVs} \times \Delta r$$

$$= 18 + \frac{13.935}{513.935 - 486.585} \times (20 - 18)$$

$$= 18 + \frac{13.935}{27.35} \times 2$$

$$= 18 + 1.019$$

$$= 19.019\%$$

Ranking the Proposals

(a) Based on the pay back period, machine A should be selected as the pay back period of machine A is less than machine B.

(b) As per the NPV method, the NPV of machine A is greater than the NPV of machine B, so machine A should be accepted.

(c) As per the IRR method, machine A should be accepted as it has higher IRR (21.970%) than machine B which has 19.019%.

3.2 DECISION TREE

Q6. What is Decision Tree? Explain in detail how to construct a decision tree.

Ans : **(Imp.)**

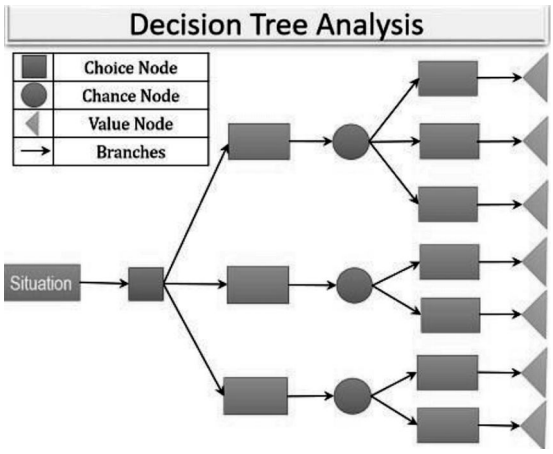
Meaning

A decision tree is a diagram that shows the sequence of decisions and events that affect the cash flows and risks of a project. Each node of the tree represents a decision point or an uncertain event, and each branch represents a possible outcome or action. The end nodes of the tree show the expected value or net present value of the project under different scenarios. A decision tree can help managers visualize the trade-offs and uncertainties involved in a project, and compare different alternatives based on their expected values and probabilities.

Steps :

1. The investment proposal must be clearly explained such as which department is going to finance the proposal, marketing or production or any other department and whether investment proposal is to enter a new market or to introduce a new product.

2. After defining the project, alternatives of the decision must be identified. Each alternative will have different outcomes and probabilities.



3. The next step in decision tree approach is to draw a , decision tree which represents the decision points, chance events and other data. The related information about probability distribution, projected cash flows, the expected present value, etc., are recorded on the branches of decision tree.

4. Final step is to evaluate all alternatives and choose the best one.

Q7. What are the advantages and disadvantages of decision tree ?

Ans :

Advantages

1. **Easy to Understand and Interpret:** Decision trees visually represent decisions and their potential outcomes in a format that is easy to understand.
2. **Flexible:** Can handle both numerical and categorical data, as well as complex decision-making scenarios.
3. **Useful for Complex Decision-Making:** Decision trees can model complex decision scenarios involving multiple variables and outcomes.
4. **Decision Support Tool:** Provide a structured framework for decision-making, helping decision-makers consider all possible options and outcomes.
5. **Can Incorporate Uncertainty:** Decision trees can incorporate probabilities and uncertainty into the decision-making process.

Disadvantages

1. **Overfitting:** Decision trees can be prone to overfitting, especially with large, complex datasets, which can lead to less accurate predictions.
2. **Sensitive to Small Changes:** Small changes in the data can result in significantly different tree structures, making them less stable.
3. **Biased Outcomes:** The outcomes of decision trees can be biased if the data used to build the tree is biased.
4. **Limited to Binary Decisions:** Traditional decision trees are limited to binary (yes/no) decisions at each node, which may not always reflect real-world decision-making.
5. **May Not Capture Interactions:** Decision trees may not capture interactions between variables, which can be important in some decision-making scenarios.

Q8. How to use Monte Carlo Simulation with decision trees ?

Ans :

'Monte Carlo simulation' is a technique that uses random sampling and statistical analysis to estimate the probability distribution and risk profile of a project. This method can be used in combination with decision trees to improve capital budgeting analysis.

1. It does this by generating a range of possible scenarios for each outcome, based on their probability distributions, and calculating the expected value or net present value of each one.
2. Then, the results are aggregated to create a histogram or cumulative distribution function that displays the range and likelihood of the expected value or net present value of the project.
3. Analyzing this histogram or function reveals measures of central tendency and dispersion, such as mean, median, standard deviation, skewness, and kurtosis.
4. Finally, this information can be used to evaluate the risk and return trade-off of the project in comparison with other alternatives or benchmarks.
5. Monte Carlo simulation is beneficial in overcoming some of the limitations and challenges of decision trees by providing more realistic and robust estimates of the expected value or net present value of the project, as well as capturing the variability and uncertainty of outcomes more effectively.

3.3. CASH FLOW IN CAPITAL BUDGETING

Q9. What are the relevant cash flows used in the capital budgeting ?

Ans : **(Imp.)**

Capital Budgeting and Cash Flow in Finance Analytics

In financial accounting, a cash flow statement, also known as statement of cash flows, is a financial statement that shows how changes in balance sheet accounts and income affect cash and cash equivalents and breaks the analysis down to operating, investing and financing activities.

Essentially, the cash flow statement is concerned with the flow of cash in and out of the business. The statement captures both the current operating results and the accompanying changes in the balance sheet.

As an analytical tool, the statement of cash flows is useful in determining the short-term viability of a company, particularly its ability to pay the bills. International Accounting Standard 7 (IAS7), is the International Accounting Standard that deals with cash flow statements.

Types

Let's start with the three types of cash flow in a Cash Flow Statement, they are:

1. Cash Flow from Operating Activities

Measures the cash generated from the core business or operations of the business. The calculation is operating income before depreciation minus taxes and adjusted for changes in the working capital. Operating Cash Flow (OCF) = Operating Income (revenue – cost of sales) + Depreciation – Taxes +/- Change in Working Capital.

2. Cash Flow from Investing Activities

This measures the cash flow of an entity's investing activities, including items such as capital expenditures, acquisitions or investments in other securities such as government bonds.

3. Cash Flow from Financing Activities

This measures the cash flow from financing activities, including issuing or buying back stock, issuing or repurchasing debt and paying dividends to shareholders.

Note: These three types of cash flows are segregated and detailed in the Statement of Cash Flow. The sum of the three makes up the Total Cash Flow for the entity.

4. Total Cash Flow

Cash Flow of the entity is the sum of the Cash Flow from all activities including operating, investing and financing activities. The Cash Flow of a period of time will equal the difference between the entity's cash balance at the beginning and ending of the time period.

5. Net Cash Flow

Net Cash Flow is the profit (or loss) of the entity plus non-cash expenses (that is depreciation and amortization). Net cash flow includes the financing and investing activities that are included on the income statement, but excludes financing and investing activities affecting the balance sheet.

6. Free Cash Flow

Free Cash Flow is operating cash flow less capital expenditures. It is the cash available to debt and equity holders after the expenses and taxes are paid and capital expenditures have been deducted.

Formula

Free Cash Flow = Cash from Operations – CapEx

Free cash flow is one measure of a company's financial performance. It shows the cash that a company can produce after deducting the purchase of assets such as property, equipment, and other major investments from its operating cash flow. In other words, FCF measures a company's ability to produce what investors care most about: cash that's available to be distributed in a discretionary way

7. Net Free Cash Flow

Net Free Cash Flow is Free Cash Flow less the current portion (amount to be paid over the next year) of capital expenditures, long term debt and dividends). Cash Flow is one of the most important investment concepts to understand. Each one of the different cash flow metrics gives pertinent insight into the health of an entity.

Q10. Explain the purpose of a cash flow statement in capital budgeting,discuss the methods of cash flow statements applied in capital budgeting

Ans : **(Imp.)**

Purpose of Cash Flow statement Capital Budgeting

The cash flow statement was previously known as the Flow of Cash Statement. The cash flow statement reflects a firm's liquidity. The balance sheet is a snapshot of a firm's financial resources and obligations at a single point in time, and the income statement summarizes a firm's financial transactions over an interval of time. These two financial statements reflect the accrual basis accounting used by firms to match revenues with the expenses associated with generating those revenues.

Non-cash activities are usually reported in footnotes.

The cash flow statement is intended to do the following :

1. Provide information on a firm's liquidity and solvency and its ability to change cash flows in future circumstances.
2. Provide additional information for evaluating changes in assets, liabilities and equity.
3. Improve the comparability of different firms' operating performance by eliminating the effects of different accounting methods.
4. Indicate the amount, timing and probability of future cash flows.

Methods

1. Direct Method

The direct method for creating a cash flow statement reports major classes of gross cash receipts and payments. Under IAS 7, dividends received may be reported under operating activities or under investing activities. If taxes paid are directly linked to operating activities, they are reported under operating activities; if the taxes are directly linked to investing activities or financing activities, they are reported under investing or financing activities.

Sample Cash Flow Statement Using the Direct Method:

2. Indirect Method

The indirect method uses net-income as a starting point, makes adjustments for all transactions for non-cash items, then adjusts from all cash-based transactions. An increase in an asset account is subtracted from net income and an increase in a liability account is added back to net income. This method converts accrual-basis net income (or loss) into cash flow by using a series of additions and deductions.

3. Cash Flow Forecasting

Definition: In the context of corporate finance, cash flow forecasting is the modeling of a company or entity's future financial liquidity over a specific timeframe. Cash usually refers to the company's total bank balances, but often what is forecast is treasury position, which is cash plus short-term investments minus short-term debt. Cash flow is the change in cash or treasury position from one period to the next period.

Q11. Explain structure of cash flows statement in capital budgeting.

Ans :

In capital budgeting, a cash flow statement is a crucial component of the proforma financial statements used to evaluate potential investment projects. The cash flow statement helps in analyzing the cash inflows and outflows associated with the project over its life. Here's how the cash flow statement is typically structured in a capital budgeting proforma:

1. **Initial Investment:** The cash outflow required to start the project, including equipment purchases, construction costs, etc.
2. **Operating Cash Flows:** Cash inflows and outflows from the project's operations, including revenues, operating expenses, taxes, and working capital changes.
3. **Investment Cash Flows:** Cash inflows and outflows related to additional investments during the project's life, such as equipment upgrades or expansions.
4. **Financing Cash Flows:** Cash inflows and outflows related to financing the project, such as loans, equity investments, and interest payments.
5. **Terminal Cash Flow:** The cash flow at the end of the project's life, including salvage value or any remaining working capital.

The cash flow statement helps in calculating important metrics used in capital budgeting, such as Net Present Value (NPV) and Internal Rate of Return (IRR), which help in determining the feasibility and profitability of the investment project.

Q12. Explain the cash flows in capital budgeting using spreadsheet applications.

Ans :

To calculate cash flows in capital budgeting using a spreadsheet, you typically create a table that outlines the cash inflows and outflows for each period of the project's life. Here's a general approach using Excel or Google Sheets.

1. Set Up Your Spreadsheet

- **Column A:** Time Period (Year 0, Year 1, Year 2, etc.)
- **Column B:** Cash Inflows
- **Column C:** Cash Outflows
- **Column D:** Net Cash Flow (Inflows - Outflows)

(i) Enter the Initial Investment

In Year 0, enter the initial cash outflow required to start the project.

(ii) Enter Operating Cash Flows

For each year of the project, enter the expected cash inflows and outflows from operations.

(iii) Enter Investment Cash Flows

If there are additional investments required during the project's life (e.g., equipment upgrades), enter the cash inflows and outflows for those years.

(iv) Enter Financing Cash Flows

Enter any cash inflows or outflows related to financing the project, such as loans or equity investments.

2. Calculate Net Cash Flow

In column D, calculate the net cash flow for each period by subtracting the cash outflows from the cash inflows.

3. Calculate Total Cash Flows

At the bottom of column D, calculate the total cash flow for each year by summing the net cash flows for that year.

4. Calculate Cumulative Cash Flows

In a new column (e.g., column E), calculate the cumulative cash flow by summing the total cash flows up to that point.

5. Use the Cash Flows for Analysis

Use the cash flow table to calculate metrics like Net Present Value (NPV) and Internal Rate of Return (IRR) to evaluate the project's feasibility and profitability

By organizing your cash flows in a spreadsheet, you can easily analyze the financial viability of your capital budgeting project and make informed investment decisions.

3.4. Cost of Capital

Q13. Define cost of capital. What are the different types of cost ?

Ans :

Meaning

An important element of financial management is cost of capital, which is the least rate of return forecasted by the investor. A firm can maintain its capital in form of debt, equity shares, preference capital and retained earnings. Cost of capital of a firm is directly proportional to the risk prevailing in the firm. Usually, higher risk involved in the firm leads to higher cost of capital.

Definitions

(i) **According to Solomon Ezra,** 'cost of capital is the minimum required rate ot earnings or the cut-off rate of capital expenditures".

(ii) **According to Hampton, John J.** defines cost of capital as "the rate of return the firm requires from investment in order to increase the value of the firm in the market place".

Therefore, it is understood that to occupy the strong position in market and increase the value of shares, firm must have cost of capital which is the least rate of return yield from the investments.

Cost of capital can be expressed in form of equation as follows,

$$k = r_o + b + f$$

Where,

k = Cost of capital

r_o = Normal rate of return at zero risk level

b = Premium for business risk

f = Premium for financial risk.

Types

Cost is classified into the following types,

1. Historical Cost and Future Cost

As the name indicates, the past records of the book costs comes under the historical cost category whereas, the forecasted costs that are valid in future constitutes the future costs. Future costs are estimated based on the historical costs. However, the future costs are significantly important for taking financial decisions.

2. Specific Cost and Composite Cost

If a capital is developed through a specific source then the cost associated with such source is referred to as "specific cost" whereas, it becomes composite cost if it emerges from varied sources. Composite cost is taken into account for making financial decisions when more than one type of capital is used in business. But if only one type of capital is used in business then specific cost is considered.

3. Explicit Cost and Implicit Cost

Explicit cost refers to a discount rate which balances the present value of cash inflows with that of the present value of cash outflows. It is considered as an internal rate of return. Implicit cost refers to the cost of opportunity sacrifice which would have been exploited by a firm if a specific project is undertaken. It is also called as "opportunity cost".

4. Average Cost and Marginal Cost

If the firm is financed through different sources of capital like debentures, preference shares and equity shares, the combined cost of such sources constitute an average cost. It is the weighted average cost of the costs associated with the different sources of finance. However, when the additional funds have to be raised by a firm, then such average cost of capital is termed as marginal cost of capital. Marginal cost must be taken into account while taking investment decisions.

Q14. What is the importance of cost of capital ?

Ans :

The concept of cost of capital is very essential in the financial management. It is useful in capital budgeting and in making decisions related to capital structure planning. The performance of the firm is analyzed with the help of concepts of cost of capital and useful in taking other financial decisions.

1. Capital Budgeting Decision

According its James T.S. Posterfield, "the concept of cost of capital has assumed growing importance largely because of the need to devise a rational mechanism for making investment decisions of the firm". Cost of capital is taken into consideration while making capital budgeting decisions. With the help of cost of capital, firms accept or reject the projects. It is very useful in capital budgeting decision.

2. Capital Structure Decisions

In order to run a business smoothly, firm must maintain an appropriate level of debt and equity mix to finance the assets. At the time of preparing optimal capital structure, management must concentrate on maximizing the value of firm and minimizing cost of capital.

3. Analyzing Financial Performance

According to S.K. Bhattacharya, the concept of cost of capital is used to 'evaluate the financial performance of top management'. At the time of evaluating the performance of top management, the actual profitability of project is compared with overall estimated cost of capital. If profitability is more, then performance is satisfactory.

4. Other Financial Decisions

Many other financial decisions can be made with the help of cost of capital such as dividend policy, capitalization of profits, working capital etc.

Q15. How to calculate cost of capital in capital budgeting using excel/spreadsheet applications ?

Ans :

To calculate the cost of capital in capital budgeting using Excel, you typically use the Weighted Average Cost of Capital (WACC) formula. The WACC is the average rate of return that a company is expected to pay to its investors, weighted by the proportion of each component in the company's capital structure. Here's how you can calculate the WACC using Excel:

Determine the components of the WACC

- **Cost of Debt (Rd):** The cost of borrowing money, usually the yield to maturity of the company's bonds.
- **Cost of Equity (Re):** The return required by investors in the company's common stock.
- **Tax Rate (T):** The corporate tax rate, which is used to calculate the after-tax cost of debt.

Calculate the WACC

The WACC formula is :

$$WACC = \left(\frac{E}{E+D} \times Re\right) + \left(\frac{D}{E+E} \times Rd \times (1-T)\right)$$

Where:

E = Market value of the company's equity

D = Market value of the company's debt

Re = Cost of equity

Rd = Cost of debt

T = Tax rate

Using Excel :

- Enter the market value of equity (E) and debt (D) in separate cells.
- Enter the cost of equity (Re) and cost of debt (Rd) in separate cells.
- Enter the tax rate (T) in a cell.
- Calculate the WACC using the formula:

[=((E/(E+D))*Re)+((D/(E+D))*Rd*(1–T))]

Example :

Market value of equity (E): Rs.500,000

Market value of debt (D): Rs.300,000

Cost of equity (Re): 10%

Cost of debt (Rd): 5%

Tax rate (T): 30%

WACC formula in Excel:

=((500000/(500000+300000))*0.10)+((300000/(500000+300000))*0.05*(1-0.30))

WACC ≈ 7.83%

This calculation gives you the company's WACC, which can be used as the discount rate in capital budgeting to evaluate potential investment projects.

PROBLEMS

5. The equity shares of a company are quoted at ` 105. The company plans to declare a dividend of ` 10 per share next year. The growth rate of dividends is 5%. The tax rate is 50%. Calculate weighted average cost of capital when the capital structure of the company as on March 31st, 2012 shows the following details,

Equity share capital 9 lakhs of ` 1 each	**` 9,00,000**
10% Preference shares	**` 6,00,000**
10% Debentures	**` 5,00,000**

Sol :

(i) Cost of Equity Capital

$$K_c = \frac{D_1}{MP} + g$$

Where,

K_c = Cost of equity capital

g = Growth rate = 5% or 0.05

MP = Market price = ` 105

D_1 = Dividend rate = ` 10

$$K_c = \frac{10}{105} + 0.05$$

$$= 0.0952 + 0.05$$

$$= 0.1452 \text{ or } 14.52\%$$

(ii) Cost of Preference Share Capital

$$K_p = \frac{D}{NP}$$

Where,

K = Cost of preference capital

D = Annual preference dividend

NP = Net Proceeds of preference shares

D = 6,00,000 × 10%

= 60,000

$$\therefore \quad K_p = \frac{60,000}{6,60,000}$$

$$= 0.10 \text{ or } 10\%$$

(iii) Cost of Debentures (After Tax)

$$K_d = \frac{1}{NP}(1 - t)$$

Where,

K_d = Cost of debentures

I = Interest

NP = Net proceeds of debentures = 5,00,000

t = Tax rate = 50%

I = 5,00,000 × 10% = 50,000

$$\therefore \quad K_d = \frac{50,000}{5,00,000}(1 - 0.5)$$

$$= 0.10 \times 0.5$$

$$= 0.05 \text{ or } 5\%$$

Computation of Weighted Average Cost of Capital Based on Existing Capital Structure

Source of Funds (1)	Amount (`) (2)	Weights (3) = 2 / 20,00,000	After Tax Cost (%) (4)	Weighted Cost (%) (5) = (3)×(4)
Equity share capital	9,00,000	0.45	14.52	
Preference share capital	6,00,000	0.30	10.00	3.00
Debentures	5,00,000	0.25	5.00	1.25
Total	20,00,000	1.00	29.52	10.78

∴ Weighted average cost of capital = 10.78%

6. Rekha Ltd. has the following specific cost of capital along with the indicated book and market value weights.

Type of Capital	Cost%	Book Value	Market Valued
Equity	**0.18**	**0.50**	**0.58**
Preference shares	**0.15**	**0.20**	**0.17**
Long term debt	**0.07**	**0.30**	**0.25**
		1.00	**1.00**

(i) Calculate the weighted cost of capital using book and market value weights

(ii) Calculate weight of average cost of capital using marginal cost. If they intends to raise 50% long term debt, 35% pref. shares and 15% retained earnings to raise additional funds.

Sol :

(i) Computation of Weighted Cost of Capital Using Book and Market Value Weights

Book-Value Weights

Source of Capital (1)	Book Value Weight (2)	Cost (3)	Total Cost (4) = (2)×(3)
Equity	0.50	0.18	0.09
Preference shares	0.20	0.15	0.03
Long term debt	0.30	0.07	0.021
			0.141

Market-Value Weights

Source of Capital (1)	Market Value Weight (2)	Cost (3)	Total Cost (4) = (2)×(3)
Equity	0.58	0.18	0.1044
Preference shares	0.17	0.15	0.0255
Long term debt	0.25	0.07	0.0175
			0.1474

∴ WCC-Book value = 0.141

WCC – Market value = 0.1474

(ii) Computation of Weighted Cost of Capital Using Marginal Cost

Marginal Cost

Source of Capital (1)	Weight (2)	Cost (3)	Total Cost (4) = (2)×(3)
Retained earnings	0.15	0.18	0.027
Preference shares	0.35	0.15	0.0525
Long term debt	0.50	0.07	0.035
			0.1145

∴ WCC – Marginal cost = 0.1145.

3.5 Advance Capital Budgeting Techniques

Q16. Discuss the advance capital budgeting techniques with formula and suitable examples.

Ans :

Advance capital budgeting techniques are used to evaluate investment projects by considering factors such as risk, timing of cash flows, and the impact of different financing options. Some advanced techniques include the Real Options Approach, Monte Carlo Simulation, and Decision Trees.

1. Real Options Approach

The Real Options Approach applies financial options theory to investment decisions, recognizing that managers have the option to take certain actions in the future based on how a project evolves.

Formula

The value of a real option is calculated using option pricing models such as the Black-Scholes model, which considers factors like volatility, time to expiration, and risk-free rate.

Example

A company investing in a new product line has the option to expand the production capacity if demand exceeds expectations. This option has value, which can be incorporated into the project's valuation.

2. Monte Carlo Simulation

Monte Carlo Simulation is a technique used to model the uncertainty of variables in a project by generating multiple possible scenarios and calculating the expected outcome.

Formula

Simulation involves randomly selecting values for uncertain variables (e.g., sales growth rate) based on their probability distributions, running the model for each scenario, and aggregating the results.

Example

A company is considering investing in a new factory. By simulating different scenarios for factors like demand, input costs, and exchange rates, it can assess the project's risk and potential returns more accurately.

3. Decision Trees

Decision Trees are a visual representation of decision-making under uncertainty, showing different possible decisions and outcomes.

Formula

Decision Trees are constructed by calculating the expected value of each decision node, considering the probabilities of different outcomes.

Example

A company is deciding whether to invest in a new technology. The decision tree would show the initial investment, possible outcomes (e.g., success, failure), and the expected value of each decision branch.

These advanced techniques provide a more sophisticated analysis of investment projects, considering the complexities and uncertainties involved, and help in making more informed and strategic decisions.

Q17. Discuss in detail about real options approach state its advantages and limitations.

Ans :

Meaning

'The Real Options Approach' is a strategic decision-making framework that applies financial options theory to investment decisions. It recognizes that managers have the option, but not the obligation, to take certain actions in the future based on how a project evolves.

These actions can include expanding, delaying, abandoning, or contracting a project. The Real Options Approach helps in capturing the value of these strategic options within the context of capital budgeting.

1. Options Thinking

The Real Options Approach views investment projects as a series of options, where managers can choose to exercise or not exercise these options based on future circumstances.

2. Flexibility

The approach emphasizes the value of flexibility in decision-making. By keeping strategic options open, managers can respond better to changing market conditions and uncertainties.

3. Uncertainty Management

Real options analysis considers uncertainties such as market demand, technological changes, and competitive dynamics. It helps in quantifying the value of waiting or taking action under different scenarios.

4. Valuation

The value of a real option is derived from the difference between the expected payoff of the option and the cost of exercising it. Various option pricing models, such as the Black-Scholes model, are used to estimate the value of real options.

5. Types of Real Options

- **Option to Expand:** The right to expand a project if it is successful.
- **Option to Delay:** The option to delay investment until more information is available.
- **Option to Abandon:** The option to abandon a project if it is not performing as expected.
- **Option to Contract:** The option to reduce the scale of a project if market conditions change.

Advantages

(i) Incorporates flexibility and strategic thinking into investment decisions.

(ii) Helps in capturing the value of managerial discretion and learning over time.

(iii) Provides a more comprehensive analysis of investment projects, especially in uncertain environments.

Limitations

(i) Requires complex modeling and analysis, which can be time-consuming and costly.

(ii) Relies on accurate estimation of probabilities and future cash flows, which can be challenging.

(iii) The assumptions and inputs used in real options analysis can be subjective and vary across analysts.

Q18. Discuss how to work the real options approach in a spreadsheet.

Ans :

Implementing the Real Options Approach in a spreadsheet involves modeling the key elements of the approach, such as the underlying asset, the option to invest or delay, and the uncertainty in future cash flows. Here's a simplified example of how you might set up a real options analysis in a spreadsheet:

1. Set Up Your Spreadsheet

- **Column A:** Time Period (Year 0, Year 1, Year 2, ...)
- **Column B:** Cash Flows without Option (e.g., from the project)
- **Column C:** Cash Flows with Option (considering the option to delay or abandon)
- **Column D:** Net Cash Flow (Cash Flows with Option - Cash Flows without Option)
- **Column E:** Discount Factor (1 / (1 + Discount Rate) ^ Time Period)

2. Model the Option to Delay or Abandon

- Assume a scenario where you have the option to delay or abandon the project after Year 1.
- In Year 1, the Net Cash Flow without the option is Rs.100,000. If you exercise the option, the Net Cash Flow becomes Rs.50,000 (assuming lower costs or reduced revenues due to the delay).
- Enter these values in rows 2 and 3 of columns B and C.

3. Calculate the Net Cash Flows and Discounted Cash Flows

- In column D, subtract the Cash Flow without Option (B) from the Cash Flow with Option (C).
- In column F, calculate the Discounted Cash Flows by multiplying the Net Cash Flows (D) by the Discount Factor (E).

4. Calculate the Present Value of the Project

Sum the Discounted Cash Flows (F) to get the Present Value of the project.

5. Sensitivity Analysis

You can perform sensitivity analysis by changing the Discount Rate or the Cash Flows to see how the Present Value of the project changes.

This is a simplified example, and in practice, real options analysis can be more complex, especially for projects with multiple options and uncertainties. Advanced modeling techniques and software are often used for more sophisticated real options analysis.

Q19. Discuss about in detail Monte Carlo Simulation technique in advanced capital budgeting.

Ans :

Meaning

' Monte Carlo simulation' is a technique used to model the uncertainty and variability of complex systems or processes. It generates multiple possible outcomes based on random sampling of input variables, allowing for a probabilistic assessment of the possible outcomes. In capital budgeting, Monte Carlo simulation is used to evaluate investment projects by considering the impact of uncertain factors such as market conditions, costs, and revenues.

Steps

1. Identify Variables

Identify the key variables that impact the outcome of the investment project, such as sales growth rate, production costs, and discount rate.

2. Define Probability Distributions

Define the probability distributions for each variable, such as normal, uniform, or triangular distributions. These distributions represent the range of possible values and their likelihood.

3. Generate Random Samples

Use a random number generator to generate random samples from the defined probability distributions for each variable. These samples represent possible scenarios for the project.

4. Run Simulations

For each set of random samples, calculate the cash flows, Net Present Value (NPV), or other relevant metrics for the investment project.

5. Aggregate Results

Repeat the simulations a large number of times (e.g., 1,000 or more) to create a distribution of possible outcomes. Aggregate the results to understand the range of possible NPVs and their probabilities.

6. Analyze Results

Analyze the distribution of NPVs to determine the probability of achieving different levels of return. This helps in understanding the risk and uncertainty associated with the investment project.

Q20. Explain the advantages and disadvantages-Monte Carlo Simulation.

Advantages

(i) Handles Complexity: Can model complex systems with multiple variables and uncertainties.

(ii) Provides Probabilistic Results: Provides a probabilistic assessment of outcomes, helping in risk analysis.

(iii) Flexibility: Allows for the inclusion of different types of probability distributions and assumptions.

Limitations

(i) Requires Expertise: Requires expertise in statistics and probability theory to set up and interpret.

(ii) Computational Intensity: Can be computationally intensive, especially for complex models with many iterations.

(iii) Dependent Assumptions: Results are dependent on the assumptions and distributions chosen for the variables.

Q21. Discuss how Monte Carlo Simulation Technique is implemented in a spreadsheet.

Ans :

'Implementing Monte Carlo simulation' in a spreadsheet involves generating random samples for uncertain variables and calculating the project's Net Present Value (NPV) for each sample.

Here's a simplified example using Microsoft Excel:

1. Set Up Your Spreadsheet

- **Column A:** Iteration Number (1, 2, 3, ...)
- **Columns B onward:** Variables (e.g., Sales Growth Rate, Production Costs) and their Random Samples

2. Define Probability Distributions

- For each variable, define a probability distribution. For example, you can use the NORMINV function in Excel to generate normally distributed random numbers

  : = NORM.INV(RAND(), mean, stdev)

- Replace mean and stdev with the mean and standard deviation of the variable.

3. Calculate NPV for Each Sample

In a new column, calculate the NPV for each sample based on the random values of the variables. Use the NPV formula:

= NPV(discount_rate, cash_flows_range)

Replace discount_rate with the project's discount rate and cash_flows_range with the range of cash flows for each year.

4. Aggregate Results

Calculate the average NPV and other statistics of interest (e.g., standard deviation, 5th and 95th percentiles) using Excel functions like AVERAGE, STDEV, PERCENTILE, etc.

5. Run the Simulation

Use the "Data Table" feature in Excel to run the simulation. Enter formulas that reference the random samples and the NPV calculation, then use Data Table to generate multiple scenarios.

6. Analyze Results

Analyze the distribution of NPVs to understand the range of possible outcomes and their probabilities. This can help in assessing the risk and uncertainty associated with the investment project.

This is a basic example, and in practice, Monte Carlo simulation can be more complex, especially for projects with many variables and dependencies. Advanced spreadsheet functions and software specifically designed for Monte Carlo simulation can be used for more sophisticated analyses.

Q22. Discuss in detail, how decision tree can be applied in a spreadsheet.

Ans :

Implementing a decision tree in a spreadsheet involves creating a visual representation of the decision-making process and calculating the expected value (EV) of each decision path. Here's a simplified example using Microsoft Excel:

1. Set Up Your Spreadsheet

- **Column A:** Nodes (Decision or Chance)
- **Column B:** Description of Node
- **Column C:** Probability (for Chance nodes)
- **Column D:** Payoff (for Terminal nodes)

2. Create the Decision Tree

- Use cells to represent decision nodes, chance nodes, and terminal nodes.
- Use arrows or lines to connect nodes to show the flow of decisions and outcomes.

3. Assign Probabilities and Payoffs

- For chance nodes, enter the probabilities of each outcome in column C.
- For terminal nodes, enter the payoffs associated with each outcome in column D.

4. Calculate Expected Values

- Use Excel formulas to calculate the expected value (EV) for each decision node and chance node.
- For decision nodes, the EV is the maximum of the EVs of the nodes it leads to.
- For chance nodes, the EV is the sum of the probabilities multiplied by the payoffs of the outcomes.

5. Make the Decision

Based on the EVs calculated, determine the optimal decision path by selecting the highest EV at each decision node.

6. Sensitivity Analysis

Conduct sensitivity analysis by changing the probabilities and payoffs to see how it affects the optimal decision.

3.6 Adjusted Present Value Approach

Q23. What is meant by the adjusted present value (APV) approach, also discuss the steps involved in calculated APV analysis ?

Ans : **(Imp.)**

Adjusted Present Value (APV)' is a capital budgeting technique that considers the effects of financing on a project's value. It adjusts the Net Present Value (NPV) of a project by adding the present value of any financing side effects, such as tax shields from debt, subsidies, or other financing benefits.

Steps :

Steps in calculating Adjusted Present Value (APV) Analysis :

1. Calculate the Unlevered Free Cash Flows (UFCF)

Determine the cash flows generated by the project before considering any financing effects. This is the same as calculating the NPV without considering financing.

2. Calculate the Value of Tax Shields

Calculate the present value of the tax shields from interest deductions on debt financing. This is calculated as the tax rate multiplied by the interest payments on the debt.

3. Calculate the Value of Other Financing Side Effects

If there are other financing side effects, such as subsidies or other benefits, calculate their present value.

4. Calculate the Adjusted Present Value (APV)

Add the present value of the tax shields and other financing side effects to the UFCF to get the APV.

APV = UFCF + Present Value of Tax Shields + Present Value of Other Financing Side Effects

5. Make the Decision

Compare the APV to the initial investment to determine if the project is viable.

Example:

Consider a project with an initial investment of Rs.1,000, generating annual cash flows of Rs.300 for 5 years. The tax rate is 30%, and the cost of debt is 5%.

The present value of the tax shield from debt financing is calculated as follows:

Interest on debt = Rs.1,000 * 5% = Rs.50 per year

Tax shield = Rs.50 * 30% = Rs.15 per year

Present value of tax shield = Rs.15 / (1 + Discount Rate) ^ Year

The APV would then be calculated as:

APV = UFCF + Present Value of Tax Shields + Present Value of Other Financing Side Effects

Q24. What are the advantages and limitations of adjusted present value analysis ?

Ans :

Advantages

(i) Accounts for the effects of financing, providing a more accurate assessment of a project's value.

(ii) Helps in understanding the impact of different financing structures on a project's value.

Limitations

(i) Requires accurate estimation of financing side effects, which can be challenging.

(ii) May not be suitable for projects with complex or changing financing structures.

(iii) Relies on assumptions about tax rates, interest rates, and other factors.

Q25. Describe the steps involved in implementing the calculation of adjusted present value (APV) approach in a spreadsheet.

Ans :

Implementing the Adjusted Present Value (APV) approach in a spreadsheet involves calculating the present value of the project's cash flows and adjusting it for the effects of financing. Here's a basic example using Microsoft Excel:

1. Set Up Your Spreadsheet

- **Column A:** Time Period (Year 0, Year 1, Year 2, ...)
- **Column B:** Cash Flows from Operations
- **Column C:** Interest Expense on Debt
- **Column D:** Tax Shield (Interest Expense * Tax Rate)
- **Column E:** Cash Flows to Equity (Cash Flows from Operations - Tax Shield)
- **Column F:** Discount Factor (1 / (1 + Discount Rate) ^ Time Period)

2. Calculate Cash Flows

- Enter the cash flows from operations in column B.
- Calculate the interest expense on debt in column C (assuming a fixed interest rate).
- Calculate the tax shield in column D (Interest Expense * Tax Rate).
- Calculate the cash flows to equity in column E (Cash Flows from Operations - Tax Shield).

3. Calculate Adjusted Present Value (APV)

- Calculate the present value of the cash flows to equity (E) using the discount factor (F) in column F: = E2 * F2
- Copy this formula down for all years.
- Calculate the present value of the tax shields (D) using the discount factor (F) in column F: = D2 * F2
- Copy this formula down for all years.

4. Calculate the APV by summing the present values of the cash flows to equity and tax shields: =SUM(G2:Gn)

Where G2:Gn represents the range of present values for cash flows to equity and tax shields.

5. Make the Decision

Compare the APV to the initial investment to determine if the project is viable.

6. Sensitivity Analysis

Conduct sensitivity analysis by changing the discount rate, tax rate, or other assumptions to see how it affects the APV and the project's viability.

3.7. Competing Project Risk using Spreadsheets

Q26. Explain the concept of competing using spreadsheets project risk in detail with an example.

Ans : **(Imp.)**

Meaning

'Competing project risk' refers to the situation where a company must choose between two or more investment projects, each with its own level of risk. The concept is crucial in capital budgeting, where companies evaluate and select investment projects based on their expected returns and associated risks.

Here's a detailed explanation of competing project risk:

1. Evaluation of Multiple Projects

- Companies often have several potential investment projects to choose from, each with its own expected cash flows, costs, and risks.
- The goal is to select the projects that will maximize shareholder wealth and achieve the company's strategic objectives.

2. Risk Assessment

- Risk assessment involves identifying and evaluating the risks associated with each investment project.
- Risks can include market risks, technological risks, regulatory risks, and financial risks.

3. Competing Project Risk

- Competing project risk arises when a company must choose between two or more projects that offer different risk-return profiles.
- A higher-risk project may offer the potential for higher returns but also comes with greater uncertainty and downside risk.
- A lower-risk project may offer more stable returns but at a lower potential return.

4. Risk-Return Trade off

- The decision-making process involves evaluating the trade-off between risk and return.
- Investors generally require a higher expected return for taking on higher levels of risk.

5. Considerations in Decision Making

- Companies must consider various factors when evaluating competing project risks, including the company's risk tolerance, the project's strategic fit, and the impact of risk on the company's overall portfolio.
- Sensitivity analysis and scenario analysis can be used to assess the impact of different risk levels on project outcomes.

6. Risk Management

- Companies can use risk management techniques to mitigate the risks associated with investment projects.
- Techniques such as diversification, hedging, and insurance can help reduce the impact of adverse events.

7. Decision Criteria

- Companies may use different decision criteria to evaluate competing project risks, such as the Net Present Value (NPV), Internal Rate of Return (IRR), or Risk-Adjusted Return On Capital (RAROC).
- The decision criteria used should reflect the company's risk appetite and strategic objectives.

Q27. How can competing project risk be calculated using a spreadsheet ?

Ans :

Calculating Competing Project Risk using a spreadsheet involves assessing the risk of each project and comparing them to make an informed decision. Here's a simplified example of how you might calculate and compare the risk of two competing projects using Microsoft Excel:

1. **Identify Risk Factors:** Identify the key risk factors for each project, such as market risk, technology risk, regulatory risk, etc.
2. **Assign Risk Scores:** Assign a risk score to each project for each risk factor. You can use a scale of 1 to 5, where 1 indicates low risk and 5 indicates high risk.
3. **Calculate Weighted Risk Scores:** Assign weights to each risk factor based on its importance. Multiply the risk score by the weight for each factor to calculate the weighted risk score for each project.

4. Calculate Total Risk Score: Sum up the weighted risk scores to get the total risk score for each project. The project with the higher total risk score is considered riskier.

Example :

(i) Assume Project A has the following risk factors and scores

- Market Risk: 4
- Technology Risk: 3
- Regulatory Risk: 2
- Weighted Risk Scores: Market Risk (40%), Technology Risk (30%), Regulatory Risk (30%)

(ii) Assume Project B has the following risk factors and scores

- Market Risk : 3
- Technology Risk : 4
- Regulatory Risk : 3
- Weighted Risk Scores: Market Risk (40%), Technology Risk (30%), Regulatory Risk (30%)

(iii) Calculate the Total Risk Score for each project

(iv) Total Risk Score Project A = (4 * 0.40) + (3 * 0.30) + (2 * 0.30) = 3.3

(v) Total Risk Score Project B = (3 * 0.40) + (4 * 0.30) + (3 * 0.30) = 3.4

(vi) In this example, Project B has a slightly higher total risk score, indicating that it is slightly riskier than Project A.

This is a simplified example, and in practice, may need to consider more complex risk factors and use more sophisticated risk assessment techniques.

Short Questions and Answers

1. Define capital budgeting.

Ans :

Capital budgeting is the process of evaluating and selecting long-term investment projects or expenditures that involve significant amounts of capital. It is crucial for businesses to make informed decisions about which projects to invest in, as these decisions can have a significant impact on the company's future profitability and growth. Capital budgeting techniques help in assessing the feasibility and potential profitability of investment projects.

2. Features of capital budgeting.

Ans :

(i) Growth

The impact of investment decisions continue in future and must be go through for a long period than the effects of current operating expenditure. Firm may incur heavy operating costs due to useless or loss making expansion of assets. On the other side, insufficient investment in assets may cause difficulty for firm to face competition and continue its market share.

(ii) Risk

If there is long term contract of funds it may change the difficulty involved in the firm's risk. If there is fluctuations in the profit of investment, then it will make the firm more risky. Hence, investment decisions figure out the prime features of risk of the firm.

(iii) Funding

Usually investment decisions consist of huge amount of funds which make it essential for the firm to organize its investment programmes. Investment programmes must be planned very cautiously and arrangement for attaining finances internally or externally must made in advance.

3. Disadvantages of capital budgeting.

Ans :

(i) Capital budgeting decisions are for the long term and are majorly irreversible in nature.

(ii) These techniques are mostly based on estimations and assumptions as the future will always remain uncertain.

(iii) Capital budgeting still remains introspective as the risk factor, and the discounting factor remains subjective to the manager's perception.

(iv) A wrong capital budgeting decision can affect the company's long-term durability. And hence it needs to be done judiciously by professionals who understand the project well.

4. Advantages of capital budgeting.

Ans :

(i) Capital budgeting helps a company understand the various risks involved in an investment opportunity. And how these risks affect the returns of the company.

(ii) It helps the company to estimate which investment option would yield the best possible return.

(iii) A company can choose a technique/method from various techniques of capital budgeting to estimate whether it is financially beneficial to take on a project or not.

(iv) It helps the company to make long-term strategic investments.

(v) It helps to make an informed decision about an investment considering all possible options.

(vi) All the techniques/methods of capital budgeting try to increase shareholders' wealth and give the company an edge in the market.

(vii) It helps a company in a competitive market to choose its investments wisely.

(viii) Capital budgeting presents whether an investment would increase the company's value or not.

(ix) It offers adequate control over expenditure for projects.

5. What is Decision Tree ?

Ans :

A decision tree is a diagram that shows the sequence of decisions and events that affect the cash flows and risks of a project. Each node of the tree represents a decision point or an uncertain event, and each branch represents a possible outcome or action. The end nodes of the tree show the expected value or net present value of the project under different scenarios. A decision tree can help managers visualize the trade-offs and uncertainties involved in a project, and compare different alternatives based on their expected values and probabilities.

6. Disadvantages of decision tree.

Ans :

(i) **Overfitting:** Decision trees can be prone to overfitting, especially with large, complex datasets, which can lead to less accurate predictions.

(ii) **Sensitive to Small Changes:** Small changes in the data can result in significantly different tree structures, making them less stable.

(iii) **Biased Outcomes:** The outcomes of decision trees can be biased if the data used to build the tree is biased.

(iv) **Limited to Binary Decisions:** Traditional decision trees are limited to binary (yes/no) decisions at each node, which may not always reflect real-world decision-making.

7. Cash flow in capital budgeting.

Ans :

In financial accounting, a cash flow statement, also known as statement of cash flows, is a financial statement that shows how changes in balance sheet accounts and income affect cash and cash equivalents and breaks the analysis down to operating, investing and financing activities.

Essentially, the cash flow statement is concerned with the flow of cash in and out of the business. The statement captures both the current operating results and the accompanying changes in the balance sheet. As an analytical tool, the statement of cash flows is useful in determining the short-term viability of a company, particularly its ability to pay the bills. International Accounting Standard 7 (IAS7), is the International Accounting Standard that deals with cash flow statements.

8. Cost of capital.

Ans :

An important element of financial management is cost of capital, which is the least rate of return forecasted by the investor. A firm can maintain its capital in form of debt, equity shares, preference capital and retained

earnings. Cost of capital of a firm is directly proportional to the risk prevailing in the firm. Usually, higher risk involved in the firm leads to higher cost of capital.

Definitions

(i) **According to Solomon Ezra,** 'cost of capital is the minimum required rate ot earnings or the cut-off rate of capital expenditures".

(ii) **According to Hampton, John J.** defines cost of capital as "the rate of return the firm requires from investment in order to increase the value of the firm in the market place".

9. Real options approach.

Ans :

The Real Options Approach applies financial options theory to investment decisions, recognizing that managers have the option to take certain actions in the future based on how a project evolves.

Formula

The value of a real option is calculated using option pricing models such as the Black-Scholes model, which considers factors like volatility, time to expiration, and risk-free rate.

Example

A company investing in a new product line has the option to expand the production capacity if demand exceeds expectations. This option has value, which can be incorporated into the project's valuation.

10. Adjusted present value approach.

Ans :

Adjusted Present Value (APV)' is a capital budgeting technique that considers the effects of financing on a project's value. It adjusts the Net Present Value (NPV) of a project by adding the present value of any financing side effects, such as tax shields from debt, subsidies, or other financing benefits.

Exercise Problems

1. Calculate the pay-back periods of the following projects each requiring a cash outlay of ` 1,00,000. Suggest which projects are acceptable if the standard payback period is 5 years.

Cash Inflows

Year	Project A	Project B	Project C
1	30,000	30,000	10,000
2	30,000	40,000	20,000
3	30,000	20,000	30,000
4	30,000	10,000	40,000
5	30,000	5,000	–

[Ans : Project A = 3.333 years, Project B = 4 years and Project C = 4 years, all the three projects are acceptable]

2. A project costing ` 10 lakhs has a 10 years at the end of which its scrap value is likely to be ` 1 lakh. The firm's cut off rate is 12%. The project is expected to yield an annual profit after tax of ` 1 lakh. Depreciation being charged on straight line basis. At 12% p.a., the present value of one rupee received annually for 10 years of ` 5.650 and the value of one rupee received at the end of 10 years is 0.322. Ascertain the net value of the project and state whether we should go for the project.

[Ans: NPV ` 1,05,700 project is acceptable]

3. Calculate internal rate of return for the project 'X'. The details of the project are as under:

Initial cost				**` 21,000**
	Cash Inflows (Year wise)			
Year	**1**	**2**	**3**	**A**
`	4,000	6,000	8,000	10,000
Present Value Factor at 10%	0.909	0.826	0.751	0-683
Present Value Factor at 12%	0.893	0-797	0-712	0-636

[Ans: 10.843%]

4. A company proposes to install a machine involving a capital cost of ` 1,80,000. The life of the machine is 5 years and its salvage value at the end of the life is nil. The machine will produce the net operating income after depreciation of ` 34,000 per annum. The company's tax rate is 45%. The net present value factors for 5 years are as under:

Discounting rate	14	15	16	17	18
Cumulative factor	3.43	3.35	32	320	3.13

Your are required to calculate the internal rate of return of the proposal.

[Ans: 15.74%]

Choose the Correct Answers

1. What does Net Present Value (NPV) measure in capital budgeting? [c]
   (a) The profitability of a project
   (b) The time it takes for a project to pay back its initial investment
   (c) The difference between a project's cash inflows and outflows, discounted at a specific rate
   (d) The internal rate of return of a project
2. Which of the following is a disadvantage of the Payback Period method? [c]
   (a) It considers the time value of money
   (b) It is easy to understand and calculate
   (c) It ignores cash flows beyond the payback period
   (d) It provides a clear measure of profitability
3. Internal Rate of Return (IRR) is the discount rate that makes the: [b]
   (b) Net Present Value (NPV) positive
   (b) Net Present Value (NPV) zero
   (c) Payback Period equal to the project's lifespan
   (d) Accounting Rate of Return (ARR) equal to the required rate of return
4. Which of the following capital budgeting techniques considers the risk of future cash flows by using different discount rates for different levels of risk? [d]
   (a) Net Present Value (NPV)
   (b) Internal Rate of Return (IRR)
   (c) Profitability Index (PI)
   (d) Risk-Adjusted Return On Capital (RAROC)
5. The Accounting Rate of Return (ARR) is calculated as : [b]
   (a) (Initial Investment - Salvage Value) / Number of Years
   (b) Average Annual Accounting Profit / Initial Investment
   (c) Total Cash Inflows / Total Cash Outflows
   (d) Discounted Cash Inflows - Initial Investment
6. What is the primary concept behind the Real Options Approach in capital budgeting? [b]
   (a) It considers the option to abandon a project if it becomes unprofitable
   (b) It incorporates the value of managerial flexibility in decision-making
   (c) It focuses on maximizing the Net Present Value (NPV) of a project
   (d) It calculates the Internal Rate of Return (IRR) for various investment options

7. Monte Carlo Simulation is used in capital budgeting primarily for: [b]
   (a) Estimating the Payback Period of a project
   (b) Analyzing the impact of uncertainty on project outcomes
   (c) Calculating the Accounting Rate of Return (ARR)
   (d) Determining the Discount Rate for a project
8. Decision Trees are useful in capital budgeting because they: [b]
   (a) Provide a graphical representation of project cash flows
   (b) Allow for a probabilistic assessment of project outcomes
   (c) Calculate the Net Present Value (NPV) of a project
   (d) Determine the Payback Period of a project
9. What does the Adjusted Present Value (APV) approach in capital budgeting adjust for? [b]
   (a) Inflation (b) Financing side effects
   (c) Tax deductions (d) Market risk
10. In capital budgeting, what does competing project risk refer to? [b]
   (a) The risk of investing in multiple projects simultaneously
   (b) The risk of choosing the wrong project among competing alternatives
   (c) The risk of projects having different levels of profitability
   (d) The risk of projects having different levels of risk

Fill in the blanks

1. _____ is calculated by subtracting the initial investment from the present value of expected cash flows.
2. IRR is the discount rate that makes the NPV of a project _____.
3. _____ is the time it takes for a project to recoup its initial investment.
4. PI greater than indicates a _____ investment.
5. _____ is calculated by dividing the average annual accounting profit by the initial investment.
6. The _____ applies financial options theory to investment decisions, recognizing that managers have the option, but not the obligation, to take certain actions in the future based on a project.
7. Monte Carlo Simulation is a technique used to model the uncertainty and variability of complex systems or processes by generating multiple possible outcomes based on _____.
8. _____ Trees are a visual representation of decision-making under uncertainty, showing different possible decisions and outcomes.
9. APV stands for _____.
10. _____ project risk arises when a company must choose between two or more projects that offer different risk-return profiles.

ANSWERS

1. NPV
2. Zero
3. Payback Period
4. Profitable
5. Preferable
6. Real Options Approach
7. Probabilistic inputs
8. Decision
9. Adjusted Present Value
10. Competing

UNIT IV

Equity Valuation: Calculation of Portfolio Mean and Variance, Capital Asset Pricing Model **(CAPM), Variance:** Covariance Matrix, Estimating Beta and Security Market Line. Industry Analysis, Economic Analysis and Technical Analysis in Stock, Real Option in Capital Budgeting.

4.1 EQUITY VALUATION

Q1. What is meant by Equity Valuation? Discuss the ethical considerations involved in equity valuation.

Ans : **(Imp.)**

Meaning

Equity valuation is the process of determining the fair value of a company's equity or common stock. It involves analyzing various factors such as the company's financial performance, growth prospects, industry trends, and market conditions to estimate what the stock is truly worth. This valuation is important for investors, analysts, and companies themselves to make informed decisions regarding buying, selling, or holding stocks.

Ethical considerations in equity valuation are crucial to ensure fair and transparent practices that consider the interests of all stakeholders.

Here are some key points to consider:

1. Transparency

Analysts and investors should disclose all relevant information and assumptions used in the valuation process. This includes detailing the methodology, key assumptions, and any potential conflicts of interest.

2. Fairness

Valuations should be conducted objectively, without bias or manipulation, to ensure that all stakeholders are treated fairly. This includes considering the interests of minority shareholders and other affected parties.

3. Accuracy

Valuations should be based on accurate and reliable information. Analysts and investors should use reputable sources and verify data to the best of their ability.

4. Conflicts of Interest

Analysts and investors should be aware of and disclose any conflicts of interest that may influence the valuation process. This includes avoiding situations where personal gain or bias may compromise objectivity.

5. Stakeholder Engagement

Analysts and investors should engage with stakeholders to understand their perspectives and concerns. This includes communicating with management, shareholders, and other relevant parties to gather information and address any issues.

6. Regulatory Compliance

Analysts and investors should adhere to relevant laws and regulations governing equity valuation. This includes following accounting standards and securities regulations to ensure compliance and transparency.

7. Professional Integrity

Analysts and investors should uphold high ethical standards in their conduct. This includes maintaining professional competence, integrity, and confidentiality in their work.

8. Social Responsibility

Analysts and investors should consider the broader social and environmental impacts of their valuation decisions. This includes assessing how their decisions may affect communities, the environment, and other stakeholders.

By following these ethical principles, analysts and investors can help ensure that equity valuation is conducted in a fair, transparent, and responsible manner that considers the interests of all stakeholders.

Q2. Explain the Scope of Equity Valuation?

Ans :

Investment analyst operating in different organizations need to implement equity valuation techniques to solve practical problems. Specifically, valuation models and concepts are used by analysts to achieve the following,

1. Selection of Stocks

The basic purpose of equity valuation techniques is stock selection. Equity analyst need to continuously focus on whether the client should purchase, sell or own the securities. Analyst must determine securities as fairly valued, overvalued or undervalued relating to market price or prices of comparable securities.

2. Evaluating Business Strategies and Models

Companies which are interested in increasing shareholder value should evaluate the effect of alternative strategies on share value.

3. Rendering Fairness Opinions

Merging parties require fair opinion relating to merger from third party like investment bank. Valuation plays an important role in such opinions.

4. Communicating with Analysts and Shareholders

Valuation concepts helps to communicate and discuss with company management, shareholders and analysts on corporate issues which influence company value.

5. Appraising Private Business

Valuation tools are also useful for valuing common stock of private companies. As stock of private companies are not traded publicly, it is not possible to compare an estimate of the stock's value with a market price.

6. Evaluating Corporate Events

Valuation tools are used by investment bankers, corporate analyst and investment analysts to evaluate the effect of corporate events like mergers, acquisitions, divestitures, spin offs, MBOs etc. These events influence company's future cash flows and value of equity.

4.2. Calculation Of Portfolio Mean and Variance

Q3. Explain how to calculate the mean return of a portfolio.

Ans : **(Imp.)**

Calculating the mean return of a portfolio involves determining the weighted average of the individual asset returns. The formula for the mean return of a portfolio is:

$$E(R_p) = \omega_1 \times E(R_1) + \omega_2 \times E(R_2) + \ldots + \omega_n \times E(R_n)$$

Where :

- $E(R_p)$ is the mean return of the portfolio,
- $E(R_i)$ is the expected return of asset i,
- ω_i is the weight of asset i in the portfolio, and
- n is the number of assets in the portfolio

Example:

Suppose you have a portfolio consisting of two assets: Asset A and Asset B. Asset A comprises 40% of the portfolio, while Asset B comprises 60% of the portfolio. The expected returns for Asset A and Asset B are 8% and 12%, respectively. Calculate the mean return of the portfolio.

Sol:

Step 1: Write down the weights and expected returns of each asset.

- $\omega_1 = 0.4$ (weight of Asset A)
- $\omega_2 = 0.6$ (weight of Asset B)
- $E(R_1) = 0.08$ (expected return of Asset A)
- $E(R_2) = 0.12$ (expected return of Asset B)

Step 2 : Apply the formula to calculate the mean return of the portfolio.

$$E(R_p) = 0.4 \times 0.08 + 0.6 \times 0.12$$

$$E(R_p) = 0.032 + 0.072$$

$$E(R_p) = 0.104$$

Therefore, the mean return of the portfolio is 10.4%.

Q4. Explain the process of calculation of portfolio mean in spreadsheet?

Ans :

To calculate the mean return of a portfolio in a spreadsheet, you can use the following steps:

1. Create a Table

Set up a table with columns for the asset names, their weights in the portfolio, and their expected returns.

2. Enter Data

Enter the data for each asset in the table. For example, in columns A, B, and C, you might have "Asset Name,""Weight," and "Expected Return."

3. Calculate Weighted Returns

In a new column, calculate the weighted returns for each asset by multiplying the weight of the asset by its expected return. For example, if the weight is in column B and the expected return is in column C, the formula in column D might be =B2*C2.

4. Calculate Mean Return

Finally, calculate the mean return of the portfolio by summing the weighted returns. You can use the SUM function to do this. For example, if the weighted returns are in column D, the formula might be =SUM(D2:Dn), where n is the row number of the last asset.

Here's a simple example in a spreadsheet format:

Asset Name	Weight	Expected Return	Weighted Return
Asset A	0.4	0.08	=B2*C2
Asset B	0.6	0.12	=B3*C3
Portfolio			=SUM(D2:D3)

In this example, the weighted return for Asset A is calculated by multiplying the weight (0.4) by the expected return (0.08), resulting in 0.032. Similarly, the weighted return for Asset B is 0.072. The mean return of the portfolio is then the sum of these weighted returns, which is 0.104 or 10.4%.

Q5. Explain how to calculate the variance of a portfolio in a spreadsheet.

Ans :

Calculating the variance of a portfolio involves considering the variances of individual assets as well as the covariance between the assets. The formula for the variance of a portfolio with two assets is:

$$\sigma_p^2 = \omega_1^2 \times \sigma_1^2 + \omega_2^2 \times \sigma_2^2 + 2 \times \omega_1 \times \omega_2 \times \text{Cov}(R_1, R_2)$$

Where:

σ_p^2 is the variance of the portfolio,

ω_1 and ω_2 are the weights of Asset 1 and Asset 2 in the portfolio, respectively,

σ_1^2 and σ_2^2 are the variances of Asset 1 and Asset 2, respectively, and

Cov (R_1, R_2) is the covariance between the returns of Asset 1 and Asset 2.

Example:

Suppose you have a portfolio consisting of two assets: Asset A and Asset B. Asset A comprises 40% of the portfolio, while Asset B comprises 60% of the portfolio. The variances of Asset A and Asset B are 0.04 and 0.09, respectively. The covariance between the returns of Asset A and Asset B is 0.03. Calculate the variance of the portfolio.

Sol:

Step 1: Write down the weights, variances, and covariance of each asset.

- ω_1 = 0.4 (weight of Asset A)
- ω_2 = 0.6 (weight of Asset B)
- σ_1^2 = 0.04 (variance of Asset A)
- σ_2^2 = 0.09 (variance of Asset B)
- Cov (R_1, R_2) = 0.03 (covarance between Asset A and Asset B)

Step 2 : Apply the formula to calculate the variance of the portfolio.

$$\sigma_p^2 = 0.4^2 \times 0.04 + 0.6^2 \times 0.09 + 2 \times 0.4 \times 0.6 \times 0.03$$

$$\sigma_p^2 = 0.016 + 0.0324 + 0.036$$

$$\sigma_p^2 = 0.844$$

In this example, the weighted variance for Asset A is calculated by squaring its weight (0.4) and multiplying it by its variance (0.04), resulting in 0.016. The weighted variance for Asset B is 0.036. The weighted covariance between the assets is 0.036. The portfolio variance is then the sum of the weighted variances and the weighted covariance, multiplied by 2, which is 0.084 or 8.4%.

4.3 Capital Asset Pricing Model(CAPM)

Q6. Discuss Capital Asset Pricing Model (CAPM) with assumptions. Highlight the applications of CAPM in security analysis.

(OR)

Explain capital asset pricing model theory.

Ans : **(Imp.)**

Meaning

An equilibrium model of asset pricing states that the expected return on a security is a positive linear function of the security's sensitivity to change the market portfolios return. The relevant risk for an individual asset is systematic risk (or market related risk) because non-market risk can be eliminated by diversification and systematic risk is measured by beta. In other words, all securities are expected to yield returns commensurate with their riskiness. Therefore, the relationship between an assets return and its systematic risk can be expressed by the CAPM, which is also called the security market line. The equation is as follows,

$$\boxed{\bar{r}_i = r_f + \beta_i[\bar{r}_m - r_f]}$$

Where,

$\bar{r}_i$ = The expected return for an asset

r_f = The risk-free rate

r_f = The expected market return (usually assumed to be BSE sensex)

β_i = The assets beta.

The CAPM is an equilibrium model for measuring the risk-return trade-off for all assets including both inefficient and efficient portfolios. A graph of the CAPM is as follows,

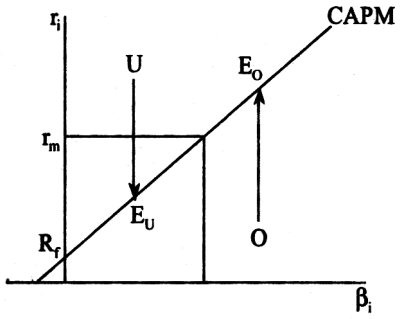


Fig .: Capital Asset Pricing Model

The above figure depicts two assets U and O, that are not in the equilibrium on the CAPM. Asset U is undervalued and therefore, a very desirable asset to own. IPs price will rise in the market as more investors purchase. However, as U's price goes up, its return falls. When U's return falls to the return consistent with its beta on the SML, equilibrium is attained. With O, just the

opposite takes place. Investors will attempt to sell O, since it is over valued and therefore, put downward pressure on O's price. When the return on asset O increases to the rate that is consistent with the beta risk level given by the SML, equilibrium will be achieved and downward price pressure will cease.

Assumptions

1. Investors evaluate portfolios by looking at the expected returns and standard deviations of the portfolios over one-period horizon.
2. Investors are never satisfied, so when given a choice between two otherwise identical portfolios, they will choose the one with the higher expected return.
3. Investors are risk-averse, so when given a choice between two otherwise identical portfolios, they will choose the one with the lower standard deviation.
4. Individual assets are infinitely divisible, meaning that an investor can buy a fraction of a share if he or she so desires.
5. There is a risk free rate at which an investor may either lend (that is, invest) money or borrow money.
6. Taxes and transaction costs are irrelevant.
7. All investors have the same one-period horizon.
8. The risk free rate is the same for all investors.
9. Information is freely and instantly available to all investors.
10. Investors have homogeneous expectations which means they have the same perceptions in regard to the expected returns, standard deviations and covariances of securities.

Application

Capital Assets Pricing Model (CAPM) is widely used for evaluating investment projects because of its significant role,

1. CAPM is advantageous in evaluating the portfolio performance and cost of equity of the companies.
2. It assess the risk and helps in determining the relationship between the risk and expected return of the portfolio.
3. CAPM is future oriented model i.e., it helps in predicting the future returns of securities.
4. It is also used even if the dividend information is not provided.
5. CAPM uses historical data for calculating the betas which may or may non predict the risk associated with the future returns.

Q7. Explain the process of calculating the Capital Asset Pricing Model in a MS - Excel ?

Ans :

Calculating the expected return of an asset using the Capital Asset Pricing Model (CAPM) in a spreadsheet involves using the formula:

$$R_e = R_f + \beta \times (R_m - R_f)$$

Steps:

1. Enter Data

Set up a table with columns for the asset name, risk-free rate, beta, and market risk premium. For example, in columns A, B, C, and D, you might have "Asset Name,""Risk-Free Rate,""Beta," and "Market Risk Premium."

2. Calculate Expected Return

In a new column, calculate the expected return of each asset using the CAPM formula. For example, if the risk-free rate is in cell B2, the beta is in cell C2, and the market risk premium is in cell D2, the formula in column E might be =B2+C2*(D2-B2).

3. Repeat for Each Asset

Copy the formula down the column to calculate the expected return for each asset in the portfolio.

In this example, the expected return for Asset A is calculated as 0.02 + 1.2 * (0.08 - 0.02) = 0.092 or 9.2%. Repeat the calculation for Assets B and C to calculate their expected returns based on their beta and the market risk premium.

Q8. Discuss the working Mechanism of CAPM ?

Ans :

The capital asset pricing model (CAPM) is a fundamental method in corporate finance used to determine the required rate of return on an investment given its risk profile.

The CAPM establishes a relationship between the risk and expected return by an investor based on three key variables:

1. Risk-Free Rate (rf)
2. Beta (β) of the Underlying Security
3. Equity Risk Premium (ERP)

(i) The discount rate represents the "hurdle rate" – i.e. the minimum rate of return – corresponding to the risk profile of an investment, which could refer to share issuances by a publicly-traded company or a proposed project that a corporation is under consideration on whether to proceed.

(ii) To perform a cash flow-oriented valuation on a company, the implied intrinsic value equals the sum of its future cash flows discounted to their present value (PV) using an appropriate discount rate.

(iii) Under the specific context of equity investors, the discount rate that pertains solely to common shareholders is referred to as the "cost of equity," — which is the required rate of return to equity investors that the capital asset pricing model is used to calculate.

(iv) The unlevered free cash flow, or free cash flow to firm (FCFF), is generated by a company and discounted using the weighted average cost of capital (WACC), whereas levered free cash flow or free cash flow to equity (FCFE) is discounted using the cost of equity (ke).

- Free Cash Flow to Firm (FCFF) → Weighted Average Cost of Capital (WACC)
- Free Cash Flow to Equity (FCFE) → Cost of Equity (Ke)

But regardless of the type of cash flow being discounted, the cost of equity (ke) serves an integral role in either approach because it is an input in the WACC formula.

Q9. Discuss the components of capital asset Pricing Model?

Ans : **(Imp.)**

The capital asset pricing model (CAPM) equation is composed of three components:

1. Risk-Free Rate (rf)

(i) Starting off, the risk-free rate (rf) should theoretically reflect the yield to maturity (YTM) of default-free government bonds of equivalent maturity to the duration of each cash flow being discounted.

(ii) However, due to the lack of liquidity in government bonds with the longest maturities (i.e. less trade volume and data sets), the current yield on 10-year US treasury notes has become the standard proxy for the risk-free rate assumption for companies based in the US.

2. Beta (β)

(i) In corporate finance, beta (β) measures the systematic risk of a security compared to the broader market (i.e. non-diversifiable risk).

(ii) The beta of an asset is calculated as the covariance between expected returns on the asset and the market, divided by the variance of expected returns on the market.

(iii) The relationship between beta (β) and the expected market sensitivity is as follows:

- $\beta = 0$: No Market Sensitivity
- $\beta < 1$: Low Market Sensitivity
- $\beta = 1$: Same as Market (Neutral)
- $\beta > 1$: High Market Sensitivity
- $\beta < 0$: Negative Market Sensitivity

(iv) **Systematic Risk** → Often referred to as market risk, systematic risk is inherent to the entire equities market, as opposed to being specific to a particular company or industry. In short, systematic risk is unavoidable and cannot be mitigated through portfolio diversification (e.g. global recessions).

(v) **Unsystematic Risk** → Unsystematic risk refers to the company-specific (or industry-specific) risk that can actually be reduced through portfolio diversification (e.g. supply chain shutdowns, lawsuits). The benefits of diversification become more profound if the portfolio contains investments in different asset classes, industries, and geographies.

The common source of criticism is most often related to beta, as many criticize it as a flawed measure of risk.

(vi) **Trailing-Basis** → The standard procedure for estimating the beta of a company is through a regression model that compares the historical market index returns and company-specific returns, in which the slope of the regression line corresponds to the beta of the company's shares (the calculation is thus "backward-looking").

However, the past performance (and correlation) of a company relative to the market may not be an accurate indicator of future share price performance.

(vii) Capital Structure Mix → The capital structure (debt/equity ratio) of companies also progressively changes over time, which can alter their risk profiles and performance.

3. Equity Risk Premium (ERP)

- Our third input, the equity risk premium (ERP), or "market risk premium," measures the incremental risk (or excess return) of investing in equities over risk-free securities.
- Since investing in risky assets such as equities comes with additional risk (i.e. potential for loss of capital), the equity risk premium serves as additional compensation for investors to have an incentive to take on the risk.
- The equity risk premium has been around the 4% to 6% range, based on historical spreads between the S&P 500 returns over the yields on risk-free government bonds.

4.4. VARIANCE AND COVARIANCE MATRIX, ESTIMATING BETA IN CAPM

Q10. How to calculate Variance of Portfolio using Capital Asset Pricing Model ?

Ans :

To calculate the variance of a portfolio using the Capital Asset Pricing Model (CAPM), you need the beta values of the assets in the portfolio, the variance of the market portfolio, and the weights of the assets in the portfolio. The formula for calculating the variance of a portfolio using CAPM is:

$$\sigma_p^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} \omega_i \omega_j \sigma_i \sigma_j \rho_{ij}$$

(i) σ_p^2 is the variance of the portfolio.

(ii) ω_i and ω_j are the weights of assets i and j in the portfolio, respectively.

(iii) σ_i and σ_j are the standard deviations of the returns of assets i and j, respectively.

(iv) ρij is the correlation coefficient between the returns of assets i and j.

(v) n is the number of assets in the portfolio.

Here's how you can calculate the variance of a portfolio using CAPM in a spreadsheet:

1. Enter Data

Set up a table with columns for the asset names, beta values, standard deviations, and weights. For example, in columns A, B, C, and D, you might have "Asset Name,""Beta,""Standard Deviation," and "Weight."

2. Calculate Covariance Matrix

In a new section of the spreadsheet, create a covariance matrix for the assets in the portfolio. The covariance between covariance matrix for the assets in the portfolio. The covariance between assets i and j can be calculated as $\sigma_i \sigma_j \rho_{ij}$, where ρ_{ij} is the correlation coefficient between the returns of assets i and j.

3. Calculate Portfolio Variance

Use the formula above to calculate the variance of the portfolio. The formula involves summing the products of the weights and the elements of the covariance matrix. Use the SUMPRODUCT function in Excel to do this.

Here's a simple example in a spreadsheet format:

Asset Name	Beta	Standard Deviation	Weight
Asset A	1.2	0.15	0.4
Asset B	0.8	0.10	0.6

Assuming the correlation coefficient between Asset A and Asset B is 0.5, the covariance matrix would be:

	Asset A	Asset B
Asset A	0.0225	0.0075
Asset B	0.0075	0.01

The variance of the portfolio would then be calculated as :

$\sigma_p^2 = (0.4^2) \times 0.0225 + (0.6^2) \times 0.01 + 2 \times 0.4 \times 0.6 \times 0.0075$

$\sigma_p^2 = 0.0045 + 0.0036 + 0.0054$

$\sigma_p^2 = 0.0135$

Therefore, the variance of the portfolio is 0.0135 or 1.35%

Q11. Explain Variance and Covariance matrix in CAPM by MS. Excel ?

Ans :

In the Capital Asset Pricing Model (CAPM), the variance-covariance matrix is used to calculate the variance of a portfolio. The matrix includes the variances of individual assets on the diagonal and the covariances between asset pairs off the diagonal. The formula for the variance of a portfolio using the variance-covariance matrix in CAPM is:

$$\sigma_P^2 = w^T \, Cw$$

where :

(i) σ_P^2 is the variance of the portfolio.

(ii) w is a column vector of the weights of the assets in the portfolio.

(iii) C is the variance -covariance matrix of the assets' returns.

Here's how you can calculate the variance of a portfolio using the variance-covariance matrix in a spreadsheet:

1. Enter Data

Set up a table with columns for the asset names, weights, variances, and covariances. For example, in columns A, B, C, and D, you might have "Asset Name,""Weight,""Variance," and "Covariance."

2. Calculate Variance-Covariance Matrix

Create a variance-covariance matrix for the assets in the portfolio. Enter the variances on the diagonal and the covariances off the diagonal. Make sure the matrix is symmetric.

3. Calculate Portfolio Variance

Use the formula above to calculate the variance of the portfolio. The formula involves multiplying the transpose of the weight vector by the variance-covariance matrix and then by the weight vector. Use the MMULT function in Excel to multiply matrices.

Here's a simple example in a spreadsheet format:

Asset Name	Weight	Variance	Covariance
Asset A	0.4	0.04	0.006
Asset B	0.6	0.09	

The variance-Covariance matrix for this example would be:

$$\begin{bmatrix} 0.04 & 0.006 \\ 0.006 & 0.09 \end{bmatrix}$$

Assuming the weight vector is $w = \begin{bmatrix} 0.4 \\ 0.6 \end{bmatrix}$, the variance of the portfolio would be calculated as :

$$\sigma_P^2 = [0.4 \quad 0.6] \times \begin{bmatrix} 0.04 & 0.006 \\ 0.006 & 0.09 \end{bmatrix} \times \begin{bmatrix} 0.4 \\ 0.6 \end{bmatrix}$$

$$\sigma_P^2 = [0.4 \quad 0.6] \times \begin{bmatrix} 0.0288 \\ 0.0516 \end{bmatrix}$$

$$\sigma_P^2 = 0.4 \times 0.0288 + 0.6 \times 0.0516$$

$$\sigma_P^2 = 0.01152 + 0.03096$$

$$\sigma_P^2 = 0.04248$$

Therefore, the variance of the portfolio is 0.04248 or 4.248%.

Q12. Explain briefly about Variance and Covariance matrix in CAPM with an example?

Ans : **(Imp.)**

The covariance matrix is a square matrix to show the covariance among the columns and variance in columns. Excel presented an inbuilt "Data Analysis" tool to determine the covariance between the data sets. The present article will explain the covariance matrix calculation in Excel by covering the following topics.

For example, suppose we have an Age(X) and Score (Y) dataset. We need to determine the joint variability of the given variables in a dataset. In such a scenario, we can use the covariance matrix function that helps to display the covariance between a pair of datasets and the variance shown by the dataset elements.

Explanation

Covariance is one of the measures used for understanding how a variable is associated with another variable. The following formula is used for covariance determination.

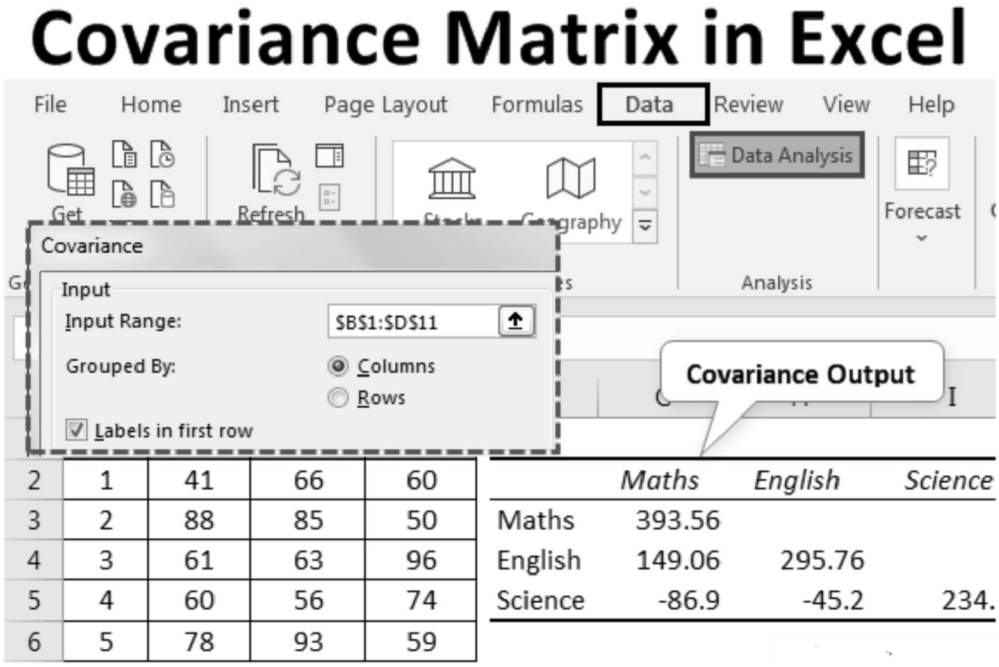
$$COV(X,Y) = \Sigma(x - x)(y - y) / n$$

The covariance matrix is a square matrix to understand the relationships presented between the different variables in a dataset. It is easy and useful to show the covariance between two or more variables.

The covariance will have both positive and negative values. A positive value indicates that two variables will decrease or increase in the same direction. A negative value indicates that if one variable decreases, the other increases, and an inverse relationship exist between them. The covariance matrix is represented in the following format. The three-dimensional covariance matrix is shown as:

$$S = \begin{matrix} COV(X,X) & COV(X,Y) & COV(X,Z) \\ COV(Y,X) & COV(Y,Y) & COV(Y,Z) \\ COV(Z,X) & COV(Z,Y) & COV(Z,Z) \end{matrix}$$

To create the 3 × 3 square covariance matrix, we need to have three-dimensional data. The diagonal values of the matrix represent the variances of X, Y, and Z variables (i.e., COV(X, X), COV(Y, Y), and COV (Z, Z)). The covariance matrix is symmetric concerning diagonal. This indicates that COV(X,Y) = COV(Y,X), COV(X,Z) = COV(Z,X), and COV(Y,Z) = COV(Z,Y). One point to remember about this matrix is the result from the NXN covariance matrix for data of n-dimensional.



To Use a Covariance Matrix in Excel

The covariance matrix is used in various applications, including:

- Analyzing how two vectors are differentiated from each other.
- In machine learning, determine the dependency patterns between the two vectors.
- The covariance matrix tells the relationship among the different dimensions of random variables.
- It can be used in stochastic modeling
- in financial engineering
- to correlate the random variables.
- The principal component is another application of the covariance matrix to original variables to linear independent variables.
- In data analysis, the covariance matrix has a vital role.
- The covariance matrix is utilized in modern portfolio theory
- to estimate risks.
- The measures of the covariance matrix are used in anticipating the returns on the financial assets

Examples of Covariance Matrix in Excel

Below are some examples of using the covariance matrix in Excel.

Example 1

Performing covariance analysis on the marks obtained by students in different subjects.

Step 1: The following data, including the marks of students in Mathematics, English, and Science, are considered as shown in the figure.

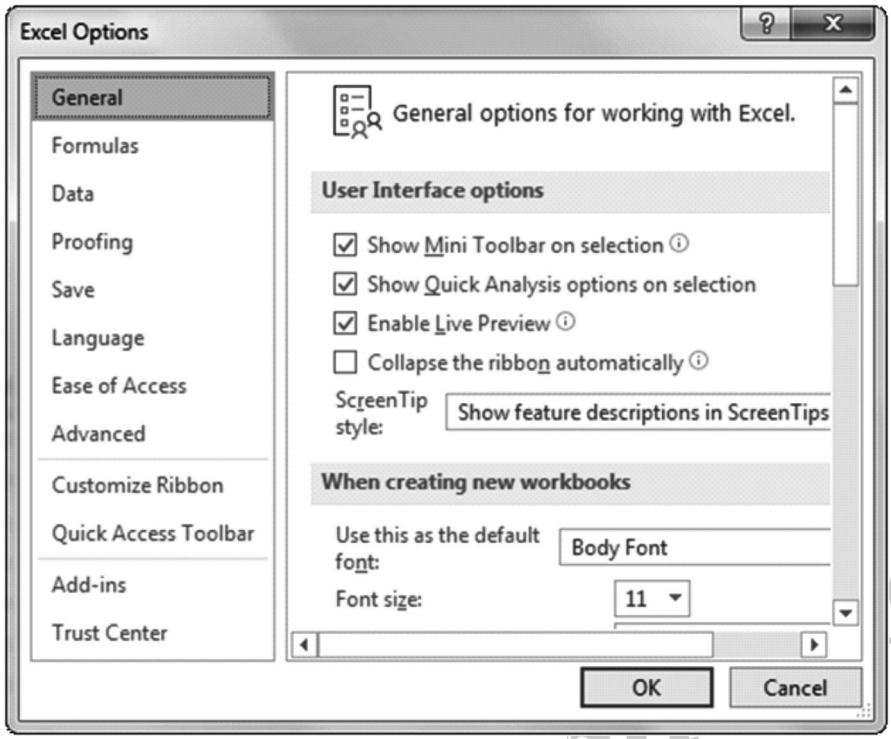
	A	B	C	D	E
1	Sr. No	Maths	English	Science	
2	1	41	66	60	
3	2	88	85	50	
4	3	61	63	96	
5	4	60	56	74	
6	5	78	93	59	
7	6	85	69	48	
8	7	40	41	50	
9	8	81	67	78	
10	9	38	44	82	
11	10	90	38	58	
12					

Step 2: First, we must go to the "Data" tab on the ribbon and find the "Data Analysis" ToolPak on the right side corner.

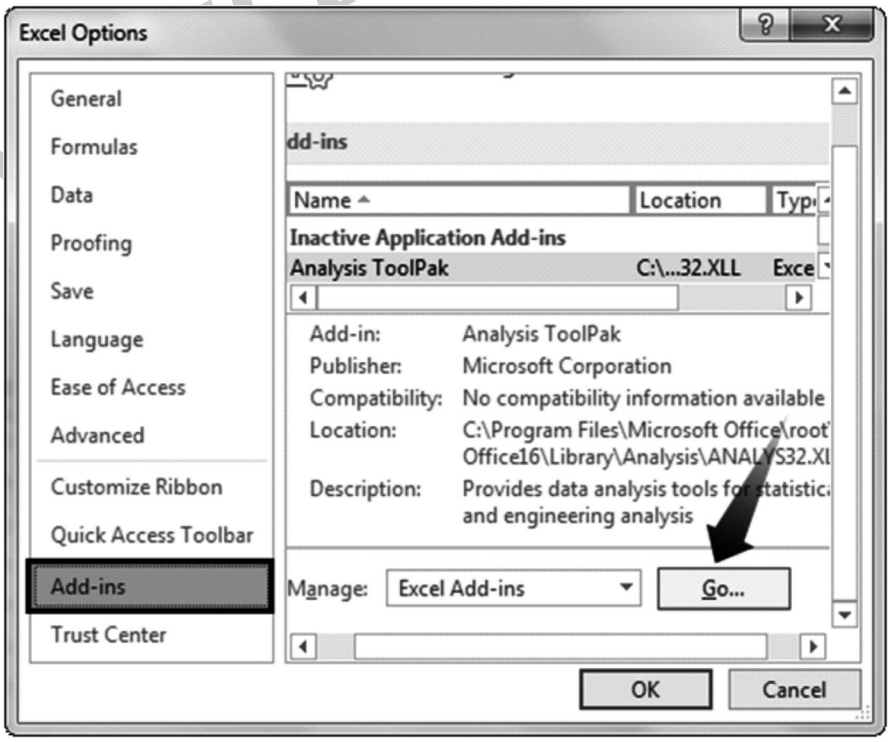
If Data analysis ToolPak is not available, then follow these steps.

Step A: First, we must go to the "File" tab and select the "Options."

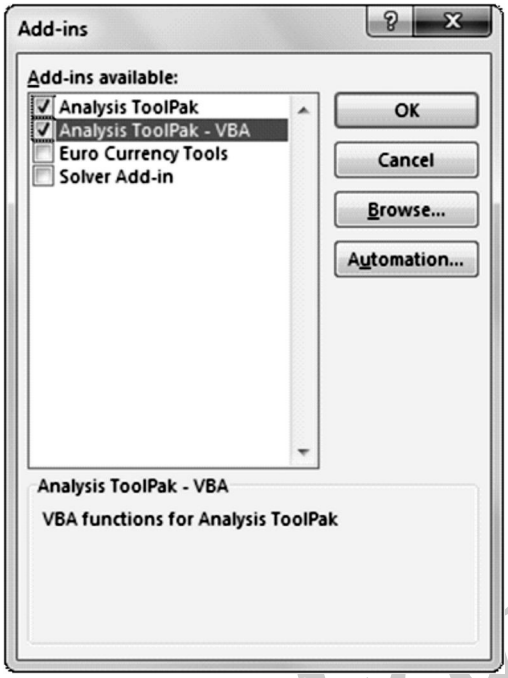
It will open the following screen.



Step B: Then, we need to go to "Add-ins." Under the "Manage Option," ensure that "Excel add-ins" are selected and select the "Go" button, as shown in the figure.

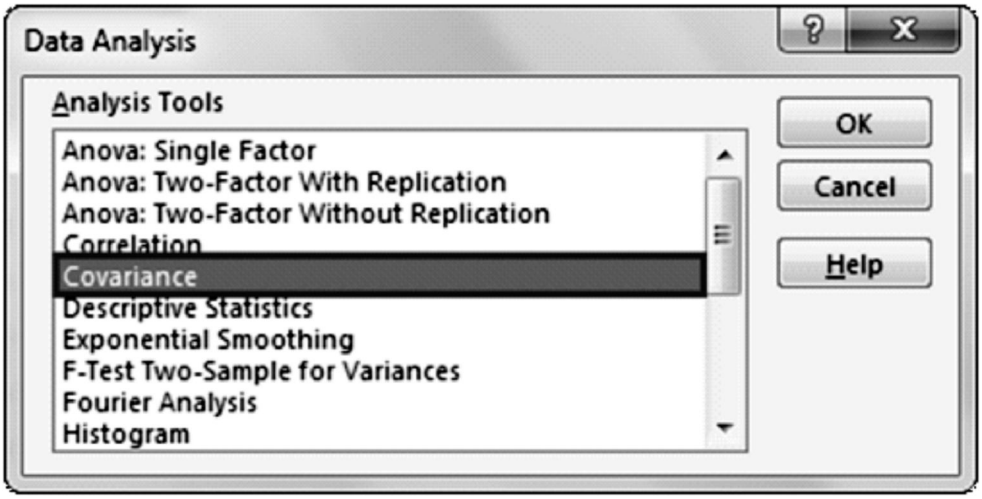


Step C: Select the "Analysis ToolPak" and "Analysis-ToolPak VBA," as shown in the screenshot.

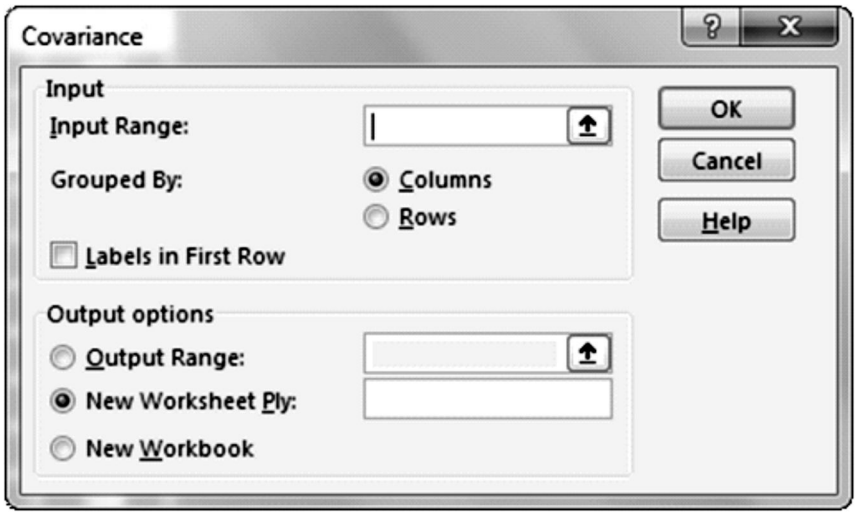


After completing these steps, the "Data Analysis" ToolPak is added to the "Data" tab.

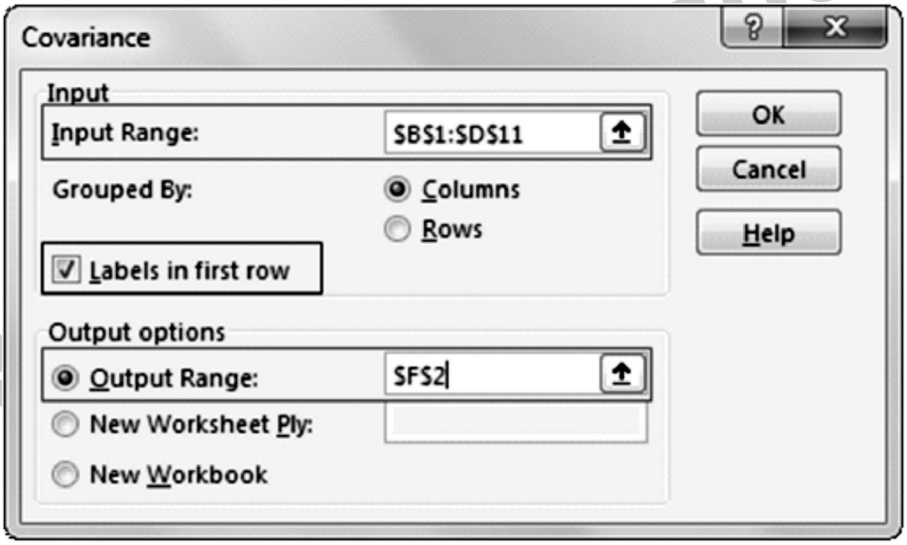
Step 3: We need to click on "Data Analysis." As a result, it opens the "Data Analysis" dialog box. Select the "Covariance" by scrolling up and clicking on "OK."



It displays the "Covariance" dialog box.



Step 4: Next, we must select the input range, including the subject names, check the "Labels in first row," and give the "output range" in the existing worksheet. And click on "OK."



Step 5: We will get the output as follows –

	F	G	H	I
1				
2		*Maths*	*English*	*Science*
3	Maths	393.56		
4	English	149.06	295.76	
5	Science	-86.9	-45.2	234.65
6				

The upper part of the diagonal is empty as the Excel covariance matrix is symmetric towards the diagonal.

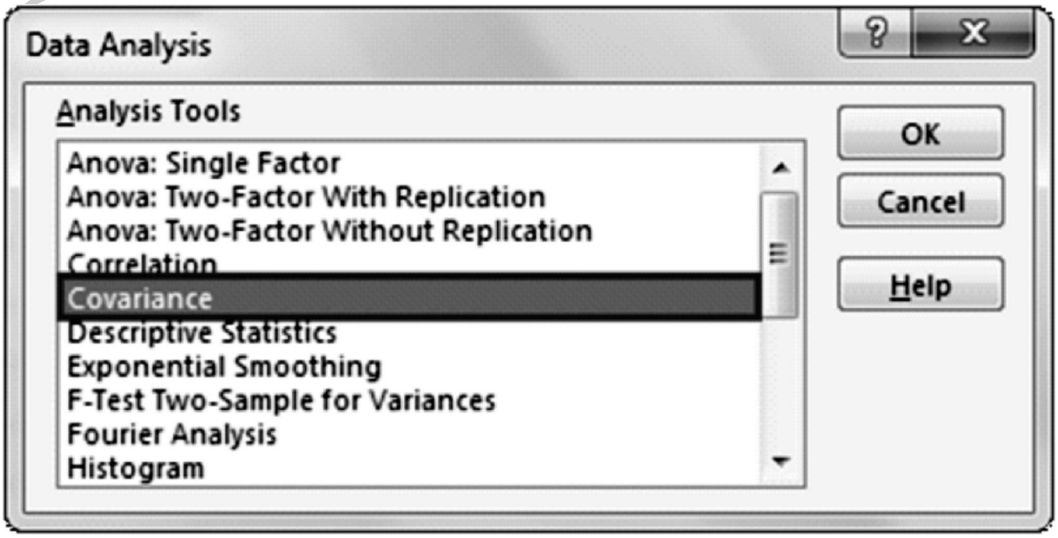
Example

Perform a calculation of the covariance matrix to determine variances between the returns of different portfolio stocks.

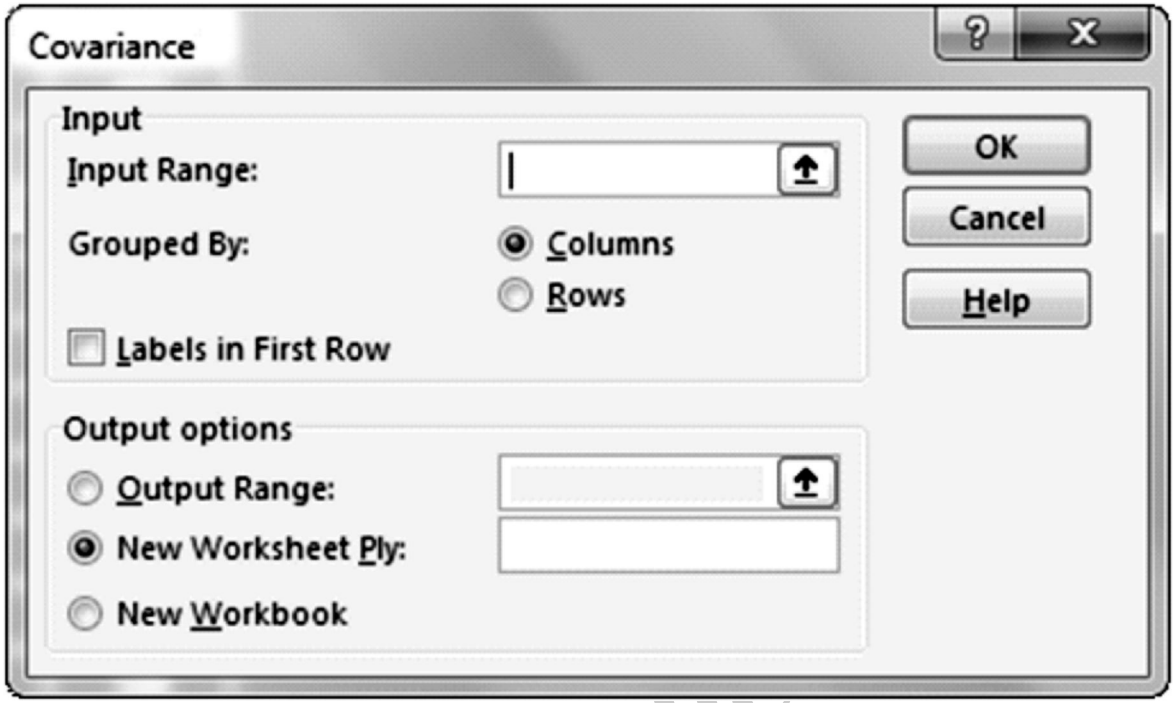
Step 1: For this example, the following data, including the stock returns, are considered.

	A	B	C	D
1	Year	Stock A Returns	Stock B Returns	
2	2010	7.00%	5.00%	
3	2011	9.00%	6.00%	
4	2012	8.00%	3.90%	
5	2013	5.80%	4.70%	
6	2014	8.50%	5.40%	
7	2015	7.30%	6.20%	
8	2016	6.90%	7.40%	
9	2017	9.30%	9.10%	
10	2018	4.90%	3.50%	
11	2019	6.50%	2.50%	
12				

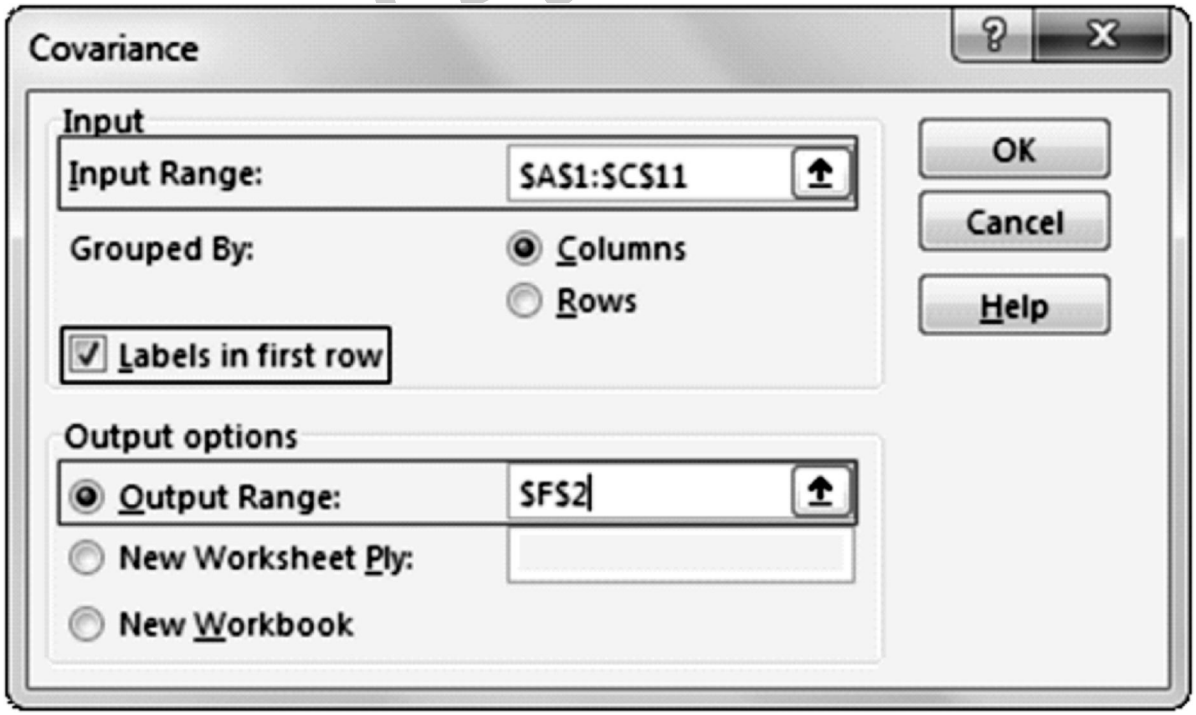
Step 2: We need to open the "Data Analysis" dialog box and select the "Covariance" by scrolling up and clicking on "OK."



It displays the "Covariance" dialog box.



Step 3: We must select the input range, including the headers, check the "Labels in first row," and give the "Output Range" in the existing worksheet. And click on "OK."



Step 4: We will get the output as follows –

	F	G	H	I
1				
2		*Year*	*Stock A Returns*	*Stock B Returns*
3	Year	8.25		
4	Stock A Returns	-0.0123	0.00017716	
5	Stock B Returns	-0.0026	0.00014626	0.00033601

The upper part of the diagonal is empty as the covariance matrix is symmetric towards the diagonal.

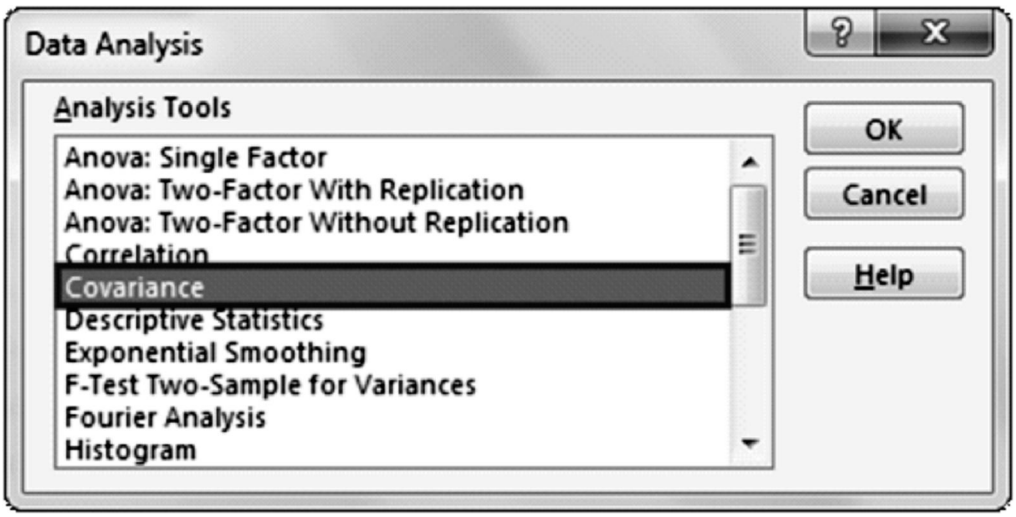
Example #3

Calculation of covariance matrix for stock prices of corporate companies

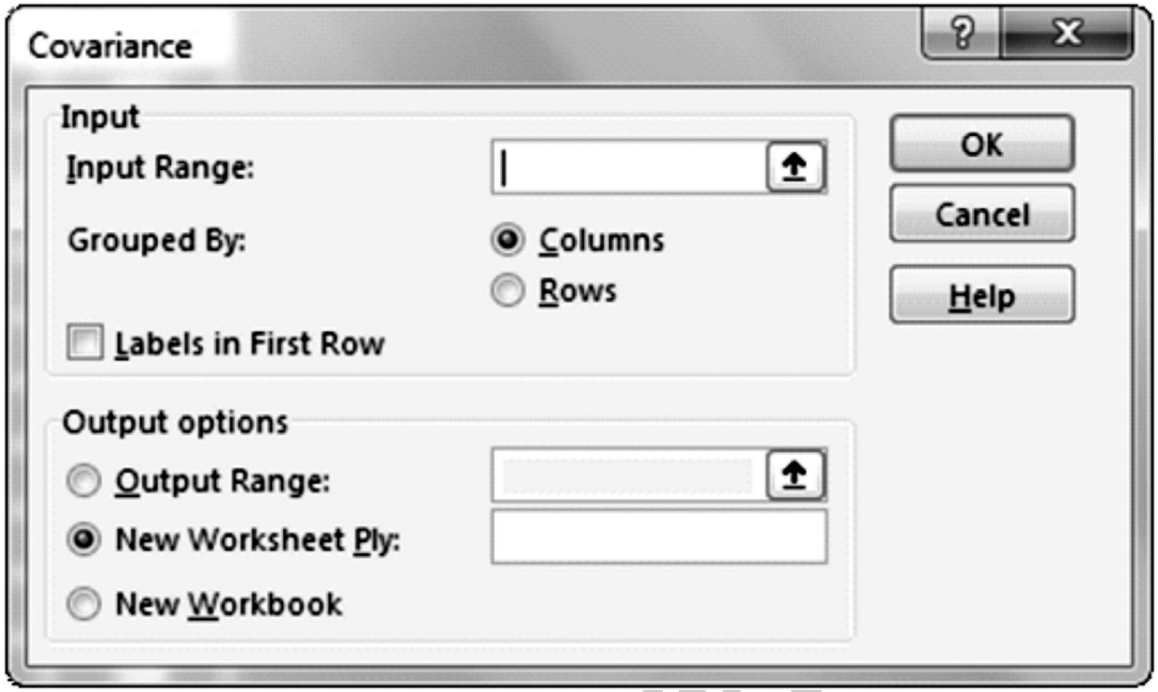
Step 1: For this example, the following data, including stock prices of different companies, are considered.

	A	B	C	D	E
1	IBM	Infosys	GM	J and J	
2	134.4	9.87	37	131.25	
3	135.1	9.79	37.1	131.03	
4	134.4	9.6	38.4	131.04	
5	134.9	9.73	38.74	132	
6	134.2	9.75	38.6	132.27	
7					

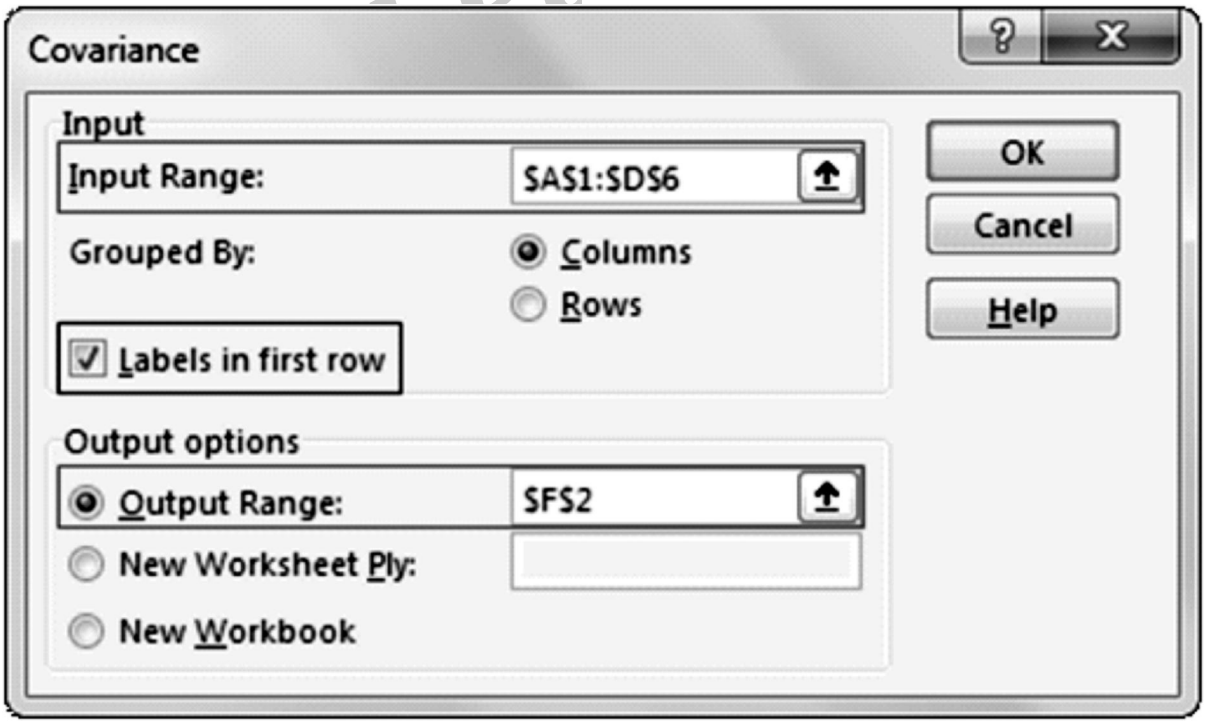
Step 2: We have to open the "Data Analysis" dialog box and select the "Covariance" by scrolling up and clicking on "OK."



It displays the "Covariance" dialog box.



Step 3: Next, we must select the range of input, including the headers, check the "Labels in first row," give the "Output Range" in the existing worksheet and click on "OK."



Step 4: We will get the output as follows –

	F	G	H	I	J
1					
2		*IBM*	*Infosys*	*GM*	*J and J*
3	IBM	0.12038			
4	Infosys	0.00441	0.007776		
5	GM	-0.0784	-0.046224	0.574496	
6	J and J	-0.0545	0.002076	0.264776	0.26726

- The covariance tool presented by Excel has some limitations, including the determination of only population variances formula
- creation of matrix with only lower diagonal values, and consideration of formulae only for a variance.
- When return values are changed, it doesn't automatically update the values of the matrix.
- The upper half of the matrix is empty since it is symmetric, and mirror-image values are shown in the lower diagonal.

Q13. Explain briefly about Variance and Covariance matrix in CAPM by using MS Excel ?

Ans : **(Imp.)**

In the context of the Capital Asset Pricing Model (CAPM), the variance and covariance matrix are used to calculate the risk and return of a portfolio of assets.

(i) Variance

Variance measures how spread out the values in a data set are around the mean. In finance, variance is used to measure the volatility or risk of an asset's returns. The formula for variance is:

$$\text{Var}(X) = \frac{\Sigma_{i=1}^{n}\left(X_i - \bar{X}\right)^2}{n-1}$$

where

X is the random variable,

X_i is each observation in the data set,

$\bar{X}$ is the mean of the data set, and n is the number of observations.

(ii) Covariance

Covariance measures the relationship between two random variables. In finance, covariance is used to measure how two assets move in relation to each other.

The formula for covariance between two random variables X and Y is :

$$\text{Cov}(X, Y) = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{n-1}$$

where

X_i and Y_i are each observation in the data set for X and Y,

$\bar{X}$ and $\bar{Y}$ are the means of the data sets.

Example

Let's say we have a portfolio of two assets, A and B. We have the following data for their returns over a period of time:

Asset A returns : 5%, 8%, 10%, 12%

Asset B returns : 3%, 6%, 8%, 9%

First, we calculate the mean returns for each asset :

- **Mean return of Asset A :** $\bar{X}_A = \frac{5+8+10+12}{4} = 8.75$
- **Mean return of Asset B :** $\bar{X}_B = \frac{3+6+8+9}{4} = 6.5$

Next, we calculate the variance of each asset's returns :

- **Variance of Asset A :** Var $(X_A) = \frac{(5-8.75)^2+(8-8.75)^2+(10-8.75)^2+(12-8.75)^2}{4-1} = 6.1875$
- **Variance of Asset B :** Var $(X_B) = \frac{(3-6.5)^2+(6-6.5)^2+(8-6.5)^2+(9-6.5)^2}{4-1} = 5.1875$

Finally, we calculate the covariance between the returns of Asset A and Asset B :

- Covariance of Asset A and Asset B : Cov (X_A, X_B) =

$$\frac{(5-8.75)(3-6.5)+(8-8.75)(6-6.5)+(10-8.75)(8-6.5)+(12-8.75)(9-6.5)}{4-1} = 6.6875$$

In a spreadsheet, you can set up a table like this :

	Returns (Asset A)	Returns (Asset B)
Period1	5%	3%
Period2	8%	6%
Period3	10%	8%
Period4	12%	9%

And then calculate the mean, variance, and covariance using formulas similar to those described above.

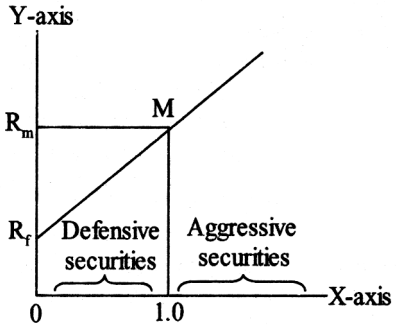
4.5 Security Market Line

Q14. Discuss about Securities Market Line (SML) and diversification of portfolio.

Ans : **(Imp.)**

Meaning

(i) In case of portfolios involving complete diversification, where the unsystematic risk tends to zero, there is only systematic risk measured by beta(β). The only dimension of a security which concerns are expected return and beta.



To determine this line we need to connect the intercept (where beta is zero as it is riskless security) and the market portfolio (beta of one and return of R_m). These points are R_f and Min the graph above. The equation of that straight line is Security Market Line (SML).

$$\boxed{R_i = \alpha + b\beta_i}$$

$R_f = \alpha$ as b β_i becomes zero for risk less asset ($\beta = 0$)

Where,

$\beta_i = 1$

$R_m = \alpha + b(1)$ or $R_m - \alpha = b$

Since,

$R_f = \alpha$, then $R_m - R_f = b$

Combining the above two results, we have,

$R = R_f + \beta_i (R_m - R_f)$

This is the key equation for security market line and can be rewritten as,

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

Covariance to have as much as possible negative interactive effect among the securities within the portfolio and coefficient of correlation to have - 1 (negative) so, that the overall risk of the portfolio as a whole is nil or negligible. Then the securities have to be combined in a manner that standard deviation is zero.

(ii) Diversification of Portfolio

Diversification is a much-used and much-talked about set of strategies. These strategies involve all the dimensions of strategic alternatives. It may involve internal or external, related or unrelated, horizontal or vertical and active or passive dimensions either singly or collectively.

The firms opts for diversification for providing flexibility to the business portfolio in order to contradict vulnerability. The firms following single product approach feels unprotected or vulnerable to the changing conditions of environment. In order to overcome these problems firms are choosing diversification by maintaining flexibility in the portfolio.

When a person invests in a mutual fund, he participates in a large basket of shares of many different companies in a number of different industries which are included in the fund's portfolio. To achieve a similar degree of diversification, an individual investor has to spend considerable time and money. Further, since a fund purchase shares in large volumes it has the advantage of paying the minimum brokerage.

Q15. Explain in detail calculation of Security Market Line in Spreadsheet ?

Ans : **(Imp.)**

The Security Market Line (SML) is a graphical representation of the Capital Asset Pricing Model (CAPM). It depicts the relationship between the expected return and the systematic risk (beta) of an individual security. To calculate the Security Market Line in a spreadsheet, follow these steps:

1. Gather Data

You will need the risk-free rate, the expected market return, and the beta of the security you are analyzing.

2. Calculate the Expected Return

Use the CAPM formula to calculate the expected return of the security. The formula is:

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

Where :

- $E(R_i)$ = Expected return of the security
- R_f = Risk-free rate
- β_i = Beta of the security
- $E(R_m)$ = Expected return of the market

(i) Create a Table

In your spreadsheet, create a table with columns for the beta values and the corresponding expected returns.

(ii) Plot the SML

Use a scatter plot to plot the beta values on the x-axis and the expected returns on the y-axis. This will give you the Security Market Line.

Here's an example in a spreadsheet:

Beta	Expected Return
0.5	=B2*($E$2-$B$2)+$B$2
1.0	=B3*($E$2-$B$2)+$B$2
1.5	=B4*($E$2-$B$2)+$B$2
…	…

E(Rm) is in cell E2(Rf)is in cell B2, and the beta values are in column B. You can drag the formula down to calculate the expected return for different beta values. Finally, create a scatter plot using the beta values as the x-axis and the expected returns as the y-axis to visualize the Security Market Line.

Q16. Explain briefly about Estimated Beta in CAPM?

Ans : **(Imp.)**

CAPM Beta is a theoretical measure of the way how a single stock moves with respect to the market, by taking correlation between the both; market represents the unsystematic risk and beta represents the systematic risk.

CAPM Beta When we invest in stock markets, how do we know that stock A is less risky than stock B. Differences can arise due to market capitalization, revenue size, sector, growth, management, etc. Can we find a single measure that tells us which stock is riskier? The answer is YES, and we call this as CAPM Beta or Capital Asset Pricing Model Beta.

CAPM Beta:

Beta is a very important measure that is used as a key input for Discounted Cash Flow or DCF valuations.

CAPM Beta Formula

If you have a slightest of the hint regarding DCF, then you would have heard about the Capital Asset Pricing Model (CAPM) that calculates the Cost of Equity as per the below Beta formula.

Cost of Equity = Risk Free Rate + Beta x Risk Premium

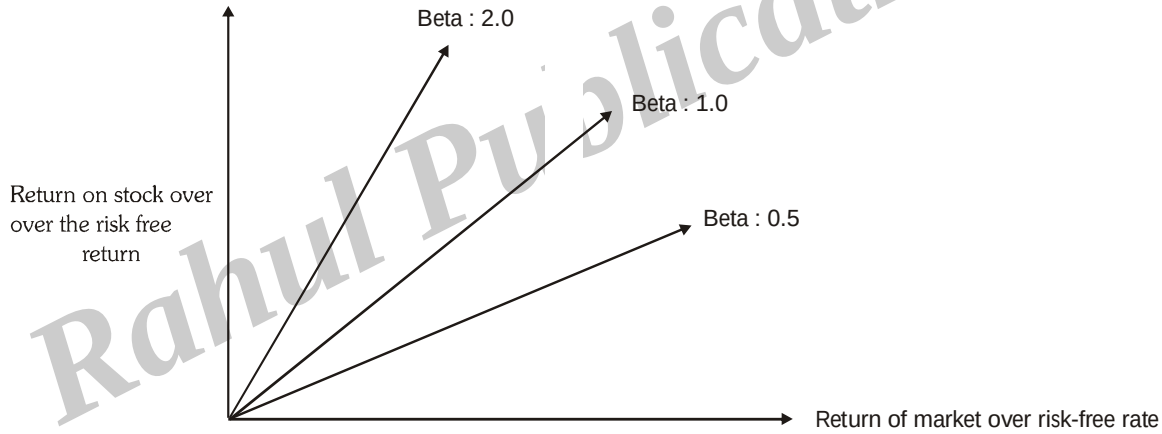
Let us take an example: when we invest in stocks, it is but human to pick stocks that have the highest possible returns. However, if one chases only returns, the other corresponding element is missed, i.e., Risk.

Actually, every stock is exposed to two types of risks.

- Non-Systematic Risks include risks that are specific to a company or industry. This kind of risk can be eliminated through diversification across sectors and companies. The effect of diversification is that the diversifiable risk of various equities can offset each other.
- Systematic Risks are those risks that affect the overall stock markets. Systematic risks can't be mitigated through diversification but can be well understood via an important risk measure called "BETA."

Beta:

Beta measures the stock risks in relation to the overall market.



(i) If Beta = 1

If the Beta of the stock is one, then it has the same level of risk as to the stock market. Hence, if the stock market (NASDAQ and NYSE, etc.) rises up by 1%, the stock price will also move up by 1%. If the stock market moves down by 1%, the stock price will also move down by 1%.

(ii) If Beta > 1

If the Beta of the stock is greater than one, then it implies a higher level of risk and volatility as compared to the stock market. Though the direction of the stock price change will be the same; however, the stock price movements will be rather extreme.

(iii) If Beta > 0 and Beta < 1

If the Beta of the stock is less than one and greater than zero, it implies the stock prices will move with the overall market; however, the stock prices will remain less risky and volatile. For example, if the beta of the stock XYZ is 0.5, it means if the overall market moves up or down by 1%, XYZ stock price will show an increase or decrease of only 0.5% (less volatile)

Q17. Explain in detail about procedure how to calculate CAPM Beta in MS Excel ?

Ans : **(Imp.)**

CAPM Beta Calculation in Excel

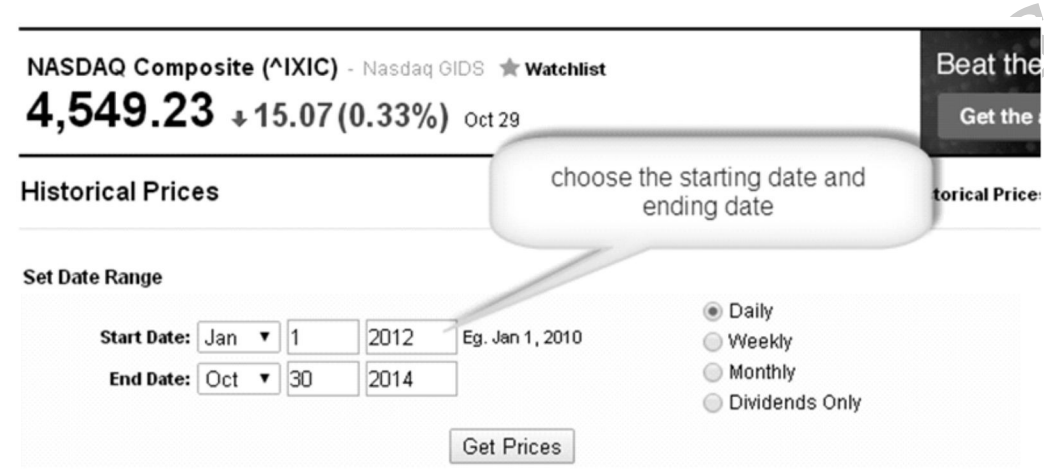
Technically speaking, Beta is a measure of stock price variability in relation to the overall stock market (NYSE, NASDAQ, etc.). Beta is calculated by regressing the percentage change in stock prices versus the percentage change in the overall stock market. CAPM Beta calculation can be done very easily on excel.

Let us calculate the Beta of Make MyTrip (MMTY) and Market Index as NASDAQ.

- Most Important – Download Beta Calculation Excel Template
- Calculate the BETA of MakeMyTrip in Excel using SLOPE and Regression

Step 1 – Download the Stock Prices & Index Data for the past 3 years.

The first step is to download the stock price and Index data. For NASDAQ, download the dataset from Yahoo Finance.



First | Previous | Next | Last

Prices

Date	Open	High	Low	Close	Volume	Adj Close*
Oct 29, 2014	4,551.37	4,564.44	4,517.02	4,549.23	2,184,050,000	4,549.23
Oct 28, 2014	4,505.73	4,564.29	4,505.11	4,564.29	1,966,920,000	4,564.29
Oct 27, 2014	4,469.02	4,489.60	4,450.29	4,485.93	1,585,580,000	4,485.93
Oct 24, 2014	4,459.46	4,486.26	4,445.85	4,483.72	1,754,300,000	4,483.72
Oct 23, 2014	4,427.44	4,475.55	4,421.56	4,452.79	1,952,380,000	4,452.79
Oct 22, 2014	4,429.16	4,435.86	4,381.28	4,382.85	1,967,020,000	4,382.85
Oct 21, 2014	4,359.17	4,419.48	4,356.10	4,419.48	1,997,580,000	4,419.48
Oct 20, 2014	4,254.16	4,316.87	4,248.22	4,316.07	1,717,370,000	4,316.07
Oct 17, 2014	4,275.09	4,296.11	4,241.67	4,258.44	2,260,070,000	4,258.44
Oct 16, 2014	4,133.25	4,246.01	4,131.65	4,217.39	2,591,940,000	4,217.39
Oct 15, 2014	4,154.10	4,231.54	4,116.60	4,215.32	3,058,740,000	4,215.32
Oct 14, 2014	4,246.23	4,281.34	4,212.82	4,227.17	2,496,120,000	4,227.17
Oct 13, 2014	4,274.91	4,303.82	4,212.87	4,213.66	63,104,908,800	4,213.66

Likewise, download the corresponding stock price data for the MakeMyTrip example from here.

Step 2 – Sort the Dates & Adjusted Closing Prices

Once you have downloaded the data set for the two, please do the following for each of the data set-

- Sort the dates and Adjusted Closing prices in ascending order
- Delete Open, High, Low, Close & Volume Column. They are not required for Beta Calculations.

Date	Open	High	Low	Close	Volume	Adj Close
10/29/2014	28.04	28.19	27.17	28.09	360500	28.09
10/28/2014	26	28.18	26	28.01	185600	28.01
10/27/2014	26.1	26.61	25.85	26.28	70500	26.28
10/24/2014	26.31	26.44	25.8	26.2	96300	26.2
10/23/2014	26.08	26.98	25.8	26.28	181600	26.28
10/22/2014	26.07	26.61	25.64	25.77	214300	25.77
10/21/2014			24.8	26.06		26.06
10/20/2014			24.36			
10/17/2014			23.9			
10/16/2014			22.32			
10/15/2014			22.15			
10/14/2014	23.8	24.83	23.03	24.13	293200	24.13
10/13/2014	23.88	24.55	22.97	23.54	353800	23.54
10/10/2014	24.48	25.74	23.87	24	562700	24
10/9/2014	26.87	27.41	21.42	24.01	1171000	24.01
10/8/2014	25.49	27.79	25.46	26.77	197200	26.77
10/7/2014	26.63	26.97	25.26	25.46	197300	25.46
10/6/2014	26.88	27.14	26.4	26.78	82200	26.78

sort the dates from oldest to newest

only Adjusted Close is required.

Step 3 – Prepare a single sheet of Stock Prices Data & Index Data.

Date	NASDAQ Adj Close	% change in NASDAQ	MakeMyTrip Adj Close	% change in MakeMyTrip
1/3/2012	2648.72		24.23	
1/4/2012	2648.36		23.99	
1/5/2012	2669.86		23.75	
1/6/2012	2674.22		21.83	
1/9/2012	2676.56		21.92	
1/10/2012	2702.5		22.42	
1/11/2012	2710.76		22.58	
1/12/2012	2724.7		22.36	
1/13/2012	2710.67		22.58	
1/17/2012	2728.08		22.08	
1/18/2012	2769.71		22.64	
1/19/2012	2788.33		23.44	

single sheet containing the corresponding prices

Step 4 – Calculate the Fractional Daily Return

Date	NASDAQ Adj Close	% change in NASDAQ	MakeMyTrip Adj Close	% change in MakeMyTrip
1/3/2012	2648.72		24.33	
1/4/2012	2648.36	0.0%	23.99	-1.4%
1/5/2012	2669.86	0.8%	23.75	-1.0%
1/6/2012	2674.22	=B6/B5-1		-8.1%
1/9/2012	2676.56	0.1%		0.4%
1/10/2012	2702.5	1.0%		2.3%
1/11/2012	2710.76	0.3%	22.58	0.7%
1/12/2012	2724.7	0.5%	22.36	-1.0%

calculate the fractional daily return

Step 5 – Calculate Beta – Three Methods

You can use either of the three methods to calculate Beta – 1) Variance/Covariance Method 2) SLOPE Function in excel

3) Data Regression

- Variance / Covariance Method

Date	NASDAQ Adj Close	% change in NASDAQ	MakeMyTrip Adj Close	% change in MakeMyTrip
1/3/2012	2648.72		24.33	
1/4/2012	2648.36	0.0%	23.99	-1.4%
1/5/2012	2669.86	0.8%	23.75	-1.0%
1/6/2012	2674.22	0.2%	21.83	-8.1%
1/9/2012	2676.56	0.1%	21.92	0.4%
1/10/2012	2702.5	1.0%	22.42	2.3%
1/11/2012	2710.76	0.3%	22.58	0.7%
1/12/2012	2724.7	0.5%	22.36	-1.0%
1/13/2012	2710.67	-0.5%	22.58	1.0%
1/17/2012	2728.08	0.6%	22.08	-2.2%

Variance / Covariance Formula

=COVARIANCE.P(C4:C713,E4:E713)/VAR.P(C4:C713)

Using the variance-covariance method, we get the Beta as 0.9859 (Beta Coefficient)

- **SLOPE function in excel**

Date	NASDAQ Adj Close	% change in NASDAQ	MakeMyTrip Adj Close	% change in MakeMyTrip
1/3/2012	2648.72		24.33	
1/4/2012	2648.36	0.0%	23.99	-1.4%
1/5/2012	2669.86	0.8%	23.75	-1.0%
1/6/2012	2674.22	0.2%	21.83	-8.1%
1/9/2012	2676.56	0.1%	21.92	0.4%
1/10/2012	2702.5	1.0%	22.42	2.3%
1/11/2012	2710.76	0.3%	22.58	0.7%
1/12/2012	2724.7	0.5%	22.36	-1.0%
1/13/2012	2710.67	-0.5%	22.58	1.0%

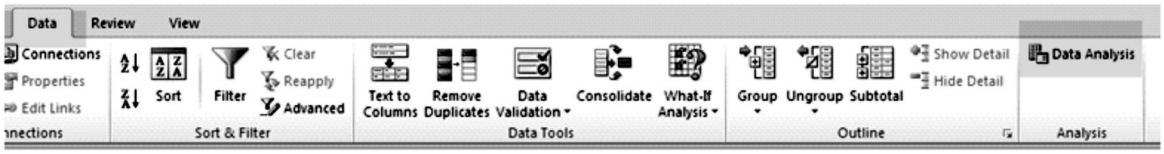
SLOPE Method

=SLOPE(E4:E713,C4:C713)

Using this SLOPE function method, we again get the Beta as 0.9859 (Beta Coefficient)

- **3rd Method – Using Data Regression**

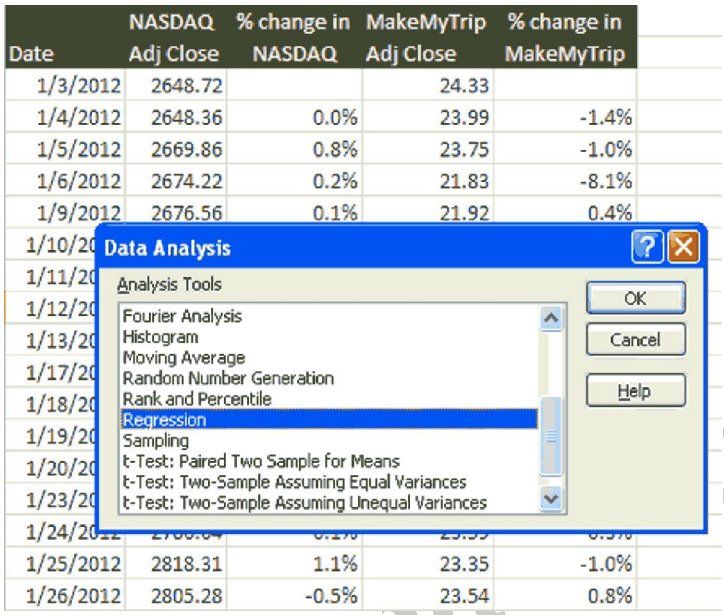
For using this function in excel, you need to go to the Data Tab and select Data Analysis.



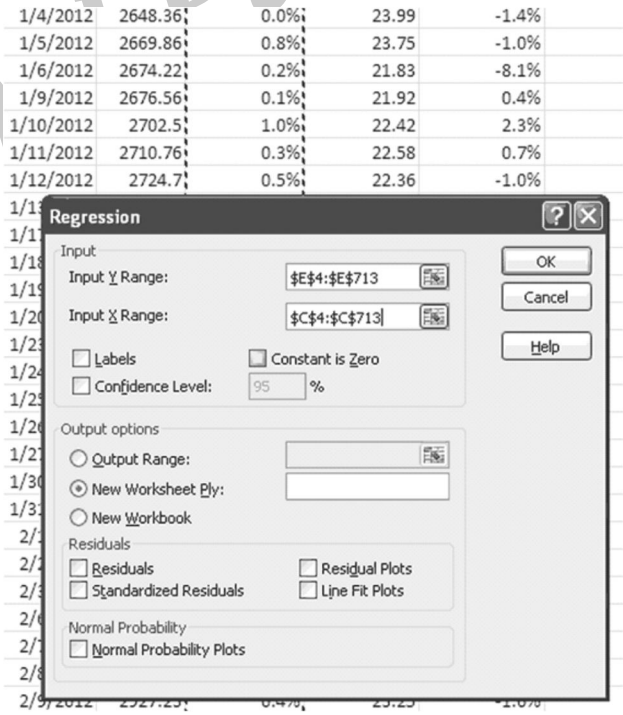
If you are unable to locate Data Analysis in Excel, then you need to install the Analysis ToolPak. This process is relatively easy: Go to FILE -> Options -> Add-Ins -> Analysis ToolPak

→ Go → Check Analysis ToolPak → OK

Select Data Analysis and click on Regression.



Choose the Y Input Range and X Input Range



Once you click OK, you get the following Summary Output

4.6. Industry Analysis, Economic Analysis Technical Analysis In Stock

Q18. What is an economic analysis ? Write about the factor analyzed in economic analysis.

Ans : **(Imp.)**

Meaning

The level of economic activity has an impact on investment in many ways. If the economy grows rapidly, the industry can also be expected to show rapid growth and vice-versa.

When the level of economic activity is low, stock prices are low, and when the level of economic activity is high, stock prices are high reflecting the prosperous outlook for sales and profits of the firms. Therefore analysis of macro economic environment is essential to understand the behavior of the stock prices.

Factors

(i) Gross Domestic Product (GDP)

GDP indicates the rate of growth of the economy. It represents aggregate value of the goods and services produced in the economy. The GDP growth of economy points out the prospects for the industrial sector and return investors can expect from investment in shares. The higher growth rate is more favourable to the stock market.

(ii) Savings and Investment

Stock market is a channel through which the savings of the investors are made available to the corporate bodies. Savings are distributed over various assets like equity shares, deposits, mutual funds units, real estate and bullion. The savings and investment patterns of the public, affect the stock to a great extent.

(iii) Inflation

With the increase in inflation rate, the real rate of growth would be very little. The demand in the consumer product industry is significantly affected. If there is a mild level of inflation, it is good to the stock market but high rate of inflation is harmful to the stock market.

(iv) Interest Rates

The interest rate affects the cost of financing to the firms. A decrease in interest rate implies lower cost of finance for firms and more profitability. Availability of cheap fund, encourages speculation and rise in the price of shares.

(v) Budget

The budget draft provides an elaborate account of the government revenues and expenditure. A deficit budget may lead to high rate of inflation and adversely affect the cost of production. Surplus budget may result in deflation. Hence, balanced budget is highly favourable to the stock market.

(vi) Tax Structure

Every year in March, the business community eagerly awaits the governments announcement regarding the tax policy. Tax reliefs given to savings encourage savings. The type of tax exemption has impact on the profitability of the industries.

(vii) Balance of Payment

The balance of payment is the record of a country's money receipts from and payments abroad. The difference between receipts and payments may be surplus or deficit. Balance of payment is a measure of the strength of rupee on external account. A favourable balance of payment renders a positive effect on the stock market.

(viii) Monsoon and Agriculture

Agriculture is directly and indirectly linked with the industries. For example, sugar, cotton, textile and food processing industries depend upon agriculture for raw material. Fertilizer and insecticide industries are supplying inputs to the agriculture.

(ix) Infrastructure Facilities

Infrastructure facilities are essential for the growth of industrial and agricultural sector. A wide network of communication system is a must for the growth of the economy. Regular supply of power without any power cut would boost the production.

(x) Demographic Factors

The demographic data provides details about the population by age, occupation, literacy and geographic location. This is needed to forecast the demand for the consumer goods. The population by age indicates the availability of able work force.

Q19. "Define industry analysis. Describe the various characteristics of an industry that an analyst must consider while doing industry analysis.

Ans : **(Imp.)**

Meaning

An industry is a group of firms that have similar technological structure of production and produce similar products. An analysis of industry helps in identifying opportunities for investment purpose and this requires careful assessment of its ability to maintain its profitability in the long run to deserve investment.

Characteristics

The various characteristics of an industry that an analyst must consider while doing industry analysis are as follows,

1. Demand Supply Gap

There always exists a deviation in demand for a product and the capacity to produce the product and this variation may be due to market situation or installation of additional production capacity. These factors tend to under-supply and over-supply of capacity at different phases of an industry. The profitability of the industry and a fall in unit-price realization may be subject to over-supply.

2. Competitive Conditions

The other feature to be considered in the industry analysis is the competitive conditions. The competition which exists among various companies in an industry is estimated on the basis of competitive forces. The competitive forces include,

(i) Barriers to entry

(ii) The threat of substitution

(iii) Bargaining power of the buyers

(iv) Bargaining power of suppliers and

(v) Rivalry among competitors.

3. Permanence

Permanence is a crucial feature concerning products and the technology. If the analyst feels that the products launched in the market are not doing well or the existing products/technology are becoming obsolete, then the analyst suggest not to invest in that industry.

4. Labour Conditions

Labour conditions is also one of the important characteristic of industry analysis. An industry can progress if the labour unions obey the rules and at the same time the progress of industry tend to fall significantly. If labours are rebellious and does frequent strikes. This activities by Labours hinders the growth of an industry.

5. Attitude of Government

The attitude of Government towards industry also have significant influence. It can promote industries and can assist such industries by providing favourable legislation. The investor should analyze the role of the government towards industry in terms of support or restrain the growth of industry by imposing restrictive legislation.

6. Supply of Raw Materials

One of the important factor for determining the profitability of an industry is 'Availability of raw materials' Few industries can obtain raw materials easily and few industries have to depend on imports from outside the country or on some manufactures for obtaining raw materials.

7. Cost Structure

The cost structure is one of the important factor to be considered in the industry analysis. It should focus on proportion of fixed costs to variable costs. Higher fixed cost indicates more sales and more will be break-even point. Lower fixed cost indicates lower sales and low break-even point. Lower break-even point indicates increase in margin of safety.

An analyst should consider all the above factors for making investment decisions in the industry.

Q20. Explain different types of cycles used in industry analysis.

OR

Describe the industry life cycle. What are its implications for the investor?

Ans : **(Imp.)**

There are two types of cycles used in industry analysis, they are as follows,

(a) Industry Life Cycle

The industry life cycle theory generally attributed to Julivs Grodensky. It consist of the following four separate stages,

(i) Pioneering Stage

The prospective demand for the product is promising in this stage and the demand for the product attracts many producers to produce the particular product leading to severe competition. This stage may offer higher returns to the investor but also offers the greatest risk.

(ii) Rapid Growth Stage

This stage starts with the appearance of surviving firms from the pioneering stage. These companies grow strongly in market share and financial performance as the cost of production is low and they have good quality products. It is advisable to invest in the shares of these companies because of growth in potential returns and decrease in the risk of failure.

(iii) Maturity and Stabilization Stage

In this stage, the growth rate tends to be moderate. Sales may increase but at a slower rate than before. Symptoms of obsolescence may appear in the technology. Products may become more standardised and less innovative and the market place is full of competitors. Earnings are stable and hence investors may get high dividend but must be avoided by those who are primarily interested in capital gains.

(iv) Declining Stage

The demand for the product and earnings decline in this stage. It is better to avoid investing in the shares of these industry staged companies as it will lead to erosion of capital.

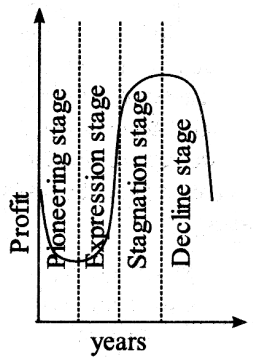


Fig.: Industry Life Cycle

(b) Business Cycle

The other way to analyze industries is by their operating ability in relation to the economy as a whole and that is classifying industries on the basis of the business cycle. There are three stages of business cycle. They are,

(i) Growth Industry

In growth industries, earnings are expected to be above the average of all industries and such growth occur regardless of setbacks of the economy.

(ii) Cyclical Industry

The industries are mostly volatile and companies do well when the economy prospers and during depression they suffer a setback.

(iii) Defensive Industry

They are least affected by recessions and economic adversity. The stocks of the defensive industries can beheld by the investor for income earning purpose.

Q21. What is technical analysis? Explain its features, advantages and disadvantages.

(OR)

What is technical analysis? What are the advantages and limitations of technical analysis?

Ans : **(Imp.)**

Meaning

Technical analysis studies the characteristics which may be expected at major market turning points and their objective assessment. It provides information about future stock price movements by taking historical price movements of shares into its consideration.

The rational behind technical analysis is that share price behaviour repeats itself overtime and the analyst attempts to drive methods to predict this repetition so that buying and selling decisions of shares can be made.

Features of Technical Analysis

The technical analysis has the following features,

1. It stands in contrast with fundamental analysis for analysis securities and stocks.

2. It is very useful for traders and financial professionals.

3. It analyzes the stock based on past history of stock prices.

4. It studies two basic market data i.e., price and volume of securities.

5. It predicts the short-term price movement rather than long-term movement.

6. It takes less time and facilitates timely decisions.

Advantages

The usefulness or advantages of technical analysis are as follows,

1. It helps in identifying the best timing of an investment i.e., the best time to buy or sell a security.

2. It helps to make effective investment decisions.

3. It uses charts to explain the information related to price and volume of securities.

4. It helps the traders to find trading opportunities in securities market.

5. It provides information about future stock price movement with the help of historical data of price movement.

Limitations

Following are the limitations of technical analysis,

1. In technical analysis value is determined by considering fundamental data as an essential input.

2. Technical analysis does not consider financial, economic, societal and political trends.

3. Technical analysis is used for limited purpose in illiquid market.

4. Technical analysis is time consuming in determining the changes in trends and patterns.

5. Technical analysis unable to deliver for those securities which are held by dominant holders.

6. Technical analysis is inappropriate in case of unexpected events.

Q22. Discuss about the types of charts used in technical analysis.

Ans :

The technical analyst uses different types of charts to identity the fluctuations in prices of securities. William L. Jiler has developed a comprehensive technique which is called as Chart 'Reading' for understanding the price behaviour of securities in securities market. The following types of charts ar prepared in technical analysis.

1. Line charts

2. Bar charts

3. Candlestick charts

4. Point and figure charts.

1. Line Charts

Line charts represents the closing prices of securities for a given period of time. In line chart, a line will be drawn by connecting the closing prices of securities as shown in the following figure,

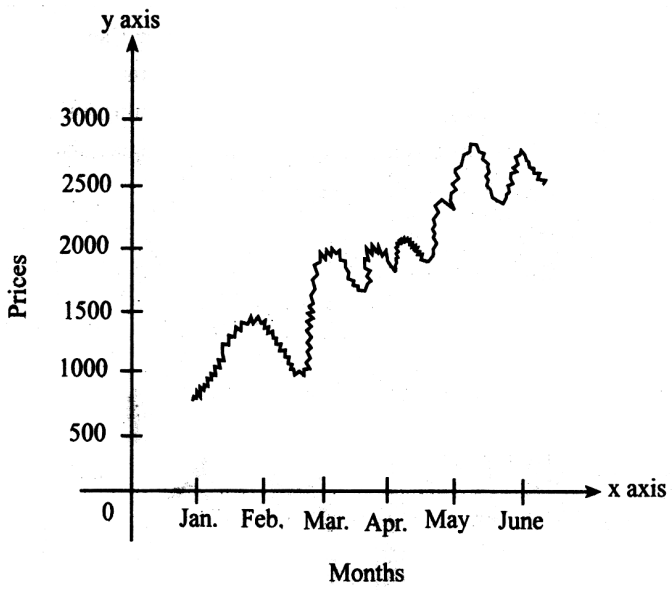


Fig.: Line Chart

Above figure shows the interconnection of closing prices of securities for a period of six months i.e January to June.

The line chart may not provide the visual information regarding the trading range of securities like high, low or opening. However, it consider the most important aspect of securities trading i.e closing prices. Thus, line chart is one of the common chart used by technical analysts for identifying the prices behaviour of securities.

2. Bar Charts

The Bar Chart is one of the common types of chart used by various analysis for analyzing and identifying the price behaviour of securities. These charts are very familiar and easy to drawn. Bar charts are also referred as vertical line charts because under chart vertical lines are drawn which represent the price movements for a time period like day, week, month or year. However, bar charts have vertical as well as horizantal dimensions which shows the time involved in a chart as a whole. The following figure shows the specimen of a bar chart.

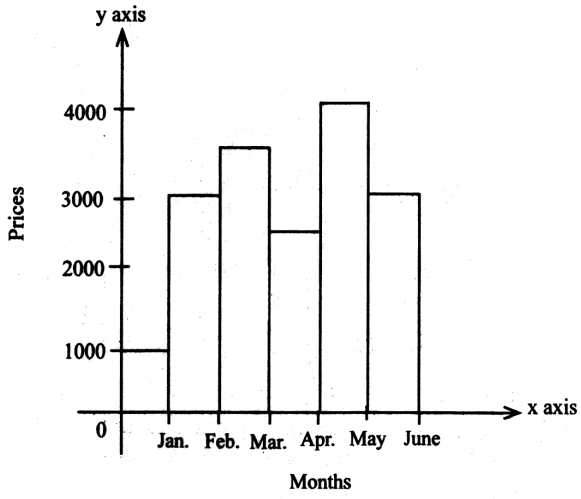


Fig.: Bar Chart

3. Candlestick Charts

Candlestick charts are visually constructed. There charts are similar to bar charts as it indicates the thin vertical line which shows trading range of a certain period like day, week, month or year. Candlestick charts also uses column to highlight certain information during the trading period. Usually, candlestick charts highlights two colour white and black to Red. It uses while colour to highlight the up and close prices of stock at opening trade. Whereas, it uses black or red colour to highlight down prices of stocks for the given period. The following figure shows the specimen of candlestick chart.

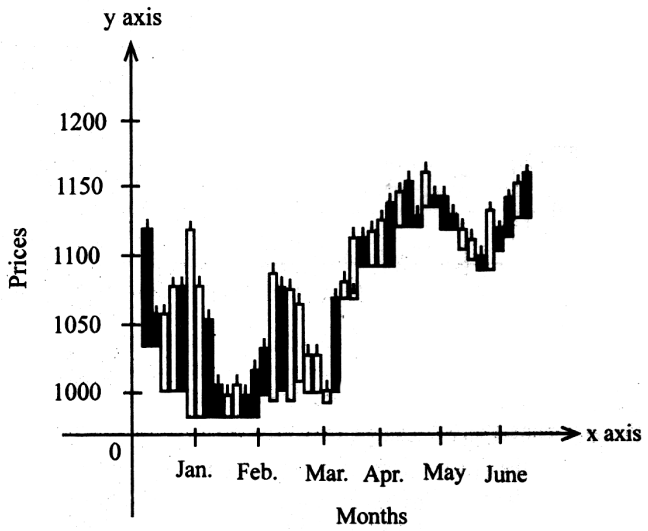


Fig.: Candlestick Chart

4. Point and Figure Chart

Point and figure charts is used to show the filtered price movement of securities under these charts 'X' and 'O' are used for highlighting the rising and falling prices. However, no movement in prices results is no changes in point and figure charts. These charts focus.

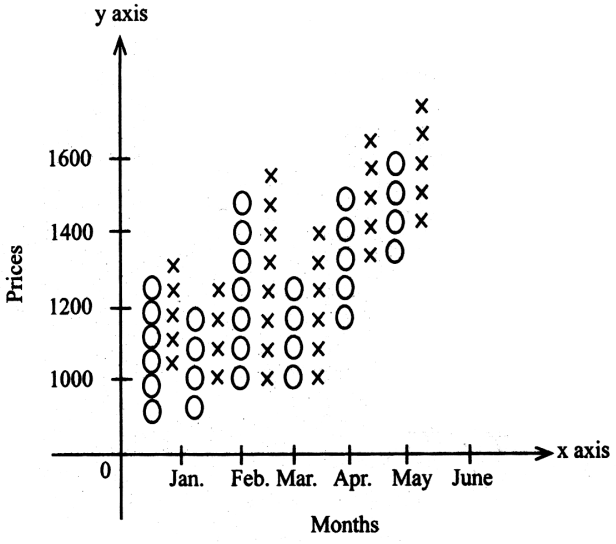


Fig.: Point and Figure Chart

Q23. What are the factors to be considered in technical analysis?

Ans : **(Imp.)**

Factors to be Considered in Technical Analysis

Technical analysis is done by considering following factors,

1. Price

Changes in price reflect changes in investor attitude and demand for and supply of securities.

2. Time

The degree of movement in price is a function of time. The longer it takes for a reversal in trend, the greater the price change that would follow.

3. Volume

The intensity of price changes is reflected in the volume of transactions that accompany the change. An increase in price accompanied by a low volume implies that the change is not strong enough.

4. Breadth

The quality of price change is measured by studying whether a change in trend spreads across most sectors and industries or is concentrated in few scripts. Study of the breadth of the market indicates the extent to which price changes have taken place in the market in accordance with a certain overall trend.

5. Charts

The basic tool in technical analysis is movement in prices, measured by charts. The graphical presentation of data of price movements of shares are known as charts.

They are the valuable and easiest tools as it helps the investor to find out the trend of the price without any difficulty, charts have the following uses.

(i) They spot the current trend for buying and selling.

(**ii**) Indicates the probable future action of the market by projections.

(iii) Shows the past historic movements.

(iv) Indicates the important areas of support and resistance.

Q24. Differentiate between Fundamental Analysis Vs Technical Analysis

Ans :

The following are the differences between fundamental and technical analysis,

S.No.	Fundamental Analysis	S.No.	Technical Analysis
1.	It analysis the stock based on the specific goals of the investor.	1.	It analysis stock on the basic of past history of prices.
2.	It studies the financial strength of corporate, growth of sales, earnings and profitability. They also considers industry and economic conditions.	2.	It studies two basic market data i.e., price and volume of securities.
3.	The fundamental analyst estimate the intrinsic value of shares. They suggest to purchase them, when they are undervalued and suggest to dispose when they are overpriced.	3.	The technical analyst mainly predict the short terms price movement rather than long term movement. The rallies and historical chart give buying and selling signals.
4.	They are committed to buy and hold policy.	4.	They are not committed to buy and hold strategy

5.	They are of opinion that supply and demand of stock depend on the underlying fundamental factors of the company, industry and economy.	5.	They are of opinion that demand and supply of stock depend on rational and irrational factors.
6.	This is a tedious process and rather takes a long time to complete the analysis.	6.	The whole process involves much less time and hence facilitates timely decisions.
7.	It helps in identifying overvalued and undervalued securities and ignores time factor of an investment.	7.	It helps in identifying the best timing of an investment i.e., the best time to buy or sell a security.

4.7 REAL OPTIONS IN CAPITAL BUDGETING

Q25. Define Real Option Explain the advantages of Real Options ?

Ans : **(Imp.)**

Meaning

A real option is a concept that grants companies the freedom to make business decisions and evaluate investment opportunities. These decisions typically revolve around initiating, delaying, terminating, or progressing with specific projects. Importantly, having the right to act on a project does not obligate the company to do so.

The term "real" in real options refers to investments involving tangible assets rather than financial instruments. These investments possess underlying assets that hold economic value but cannot be easily exchanged. Managers and top executives use quantitative and qualitative analysis to assess options and make informed decisions. By considering various factors, they evaluate each option's potential outcomes and benefits.

1. A real option gives companies rights, but no obligation to take up investment opportunities. Real options valuation (ROV) is a capital budgeting tool for companies. Companies take decisions related to tangible investments such as land, buildings, machinery, etc. Thus, financial and technical analysis differs from those used to evaluate instruments such as stocks and bonds. Also, these options are often compared with financial derivatives due to the underlying assets. However, the distinction lies in that the underlying assets in real options are not easily transferable.

2. While assessing future projects, companies evaluate the payback period, the net present value, future cash flows, etc. For this, they use net present value (NPV) and discounted cash flow (DCF) methods to analyze the efficiency of projects.

3. Enter real options, a more comprehensive approach. ROV considers the present value of expected cash flows, unpredictability of expected cash flows, present value of fixed costs, the period of which opportunity is valid, the yield of riskless security, and the value lost over the duration of the option.

4. While there aren't any standard formulas or clear-cut procedures to quantitatively measure the ROV, businesses can resort to two alternatives. Firstly, methods used to quantify financial options can be extended to real options.

5. Secondly, as seen above, NPV/ DCF analysis can help quantify. Projects with a positive NPV are approved as they can recover the initial investment and recurring costs the company puts into them. Similarly, a positive ROV is preferred. Nevertheless, it depends on the quantifying method chosen, such as the Black-Scholes model.

Advantages

(i) Risk management is an important part of running a business. Especially while deciding to expand a business, there can be many factors that the company hadn't yet considered. Risk assessment is also equally important, like accounting for future cash flows, capital investment, market demographics, and economic situation.

(ii) Decision-making becomes easier with ROV. It addresses the questions related to the continuity of a project, its size, life, and operation. While a company has to research a lot when it is looking to expand, it also has to keep track of its existing projects. This will tell the business what action suits its survival and growth.

(iii) While real options confer rights to the company regarding tangible investments, they do not place an obligation. This is a double positive for the company as they can take advantage of their rights but not have their hands tied.

(iv) Businesses actively use the NPV method to evaluate future projects. But ROV makes up for the defects of the NPV method by considering uncertainty related to a project. It is more comprehensive and works well in volatile and flexible markets.

Q26. Explain different types of Real Options ?

Ans : **(Imp.)**

Real options are a right but not an obligation to make a business decision. The concept of a real option is crucial to the success of a business as the ability to choose the right business opportunity bears a significant effect on the company's profitability and growth. A real option allows the management team to analyze and evaluate business opportunities and choose the right one.

Types

1. Option to expand

Option to expand is the option to make an investment or undertake a project in the future to expand the business operations (a fast food chain considers opening new restaurants).

2. Option to abandon

Option to abandon is the option to cease a project or an asset to realize its salvage value (a manufacturer can opt to sell old equipment).

3. Option to wait

Option to wait is the option of deferring the business decision to the future (a fast food chain considers opening new restaurants this year or in the next year).

4. Option to contract

Option to contract is the option to shut down a project at some point in the future if conditions are unfavorable (a multinational corporation can stop the operations of its branches in a country with an unstable political situation).

5. Option to switch

Option to switch is the option to shut down a project at some point in the future if the conditions are unfavorable and resume it when the conditions are favorable (an oil company can shut down the operation of one of its plants when oil prices are low and resume operation when prices are high).

Q27. Explain briefly about Real options in capital budgeting using Ms. Excel?

Ans : **(Imp.)**

Real options in capital budgeting can be analyzed and evaluated in a spreadsheet using a variety of techniques. Here's a simplified example of how you might set up a spreadsheet to analyze a simple real option:

1. Expansion Option Example

- Assume a company is considering investing Rs.1,000,000 in a new project with uncertain cash flows. If the project succeeds, it will generate cash flows of Rs. 500,000 per year for 5 years. However, if the project fails, the company can abandon it and receive Rs.200,000 salvage value.

- The company also has the option to wait one year before investing. If it waits, it will have more information about the project's potential success, but it will lose one year of cash flows.

2. Spreadsheet Setup:

- Create a table with columns for the different years of the project (Year 0 to Year 5) and rows for cash flows and calculations.
- Use formulas to calculate the net present value (NPV) of the project under different scenarios (invest now, invest later, abandon).
- Use conditional formatting to highlight the best decision based on the NPV calculations.

3. Calculations

- Calculate the NPV of investing now: Use the NPV formula with the project's cash flows and discount rate.
- Calculate the NPV of waiting: Use the NPV formula with the project's cash flows starting from Year 2 (since you're waiting one year) and discount rate.
- Calculate the NPV of abandoning: Use the salvage value and discount it back to Year 0 using the discount rate.

4. Decision Making

- Compare the NPVs of the different options (invest now, invest later, abandon) to determine the best course of action.
- Consider the flexibility and strategic value of each option in addition to the NPV.

This is a simplified example, and real options analysis can be much more complex in practice. However, it demonstrates how a spreadsheet can be used to analyze real options and incorporate them into the capital budgeting decision-making process.

Short Questions and Answers

1. Equity Valuation

Ans :

Equity valuation is the process of determining the fair value of a company's equity or common stock. It involves analyzing various factors such as the company's financial performance, growth prospects, industry trends, and market conditions to estimate what the stock is truly worth. This valuation is important for investors, analysts, and companies themselves to make informed decisions regarding buying, selling, or holding stocks.

2. Capital Asset Pricing Model.

Ans :

An equilibrium model of asset pricing states that the expected return on a security is a positive linear function of the security's sensitivity to change the market portfolios return. The relevant risk for an individual asset is systematic risk (or market related risk) because non-market risk can be eliminated by diversification and systematic risk is measured by beta. In other words, all securities are expected to yield returns commensurate with their riskiness. Therefore, the relationship between an assets return and its systematic risk can be expressed by the CAPM, which is also called the security market line.

3. Security Market line.

Ans :

In case of portfolios involving complete diversification, where the unsystematic risk tends to zero, there is only systematic risk measured by beta(β). The only dimension of a security which concerns are expected return and beta.

4. Diversification of Portfolio

Ans :

Diversification is a much-used and much-talked about set of strategies. These strategies involve all the dimensions of strategic alternatives. It may involve internal or external, related or unrelated, horizontal or vertical and active or passive dimensions either singly or collectively.

The firms opts for diversification for providing flexibility to the business portfolio in order to contradict vulnerability. The firms following single product approach feels unprotected or vulnerable to the changing conditions of environment. In order to overcome these problems firms are choosing diversification by maintaining flexibility in the portfolio.

5. Economic analysis.

Ans :

The level of economic activity has an impact on investment in many ways. If the economy grows rapidly, the industry can also be expected to show rapid growth and vice-versa.

When the level of economic activity is low, stock prices are low, and when the level of economic activity is high, stock prices are high reflecting the prosperous outlook for sales and profits of the firms. Therefore analysis of macro economic environment is essential to understand the behavior of the stock prices.

6. Industry analysis.

Ans :

An industry is a group of firms that have similar technological structure of production and produce similar products. An analysis of industry helps in identifying opportunities for investment purpose and this requires careful assessment of its ability to maintain its profitability in the long run to deserve investment.

7. What is technical analysis

Ans :

Technical analysis studies the characteristics which may be expected at major market turning points and their objective assessment. It provides information about future stock price movements by taking historical price movements of shares into its consideration.

The rational behind technical analysis is that share price behaviour repeats itself overtime and the analyst attempts to drive methods to predict this repetition so that buying and selling decisions of shares can be made.

8. Features of Technical Analysis

Ans :

The technical analysis has the following features,

(i) It stands in contrast with fundamental analysis for analysis securities and stocks.

(ii) It is very useful for traders and financial professionals.

(iii) It analyzes the stock based on past history of stock prices.

(iv) It studies two basic market data i.e., price and volume of securities.

9. Define Real Option

Ans :

A real option is a concept that grants companies the freedom to make business decisions and evaluate investment opportunities. These decisions typically revolve around initiating, delaying, terminating, or progressing with specific projects. Importantly, having the right to act on a project does not obligate the company to do so.

10. Different types of Real Options ?

Ans :

(i) Option to expand

Option to expand is the option to make an investment or undertake a project in the future to expand the business operations (a fast food chain considers opening new restaurants).

(ii) Option to abandon

Option to abandon is the option to cease a project or an asset to realize its salvage value (a manufacturer can opt to sell old equipment).

(iii) Option to wait

Option to wait is the option of deferring the business decision to the future (a fast food chain considers opening new restaurants this year or in the next year).

(iv) Option to contract

Option to contract is the option to shut down a project at some point in the future if conditions are unfavorable (a multinational corporation can stop the operations of its branches in a country with an unstable political situation).

Choose the Correct Answers

1. Which of the following methods of equity valuation compares a company's value to similar publicly traded companies? [b]

   (a) Discounted Cash Flow (DCF) method (b) Comparable Companies method

   (c) Asset-based method (d) Market Capitalization method

2. The Capital Asset Pricing Model (CAPM) is commonly used in equity valuation to: [a]

   (a) Estimate a company's beta

   (b) Calculate a company's weighted average cost of capital (WACC)

   (c) Determine a company's market capitalization

   (d) Forecast a company's future cash flows

3. Which of the following is a key assumption of the Discounted Cash Flow (DCF) method of equity valuation? [b]

   (a) All investors are risk-averse

   (b) Cash flows are assumed to grow at a constant rate

   (c) Market prices are efficient and reflect all available information

   (d) The risk-free rate is equal to the expected return on the market.

4. The portfolio mean return is calculated as: [a]

   (a) The weighted average of the individual asset returns

   (b) The average of the individual asset returns

   (c) The sum of the individual asset returns

   (d) The median of the individual asset returns.

5. Portfolio variance is a measure of: [b]

   (a) The average deviation of individual asset returns from the mean

   (b) The volatility of a portfolio's returns

   (c) The correlation between individual asset returns

   (d) The average of the squared deviations of individual asset returns from the mean

6. The covariance matrix in portfolio analysis is used to: [d]

   (a) Calculate the expected return of the portfolio

   (b) Estimate the correlation between individual asset returns

   (c) Determine the weights of each asset in the portfolio

   (d) Calculate the variance and covariance of individual asset returns.

7. What does the Capital Asset Pricing Model (CAPM) measure? [a]
   (a) The expected return of an individual asset
   (b) The risk premium of an individual asset
   (c) The relationship between risk and return in a diversified portfolio
   (d) The market risk of an individual asset
8. According to the CAPM, what is the relationship between the expected return of an asset and its beta? [a]
   (a) The expected return is directly proportional to beta
   (b) The expected return is inversely proportional to beta
   (c) There is no relationship between expected return and beta
   (d) The relationship between expected return and beta is nonlinear
9. Which of the following is an assumption of the CAPM? [b]
   (a) Investors are risk-neutral
   (b) Investors can borrow and lend at the risk-free rate
   (c) Market prices reflect all available information
   (d) All investors have the same risk preferences
10. What does the Security Market Line (SML) represent in finance? [b]
   (a) The relationship between market risk and expected returns for individual securities
   (b) The relationship between systematic risk and expected returns for individual securities
   (c) The relationship between firm-specific risk and expected returns for individual securities
   (d) The relationship between total risk and expected returns for individual securities

Fill in the blanks

1. The _____ method of equity valuation estimates a company's value by comparing it to similar companies that are publicly traded.
2. The Capital Asset Pricing Model (CAPM) is a model used to calculate the _____ of an asset based on its risk as measured by beta.
3. In the CAPM formula, the _____ is added to the product of the asset's beta and the market risk premium to determine the expected return of the asset.
4. The _____ of a portfolio is calculated as the square root of the portfolio variance. It represents the standard deviation of the portfolio's returns, which is a measure of the portfolio's risk.
5. The _____ of a portfolio is a measure of how the returns of the individual assets in the portfolio move together. It is calculated as the weighted average of the individual asset variances, plus the weighted average of all pairs of assets' covariances.
6. The _____ method of equity valuation estimates a company's value based on its expected future cash flows.
7. The _____ method of equity valuation estimates a company's value based on the market value of its assets and liabilities.
8. The _____ of a portfolio is a weighted average of the individual asset returns, where the weights are the proportions of the total portfolio value invested in each asset.
9. The CAPM assumes that investors are _____ and that there are no taxes or transaction costs.
10. The _____ is a square matrix that contains the variances of each asset's returns on the diagonal and the covariances between the returns of each pair of assets off the diagonal.

ANSWERS

1. Comparable companies
2. Expected return
3. Risk-free rate
4. Standard deviation
5. Variance
6. Discounted cash flow (DCF)
7. Asset-based
8. Expected return
9. Risk-averse
10. Covariance matrix

UNIT V

Bond Valuation: Duration, Duration of Bond with Uneven Payments, Immunization Strategies, Modeling the Term Structure, Calculating Expecting Bond Return in a Single and Multi-period Framework, Semi-annual Transition Matrix, Computation of Bond Beta.

5.1 BOND VALUATION

Q1. Define bond. Explain the characteristics and objectives of a bond.

Ans : **(Imp.)**

Meaning

Bond refers to a debt instrument which is issued by a corporate body or a government organization. The face value of bond is a-par value which must be agreeable by the firm for its repayment at the time of its maturity. Bonds are issued at par, premium or at discount. By issuing bonds, firms are able to generate fixed returns in the form of interest over a fixed period of time. Bond valuation is also known as debt valuation because bonds generate stream of income which are less risky when compared to the shares. The value of bond depends on the rate of discount.

Characteristics

The following are the characteristics in a bond. They are,

i) Par Value

Par value refers to the face value which a bond pays to its owner on some date in the future.

ii) Coupon and Coupon Rate

Coupon is the predetermined amount of interest to be paid on bond. Coupon rate of interest obtained from annual coupon divided by the face value.

iii) Maturity Date

Every bond have a specified maturity date on which issuer is obliged to make payment of face value of bond to the bondholder.

iv) Yield to Maturity (YTM)

Yield to maturity is the market rate of interest which is required for a bond.

v) Current Yield

Current yield is obtained by dividing annual interest payment with the price of the bond.

Current yield + Capital gains yield = Yield to maturity.

vi) Yield to Call

It is expected rate of return which is calculated instead of yield to maturity in the situations where bond is likely to be called due to fall in current interest rates which are below the coupon rate of bonds.

vii) Premium and Discount Bond

Premium bond refers to a bond which is sold for a value more than its face value due to fall in market interest rate whereas if bond is sold for value less than its face value due to rise in market interest rate is known as discount bond.

viii) Value of Bond

The sum of present value of coupons and present value of the face amount represents the value of bond.

Objectives

The objectives or reasons for issuing bonds are as follows,

i) Raising Capital

Issuing of bonds helps the organisation to raise their capital. It is one of the effective sources of raising capital.

ii) Low Interest Rate

Organization can borrow funds through bonds at low interest rate when compared to bank loans.

iii) Eliminates Middlemen

Organisation can issue bonds directly to the investors which will not allow banks to act as middlemen between organisation and investors. As a result, the process of borrowing becomes efficient and less expensive.

iv) Borrow for Long-term

Organization through bonds can borrow funds for long-term period at a fixed rate, which could not be possible while borrowing loans from banks.

v) Efficient Way

Bond market provides organisations an efficient way to raise their fund. Whereas other sources of borrowing funds include complex, lengthy and expensive aspects.

Q2. What are the different types of bonds?

Ans :

Types of bonds available are as follows,

i) Zero Coupon Bonds

Zero coupon bonds are also known as zero-interest fully convertible debentures. It is converted into equity shares at the expiry of the prescribed date. They are issued without coupon payments.

ii) Callable Bond

The borrower can retire or redeem the bond after the end of the initial specified period. This type of boi s known as callable bond. The holders are left with no op a but to accept the redemption value, when borrowe ues to redeem the debt.

iii) Putable Bond

Putable bonds are those which can be redeemed after the end of the initial specified period by lender. The holder has the option to redeem the bond when coupon rate becomes less than market interest rate.

iv) Floating Rate Bonds

The bonds which do not have a fixed interest rate (coupon rate) are floating rate bonds. The interest rate of such bonds is related to the market rate known as benchmark.

v) Junk Bonds

Junk bonds are very risky in nature. Both interest risk and principal risk are high in junk bonds. It is suitable for speculators.

vi) Deep Discount Bonds

It is a kind of zero interest bond. Both coupon rate and interest is not paid on these bonds. They are non-convertible bonds which have a face value and issue price of these bonds is discounted value.

vii) Municipal Bonds

The debt securities offered by the municipal authority in a particular city are called as municipal bonds. These bonds are used for the development of the city 's infrastructure through raising funds. It is mainly issued to retail or institutional investors.

Q3. Explain briefly about bond valuation?

Ans:

Meaning

Bond valuation is the process of determining the bond values. Bond values actually refers to the present values of securities like bonds, debentures etc. The present value of all the securities future cash flow is given by,

$$\text{Present value} = \frac{\text{Coupon,}}{(1+\text{YTM})^2} + \frac{\text{Coupon,}}{(1+\text{YTM})^2} + ... + \frac{\text{Coupon,} + \text{Face value}}{(1+\text{YTM})^2}$$

Capitalization of Income Method

An investor who believes that the efficiency of bond market would question the ability of other investors to identify mispriced situations. However, if an investor believes that such situations exist, then an economically sensible and logical approach to valuation is needed to identify them. One such approach is the capitalization of income method of valuation.

This method of valuation states that the intrinsic value of any asset is based on the discounted value of cash flows that the investor expects to receive in the future from owning the bond. The intrinsic value is to be compared with existing v ue of a bond, so as to state whether the bond is overpriced, underpriced or fairly priced. Another way is to compare the bond YTM (Yield To Maturity) with AYTM (Approximate Yield to Maturity).

If YTM > AYTM, then the bond is underpriced,

If YTM < AYTM, then the bond is overpriced.

However,

If YTM = AYTM, then the bond is said to be fairly priced.

Example

Sachin is considering investing in a bond current selling for ` 8,785. The bond has four years to maturity, a ` 10,000 face value and 8% coupon rate. The next annual payment is due one year from today. The approximate discount factor for investments of similar risk is 10%. Calculate the intrinsic value of a bond using capitalization of income method. Should Sachin purchase the bond?

Sol:

According to capitalization of income method, the intrinsic value of a bond is calculated as follows.

Year	Cash flows (`)	PVIF @ 10%	PV_8(`)
1	800	0,9091	737.28
2	800	0.8246	661.12
3	800	0.7513	601.04
4	10,800	0.6830	7,376.46
			P_0 = 9,365.84

The bond is actually selling for ` 8,785.00, whereas its intrinsic value is ` 9,365.84 and hence the bond is underpriced. Therefore, Sachin should purchase it.

5.2 Duration of Bond with Uneven Payments

Q4. Explain the duration of bond with, Even, uneven payments?

Sol : **(Imp.)**

Meaning

Duration measures the time structure of a bond and the bond's interest rate risk. The time structure of investment in bonds is expressed in two ways. The common way to state is how many years he has to wait until the bond matures and the principal money is paid back.

This is known as asset's time to maturity or its years to maturity. The other way is to measure the average time until all interest coupons and the principal is recovered.

This weight average of time periods to maturity, weights being present values of the cash flow in each time period. The formula for duration is,

$$D = \frac{\frac{C_1}{(1+r)}}{P_0} + \frac{\frac{C_2}{(1+r)^2}}{P_0} + \ldots\ldots + \frac{\frac{C_t}{(1+r)^2}}{P_0} \times T$$

Where,

D = Duration

C = Cash flow

r = Current yield to maturity

T = Number of years

$P_v(C)$ = Present value of the cash flow

P_0 = Sum of the present values of cash flow

As this model is developed by F.R Macaulay in 1938, it is known as Macaulay's Duration. It is also known as 'Continuous Model'.

Calculation of Macaulay's duration for semi annual bonds.

$$MD = \frac{C[(Z)^{(T)(m)+1} - Z - (YTM)(T)] + (MV)(T)(m)\left(\frac{YTM}{m}\right)^2}{C\left(\frac{YTM}{m}\right)[(Z)^{(T)(m)} -] + MV(YTM / m)^2}$$

$$Z = \left(1 + \frac{YTM}{m}\right)$$

Where,

m = Number of compounding periods in a year

T = Number of years until maturity,

MV = Face value

YTM = Yield to maturity out an annual rate

C = Coupon per period

Modified Macaulay's Duration

The relationship between a change in the price of a bond relative to change in its yield to maturity is usually referred to as Modified Macaulay's Duration (MMD).

The relationship between a change in price of a bond to a change in YTM is,

$$\frac{\Delta P_0}{\Delta YTM} = -\left(\frac{1}{1+YTM}\right) \times MD \times P$$

Where, P_0 is bond's price and $\frac{\Delta P_0}{\Delta YTM}$ indicates change in bond's price with corresponding change in YTM.

Therefore, it can be determined as follows,

$$MMD = \frac{MD}{1+YTM}$$

Where,

MMD = Modified Macaulays' Duration

MD = Macaulay's Duration

YTM = Yield to Maturity.

PROBLEMS

1. A bond with face value of ` 1000 has left over period of maturity of 4 years. Its coupon rate is 8% and YTM is 10%. Calculate Macaulay's Duration and Modified Duration.

Sol :

Macaulay's Duration

CF = Cash flows i.e., coupon amount

= `80

Received in year 1, 2 and 3 but in 4th year it is coupons amount and principal.

I) Calculation of Price of a Bond

Year	CFs	PVCF@10%	PV_s
1	80	0.9091	72.73
2	80	0.8264	66.11
3	80	0.7513	60.10
4	1080	0.6830	737.64
		Bond price, P_0 = 936.58	

II. Determination of Macaulay's Duration

Year	PVCF	PVCF as Proportion of $(W_i) = \frac{PV_s}{P_0}$	$n \times W_1$
1	72.73	0.0777	0.0777
2	66.11	0.0706	0.1412
3	60.10	0.0641	0.1923
4	737.64	0,7876	3.1504
	P_0 = 936.58		**MD = 3.5616**

$\therefore$ Macaulay's duration = 3.56 years

Modified Duration

$$MMD = \frac{MD}{1+YTM} = \frac{3.56}{1+0.10} = \frac{3.56}{1.10} = 3.24 \text{ Years.}$$

2. Calculate the Macaulay duration of an 8 percent, $ 1000 per bond that matures in three years if the bond's YTM is 10 percent and interest is paid semiannually.

Sol :

Given that,

C = 40

i = 8%

$I = 4\% \left(\frac{8}{2}\right)$

t = 6

T = 12(6×2)

$$\text{Macaulay Duration (Semiannually)} = \frac{C[Z^{Tm+1} - Z - YTM(T)] + MV(T)(m)\left[\frac{YTM}{m}\right]^2}{C\left[\frac{YTM}{m}\right][(Z)^{Tm} - 1] + MV\left[\frac{YTM}{m}\right]^2}$$

$$= \frac{40[(1+0.04)^{13} - 1.04 - 0.48] + (1000)(12)(2)(0.04)^2}{[40(0.04)\,(1.04)^{12} - 1] + 100(0.04)}$$

$$= \frac{5.8 + 38.4}{-37.44 + 40}$$

$$= \frac{44.2}{2.56} = 17.266 \text{ semi annual period}$$

(OR)

$$= \frac{17.266}{2} = 8.633 \text{ years.}$$

3. The National Thermal Power Corporation recently issued a `1,000,12 percent, semiannual bond with 20 years to maturity.

(i) What will be the price of the bond if the market rate of interest is 14 percent?

(ii) Determine the bonds Macaulay's duration when it was issued, and

(iii) Two years later the issue.

Sol :

(i) Bond's Price

$$P_0 = \sum_{t=1}^{2t} \frac{(6\%)(F)}{(1 + YTM/2)^i} + \ldots + \frac{Coupon + F}{(1 + YTM/2)^{2t}}$$

$$P_0 = \frac{`60}{(1+.07)^1} + \frac{`60}{(1+.07)^2} + \ldots. + \frac{`60 + `1000}{(1+.07)^{40}}$$

$$= \sum_{i=1}^{40} \frac{`60}{(1+.07)^t} + \sum_{i=1}^{40} \frac{`60}{(1+.07)^t}$$

= `60 × PVA(I, T) + `1000 × PV(I, T)

Where,

i = 14%, I = 7%

t = 20 years, T = 40 years

P_0 = ` 60 × PVA(7, 40) + `1000 × PV(7, 40)

= ` 60 × 12.332 + `1000 × .067 = `739.92 + `67

= ` 806.92

(ii) Calculation for Bond's Macaulay's Duration

$$MD = \frac{\left[(Z)^{(r)(m)+1} - Z - (YTM)(T)\right] + (MV)(T)(m)\left(\frac{YTM}{m}\right)^2}{C\left[\frac{YTM}{m}\right]\left[(Z)^{(T)(m)} - 1\right] + MV\left(\frac{YTM}{m}\right)}$$

$$MD = \frac{`60[1 + 0.7]^{41} - 1.07 - 2.8] + (`100)(20)(2)(.0049)}{(`60)(.07)[(1.07)^{40} - 1] + (`1000)(.0049)}$$

= 14.548 Semiannual period

(or)

$$= \frac{14.548}{2} = 7.274 \text{ years.}$$

(iii) Two Years After Issue of Duration

$$MD = \frac{`60(1.07)^{37} - 1.07 - 2.52] + (`1000)(18)(2)(.0049)}{(`60)(.07)[(1.07)^{40} - 1] + (`1000)(.0049)}$$

$$= 14.264 \text{ Semiannual period}$$

(or)

$$= \frac{14.264}{2}$$

$$= 7.132 \text{ years}$$

Since, we have to determine the duration after 2 years of an semiannual issue (i.e., 4 years).

Q5. How to Calculate present value of a Bond in MS Excel?

Ans : **(Imp.)**

A bond is a type of loan contract between an issuer (the seller of the bond) and a holder (the purchaser of a bond). The issuer is essentially borrowing or incurring a debt that is to be repaid at "par value" entirely at maturity (i.e., when the contract ends). In the meantime, the holder of this debt receives interest payments (coupons) based on cash flow determined by an annuity formula. From the issuer's point of view, these cash payments are part of the cost of borrowing, while from the holder's point of view, it's a benefit that comes with purchasing a bond.

The present value (PV) of a bond represents the sum of all the future cash flow from that contract until it matures with full repayment of the par value. To determine this – in other words, the value of a bond today – for a fixed principal (par value) to be repaid in the future at any predetermined time – we can use a Microsoft Excel spreadsheet.

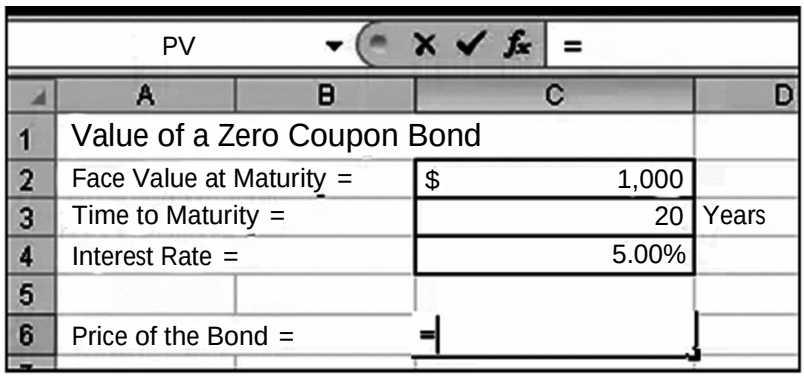
$$\text{Bond Value} = \sum_{p=1}^{n} PVI_n + PVP$$

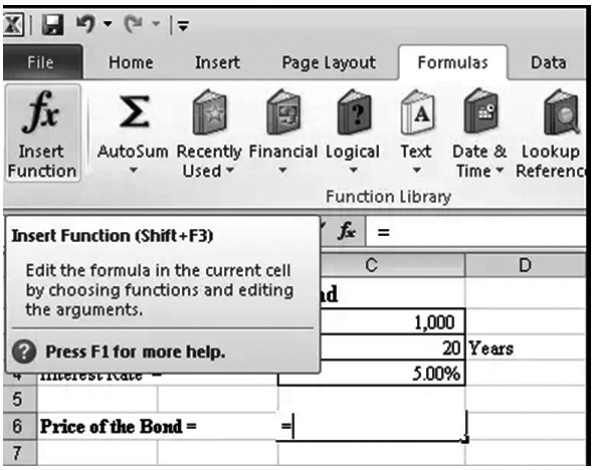
where:

n = NuAarate. The amount needed or desired at the end of the holding period is not necessary (we assume it to be the bond's face value).

1. Zero Coupon Bonds

A zero coupon bond (a bond which does not deliver any coupon payment during the life of the bond but sells at a discount from the par value) maturing in 20 years with a face value of Rs.1,000. In this case, the bond's value has decreased after it was issued, leaving it to be bought today at a market discount rate of 5%. Here is an easy step to find the value of such a bond:





Here, "rate" corresponds to the interest rate that will be applied to the face value of the bond.

"Nper" is the number of periods the bond is compounded. Since our bond is maturing in 20 years, we have 20 periods.

"Pmt" is the amount of the coupon that will be paid for each period. Here we have 0.

"Fv" represents the face value of the bond to be repaid in its entirety at the maturity date.

The bond has a present value of Rs.376.89.

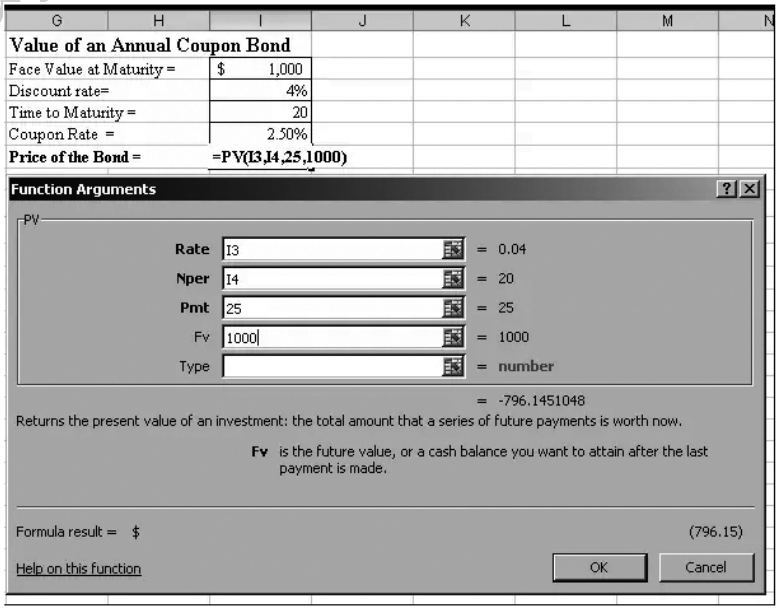
2. Bonds with Annuities

Company 1 issues a bond with a principal of Rs.1,000, an interest rate of 2.5% annually with maturity in 20 years and a discount rate of 4%.

The bond provides coupons annually and pays a coupon amount of 0.025 x 1000 = Rs.25.

Notice here that "Pmt" = Rs.25 in the Function Arguments Box.

The present value of such a bond results in an outflow from the purchaser of the bond of -Rs.796.14. Therefore, such a bond costs Rs.796.14.



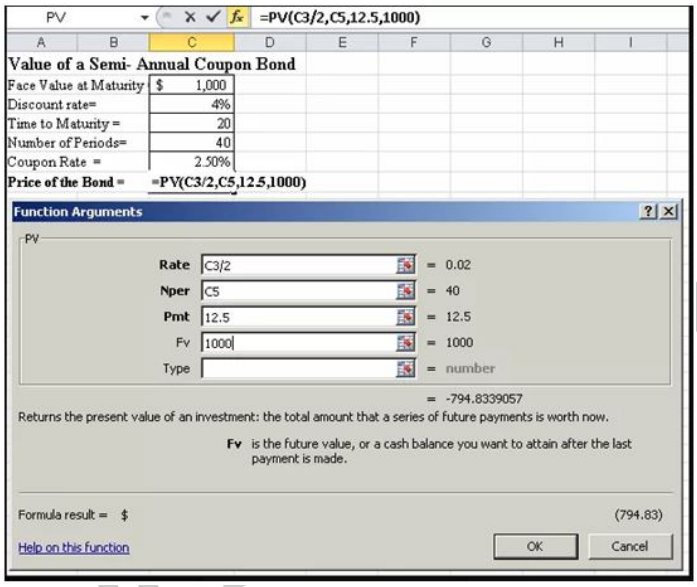
3. Bonds with Bi-annual Annuities

Company 1 issues a bond with a principal of Rs.1,000, an interest rate of 2.5% annually with maturity in 20 years and a discount rate of 4%.

The bond provides coupons annually and pays a coupon amount of 0.025 x 1000 ÷ 2= Rs.25 ÷ 2 = Rs.12.50.

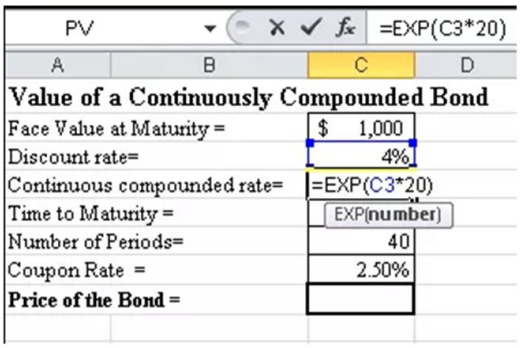
The semiannual coupon rate is 1.25% (= 2.5% ÷ 2).

Notice here in the Function Arguments Box that "Pmt" = Rs.12.50 and "nper" = 40 as there are 40 periods of 6 months within 20 years. The present value of such a bond results in an outflow from the purchaser of the bond of -Rs.794.83. Therefore, such a bond costs Rs.794.83.



4. Bonds with Continuous Compounding

Continuous compounding refers to interest being compounded constantly. As we saw above, we can have compounding that is based on an annual, bi-annual basis or any discrete number of periods we would like. However, continuous compounding has an infinite number of compounding periods. The cash flow is discounted by the exponential factor.



5. Dirty Pricing

The clean price of a bond does not include the accrued interest to maturity of the coupon payments. This is the price of a newly issued bond in the primary market. When a bond changes hands in the secondary market, its value should reflect the interest accrued previously since the last coupon payment. This is referred to as the dirty price of the bond.

Dirty Price of the Bond = Accrued Interest + Clean Price.

The net present value of the cash flows of a bond added to the accrued interest provides the value of the

Dirty Price. The Accrued Interest = (Coupon Rate x elapsed days since last paid coupon) ÷ Coupon Day Period.

5.3 IMMUNIZATION STRATEGIES

Q6. Discuss about Bond immunization.

(OR)

Explain briefly about bond immunization.

Ans :

Meaning

Immunization, also known as multi-period immunization, is a risk-mitigation strategy that matches the duration of assets and liabilities in order to minimize the impact of interest rates on net worth over time.

1. Immunization helps large firms and institutions protect their portfolios from exposure to interest rate fluctuations. Using a perfect immunization strategy, firms can nearly guarantee that movements in interest rates will have virtually no impact on the value of their portfolios.
2. Immunization is considered a "quasi-active" risk mitigation strategy because it has the characteristics of both active and passive strategies. By definition, pure immunization implies that a portfolio is invested for a defined return for a specific period of time regardless of any outside influences, such as changes in interest rates.
3. The opportunity cost of using the immunization strategy is potentially giving up the upside potential of an active strategy for the assurance that the portfolio will achieve the intended desired return. As in the buy-and-hold strategy, by design, the instruments best suited for this strategy are high-grade bonds with remote possibilities of default.
4. Duration, (or) the average life of a bond (which is also its price sensitivity to changes in interest rates), is commonly used in immunization. It is a much more accurate predictive measure of a bond's volatility than a bond's term to maturity.
5. It is one of the most sound strategies and can also be used successfully by individuals. For example, just like a pension fund would use an immunization to plan for cash flows upon an individual's retirement, that same individual could build a dedicated portfolio for their own retirement plan.
6. Immunization can be accomplished by cash flow matching, duration matching, convexity matching, and trading forwards, futures and options on bonds. Similar strategies can be used to immunize other financial risks, such as exchange rate risk.

Q7. Immunization is an investment strategy used to minimize the impact of interest rate changes on a bond portfolio Explain ?

Ans : **(Imp.)**

Immunization is an investment strategy used to minimize the impact of interest rate changes on a bond portfolio. The goal of immunization is to match the duration of assets (bonds) with the investment horizon or the duration of liabilities (future obligations). This strategy aims to ensure that the value of the assets and liabilities move in tandem, reducing the risk of interest rate fluctuations.

There are two main types of immunization strategies: cash flow matching and duration matching.

1. Cash Flow Matching

- In cash flow matching, the goal is to match the timing and amount of cash flows from the bond portfolio with the timing and amount of liabilities.
- This strategy is more common for portfolios with known future cash flow requirements, such as pension funds.
- Formula: No specific formula, as it involves matching specific cash flows.

2. Duration Matching

- Duration matching involves matching the duration of the assets with the duration of the liabilities.
- Duration is a measure of the sensitivity of a bond's price to changes in interest rates. By matching durations, the impact of interest rate changes on the value of assets and liabilities is minimized.

Formula for duration matching

- Duration assets = Duration liabilities
- Durationassets = Durationliabilities

Where:

- Duration Assets
- Durationassets = Duration of the bond portfolio
- Duration liabilities
- Duration liabilities = Duration of the liabilities

Q8. Discuss about various immunization strategies in a spreadsheet?

Ans : **(Imp.)**

Bond immunization can be implemented in a spreadsheet by using the duration matching approach. Here's a step-by-step guide to implementing a basic bond immunization strategy in a spreadsheet:

1. Set Up the Spreadsheet

Create a new spreadsheet with columns for the bond information, including the bond name, face value, coupon rate, years to maturity, and cash flows.

2. Calculate the Present Value of Cash Flows

In a new column, calculate the present value of each cash flow using the formula:

$$PV = \frac{CF}{(1+r)^t}$$

Where:

- PV = Present value of the cash flow
- CF = Cash flow
- r = Yield to maturity (annual interest rate)
- t = Time period until cash flow is received (in years)

Repeat this calculation for each cash flow in the bond.

3. Calculate the Weighted Average Duration

In a new column, calculate the weighted average duration of the bond using the formula:

$$\text{Weighted Avg. Duration} = \sum_{t=1}^{n}\left(\frac{t \times PV_t}{\text{Total Present Value}}\right)$$

Where:

- PV_t = Present value of cash flow at time t
- Total Present Value = Sum of all present values of cash flows
- This calculation gives you the weighted average duration of the bond.

4. Match the Duration to the Investment Horizon

- Determine the investment horizon or the duration of the liabilities you want to match.
- Adjust the bond portfolio to match the duration of the liabilities. This may involve buying or selling bonds to achieve the desired duration.

5. Monitor and Rebalance

- Regularly monitor the bond portfolio and the liabilities to ensure that the durations remain matched.
- Rebalance the portfolio as necessary to maintain the desired duration matching.

Here's a simplified example of how this might look in a spreadsheet:

Bond Name	Face Value	Coupon Rate	Years to Maturity	Cash Flow	Present Value
Bond A	Rs.1,000	5%	5	Rs.50	Rs.47.62
Bond A	Rs.1,000	5%	4	Rs.50	Rs.45.35
Bond A	Rs.1,000	5%	3	Rs.50	Rs.43.22
Bond A	Rs.1,000	5%	2	Rs.50	Rs.41.22
Bond A	Rs.1,000	5%	1	Rs.1,050	Rs.952.38
			Weighted Avg. Duration		3.92

In this example, the weighted average duration of Bond A is calculated as 3.92 years. If the investment horizon or the duration of liabilities is 4 years, the bond portfolio is immunized to changes in interest rates.

5.4 MODELING THE TERM STRUCTURE

Q9. What is term structure of interest rates? Explain various theories proposed for understanding the term structure of interest rates.

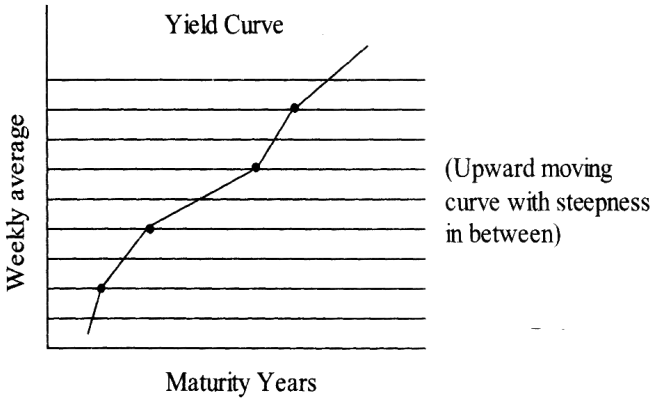
Ans :

Term Structure of Interest Rates

It is a connection between time to maturity and yield for a particular category of bonds at a particular time by keeping all the factors constant, especially the default risk. Mostly if the length of time to maturity is more, the more will be the interest rates.

The term structure scenario is outlined by yield curve.

Yield curve is a graphical representation which shows the connection between the length of time to maturity and yields, where the X-axis represents time to maturity and Y-axis represents yield to maturity.



The yield curve basically includes the instincts but not the actual connection between the yield and time to maturity. Therefore, this yield curve is not fit for showing the connection between yield and time to maturity.

Theories

The term structure theories of interest rates are used for describing the shape, slope and reasons for its changes (shifts of the yield curve). The term structure theories are,

1. Pure or unbiased expectation hypothesis theory
2. Liquidity preference theory
3. Segmentated market theory
4. Preferred habitat theory.

1. Pure (or) Unbiased Expectation Hypothesis Theory

This theory specifies that there exists evenly balanced amount between long term rate of interest and an average returns of short-term rates.

In expectation theory, the long term rates should be an average of present short term rates and also be an average of future short term rates.

This expectation theory states that, today's rates and future expected rates have a connection and after ascertaining under the hypothesis, this theory concludes that "investors may anticipate identical return by not considering the option of investment". The yield curve for expectation hypothesis will be flat.

Explanation

$R \rightarrow$ Securities current known yield at time 't' with 'n' periods to maturity

$R \rightarrow$ The yield that is likely to prevail an year from today at time

't + 1' for V periods (i.e., the forward rates)

The 3 years bond rate should be a geometric average of the current 1 year rate (i.e., JR_1) and the expected forward rates for subsequent 2 years.

Equation

$${}_tR_3 \rightarrow = [(1 + {}_tR_1)(1 + {}_{t+1}r_1)(1 + {}_{t+2}r_2)]^{1/3} - 1.0$$

Where,

$_tR_3$ → Rate on 3 year bond

$(1 + {}_tR_1)$ → Known rate on a current 1 year bond

$(1 + {}_{t+1}R_1)$ → Expected rate on a bond with 1 year to maturity beginning 1 year from the current year.

$(1 + {}_{t+2}R_2)$ → Expected rate on a bond with l year to maturity beginning 2 years from the current year.

The identical rule is followed for various number of periods. All long term rates are a geometric average of subsequent one-period rates.

2. Liquidity Preference Theory

This theory specifies the same rule as of the expectation theory, but it also includes the risk premiums for its hypothesis.

Liquidity preference theory = Expectation theory + Liquidity risk premiums.

The distinguished features between liquidity preference theory and expectation hypothesis theory are,

(i) Uncertainty in expected interest rates and

(ii) Expected future rates are not similar when compared to forward rates.

Ultimately, this theory concludes that the prolonged term bonds have to be put forward for the higher yields. Thus, yield curve under this theory has upward sloping direction.

3. Segmentated Market Theory

In segmentated market theory, several investors, instead of containing distinctive maturity requirements, restrict themselves to a particular maturity segment. The investor does not want to move from one to the other maturity sector even though it possesses benefits from the consequences which occurs.

The yield curve in this segmentated market theory depends upon the supply and demand determinants, curve can come to any shape, it can slope downwards or upwards accordingly.

4. Preferred Habitat Theory

This theory of preferred Habitat is like segmentated market theory but varies to a certain extent. The investor has option for maturity sector and different habitats. The investor who wishes to move to any maturity sector, must have fairly obtain a suitable risk premiums under this theory.

The expected future interest rates and risk premiums play a crucial role in this hypothesis and yield curve can have any shape.

Q10. Explain in detail about Modeling of the term Structure in Bonds?

Ans :

Modeling the term structure of interest rates in bonds involves understanding how interest rates vary across different maturities. The term structure is often graphed as a yield curve, which plots the yields to maturity of bonds with similar credit quality but different maturity dates.

Here's a detailed explanation of how to model the term structure:

1. Understand the Term Structure

i) The term structure reflects the relationship between interest rates (yields) and the time to maturity of bonds.

ii) The yield curve can take different shapes, such as upward sloping (normal), downward sloping (inverse), or flat.

2. Collect Data

i) Gather data on bond yields with different maturities. These can be government bonds, corporate bonds, or other fixed-income securities.

ii) Ensure that the bonds are of similar credit quality to make meaningful comparisons.

3. Plot the Yield Curve

i) Use a spreadsheet or financial software to plot the yield curve.

ii) On the x-axis, plot the time to maturity of bonds (e.g., 1 year, 2 years, ..., 30 years).

iii) On the y-axis, plot the corresponding yields to maturity for each maturity.

4. Analyze the Shape of the Yield Curve

i) **Normal Yield Curve:** This is the most common shape, where longer-term bonds have higher yields than shorter-term bonds.

ii) **Inverted Yield Curve:** This occurs when short-term interest rates are higher than long-term rates, often seen as a sign of economic downturn.

iii) **Flat Yield Curve:** This indicates little difference between short-term and long-term interest rates, suggesting uncertainty about future economic conditions.

5. Modeling the Term Structure

i) One common approach is to use the Nelson-Siegel model or the Nelson-Siegel-Svensson model to fit a curve to the observed yields.

ii) These models use a set of parameters to describe the shape of the yield curve, capturing both the level and the slope of the curve.

6. Interpretation

i) The term structure provides insights into market expectations about future interest rates and economic conditions.

ii) Changes in the shape of the yield curve can signal shifts in investor sentiment and economic outlook.

7. Use in Financial Analysis

i) The term structure is used in various financial analyses, such as bond pricing, risk management, and investment strategy.

ii) It can help investors make decisions about the allocation of their fixed-income investments based on their outlook for interest rates.

Modeling the term structure of interest rates is a complex but important aspect of bond investing and fixed-income analysis. By understanding the term structure, investors can gain valuable insights into market conditions and make informed investment decisions.

Q11. Explain the Modeling the term Structure of bonds in MS Excel?

Ans : **(Imp.)**

Modeling the term structure of interest rates in bonds through Excel involves using historical bond yield data to construct a yield curve. Here's a step-by-step guide to modeling the term structure in bonds using Excel:

1. Collect Data

i) Obtain historical bond yield data for bonds with different maturities. This data is typically available from financial websites, central banks, or financial databases.

ii) Ensure that the data includes the yield to maturity for bonds with various maturities, such as 1-year, 2-year, 5-year, 10-year, and 30-year bonds.

2. Prepare the Excel Spreadsheet

i) Open a new Excel spreadsheet and enter the maturity dates of the bonds in one column (e.g., A1:A5 for 1-year to 5-year bonds).

ii) In the next column, enter the corresponding yields to maturity for each maturity date (e.g., B1:B5).

3. Plot the Yield Curve

i) Select the data range containing the maturity dates and yields to maturity.

ii) Click on the "Insert" tab in Excel and select "Scatter" from the charts section.

iii) Choose a scatter plot with smooth lines to plot the yield curve.

4. Fit a Curve to the Data

i) Right-click on one of the data points in the chart and select "Add Trendline."

ii) Choose the type of trendline that best fits the data (e.g., linear, exponential, polynomial).

iii) Display the equation on the chart to see the mathematical formula for the trendline.

5. Interpret the Yield Curve

i) Analyze the shape of the yield curve to understand the relationship between yields and maturities.

ii) A normal yield curve slopes upwards, indicating higher yields for longer maturities.

iii) An inverted yield curve slopes downwards, indicating lower yields for longer maturities.

6. Use the Yield Curve for Analysis

i) Use the yield curve to make predictions about future interest rates and economic conditions.

ii) The shape of the yield curve can provide insights into market expectations and investor sentiment.

7. Update the Data

i) Regularly update the Excel spreadsheet with new bond yield data to track changes in the yield curve over time.

ii) Replot the yield curve and analyze any changes to make informed investment decisions.

By following these steps, you can use Excel to model the term structure of interest rates in bonds and gain valuable insights into market trends and investor behavior.

5.5 Calculating Expecting Bond Return in a Single and Multi-period Framework

Q12. Explain the from work of Expected bond returns, Single and Multi-Period?

Ans : **(Imp.)**

Expected bond returns introduction and basic relations

We present below the basic definitions and relations that are used in our model. The bond yield to maturity (YTM) is commonly defined as the solution to equation (i):

i) p = å prom (CFt)t = 1 (1 + ytm)t

where:

t = 1,…,T are the payment dates

prom(CFt) is the promised cash flow at date t (typically coupon payment when t<T and coupon plus principal at t = T)

p is the bond market price at t = 0.

We define the expected bond return (EBR) as the solution to equation (2):

ii) p = å E [CFt] (1 + EBR)t

where E(CFt) is the expected cash flow of the bond at time t. The expectation is with respect to the "real" (often called "physical") probability measure and not the "risk neutral" probabilities.

The EBR is thus the discount factor that prices the expected payments.

Since the default risk is the only effect included in the expected payoffs, in the nominators of equation (2) compared to equation (1), the EBR differs from the bond's *ytm* by a credit risk premium (CRP):

iii) ytm = EBR + CRP

It is easy to show that CRP ≥ 0 by equating the price at t = 0 in equations (1) and (2), since prom (CFt) ≥ E(CFt) always. CRP ≥0 when the expected payoffs equal the promised payments, in a (credit) risk free bond.

EBR is not the risk free rate, it is a risk-adjusted discount rate based on the bond's market price. Therefore CRP is not the commonly used bond spread; it is a new measure of credit risk.

iv) $p_{D,t}$= p (t –1, t)Õ(1 – p (i -1,i))i=1

v) $p_{S,t}$= Õ(1 – p (i –1,i)) i=1

We assume that at time t a firm pays its debt holders the promised payoffs prom(CFt) in the solvent state, and in the default state the residual market value of the bond is δt·principal, where ät is the recovery rate of the bond at time t. Hence, the expected cash flow at time t is given by equation (6).

vi) E[CF] = p× prom (CF) + p× d × principal tS, tt, D, tt

vii) CEP = EBR – r .

Before we turn to discuss the practical estimation of EBR of coupon bonds we analyze zero coupon bonds EBR and bond premia.

1. Single Period Model

To establish the basic relations and gain some essential intuitions, we start with a single-period model.

Where,

R is the risk free gross return for the period (1 + r)

p is the price of the risky bond

π is the physical ("real") probability of default

δ is the recovery rate on the risky bond.

There are a few common definitions of recovery rate. We use a widely accepted definition: the residual value of the bond, immediately after the credit event, normalized by its face value.

Proposition 1: In a frictional ess one-period setting the following relations hold:

viii) The expected bond return is given by:

$$EBR = \frac{E[payoff]}{p} - 1 = \frac{1}{p} - \pi, \left(\frac{1-\delta}{p}\right) - 1$$

ix) The credit risk premium is given by:

$$CRP = ytm - EBR = \pi\left(\frac{1-\delta}{p}\right)$$

x) The certainty equivalent premium is given by:

$$CEP = \frac{1}{p} - p\left(\frac{1-\delta}{p}\right) - R$$

Proof :

Equation follows directly from the dfinitin of EBR and the setup of Figure 2:

$$EBR + 1 = \frac{E[Payoff]}{p} = \frac{1.(1-\pi)+\delta.\pi}{p} = \frac{1}{p} - \pi\left(\frac{1-\delta}{p}\right)$$

Equation (9) is derived by substituting the EBR of (8) into the definition of CRP of equation (3) and 1 + ytm = 1/p, as 1 is the promised payoff of the single period. To derive equation (10), we use the definition of CEP above, it is the difference between the EBR of the risky bond and the ytm of a comparable credit-risk free bond in a frictinles market. In our single period setting it requires subtracting r from equation (8), resulting in:

$$CEP = EBR - r = \frac{1}{p} - \pi\left(\frac{1-\delta}{p}\right) - 1 - r$$

which, when we write R = 1 + r gives (10).

2. Multiple Period Model

There is a vast volume of research and publications on tree models for bond pricing. We mention just a few of them. Black, Derman, and Toy impose a structure of a risk free interest tree based on market observed prices and volatilities. Jarrow and Turnbull (1995) focus on the default process and its integration into an interest rate (bond price) tree.

Broadie and Kaya (2007) construct a binomial tree that can incorporate various “real-life” features, yet it is actually a versatile and practical implementation of structural models whereas our model is of the reduced-form type.

Proposition 2

Consider a T-period zero-coupon bond in a frictionless market. Denote the probability of default at time T by pD, the bond price by p, the recovery rate by d, and the current one-period gross (i.e., one plus) interest rate by R1.12 Then the following relations hold:

- The expected bond return is given by :

$$EBR = \left(\frac{\left[1-\pi_d(1-\delta)\right]}{p}\right)^{1/T} - 1$$

- The credit risk premium is given by :

$$CRP = ytm - EBR = \frac{1-[1-\pi_p(1-\delta)^{l/T}}{p}$$

- The certainty equivalent premium is given by:

$$CEP = \left(\frac{\left[1-\pi_p(1-\delta)\right]}{p}\right)^{l/T} - R_1$$

Proof :

Equation (12) follows directly from the definition of EBR and our above assumptions:

$$EBR = \left(\frac{\left[\pi-\delta+(1-\pi).1\right]}{p}\right)^{l/T} - 1 = \left(\frac{\left[1-\pi_p(1-\delta)\right]}{p}\right)^{l/T} - 1$$

The above and subsequent relations hold for the general case, where the term structures are not flat. Each return and premium value is a functions of the maturity T which is omitted in our.

Q15. Explain how Anticipated return from Holding bond over a specific period-in Expected bond return occurs?

Ans : **(Imp.)**

Expected bond return in a single-period framework refers to the anticipated return from holding a bond over a specific period. In a multi-period framework, it involves predicting the return over multiple periods, considering factors like coupon payments, period framework, the expected return from holding a bond for one period can be calculated as:

$$\text{Expected Return} = \text{Coupon Payment} + \frac{\text{Face Value} - \text{Initial Price}}{\text{Initial Price}}$$

i) **Face Value:** The nominal value of the bond.

ii) **Initial Price:** The price paid to purchase the bond.

Example

Consider a bond with a face value of Rs.1,000, a coupon rate of 5%, and a price of Rs.950. The expected return for holding this bond for one year would be:

Sol. **Expected Return** = Rs. 1000 – Rs. 950

Rs. 50 + = Rs. 50 + Rs. 50/ Rs. 950 ≈ 5.26% Rs.950

Multi-Period Framework

In a multi-period framework, the expected return over multiple periods considers the reinvestment of coupon payments. The formula for the expected return in this case is:

$$\text{Expected Return} = \frac{\text{Coupon Payment}}{\text{Initial Price}} + \frac{\text{Face Value} - \text{Initial Price}}{\text{Initial Price}} + \left(\frac{\text{Face Value} - \text{Initial Price}}{\text{Initial Price}}\right)^2 + \ldots + \left(\frac{\text{Face Value} - \text{Initial Price}}{\text{Initial Price}}\right)^n$$

Where:

n: Number of periods

The first term represents the return from coupon payments in the first period, the second term represents the return from selling the bond at the end of the first period and the capital gain or loss, and so on for each period.

Example

Using the same bond as above, if we hold the bond for two years and assume the price at the end of year 1 is Rs.960, the expected return would be:

Sol. Expected return for holding this bond for one year would be:

Expected Return = Rs.1000 – Rs.960

$$\text{Rs. } 50 + = \frac{\text{Rs.50 + Rs.50/ Rs.960}}{\text{Rs. 960}} = 5.78\%$$

In both frameworks, the expected return provides an estimate of the bond's profitability based on assumptions about future coupon payments, reinvestment rates, and price changes. Actual returns may vary due to changes in market conditions.

5.6 SEMI ANNUAL TRANSITION MATRIX

Q14. Describe how Markov chain analysis is related to the Semi-transition Matrix?

Ans : **(Imp.)**

Meaning

Semi-transition matrix is a matrix used in Markov chain analysis to describe the probabilities of transitioning from one state to another over a specified time interval. In a Markov chain, a system transitions between a finite number of states, and the semi-transition matrix captures these transitions.

1. The term "semi" indicates that the matrix describes transitions over a single time step, as opposed to a full transition matrix, which describes transitions over multiple time steps. The semi-transition matrix is often used when analyzing short-term dynamics or when transitioning between states is more frequent.

2. In a semi-transition matrix P, the element p_{ij} represents the probability of transitioning from state i to state j in one time step. The rows of the matrix sum to 1, ensuring that all probabilities of transitioning from state i to any other state sum to 1.

3. Semi-transition matrices are particularly useful in finance, economics, and engineering for modeling dynamic systems where the transition probabilities between states are known or can be estimated. They are a key tool in analyzing the stability and behavior of Markov chains.

Definition

A semi-transition matrix is a mathematical tool used in the analysis of Markov chains. Markov chains are stochastic processes that involve a sequence of events where the probability of each event depends only on the state attained in the previous event. A semi-transition matrix describes the probabilities of transitioning from one state to another over a single time step.

Purpose

The primary purpose of a semi-transition matrix is to model the dynamic behavior of a system that can be in one of several states, with transitions between states governed by probabilities. By analyzing the semi-transition matrix, one can understand the stability, long-term behavior, and absorption properties of the Markov chain.

Structure

A semi-transition matrix is typically represented as $\boxed{P = [pij]}$,

Where

p_{ij} is the probability of transitioning from state *i* to state *j* in one time step.

The rows of the matrix sum to 1, indicating that the probabilities of transitioning from state *i* to any other state sum to 1.

Calculation

To calculate the semi-transition matrix, one needs to know the transition probabilities between states. These probabilities can be estimated from historical data or based on the nature of the system being modeled. The matrix can then be constructed using these probabilities.

Q15. Explain briefly about semi-transition Matrix in MS Excel?

Ans : **(Imp.)**

To create a semi-transition matrix in Excel, you'll need to use the TRANSPOSE function to set up the matrix properly. Let's use a simple example to illustrate this:

Suppose we have a two-state Markov chain with states A and B, and the transition probabilities are as follows:

- Probability of staying in state A: 0.8
- Probability of transitioning from state A to state B: 0.2
- Probability of staying in state B: 0.6
- Probability of transitioning from state B to state A: 0.4

We will create a 2x2 semi-transition matrix in Excel to represent these probabilities.

1. Setting Up the Excel Spreadsheet

- In cell A1, enter "State A" and in cell B1, enter "State B" to label the states.
- In cell A2, enter "State A" and in cell B2, enter "State B" to label the rows.
- In cell A3, enter "State A" and in cell B3, enter "State B" to label the columns.

2. Enter the Transition Probabilities

- In cell A4, enter the probability of staying in state A (0.8).
- In cell A5, enter the probability of transitioning from state A to state B (0.2).
- In cell B4, enter the probability of transitioning from state B to state A (0.4).
- In cell B5, enter the probability of staying in state B (0.6).

3. Create the Semi-Transition Matrix

- In cell A7, enter the formula =TRANSPOSE(A4:B5) to transpose the probabilities into a 2x2 matrix.

Output

The resulting semi-transition matrix should look like this:

	State A	State B
State A	0.8	0.4
State B	0.2	0.6

This matrix represents the probabilities of transitioning between states in the Markov chain over a single time step.

Q16. Explain with an example Markov Simulation in Excel-showing Time-Varying Transition Probabilities?

Ans :

An example Markov Simulation in Excel-showing Time-Varying Transition Probabilities and payoffs. The following information is collected from the trials. Kindly create a Markov health economic model for the same.

- The transition probability to remain in health state is 0.96
- The transition probability to move from healthy state to diseased state is 0.03
- The transition probability to move from healthy state to dead state is 0.01
- The transition probability to remain in diseased state is 0.95
- The transition probability to move from diseased state to dead state is 0.05
- The cost of each cycle in health state is 50 and QALYs is 0.9
- The cost of each cycle in diseased state is 1000 and QALYs is 0.6
- The cohort size is 1000 patients.

According to the given data, the following data table can be generated:

Transition Matrix			
	Healthy	**Diseased**	**Dead**
Healthy	0.96	0.03	0.01
Diseased	0	0.95	0.05
Dead	0	0	1
Payoffs			
State	Costs	Qalys	
Health	50	0.9	
Diseased	1000	0.6	

Step 1

According to the above data, we have a constant transition matrix that applies in every cycle and also the payoffs in each state are constant for each cycle but what we want to do is have these depend on which cycle in the model. Next thing is updating of transition probability as follows:

Transition Matrix			
	Healthy	**Diseased**	**Dead**
Healthy	#	0.03	qx
Diseased	0	#	0.04+qx
Dead	0	0	1

Step 2:

Update time varying quantities as follows:

TIME-VARYING QUANTITIES

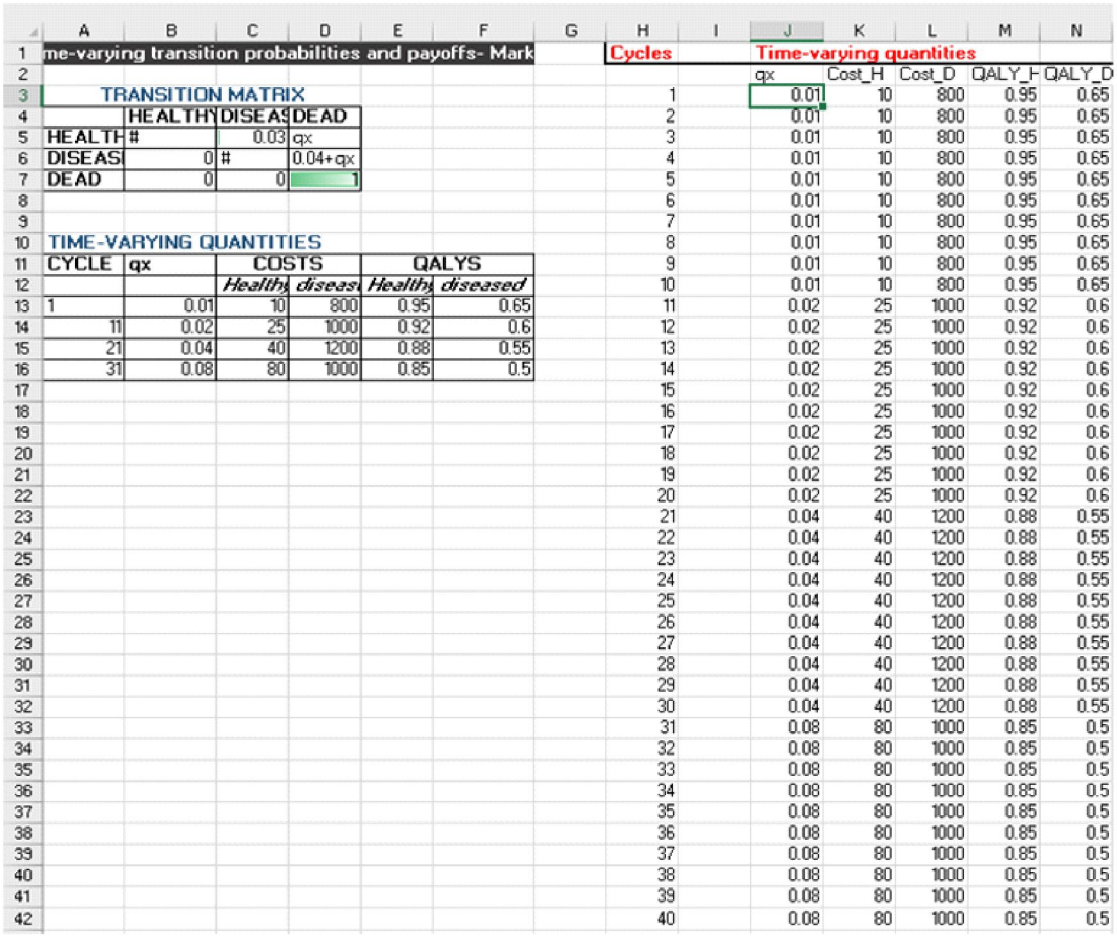
CYCLE	QX	COSTS		QALYS	
		Healthy	Diseased	Healthy	diseased
1	0.01	10	800	0.95	0.65
11	0.02	25	1000	0.92	0.6
21	0.04	40	1200	0.88	0.55
31	0.08	80	1000	0.85	0.4

Step 3:

Add time varying quantities from column J- column N including qx, Cost_H, cost_D, QALY_H, and QALY_D.

Step 4:

Select cell J3 and add formula in qx as =VLOOKUP(RsH3,RsA$13:RsFRs16,2,TRUE) and add it in all cycles. Similar add formulas in Cost_H, cost_D, QALY_H, and QALY_D (change the column numbers respectively)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	me-varying transition probabilities and payoffs- Mark							Cycles		Time-varying quantities				
2										qx	Cost_H	Cost_D	QALY_H	QALY_D
3	TRANSITION MATRIX							1		0.01	10	800	0.95	0.65
4		HEALTHY	DISEAS	DEAD				2		0.01	10	800	0.95	0.65
5	HEALTH	#	0.03	qx				3		0.01	10	800	0.95	0.65
6	DISEAS	0	#	0.04+qx				4		0.01	10	800	0.95	0.65
7	DEAD	0	0	1				5		0.01	10	800	0.95	0.65
8								6		0.01	10	800	0.95	0.65
9								7		0.01	10	800	0.95	0.65
10	TIME-VARYING QUANTITIES							8		0.01	10	800	0.95	0.65
11	CYCLE	qx	COSTS		QALYS			9		0.01	10	800	0.95	0.65
12			Healthy	diseas	Healthy	diseased		10		0.01	10	800	0.95	0.65
13	1	0.01	10	800	0.95	0.65		11		0.02	25	1000	0.92	0.6
14	11	0.02	25	1000	0.92	0.6		12		0.02	25	1000	0.92	0.6
15	21	0.04	40	1200	0.88	0.55		13		0.02	25	1000	0.92	0.6
16	31	0.08	80	1000	0.85	0.5		14		0.02	25	1000	0.92	0.6
17								15		0.02	25	1000	0.92	0.6
18								16		0.02	25	1000	0.92	0.6
19								17		0.02	25	1000	0.92	0.6
20								18		0.02	25	1000	0.92	0.6
21								19		0.02	25	1000	0.92	0.6
22								20		0.02	25	1000	0.92	0.6
23								21		0.04	40	1200	0.88	0.55
24								22		0.04	40	1200	0.88	0.55
25								23		0.04	40	1200	0.88	0.55
26								24		0.04	40	1200	0.88	0.55
27								25		0.04	40	1200	0.88	0.55
28								26		0.04	40	1200	0.88	0.55
29								27		0.04	40	1200	0.88	0.55
30								28		0.04	40	1200	0.88	0.55
31								29		0.04	40	1200	0.88	0.55
32								30		0.04	40	1200	0.88	0.55
33								31		0.08	80	1000	0.85	0.5
34								32		0.08	80	1000	0.85	0.5
35								33		0.08	80	1000	0.85	0.5
36								34		0.08	80	1000	0.85	0.5
37								35		0.08	80	1000	0.85	0.5
38								36		0.08	80	1000	0.85	0.5
39								37		0.08	80	1000	0.85	0.5
40								38		0.08	80	1000	0.85	0.5
41								39		0.08	80	1000	0.85	0.5
42								40		0.08	80	1000	0.85	0.5

Step 5:

Add state membership columns for healthy, diseased, and dead states in columns P, Q, and R of excel. As the initial cohort size is 1000 patients, add 1000 in healthy state and 0 in diseased and dead state.

Step 6:

To update the transition matrix, select P4 cell and add formula =P3*(1-Rs.CRs.5-J3). Drag and apply this to all rows till cycle number 40. For diseased state, select cell Q4 and add formula =P3*Rs.C Rs5+Q3*(1-0.04-J3). Drag and apply this to all rows till cycle number 40. For dead state, select cell R4 and add formula =P3*J3+Q3*(0.04+J3)+R3 and apply to all rows till cycle number 40.

Step 7:

For calculating cost parameters, multiply time varying health states by associated costs. Add costs and QALYS in column T, U, V, X, Y, and Z respectively.

- Formula for cost in healthy state: =P3*K3
- Formula for cost in diseased state: =Q3*L3
- Formula for QALY's in healthy state: =P3*M3
- Formula for QALY's in diseased state: =Q3*N3

	A	B	C	D	E	F
1	me-varying transition probabilities and payoffs- Mark					
2						
3	TRANSITION MATRIX					
4		HEALTHY	DISEAS	DEAD		
5	HEALTH	#	0.03	qx		
6	DISEAS	0	#	0.04+qx		
7	DEAD	0	0	1		
8						
9						
10	TIME-VARYING QUANTITIES					
11	CYCLE	qx	COSTS		QALYS	
12			Healthy	diseas	Healthy	diseased
13	1	0.01	10	800	0.95	0.65
14	11	0.02	25	1000	0.92	0.6
15	21	0.04	40	1200	0.88	0.55
16	31	0.08	80	1000	0.85	0.5

	H	J	K	L	M	N	P	Q	R	T	U	V	X	Y	Z
1	Cycles	Time-varying quantities					Health Membership			Costs			QALY's		
2		qx	Cost_H	Cost_D	QALY_I	QALY_D	Healthy	Disease	Dead	Healthy	Disease	Total	Healthy	Disease	Total
3	1	0.01	10	800	0.95	0.65	1000	0	0	10000	0	10000	950	0	950
4	2	0.01	10	800	0.95	0.65	960	30	10	9600	24000	33600	912	19.5	931.5
5	3	0.01	10	800	0.95	0.65	921.6	57.3	21.1	9216	45840	55056	875.52	37.245	912.765
6	4	0.01	10	800	0.95	0.65	884.736	82.083	33.181	8847.36	65666.4	74513.8	840.499	53.354	893.853
7	5	0.01	10	800	0.95	0.65	849.347	104.521	46.1325	8493.47	83616.7	92110.2	806.879	67.9386	874.818
8	6	0.01	10	800	0.95	0.65	815.373	124.775	59.852	8153.73	99820.2	107974	774.604	81.1039	855.708
9	7	0.01	10	800	0.95	0.65	782.758	142.998	74.2445	7827.58	114398	122226	743.62	92.9485	836.568
10	8	0.01	10	800	0.95	0.65	751.447	159.331	89.222	7514.47	127464	134979	713.875	103.565	817.44
11	9	0.01	10	800	0.95	0.65	721.39	173.907	104.703	7213.9	139126	146340	685.32	113.04	798.36
12	10	0.01	10	800	0.95	0.65	692.534	186.854	120.612	6925.34	149483	156408	657.907	121.455	779.362
13	11	0.02	25	1000	0.92	0.6	664.833	198.287	136.88	16620.8	198287	214908	611.646	118.972	730.618
14	12	0.02	25	1000	0.92	0.6	631.591	206.335	162.074	15789.8	206335	222125	581.064	123.801	704.865
15	13	0.02	25	1000	0.92	0.6	600.011	212.902	187.086	15000.3	212902	227903	552.011	127.741	679.752
16	14	0.02	25	1000	0.92	0.6	570.011	218.129	211.86	14250.3	218129	232379	524.41	130.877	655.287
17	15	0.02	25	1000	0.92	0.6	541.51	222.141	236.348	13537.8	222141	235679	498.19	133.285	631.474
18	16	0.02	25	1000	0.92	0.6	514.435	225.058	260.507	12860.9	225058	237919	473.28	135.035	608.315
19	17	0.02	25	1000	0.92	0.6	488.713	226.988	284.299	12217.8	226988	239206	449.616	136.193	585.809
20	18	0.02	25	1000	0.92	0.6	464.277	228.03	307.693	11606.9	228030	239637	427.135	136.818	563.953
21	19	0.02	25	1000	0.92	0.6	441.064	228.276	330.66	11026.6	228276	239303	405.778	136.966	542.744
22	20	0.02	25	1000	0.92	0.6	419.01	227.812	353.178	10475.3	227812	238287	385.49	136.687	522.177
23	21	0.04	40	1200	0.88	0.55	398.06	226.713	375.227	15922.4	272056	287978	350.293	124.692	474.985
24	22	0.04	40	1200	0.88	0.55	370.196	220.518	409.286	14807.8	264622	279429	325.772	121.285	447.057
25	23	0.04	40	1200	0.88	0.55	344.282	213.982	441.736	13771.3	256779	270550	302.968	117.69	420.658
26	24	0.04	40	1200	0.88	0.55	320.182	207.192	472.625	12807.3	248631	261438	281.76	113.956	395.716
27	25	0.04	40	1200	0.88	0.55	297.769	200.222	502.008	11910.8	240267	252178	262.037	110.122	372.159
28	26	0.04	40	1200	0.88	0.55	276.926	193.138	529.937	11077	231765	242842	243.695	106.226	349.92
29	27	0.04	40	1200	0.88	0.55	257.541	185.994	556.465	10301.6	223193	233495	226.636	102.297	328.933
30	28	0.04	40	1200	0.88	0.55	239.513	178.841	581.646	9580.52	214609	224190	210.771	98.3626	309.134
31	29	0.04	40	1200	0.88	0.55	222.747	171.719	605.534	8909.88	206063	214973	196.017	94.4456	290.463
32	30	0.04	40	1200	0.88	0.55	207.155	164.664	628.181	8286.19	197597	205883	182.296	90.5652	272.861
33	31	0.08	80	1000	0.85	0.5	192.654	157.706	649.64	15412.3	157706	173118	163.756	78.8528	242.609
34	32	0.08	80	1000	0.85	0.5	171.462	144.561	683.977	13717	144561	158278	145.743	72.2803	218.023
35	33	0.08	80	1000	0.85	0.5	152.601	132.357	715.042	12208.1	132357	144565	129.711	66.1786	195.89
36	34	0.08	80	1000	0.85	0.5	135.815	121.052	743.133	10865.2	121052	131918	115.443	60.5262	175.969
37	35	0.08	80	1000	0.85	0.5	120.875	110.6	768.524	9670.03	110600	120271	102.744	55.3002	158.044
38	36	0.08	80	1000	0.85	0.5	107.579	100.955	791.466	8606.33	100955	109561	91.4422	50.4773	141.92
39	37	0.08	80	1000	0.85	0.5	95.7454	92.0675	812.187	7659.63	92067.5	99727.1	81.3836	46.0338	127.417
40	38	0.08	80	1000	0.85	0.5	85.2134	83.8918	830.895	6817.07	83891.8	90708.8	72.4314	41.9459	114.377
41	39	0.08	80	1000	0.85	0.5	75.8399	76.3812	847.779	6067.19	76381.2	82448.3	64.4639	38.1906	102.655
42	40	0.08	80	1000	0.85	0.5	67.4975	69.4906	863.012	5399.8	69490.6	74890.4	57.3729	34.7453	92.1182
43							Health Membership			Costs			QALY's		
44						Parameters	Healthy	Disease	Dead	Healthy	Disease	Total	Healthy	Disease	Total
45						Total	17854.3	6307.77	15837.9	430976	6488017	6918992	16475.6	3630.7	20106.3
46						Per Patient	17.8543	6.30777	15.8379	430.976	6488.02	6918.99	16.4756	3.6307	20.1063

5.7 COMPUTATION OF BOND BETA

Q17. Discuss about computation of bond beta.

Ans :

The beta of a bond measures its sensitivity to changes in interest rates compared to a benchmark, typically a government bond with similar maturity. The beta of a bond can be calculated using the following formula:

$$\text{Bond Beta} = \frac{\text{Covariance}(r_b, r_m)}{\text{Variance}(r_m)}$$

Where,

r_b is the return on the bond.

r_m is the return on the benchmark bond.

Covariance (r_b, r_m) is the covariance between the returns of the bond and the benchmark.

To compute the bond beta, you need historical data for both the bond and the benchmark bond. Here's a step-by-step guide to computing the bond beta:

1. Collect Data

Gather historical returns for the bond and the benchmark bond. Ensure that the returns are calculated over the same time periods (e.g., daily, monthly, yearly).

2. Calculate Returns

Calculate the returns for both the bond and the benchmark bond using the formula:

$$\text{Return} = \frac{\text{Price}_1 - \text{Price}_0 + \text{Coupon}}{\text{Price}_0} \times 100\%$$

Where:

- Price_0 is the initial price of the bond.
- Price_1 is the final price of the bond.
- Coupon is the coupon payment.
- Calculate the benchmark bond returns in the same manner.

3. Calculate Covariance and Variance

- Calculate the covariance between the bond returns and the bench returns.
- Calculate the variance of the benchmark bond returns.

4. Compute Bond Beta

Use the formula above to calculate the bond beta using the covariance and variance calculated in the previous step.

6. Interpretation

- A bond beta greater than 1 indicates that the bond is more volatile than the benchmark bond.
- A bond beta less than 1 indicates that the bond is less volatile than the benchmark bond.
- A bond beta of 1 indicates that the bond has the same volatility as the benchmark bond.

Note

Computing bond beta requires access to historical data and an understanding of statistics. It's also important to note that bond beta is not as commonly used as equity beta, as bonds are typically less volatile than stocks.

Q18. Explain the process of calculation of Beta to Bond in MS Excel with an example?

Ans : **(Imp.)**

Covariance refers to the measure of a stock's return relative to that of the market, and variance refers to the measure of how the market moves relative to its mean.

Once those figures are identified, beta is calculated by dividing covariance by variance (Beta = Covariance/ Variance).

Beta Formula Calculation

Beta is a measure of the stock's volatility compared to the overall stock market. We can calculate beta using three formulas:-

1. Covariance/Variance Method
2. By Slope Method in Excel
3. Correlation Method

The beta formula measures a stock's volatility relative to the overall stock market. It can be calculated using the covariance/variance method, the slope method in Excel, and the correlation method.

A beta value of 1 indicates that the stock closely tracks the movements of the overall market.

A higher beta value suggests that the stock is riskier, as it tends to have more significant price fluctuations compared to the market. Conversely, a lower beta indicates less volatility compared to the market.

1. Covariance/Variance Method

Beta Formula = Covariance (Ri, Rm) / Variance (Rm)Σ

Covariance(R_i, R_m) = Σ(R i,n – R i,avg) * (R m,n – R m, avg) / (n-1)

Variance (Rm) = Σ (R m,n – R m,avg)^2 2 / nXX

To calculate the covariance

We must know the stock return and the market return, which is taken as a benchmark value. We must also know the variance of the market return.

2. By Slope Method in Excel

We can also calculate Beta by using the slope function in excel. The Microsoft Excel SLOPE function returns **the slope of** a regression line based on the data points identified by % change in NASDAQ and % change of the company, which we are calculating.

% change is calculated as below:

Return = Closing Share Price - Opening Share Price / Opening Share Price

Date	NASDAQ Adj Close	% Change in NASDAQ	Amazon Adj Close	% Change in Amazon
12/20/2016	5483.939941		771.219971	
12/21/2016	5471.430176	-0.23%	770.599976	-0.08%
12/22/2016	5447.419922	-0.44%	766.340027	-0.55%
12/23/2016	5462.689941	0.28%	760.590027	-0.75%
12/27/2016	5487.439941	0.45%	771.400024	1.42%
12/28/2016	5438.560059	-0.89%	772.13005	0.09%
12/29/2016	5432.089844	-0.12%	765.150024	-0.90%
12/30/2016	5383.120117	-0.90%	749.869995	-2.00%

Using Slop Function

Beta = 1.433958387

3. Correlation Method

Beta can also be calculated using the correlation method. Beta can be calculated by dividing the asset's standard deviation of returns by the market's standard deviation. The result is then multiplied by the correlation of the security's return and the market's return.

Beta Formula = Σ Correlation (R_i, R_m) * σ_i /σm

Steps

i) First, download Historical prices and NASDAQ index data from the past three years.

You can download the data from yahoo finance.

1 – For NASDAQ Dataset.

Summary Chart Conversations Historical Data Options Components

Time Period: Dec 20, 2016 – Dec 20, 2018 Show: Historical Prices Frequency: Daily Apply

Currency in USD Download Data

Date	Open	High	Low	Close*	Adj Close**	Volume
Dec 19, 2018	6,777.59	6,868.86	6,586.50	6,636.83	6,636.83	2,899,950,000
Dec 18, 2018	6,809.82	6,847.27	6,733.71	6,783.91	6,783.91	2,595,400,000
Dec 17, 2018	6,886.46	6,931.81	6,710.01	6,753,73	6,753.73	2,665.240,000
Dec 14, 2018	6,986.37	7,027.17	6,898.99	6,910.66	6,910.66	2,200,510,000

2 – For Google Prices, finance.yahoo.com

Summary Chart Conversations Statistics Historical Data Profile Financials Analysis Options Holders Sustainability

Time Period: Dec 19, 2016 – Dec 21, 2018 Show: Historical Prices **Frequency:** Daily **Apply**

Currency in USD **Download Data**

Date	Open	High	Low	Close*	Adj Close**	Volume
Dec 20, 2018	1,018.13	1,034.22	996.36	1,009.41	1,009.41	2,673,500

ii) Then Sort the Prices as Done Below.

Then we need to sort the dates of the stock prices and adjusted closing prices in ascending order of dates. We need only these two columns, and the remaining columns can be deleted as we donu2019t have use of those for beta calculations in excel.

Date	NASDAQ Adj Close
12/20/2016	5483.939941
12/21/2016	5471.430176
12/22/2016	5447.419922
12/23/2016	5462.689941
12/27/2016	5487.439941
12/28/2016	5438.560059
12/29/2016	5432.089844
12/30/2016	5383.120117
1/3/2017	5429.080078
1/4/2017	5477
1/5/2017	5487.939941
1/6/2017	5521.060059

iii) Then, prepare the beta coefficient excel sheet, as shown below. We put both the data on one sheet.

Date	NASDAQ AdjClose	% Change in NASDAQ	Google AdjClose	% Changein Google
12/19/2016	5457.439941		794.200012	
12/20/2016	5483.939941	0.49%	796.419983	0.28%
12/21/2016	5471.430176	-0.23%	794.559998	-0.23%
12/22/2016	5447.419922	-0.44%	791.26001	-0.42%
12/23/2016	5462.689941	0.28%	789.909973	-0.17%
12/27/2016	5487.439941	0.45%	791.549988	0.21%
12/28/2016	5438.560059	-0.89%	785.049988	-0.82%
12/29/2016	5432.089844	-0.12%	782.789978	-0.29%
12/30/2016	5383.120117	-0.90%	771.820007	-1.40%
1/3/2017	5429.080078	0.85%	786.140015	1.86%
1/4/2017	5477	0.88%	786.900024	0.10%
1/5/2017	5487.939941	0.20%	794.02002	0.90%
1/6/2017	5521.060059	0.60%	806.150024	1.53%
1/9/2017	5531.819824	0.19%	806.650024	0.06%
1/10/2017	5551.819824	0.36%	804.789978	-0.23%
1/11/2017	5563.649902	0.21%	807.909973	0.39%
1/12/2017	5547.490234	-0.29%	806.359985	-0.19%

4. Then calculate Daily Returns we get.

Return = Closing Share Price ‼ Opening Share Price / Opening Share Price

5. Then, calculate Beta by the Variance-Covariance method.

In this case, we need to use the two formulas (formulas of variance and covariance in excel), as shown below:

Date	NASDAQ AdjClose	% Change in NASDAQ	Google Adj Close	% Changein Google
12/19/2016	5457.439941		794.200012	
12/20/2016	5483.939941	0.49%	796.419983	0.28%
12/21/2016	5471.430176	-0.23%	794.559998	-0.23%
12/22/2016	5447.419922	-0.44%	791.26001	-0.42%
12/23/2016	5462.689941	0.28%	789.909973	-0.17%

Covariance / Variance Method

Beta = Variance / Covariance

0.165488681

Using the variance-covariance method, we get the Beta as 0.16548 (Beta Coefficient)

6. Calculate Beta using SLOPE Function available in excel

Date	NASDAQ AdjClose	% Change in NASDAQ	Google AdjClose	% Changein Google
12/19/2016	5457.439941		794.200012	
12/20/2016	5483.939941	0.49%	796.419983	0.28%
12/21/2016	5471.430176	-0.23%	794.559998	-0.23%
12/22/2016	5447.419922	-0.44%	791.26001	-0.42%
12/23/2016	5462.689941	0.28%	789.909973	-0.17%
12/27/2016	5487.439941	0.45%	791.549988	0.21%
12/28/2016	5438.560059	-0.89%	785.049988	-0.82%
12/29/2016	5432.089844	-0.12%	782.789978	-0.29%
12/30/2016	5383.120117	-0.90%	771.820007	-1.40%
1/3/2017	5429.080078	0.85%	786.140015	1.86%
1/4/2017	5477	0.88%	786.900024	0.10%
1/5/2017	5487.939941	0.20%	794.02002	0.90%

Covariance / Variance Method

Beta = Variance / Covariance

0.165488681

Using Slope Function

Beta = 1.205117858

Using this SLOPE function method, we again get the Beta as **1.2051 (Beta Coefficient)**

Short Questions and Answers

1. Define bond.

Ans :

Bond refers to a debt instrument which is issued by a corporate body or a government organization. The face value of bond is a-par value which must be agreeable by the firm for its repayment at the time of its maturity. Bonds are issued at par, premium or at discount. By issuing bonds, firms are able to generate fixed returns in the form of interest over a fixed period of time. Bond valuation is also known as debt valuation because bonds generate stream of income which are less risky when compared to the shares.

2. Characteristics of bond

Ans :

i) Par Value: Par value refers to the face value which a bond pays to its owner on some date in the future.

ii) Coupon and Coupon Rate: Coupon is the predetermined amount of interest to be paid on bond. Coupon rate of interest obtained from annual coupon divided by the face value.

iii) Maturity Date: Every bond have a specified maturity date on which issuer is obliged to make payment of face value of bond to the bondholder.

iv) Yield to Maturity (YTM): Yield to maturity is the market rate of interest which is required for a bond.

3. Zero Coupon Bonds

Ans :

Zero coupon bonds are also known as zero-interest fully convertible debentures. It is converted into equity shares at the expiry of the prescribed date. They are issued without coupon payments.

4. Explain the duration of bond with, Even, uneven payments?

Sol :

Duration measures the time structure of a bond and the bond's interest rate risk. The time structure of investment in bonds is expressed in two ways. The common way to state is how many years he has to wait until the bond matures and the principal money is paid back.

This is known as asset's time to maturity or its years to maturity. The other way is to measure the average time until all interest coupons and the principal is recovered.

5. Bond immunization.

Ans :

Immunization, also known as multi-period immunization, is a risk-mitigation strategy that matches the duration of assets and liabilities in order to minimize the impact of interest rates on net worth over time.

6. Structure of interest rates?

Ans :

It is a connection between time to maturity and yield for a particular category of bonds at a particular time by keeping all the factors constant, especially the default risk. Mostly if the length of time to maturity is more, the more will be the interest rates.

The term structure scenario is outlined by yield curve.

7. Bond beta.

Ans :

The beta of a bond measures its sensitivity to changes in interest rates compared to a benchmark, typically a government bond with similar maturity. The beta of a bond can be calculated using the following formula:

$$\text{Bond Beta} = \frac{\text{Covariance}(r_b, r_m)}{\text{Variance}(r_m)}$$

Where,

r_b is the return on the bond.

r_m is the return on the benchmark bond.

Covariance (r_b, r_m) is the covariance between the returns of the bond and the benchmark.

8. Objectives of a bond.

Ans :

i) Raising Capital

Issuing of bonds helps the organisation to raise their capital. It is one of the effective sources of raising capital.

ii) Low Interest Rate

Organization can borrow funds through bonds at low interest rate when compared to bank loans.

iii) Eliminates Middlemen

Organisation can issue bonds directly to the investors which will not allow banks to act as middlemen between organisation and investors. As a result, the process of borrowing becomes efficient and less expensive.

iv) Borrow for Long-term

Organization through bonds can borrow funds for long-term period at a fixed rate, which could not be possible while borrowing loans from banks.

9. Deep Discount Bonds

Ans :

It is a kind of zero interest bond. Both coupon rate and interest is not paid on these bonds. They are non-convertible bonds which have a face value and issue price of these bonds is discounted value.

10. Capitalization of Income Method

Ans :

An investor who believes that the efficiency of bond market would question the ability of other investors to identify mispriced situations. However, if an investor believes that such situations exist, then an economically sensible and logical approach to valuation is needed to identify them. One such approach is the capitalization of income method of valuation.

This method of valuation states that the intrinsic value of any asset is based on the discounted value of cash flows that the investor expects to receive in the future from owning the bond. The intrinsic value is to be compared with existing v ue of a bond, so as to state whether the bond is overpriced, underpriced or fairly priced. Another way is to compare the bond YTM (Yield To Maturity) with AYTM (Approximate Yield to Maturity).

If YTM > AYTM, then the bond is underpriced,

If YTM < AYTM, then the bond is overpriced.

Exercise Problems

1. A bond has a YTM of 10% and its duration is 8 years. The YTM of the bond is expected to go down by 75 basis points (from 10% to 9.25%). Find out the modified duration and the percentage change in bond price.

   (Ans : Modified duration is 7.62 years and percentage increase in price is 5.72%).

2. Consider a ` 100 par value bond, carrying a coupon rate of 12 percent and maturity after 6 years. The bond is currently selling for ` 110. What is the YTM on this bond? What is duration of the bond?

   (Ans : YTM = 9.75%, Duration = 4.665 years).

3. Consider a ` 1000 par value bond, carrying an interest rate of 15 percent (payable annually) and maturity after 5 years. The present market price of this bond is 16 percent. Find the future value of bond.

   (Ans : Total Future Value = ` 2,032).

Choose the Correct Answers

1. What is the key factor that determines the present value of a bond's cash flows? [c]
   (a) The bond's coupon rate (b) The bond's face value
   (c) The discount rate (d) The bond's maturity date
2. Which of the following statements about bond valuation is true? [b]
   (a) Bonds always trade at par value.
   (b) Bond prices and yields move in opposite directions.
   (c) Coupon payments are fixed for the life of the bond.
   (d) Bond valuation is unaffected by changes in market interest rates
3. What does the yield to maturity (YTM) of a bond represent? [b]
   (a) The annual interest rate paid by the bond.
   (b) The total return expected if the bond is held until maturity.
   (c) The current market price of the bond.
   (d) The face value of the bond.
4. What is the primary goal of bond immunization? [c]
   (a) Maximizing returns
   (b) Minimizing duration
   (c) Matching assets' duration with liabilities' duration
   (d) Avoiding interest rate risk
5. Which of the following strategies is used in bond immunization to minimize interest rate risk? [b]
   (a) Cash flow matching (b) Duration matching
   (c) Convexity matching (d) Yield curve fitting
6. Which of the following best describes the term structure of interest rates? [a]
   (a) It represents the relationship between interest rates and bond maturities.
   (b) It refers to the difference between short-term and long-term interest rates.
   (c) It shows the correlation between interest rates and inflation.
   (d) It measures the volatility of interest rates over time.
7. What do upward-sloping, downward-sloping, and flat yield curves indicate about market expectations? [b]
   (a) Upward-sloping indicates economic downturn, downward-sloping indicates economic growth, and flat indicates stability.
   (b) Upward-sloping indicates economic growth, downward-sloping indicates economic downturn, and flat indicates uncertainty.
   (c) Upward-sloping indicates stability, downward-sloping indicates economic growth, and flat indicates economic downturn.
   (d) Upward-sloping indicates economic growth, downward-sloping indicates stability, and flat indicates economic downturn.

8. What does bond beta measure? [b]
   (a) The volatility of a bond's price compared to the stock market.
   (b) The sensitivity of a bond's price to changes in interest rates.
   (c) The correlation between a bond's price and the stock market.
   (d) The risk-adjusted return of a bond compared to a benchmark
9. How is bond beta calculated? [b]
   (a) By dividing the bond's duration by the benchmark bond's duration.
   (b) By calculating the covariance between the bond's returns and the benchmark bond's returns.
   (c) By dividing the bond's yield by the benchmark bond's yield.
   (d) By calculating the standard deviation of the bond's returns
10. What is the formula for calculating the expected return of a bond in a single-period framework? [a]
   (a) Coupon Payment + (Face Value - Initial Price) / Initial Price
   (b) Coupon Payment + Face Value
   (c) Coupon Payment / Initial Price
   (d) Face Value - Initial Price

Fill in the Blanks

1. _____ refers to a debt instrument which is issued by a corporate body or a government organization.
2. _____ is the predetermined amount of interest to be paid on bond.
3. _____ is the process of determining the bond values. Bond values actually refers to the present values of securities like bonds, debentures etc.
4. Zero coupon bonds are also known as _____.
5. _____ bonds are those which can be redeemed after the end of the initial specified period by lender.
6. _____ are very risky in nature. Both interest risk and principal risk are high in junk bonds. It is suitable for speculators.
7. _____ measures the time structure of a bond and the bond's interest rate risk.
8. YTM stands for _____
9. The term structure of interest rates describes the relationship between _____ and the _____.
10. _____ measures its sensitivity to changes in interest rates compared to a benchmark.

ANSWERS

1. Bond
2. Coupon
3. Bond valuation
4. Zero-interest fully convertible debentures
5. Putable
6. Junk bonds
7. Duration
8. Yield to Maturity
9. Interest rates, Time to maturity of bonds
10. The beta of a bond

Internal Assessment (Mid Examinations)

In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each MidTerm examination consists of two parts i) Part – A for 10 marks, ii) Part – B for 20 marks with a total duration of 2 hours as follows:

1. Mid-Term Examination for 30 marks:

   (a) Part - A: Objective/quiz paper/Short Note questions for 10 marks.

   (b) Part - B: Descriptive paper for 20 marks.

   The objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The average of the two Mid Term Examinations shall be taken as the final marks for Mid Term Examination (for 30 marks). The remaining 10 marks of Continuous Internal Evaluation are distributed as:

2. Assignment for 5 marks. (Average of 2 Assignments each for 5 marks)

3. PPT/Poster Presentation/ Case Study/Video presentation/Survey/Field Study/Group discussion /Role Play on a topic in the concerned subject for 5 marks before II Mid-Term Examination.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

PPT/Poster Presentation/ Case Study/Video presentation/Survey/Field Study/Group discussion /Role Play on a topic in the concerned subject for 5 marks before II Mid-Term Examination.

UNIT - I

Part - A

Multiple Choice Questions

1. According to modus operandi, analysis are divided into _____. [d]

   (a) Horizontal analysis (b) Vertical analysis

   (c) Internal analysis (d) Both (a) and (b)

2. Following are the methods used in analyzing financial statements are _____. [d]

   (a) Trend ratios (b) Ratio analysis

   (c) Comparative analysis (d) All the above

3. The ratio which measures the relationship between operating cost and net sales is_____, [a]

   (a) Operating ratio (b) Gross profit ratio

   (c) Net profit ratio (d) Operating profit ratio

Fill in the Blanks

4. _____ is a collection of data which is organized according to the logical and consistent accounting procedures. **(Financial statements)**
5. _____ reveals the effects of transactions involving the changes in cash or cash equivalents. **(Cash flow statement)**
6. Cash flow statement is useful for _____. **(Short-term financial analysis)**

Short Notes

7. Horizontal analysis. **(Unit-I, SQA- 2)**
8. Disadvantages of vertical financial statement analysis. **(Unit-I, SQA- 4)**
9. Advantages of ratio analysis. **(Unit-I, SQA- 8)**
10. What is cash flow statement ? **(Unit-I, SQA- 9)**

Part - B

1. Discuss the techniques of financial statement analysis. **(Unit-I, Q.No. 2)**
2. What is vertical financial statement analysis ? Describe the benefits of financial statement analysis. **(Unit-I, Q.No.6)**
3. Compare and contrast Horizontal analysis and Vertical analysis. **(Unit-I, Q.No. 8)**
4. Discuss about various types of ratio analysis. **(Unit-I, Q.No. 12)**
5. Explain different types of ratio analysis. **(Unit-I, Q.No. 16)**
6. What are the features of cash flow statement? **(Unit-I, Q.No. 18)**

UNIT - II

Part - A

Multiple Choice Questions

1. What does the time value of money principle state? [a]
   (a) A dollar today is worth more than a dollar in the future.
   (b) A dollar in the future is worth more than a dollar today.
   (c) A dollar today is worth the same as a dollar in the future.
   (d) The value of money does not change over time.
2. Beta is a measure of: [a]
   (a) Stock volatility compared to the market (b) Stock price compared to earnings
   (c) Dividend yield compared to stock price (d) Total return compared to risk-free rate
3. The risk-free rate is used in finance to: [c]
   (a) Determine the maximum amount of risk an investor should take
   (b) Estimate the future value of an investment
   (c) Calculate the expected return of a risky investment
   (d) Measure the volatility of a stock

Fill in the Blanks

4. _____ reduces the purchasing power of money over time. **(Inflation)**
5. The _____ calculation allows investors to predict the amount of profit that can be generated by assets. **(Future value)**
6. Paying off the loan over the scheduled period with equated payments or installments at regular intervals is known as _____. **(Amortization)**

Short Notes

7. Time value of money. **(Unit-II, SQA- 1)**
8. Advantages of Future value. **(Unit-II, SQA- 4)**
9. Perpetuity **(Unit-II, SQA- 7)**
10. Limitation of perpetuity **(Unit-II, SQA- 8)**

Part - B

1. Explain the importance of time value of money. How does the time value of money relate to opportunity cost? **(Unit-II, Q.No. 2)**
2. What impact does inflation have on the time value of money? **(Unit-II, Q.No. 4)**
3. What are the limitations/disadvantages of calculating Future Value ? **(Unit-II, Q.No. 8)**
4. What is meant by Equated Loan Amortiza-tion? How does it work ? Explain the working mechanism of equated Loan Amortization. **(Unit-II, Q.No. 13)**
5. Explain different methods of spreadsheet formulas for calculating 'Equated Loan Amortization'? **(Unit-II, Q.No. 16)**
6. Distinguish between systematic risk and unsystematic risk. **(Unit-II, Q.No. 21)**

UNIT - III

Part - A

Multiple Choice Questions

1. Which of the following is a disadvantage of the Payback Period method? [c]
   (a) It considers the time value of money
   (b) It is easy to understand and calculate
   (c) It ignores cash flows beyond the payback period
   (d) It provides a clear measure of profitability
2. Which of the following capital budgeting techniques considers the risk of future cash flows by using different discount rates for different levels of risk? [d]
   (a) Net Present Value (NPV)
   (b) Internal Rate of Return (IRR)
   (c) Profitability Index (PI)
   (d) Risk-Adjusted Return On Capital (RAROC)

3. What is the primary concept behind the Real Options Approach in capital budgeting? [b]
   (a) It considers the option to abandon a project if it becomes unprofitable
   (b) It incorporates the value of managerial flexibility in decision-making
   (c) It focuses on maximizing the Net Present Value (NPV) of a project
   (d) It calculates the Internal Rate of Return (IRR) for various investment options

Fill in the Blanks

4. _____ is calculated by subtracting the initial investment from the present value of expected cash flows.
(NPV)

5. _____ is calculated by dividing the average annual accounting profit by the initial investment.
(Preferable)

6. The _____ applies financial options theory to investment decisions, recognizing that managers have the option, but not the obligation, to take certain actions in the future based on a project.
(Real Options Approach)

Short Notes

7. Advantages of capital budgeting. **(Unit-III, SQA- 4)**
8. Cost of capital. **(Unit-III, SQA- 8)**
9. Real options approach. **(Unit-III, SQA- 9)**
10. Adjusted present value approach. **(Unit-III, SQA- 10)**

Part - B

1. Discuss the techniques of capital budgeting in detail with advantages and disadvantages of each technique. **(Unit-III, Q.No. 2)**
2. What is Decision Tree? Explain in detail how to construct a decision tree. **(Unit-III, Q.No. 6)**
3. How to use Monte Carlo Simulation with decision trees ? **(Unit-III, Q.No. 8)**
4. Explain the cash flows in capital budgeting using spreadsheet applications. **(Unit-III, Q.No.12)**
5. Discuss the advance capital budgeting techniques with formula and suitable examples. **(Unit-III, Q.No.16)**
6. Discuss how to work the real options approach in a spreadsheet. **(Unit-III, Q.No. 18)**

UNIT - IV

Part - A

Multiple Choice Questions

1. The covariance matrix in portfolio analysis is used to: [d]
   (a) Calculate the expected return of the portfolio
   (b) Estimate the correlation between individual asset returns
   (c) Determine the weights of each asset in the portfolio
   (d) Calculate the variance and covariance of individual asset returns.
2. Portfolio variance is a measure of: [b]
   (a) The average deviation of individual asset returns from the mean
   (b) The volatility of a portfolio's returns
   (c) The correlation between individual asset returns
   (d) The average of the squared deviations of individual asset returns from the mean

3. Which of the following is an assumption of the CAPM? [b]
   (a) Investors are risk-neutral
   (b) Investors can borrow and lend at the risk-free rate
   (c) Market prices reflect all available information
   (d) All investors have the same risk preferences

Fill in the Blanks

4. The Capital Asset Pricing Model (CAPM) is a model used to calculate the _____ of an asset based on its risk as measured by beta. **(Expected return)**
5. In the CAPM formula, the _____ is added to the product of the asset's beta and the market risk premium to determine the expected return of the asset. **(Risk-free rate)**
6. The _____ of a portfolio is a measure of how the returns of the individual assets in the portfolio move together. It is calculated as the weighted average of the individual asset variances, plus the weighted average of all pairs of assets' covariances. **(Variance)**

Short Notes

7. Capital Asset Pricing Model. **(Unit-IV, SQA- 2)**
8. Diversification of Portfolio **(Unit-IV, SQA- 4)**
9. Features of Technical Analysis **(Unit-IV, SQA- 8)**
10. Define Real Option **(Unit-IV, SQA- 9)**

Part - B

1. What is meant by Equity Valuation? Discuss the ethical considerations involved in equity valuation. Explain how analysts and investors should approach valuation in a fair and transparent manner, considering the interests of all stakeholders ? **(Unit-IV, Q.No. 1)**
2. Explain the Scope of Equity Valuation? **(Unit-IV, Q.No. 2)**
3. Discuss the components of capital asset Pricing Model? **(Unit-IV, Q.No. 9)**
4. Explain briefly about Variance and Covariance matrix in CAPM with an example? **(Unit-IV, Q.No. 12)**
5. Explain briefly about Variance and Covariance matrix in CAPM by using MS Excel ? **(Unit-IV, Q.No. 13)**
6. Explain in detail about procedure how to calculate CAPM Beta in MS Excel ? **(Unit-IV, Q.No. 17)**

UNIT - V

Part - A

Multiple Choice Questions

1. Which of the following statements about bond valuation is true? [b]
   (a) Bonds always trade at par value.
   (b) Bond prices and yields move in opposite directions.
   (c) Coupon payments are fixed for the life of the bond.
   (d) Bond valuation is unaffected by changes in market interest rates

2. What does bond beta measure? [b]
   (a) The volatility of a bond's price compared to the stock market.
   (b) The sensitivity of a bond's price to changes in interest rates.
   (c) The correlation between a bond's price and the stock market.
   (d) The risk-adjusted return of a bond compared to a benchmark
3. How is bond beta calculated? [b]
   (a) By dividing the bond's duration by the benchmark bond's duration.
   (b) By calculating the covariance between the bond's returns and the benchmark bond's returns.
   (c) By dividing the bond's yield by the benchmark bond's yield.
   (d) By calculating the standard deviation of the bond's returns

Fill in the Blanks

4. _____ refers to a debt instrument which is issued by a corporate body or a government organization. **(Bond)**
5. _____ bonds are those which can be redeemed after the end of the initial specified period by lender. **(Putable)**
6. _____ are very risky in nature. Both interest risk and principal risk are high in junk bonds. It is suitable for speculators. **(Junk bonds)**

Short Notes

7. Characteristics of bond **(Unit-V, SQA- 2)**
8. Explain the duration of bond with, Even, uneven payments? **(Unit-V, SQA- 4)**
9. Structure of interest rates? **(Unit-V, SQA- 6)**
10. Objectives of a bond. **(Unit-V, SQA- 8)**

Part - B

1. What are the different types of bonds? **(Unit-V, Q.No. 2)**
2. Explain the duration of bond with, Even, uneven payments? **(Unit-V, Q.No. 4)**
3. Discuss about various immunization strategies in a spreadsheet? **(Unit-V, Q.No. 8)**
4. Explain in detail about Modeling of the term Structure in Bonds? **(Unit-V, Q.No. 10)**
5. Describe how Markov chain analysis is related to the Semi-transition Matrix? **(Unit-V, Q.No. 14)**
6. Explain with an example Markov Simulation in Excel-showing Time-Varying Transition Probabilities? **(Unit-V, Q.No. 16)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA IV-Semester Examinations

MODEL PAPER - I

R22

FINANCIAL ANALYTICS

Time : 3 Hours] **[Max. Marks : 60**

Note : This question paper contains two parts **A** and **B**.

Part A is compulsory which carries 10 marks. Answer all questions in **Part A.**

Part B consists of 5 Units. Answer any **One** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (10 × 1 = 10 Marks)

ANSWERS

1. (a) Disadvantages of vertical financial statement analysis. **(Unit-I, SQA-4)**

   (b) Horizontal analysis. **(Unit-I, SQA-2)**

   (c) Uses of time value of money. **(Unit-II, SQA-2)**

   (d) Equated Loan Amortization **(Unit-II, SQA-6)**

   (e) Disadvantages of capital budgeting. **(Unit-III, SQA-3)**

   (f) Advantages of capital budgeting. **(Unit-III, SQA-4)**

   (g) Industry analysis. **(Unit-IV, SQA-6)**

   (h) Equity Valuation. **(Unit-IV, SQA-1)**

   (i) Explain the duration of bond with, Even, uneven payments. **(Unit-V, SQA-4)**

   (j) Deep Discount Bonds **(Unit-V, SQA-9)**

PART - B (5 × 10 = 50 Marks)

2. What is meant by ratio analysis? Explain the importance and uses of ratio analysis? **(Unit-I, Q.No.11)**

OR

3. From the following information calculate cash flow from business operations:

Particulars	Purchase (`)	Sold (`)
Investment	2,30,000	1,40,000
Goodwill	1,75,000	–
Machinery	5,30,000	2,10,000
Patents	–	75,000

Interest received on debentures held as an investment ` 18,000. Dividend received on shares held as investments ` 25,000. A part of building was purchased out of surplus funds for investment purposes, which earned ` 75,000 by way of rent. **(Unit-I, Prob.5)**

4. Explain the difference between future value and present value with an example. **(Unit-II, Q.No.12)**

OR

5. Explain how to calculate standard deviation in MS Excel? **(Unit-II, Q.No.25)**

6. Define capital budgeting. Explain the characteristics of capital budgeting. **(Unit-III, Q.No.1)**

OR

7. A firm is contemplating the following projects. Which one is better according to you?

Year	Project A	Project B
0	–1,00,000	–1,00,000
1	25,000	35,000
2	24,000	20,000
3	23,000	24,000
4	20,000	23,000
5	15,000	18,000

Closing NPV, PI and payback period evaluate the projects assuming a 10% discount rate. **(Unit-III, Prob.2)**

8. Explain how to calculate the variance of a portfolio in a spreadsheet. **(Unit-IV, Q.No.5)**

OR

9. Discuss about Securities Market Line (SML) and diversification of portfolio. **(Unit-IV, Q.No.14)**

10. Define bond, Explain the characteristics of a bond. State the objectives of issuing bonds. **(Unit-V, Q.No.1)**

OR

11. Explain the Modeling the term Structure of bonds in MS Excel? **(Unit-V, Q.No.11)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA IV-Semester Examinations

R22

MODEL PAPER - II

FINANCIAL ANALYTICS

Time : 3 Hours] **[Max. Marks : 60**

Note : This question paper contains two parts **A** and **B**.

Part A is compulsory which carries 10 marks. Answer all questions in **Part A.**

Part B consists of 5 Units. Answer any **One** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (10 × 1 = 10 Marks)

ANSWERS

1. (a) Advantages of ratio analysis. **(Unit-I, SQA-8)**
   (b) Define trend analysis. **(Unit-I, SQA-5)**
   (c) What is Future Value? **(Unit-II, SQA-3)**
   (d) Limitation of perpetuity **(Unit-II, SQA-8)**
   (e) Real options approach. **(Unit-III, SQA-9)**
   (f) Define capital budgeting. **(Unit-III, SQA-1)**
   (g) Security Market line. **(Unit-IV, SQA-3)**
   (h) What is technical analysis. **(Unit-IV, SQA-7)**
   (i) Characteristics of bond. **(Unit-V, SQA-2)**
   (j) Objectives of a bond. **(Unit-V, SQA-8)**

PART - B (5 × 10 = 50 Marks)

2. What is a three-statement model? Explain steps in building a three statement model. **(Unit-I, Q.No.22)**

OR

3. Describe how excel is used for data interpretation and reporting. **(Unit-I, Q.No.25)**
4. Explain different methods of spreadsheet formulas for calculating 'Equated Loan Amortization'? **(Unit-II, Q.No.16)**

OR

5. Explain how to calculate coefficient of variation in spread-sheet? **(Unit-II, Q.No.26)**
6. Explain the techniques of capital budgeting with formulas calculated in spreadsheets. **(Unit-III, Q.No.3)**

OR

7. An industry is contemplating to purchase a machine. Two machines A and B are

available, each costing ` 5,00,000. In comparing the profitability of machines a discount rate of 10% is used earnings after taxation are expected as follows,

Year	Machine A	(` in 000's) Machine B
1	150	50
2	200	150
3	250	200
4	150	300
5	100	200

Rank the investment proposals using,

(a) Pay-back period

(b) NPV @ 10%

(c) IRR method. **(Unit-III, Prob.4)**

8. Explain Variance and Covariance matrix in CAPM by MS. Excel ? **(Unit-IV, Q.No.11)**

OR

9. Explain in detail about procedure how to calculate CAPM Beta in MS Excel ? **(Unit-IV, Q.No.17)**

10. How to Calculate present value of a Bond in MS Excel? **(Unit-V, Q.No.5)**

OR

11. Explain the from work of Expected bond returns, Single and Multi-Period? **(Unit-V, Q.No.12)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA IV-Semester Examinations

R22

MODEL PAPER - III

FINANCIAL ANALYTICS

Time : 3 Hours] **[Max. Marks : 60**

Note : This question paper contains two parts **A** and **B**.

Part A is compulsory which carries 10 marks. Answer all questions in **Part A.**

Part B consists of 5 Units. Answer any **One** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (10 × 1 = 10 Marks)

ANSWERS

1. (a) What is cash flow statement ? **(Unit-I, SQA-9)**

   (b) Ratio Analysis. **(Unit-I, SQA-6)**

   (c) Time value of money. **(Unit-II, SQA-1)**

   (d) Define risk. **(Unit-II, SQA-9)**

   (e) What is Decision Tree ? **(Unit-III, SQA-5)**

   (f) Cash flow in capital budgeting. **(Unit-III, SQA-7)**

   (g) Define Real Option **(Unit-IV, SQA-9)**

   (h) Economic analysis. **(Unit-IV, SQA-5)**

   (i) Define bond. **(Unit-V, SQA-1)**

   (j) Capitalization of Income Method **(Unit-V, SQA-10)**

PART - B (5 × 10 = 50 Marks)

2. Discuss are the norms created by accounting standard - 3 for cash flow statement. **(Unit-I, Q.No.19)**

OR

3. From the following balance sheet, calculate :

   (a) Current ratio

   (b) Debt - equity ratio

   (c) Fixed assets turnover ratio

   (d) Return on capital employed and give your comments

Balance sheet as on 31.12.2014

Liabilities	Amount (`)	Assets	Amount (`)
Equity share capital	12,00,000	Fixed Assets	17,00,000
Reserves and surplus	3,00,000	Stock	3,00,000
9% Debentures	7,00,000	Debtors	2,80,000
Creditors	2,80,000	Marketable securities	2,00,000
Bills Payable	50,000	Cash	50,000
	25,30,000		25,30,000

Profit before interest and tax for the year are ` 50 lakhs and sales are ` 50 lakhs. **(Unit-I, Prob.2)**

4. (a) Distinguish between systematic risk and unsystematic risk. **(Unit-II, Q.No.21)**

   (a) Define Systematic Risk and Unsystematic Risk? **(Unit-II, Q.No.20)**

OR

5. If you deposit ` 5000 today at 12 percent rate of interest in how many years (roughly) will this amount grow to ` 1,60,000 ? Work this problem using the rule of 72. **(Unit-II, Prob.2)**

6. Discuss the advance capital budgeting techniques with formula and suitable examples. **(Unit-III, Q.No.16)**

OR

7. What is meant by the adjusted present value (APV) approach, also discuss the steps involved in calculated APV analysis ? **(Unit-III, Q.No.23)**

8. Explain briefly about Variance and Covariance matrix in CAPM by using MS Excel ? **(Unit-IV, Q.No.13)**

OR

9. What is technical analysis? What are the advantages and limitations of technical analysis? **(Unit-IV, Q.No.21)**

10. Discuss about various immunization strategies in a spreadsheet? **(Unit-V, Q.No.8)**

OR

11. Explain the process of calculation of Beta to Bond in MS Excel with an example? **(Unit-V, Q.No.18)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA IV - Semester Examinations

R22

July/August - 2024

FINANCIAL ANALYTICS

Time : 3 Hours | Max. Marks : 60

Note : This question paper contains two parts A and B. i) **Part- A** for 10 marks, (ii) **Part - B** for 50 marks.

- Part - A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part - B consists of ten questions (numbered from 2 to 11) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

PART - A (10 Marks)

Answers

1. (a) Define Horizontal Analysis ? **(Unit-I, SQA-2)**

   (b) What does the Current Ratio measure?

Ans :

$$\frac{\text{Current Assets}}{\text{Current Liabilities}}$$

   (c) Define Perpetuity? **(Unit-II, SQA-7)**

   (d) What is future value? **(Unit-II, SQA-3)**

   (e) How are spreadsheets used in competing project risk analysis? **(Unit-III, Q.No. 26)**

   (f) How is a Decision Tree used in capital budgeting? **(Unit-III, Q.No. 6)**

   (g) Define Beta in the context of CAPM? **(Unit-IV, Q.No. 9, (point 2))**

   (h) What is a Variance-Covariance Matrix? **(Unit-IV, Q.No. 13)**

   (i) What is bond duration? **(Unit-V, SQA - 4)**

   (j) Define the term structure of interest rates? **(Unit-V, SQA - 6)**

PART - B (50 Marks)

2. Discuss the role of Profitability Ratios in financial analysis with suitable examples?

Ans :

Profitability ratios are a type of accounting ratio that helps in determining the financial performance of business at the end of an accounting period. Profitability ratios show how well a company is able to make profits from its operations.

1. Gross Profit Ratio

Gross Profit Ratio is a profitability ratio that measures the relationship between the gross profit and net sales revenue. When it is expressed as a percentage, it is also known as the Gross Profit Margin.

Formula for Gross Profit ratio is

Gross Profit Ratio = Gross Profit/Net Revenue of Operations × 100

A fluctuating gross profit ratio is indicative of inferior product or management practices.

2. Operating Ratio

Operating ratio is calculated to determine the cost of operation in relation to the revenue earned from the operations.

The formula for operating ratio is as follows

Operating Ratio = (Cost of Revenue from Operations + Operating Expenses)/

Net Revenue from Operations ×100

3. Operating Profit Ratio

Operating profit ratio is a type of profitability ratio that is used for determining the operating profit and net revenue generated from the operations. It is expressed as a percentage.

The formula for calculating operating profit ratio is:

Operating Profit Ratio = Operating Profit/ Revenue from Operations × 100

Or Operating Profit Ratio = 100 – Operating ratio

4. Net Profit Ratio

Net profit ratio is an important profitability ratio that shows the relationship between net sales and net profit after tax. When expressed as percentage, it is known as net profit margin.

Formula for net profit ratio is

Net Profit Ratio = Net Profit after tax ÷ Net sales

Or

Net Profit Ratio = Net profit/Revenue from Operations × 100

It helps investors in determining whether the company's management is able to generate profit from the sales and how well the operating costs and costs related to overhead are contained.

5. Return on Capital Employed (ROCE) or Return on Investment (ROI)

Return on capital employed (ROCE) or Return on Investment is a profitability ratio that measures how well a company is able to generate profits from its capital. It is an important ratio that is mostly used by investors while screening for companies to invest.

The formula for calculating Return on Capital Employed is :

ROCE or ROI = EBIT ÷ Capital Employed × 100

Where EBIT = Earnings before interest and taxes or Profit before interest and taxes

Capital Employed = Total Assets – Current Liabilities

(OR)

3. Explain the structure and purpose of a Statement of Cash Flows. **(Unit-I, Q.No. 17, 19, 20)**

4. (a) Explain Present Value and its importc in financial decision-making. **(Unit-II, Q.No. 9)**

Ans :

Investment Evaluation

PV helps investors and businesses determine whether an investment today will generate sufficient returns in the future.

Used in techniques like **Net Present Value (NPV)** to assess project viability.

Loan and Mortgage Decisions

Lenders and borrowers use PV to determine fair loan terms and interest payments.

Retirement Planning

Individuals estimate how much they need to invest today to reach a future savings goal.

Bond and Stock Valuation

PV is used to determine the fair value of bonds (discounting future coupon payments) and stocks (discounting expected dividends).

Risk Assessment

Helps in adjusting future cash flows for risk, making financial planning more reliable.

(b) Brief on Equated Loan Amortization. **(Unit-II, Q.No. 13)**

(OR)

5. (a) Compare and contrast Arithmetic Mean and Geometric Mean in investment analysis. **(Unit-II, Q.No. 24)**

(b) Illustrate the concept of covariance of stock. **(Unit-II, Q.No. 28)**

6. (a) Explain the Payback Period method and its advantages and disadvantages. **(Unit-III, Q.No. 2)**

(b) Brief on adjusted present value approach. **(Unit-III, Q.No. 23)**

(OR)

7. (a) What is Net Present Value and why is it considered a superior method. **(Unit-III, Q.No. 4)**

   (b) Illustrate the concept of decision tree in brief. **(Unit-III, Q.No. 6)**

8. Describe the process of calculating portfolio variance and explain its significance. **(Unit-IV, Q.No. 5)**

(OR)

9. What is the Capital Asset Pricing Model and how is it used in investment decision making? **(Unit-IV, Q.No. 6)**

10. How is the duration of a bond with uneven payments calculated and why is it important? **(Unit-V, Q.No. 4)**

(OR)

11. Discuss the importance and application of a semi-annual transition matrix in bond valuation? **(Unit-V, Q.No. 14, 15)**