

Unit-1 Introduction to Corporate Finance

- Definition of finance as a discipline and its categorization into three domains: public finance, *business finance*, and personal finance
- Evolution of the terminology used for business finance (corporate finance, financial management, managerial finance)
- Widening of the scope of Corporate finance from just *procurement of funds to investment, financing, and management of a corporation's assets*



Unit-1 Introduction to Corporate Finance

- Definition of Corporate finance as a *decision-making process for managerial decisions*: investment decision, financing decision, and asset management decision.
- Concern of business finance with *total funds employed by a firm and their allocation to different activities* and projects.

Issues addressed by business finance:

- Long-term investment decisions
- Long-term funding sources
- Everyday financial activities (collecting from customers, paying suppliers)
- Payment to shareholders.



The Role of Financial Manager

- The role of a financial manager can vary depending on the size and structure of a corporation,
- In general, they are *responsible for managing the assets, making investment and financing decisions, and supervising the finance department.*
- They are involved in key financial decisions such as *investment, financing, and dividend decisions*, as well as routine functions such as *analyzing financial statements and maintaining books of accounts.*



The Role of Financial Manager

- The title of financial manager can encompass various positions, *including CFO, treasurer, and controller*,
- The specific responsibilities of a financial manager will depend on the needs of the corporation.
- Overall, the financial manager plays a crucial role in the *decision-making process* and overall operations of a corporation.

ROLE OF FINANCE MANAGER

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Major Roles of Financial Manager

Analysis of Investment Decisions

1. Interaction with other managers to understand corporation's future plans and forecasts.
2. Estimation of funds required to finance projected market shares.
3. Evaluation of investment costs and benefits and correct investment decision.
4. Optimum management of working capital and estimation of investment level.
5. Effective management of fixed assets and working capital components.



Major Roles of Financial Manager

Analysis of Financing Decision

1. Identification of *total funds required* for acquisition of necessary assets.
2. Matching source of funds with the life of assets to be financed.
3. Analysis of *different sources of funds* and determining appropriate composition of long-term and short-term funds.
4. *Comparison of advantages of different sources of funds* for long-term financing decision.
5. Capital structure decision to maximize share price.



Major Roles of Financial Manager

Analysis of Dividend Decision

1.Three options for distribution of earnings:
distribute all, retain all, or distribute some and
retain some.

2.Analysis of options relative to cost of funds,
financial requirements, tax status of shareholders,
and effect on share price.

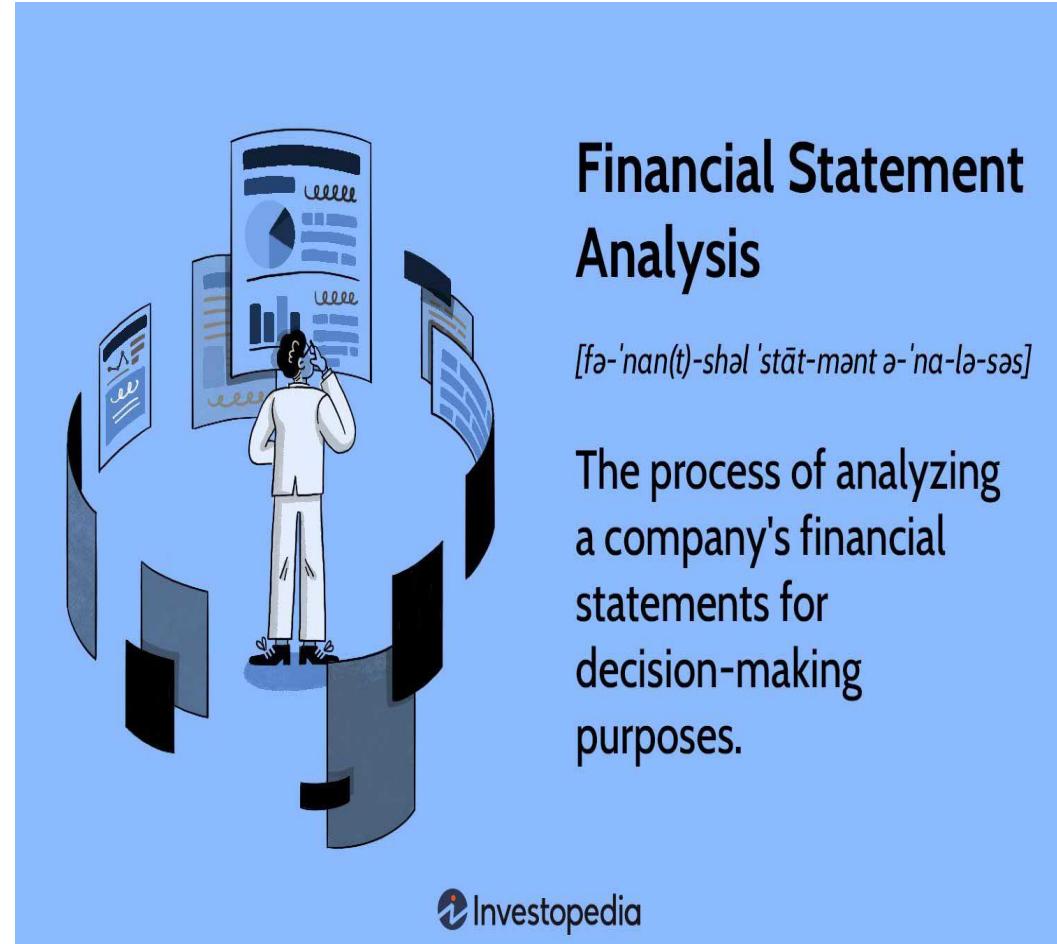
3.Selection of best option that maximizes share price.



Major Roles of Financial Manager

Analysis of Financial Condition of the Firm

1. Regular analysis of balance sheet accounts, income statement accounts, and operating cash flows.
2. Financial ratios and correction of ill financial health in a timely manner.
3. Control of operating costs and generation of additional revenue.
4. Examination of cash flows through the cash flow statement.
5. Investment of excess cash or raising deficit cash from the least expensive sources.



Major Roles of Financial Manager

Analysis of Financial Markets:

1. The financial manager must closely analyze financial markets before raising funds.
2. They should keep an eye on market response to their corporation's financial decisions and earnings.
3. They must analyze securities issued by other corporations to make informed buy/sell decisions.
4. They must be aware of market trends and changes for better management of liquidity.
5. The financial manager's role is to ensure their corporation takes advantage of favorable market conditions.



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Major Roles of Financial Manager

Analysis of the Financial Aspects of all Decisions

- Financial manager interacts with other department's line managers to understand their decisions
- Analyzes financial implications of all decisions taken by different departments
- Helps in ensuring that all decisions align with the financial goals of the firm
- Evaluates potential risks and benefits from a financial perspective
- Helps in making informed financial decisions to increase the value of the firm.



Major Roles of Financial Manager

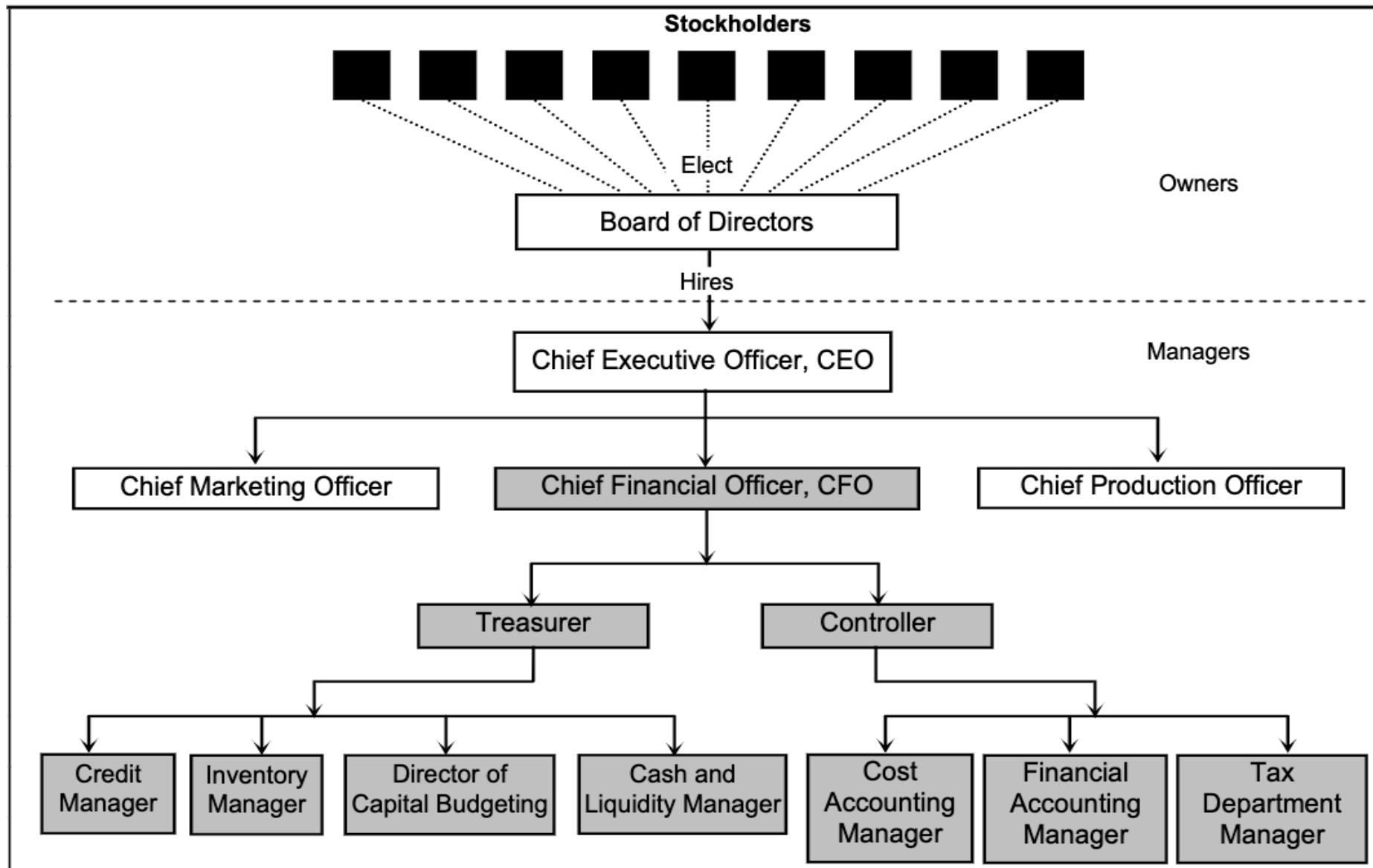
Financial Manager's responsibility:

1. Identify potential risks
2. Analyze magnitude of losses from risks
3. Take measures to minimize losses (e.g. insurance, hedging)
4. Manage risks efficiently
5. Increase firm value by minimizing losses from risks.



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Finance in the Organizational Structure of the Firm



Managerial Finance Functions

Financing Decision

- Financing decision is about *determining the sources and mix of funds needed* for a corporation
- The mix of funds can be from **short-term and long-term sources**, but the focus is on long-term sources such as equity capital and debt capital
- Debt capital is beneficial because the **interest expense is tax-deductible** and the cost is lower than other sources, but excess debt can increase financial risk and the overall cost of capital



Managerial Finance Functions

Financing Decision

- The financial manager should decide an optimal balance of debt and equity capital to reduce the cost of capital and maximize the market price of shares
- Maintaining a balance between risk and return is important to achieve these goals.



Managerial Finance Functions

Investment Decision

- ❖ Investment decision, also known as *capital budgeting decision*, is concerned with long-term investment proposals such as the *acquisition, modification, and replacement of assets* like plant, machinery, equipment, land, and buildings.
- ❖ It involves assessing the expected risk and return of the investment proposal, and evaluating it in terms of both expected return and risk.



Managerial Finance Functions

Investment Decision

- ❖ The financial manager should determine if the *investment proposal maximizes shareholder wealth by ensuring the present value of benefits exceeds the present value of cost.*
- ❖ The financial manager's decision should be based on *maximizing shareholder wealth* while considering both expected return and risk.



Managerial Finance Functions

Dividend Decision

- Concerned with deciding the portion of earnings to be allocated to common shareholders.
- Dividend could be paid in the form of cash or in the form of stock.
- The financial manager has three alternatives: pay all earnings as dividends, retain all earnings for reinvestment, or pay a certain percentage of earnings and retain the rest for reinvestment.
- The choice should be optimum, i.e. it should maximize the shareholders' wealth.
- The financial manager should consider the preference of shareholders and investment opportunities available to the firm while making the decision.

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DIVIDEND DECISION



Managerial Finance Functions

Working Capital Decision

- Involves balancing investment in current assets and financing for those assets.
- Achieving the proper trade-off between liquidity and profitability.
- Optimal investment in current assets for liquidity, but not to the point of negatively impacting profitability.
- Consideration of financing pattern for current assets, balancing short-term and long-term funds for profitability and liquidity.
- Maintaining a trade-off between the cost of short-term funds and liquidity to avoid technical insolvency.



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Managerial Finance Functions

Routine Functions

- Include tasks performed by lower level employees without managerial involvement. Tasks include:
- Supervision of cash receipts and payments
- Custody and safeguarding of valuable papers and cash balances
- Handling details of new outside financing
- Maintaining records of financial activities
- Timely reporting for financial decision making
Managerial involvement limited to setting rules and procedures, standards for personnel, and performance evaluation.



Firm Objectives in Corporate Finance:

- Business finance deals with investment, financing, dividend, and working capital decisions. Maximizing firm value through informed decision-making is crucial.
- Goals or objectives set by the firm to guide these decisions. Two widely discussed objectives:
 1. Profit maximization
 2. Wealth maximization.



Profit Maximizing Objective

- The conventional theory of the firm states that the principle objective of a business firm is to maximize profit.
- Profit maximization refers to the maximization of the firm's rupee income.
- Business firms adopt investment projects that yield larger profits and drop unprofitable activities.
- Profit is considered the most efficient and reliable measure of a firm's efficiency.
- In a competitive market, profit can be used as a performance evaluation criterion and leads to efficient allocation of resources.
- The profit maximization objective has been found to accurately predict certain aspects of a firm's behavior and trends.



Drawback of Profit Maximizing Objective

- Ignore the timing of returns
- ignore the risk associate
- profit itself is vague (short term, long term)
- conflicting interest (shareholder, employee, owner)
- unfair practice.



Wealth maximization Objectives

- Wealth maximization objectives refer to the goal of maximizing the long-term value of a business or individual's financial assets.
- This involves making strategic decisions that *aim to increase overall wealth over time, rather than simply generating short-term profits* or gains.
- For businesses, wealth maximization objectives are typically expressed in terms of maximizing **shareholder value**.
- This involves making strategic decisions around **investments, capital expenditures, and financial management**, with the aim of increasing profits and returns for shareholders over the long term.



Wealth maximization Objectives

- The key is to focus on creating *sustainable, long-term growth in wealth*, rather than pursuing short-term gains.
- Overall, wealth maximization objectives require *careful planning, analysis, and execution to ensure that the strategies being pursued are aligned with long-term financial goals*, and that they are sustainable over time.



Superiority of Wealth maximization Objectives over profit maximization

- Long-term focus: Wealth maximization has a long-term focus that takes into account the future value of a business, while profit maximization focuses on short-term gains.

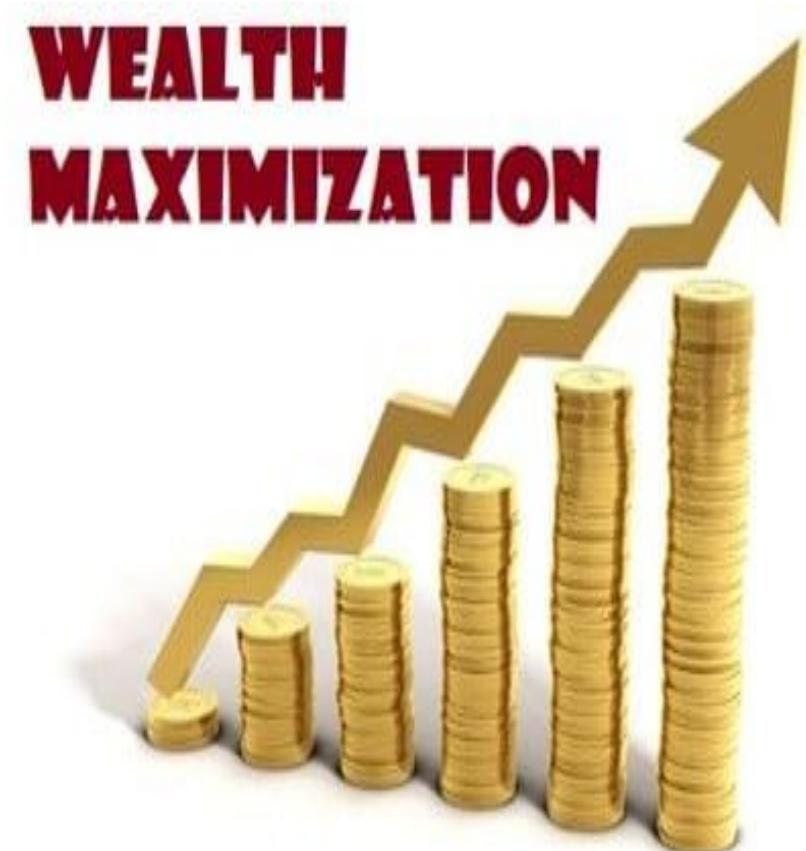
This long-term focus is more aligned with the interests of shareholders who are looking for sustained growth in their investments.

- Comprehensive view: Wealth maximization considers a range of factors, including investments, risk management, and growth potential,
- while profit maximization only focuses on maximizing profits. This comprehensive view helps businesses make better decisions that contribute to long-term growth and sustainability.



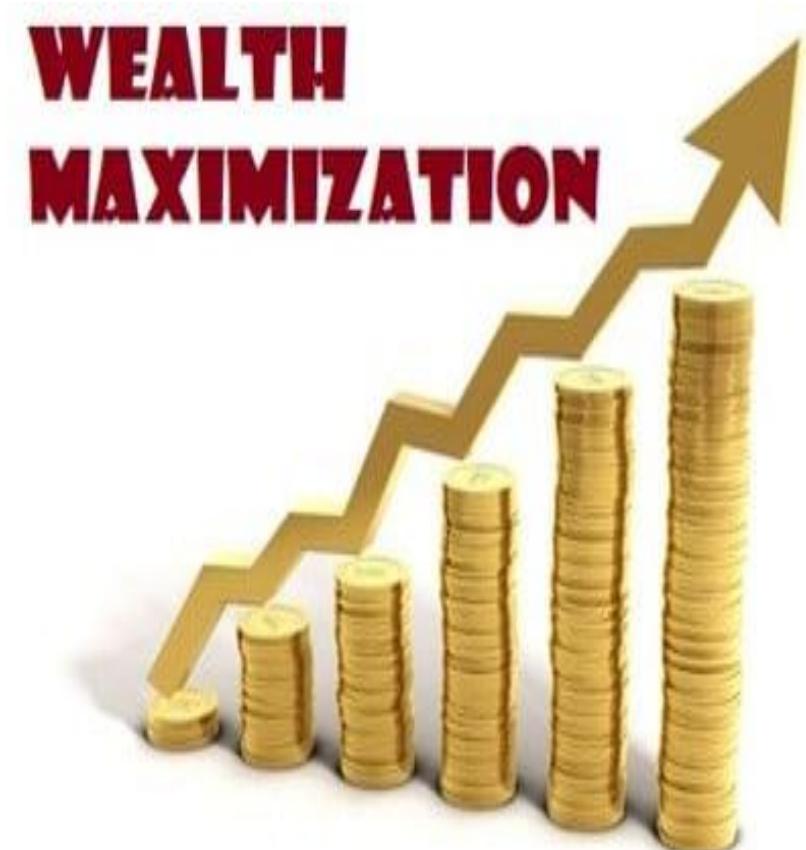
Superiority of Wealth maximization Objectives over profit maximization

- **Balanced approach:** Wealth maximization balances short-term profits with long-term growth and sustainability, while profit maximization may prioritize short-term gains over long-term value creation.
- This balance helps businesses make strategic investments in areas such as research and development, marketing, and employee training that can contribute to long-term growth.
- **Customer-focused:** Wealth maximization takes a customer-focused approach, prioritizing the needs and preferences of customers over short-term gains. This approach promotes long-term customer loyalty and brand equity, which can help businesses sustain growth over time.



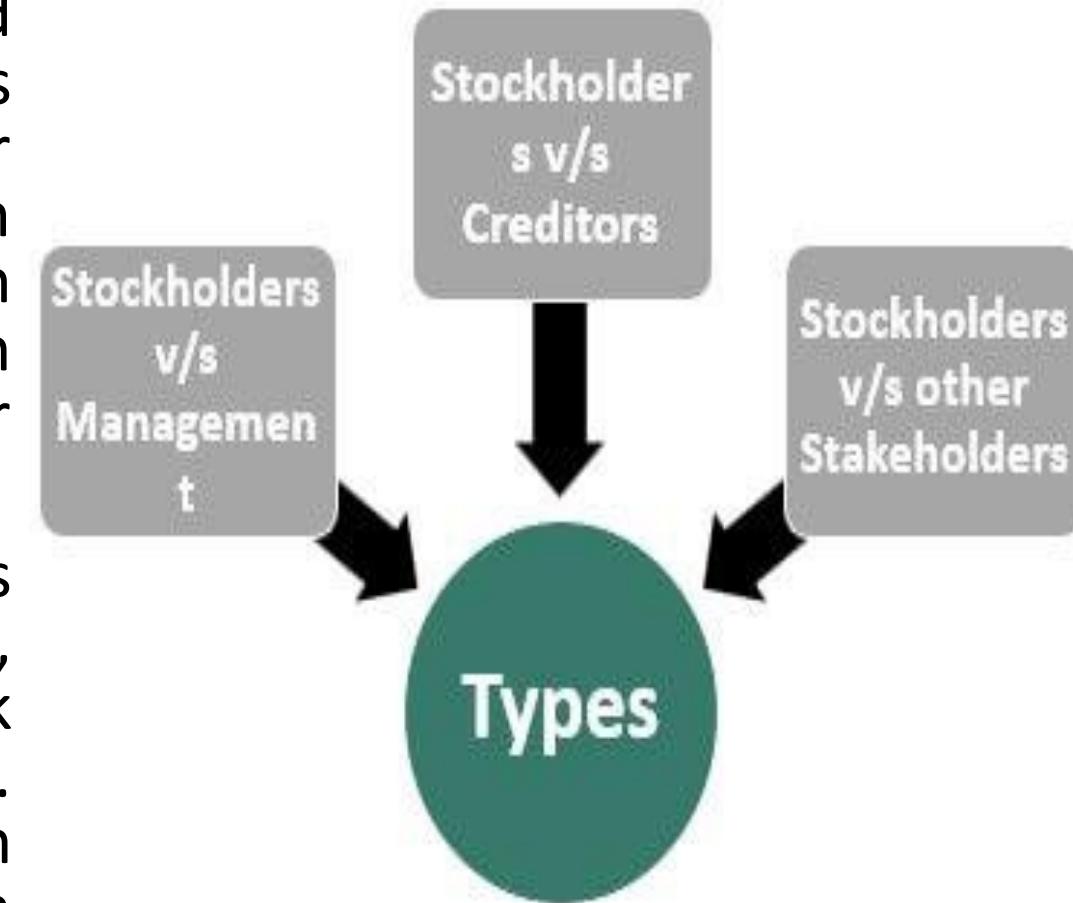
Superiority of Wealth maximization Objectives over profit maximization

- Ethical considerations: Wealth maximization considers ethical and social considerations, such as environmental impact and social responsibility, while profit maximization may not.
- This ethical approach is becoming increasingly important in today's business environment, where customers, investors, and other stakeholders are placing more emphasis on ethical and socially responsible business practices.



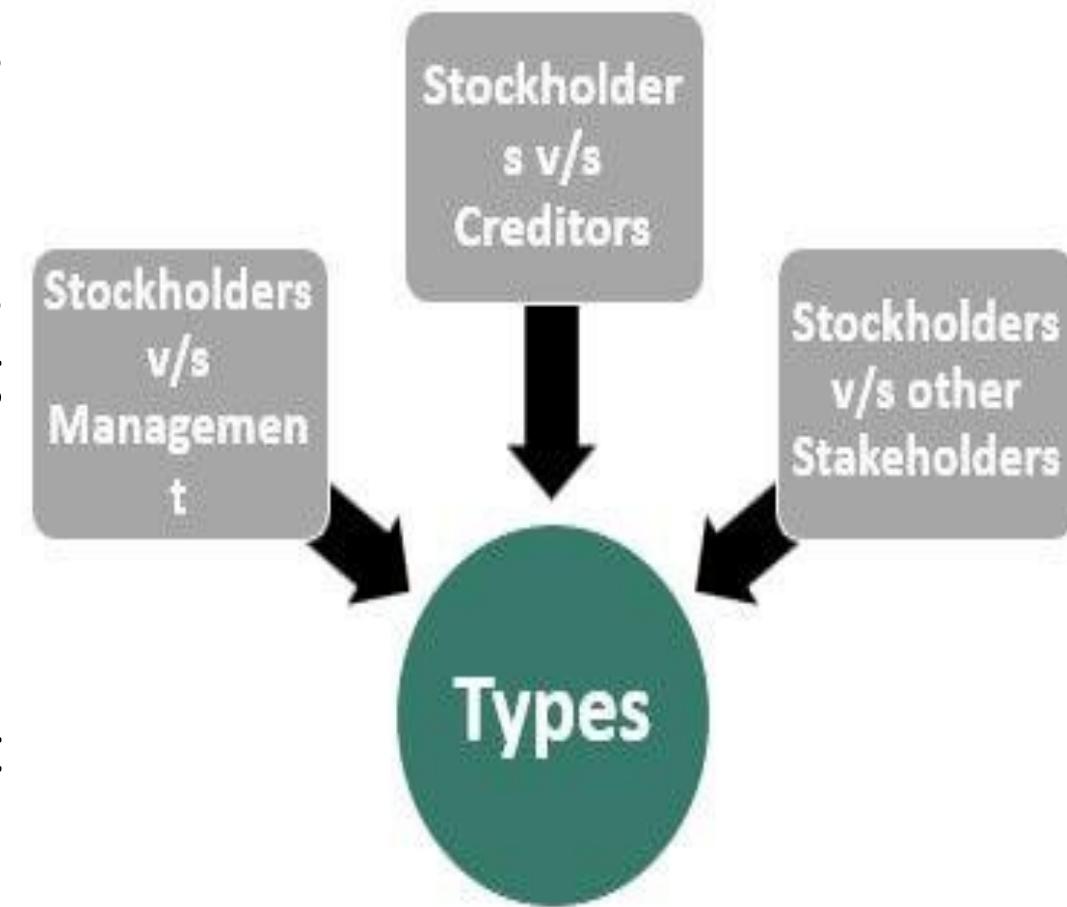
Agency Problems

- The agency problem refers to conflicts of interest that can arise between the goals and motivations of principals (such as shareholders or owners) and agents (such as managers or executives) who act on their behalf. The problem occurs when the agents prioritize their own interests over those of the principals, which can lead to inefficiencies, decreased value, or outright agency costs.
- The agency problem arises when principals delegate decision-making authority to agents, who may have different objectives, risk preferences, or incentives than the principals. For example, agents may prioritize short-term profits over long-term growth, or may engage in actions that benefit themselves at the expense of the principals.



Agency Problems

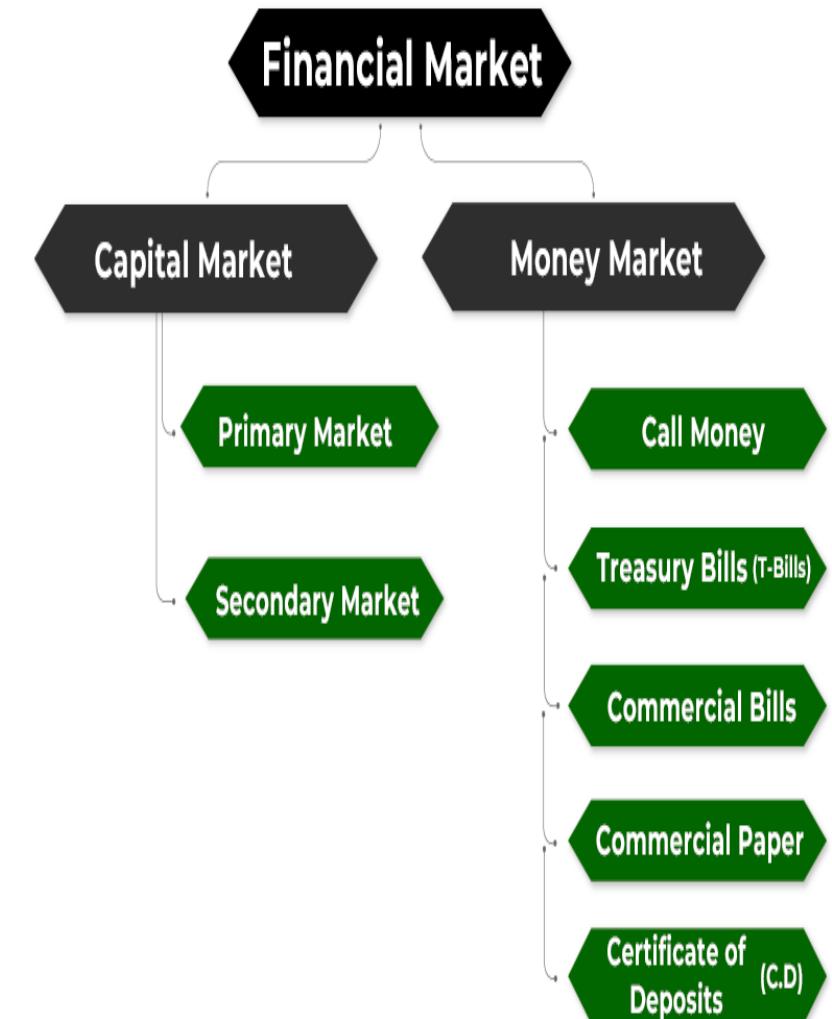
The agency problem is a common issue in corporate governance, where shareholders and boards of directors seek to align the interests of agents with those of principals through various mechanisms, such as performance-based compensation, monitoring and oversight, and transparent reporting.



Effective corporate governance can help mitigate the agency problem and ensure that agents act in the best interests of the principals.

Financial Market and Firm

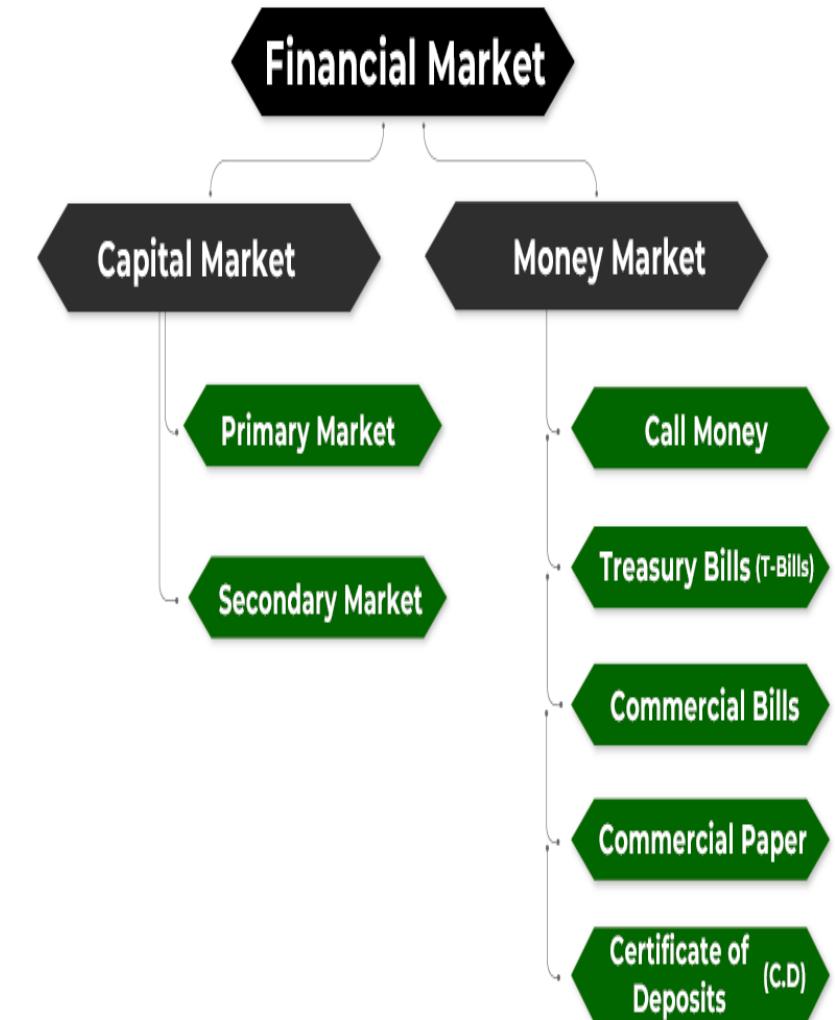
- A financial market is a marketplace where buyers and sellers trade financial securities, commodities, and other financial instruments. It is a mechanism that facilitates the exchange of financial assets and helps to allocate resources efficiently.
- Financial markets can be categorized into two types - primary and secondary markets. In the primary market, newly issued securities, such as stocks or bonds, are offered to the public for the first time, while in the secondary market, investors can buy and sell securities that are already in circulation.



Financial Market and Firm

Financial markets play a critical role in the economy, as they enable businesses and governments to raise capital, manage financial risk, and access a wide range of financial instruments.

They also help to allocate resources efficiently, by providing investors with the opportunity to invest in promising companies and projects, and allowing businesses to access the capital they need to grow and expand.



FINANCIAL STATEMENTS

Chapter 3

Balance Sheet

Income Statement

Statement of Cash Flows

Financial statements are reports that provide information about the financial performance and position of a company. They are a critical tool for investors, creditors, and other stakeholders to assess the financial health of a business. Here are some of the key characteristics and uses of financial statements:

Nature of Financial Statements:

- Objective: Financial statements are objective and based on verifiable data, such as financial transactions, assets, and liabilities.
- Historical: Financial statements are prepared based on past financial data and provide an overview of a company's financial performance and position during a specific period.
- Standardized: Financial statements follow standardized accounting principles, which ensure consistency in reporting and facilitate comparisons between companies.

Uses of Financial Statements:

- Assessing financial performance: Financial statements help stakeholders to evaluate a company's financial performance by providing information on revenue, expenses, and profits.
- Evaluating financial position: Financial statements provide information on a company's assets, liabilities, and equity, which enables stakeholders to assess the company's financial position and liquidity.
- Analyzing financial trends: Financial statements provide data over multiple periods, which helps stakeholders to identify financial trends and changes in a company's performance and position.
- Making investment decisions: Financial statements are a key tool for investors to assess a company's financial health and make investment decisions.
- Supporting regulatory compliance: Financial statements are used to comply with regulatory requirements, such as tax reporting, accounting standards, and other legal and regulatory requirements.

Balance Sheet

- A balance sheet is a financial statement that shows a company's assets, liabilities, and equity at a specific point in time. Assets are what the company owns, liabilities are what it owes, and equity is the difference between the two. It is used to assess the financial health of a company and its ability to meet its financial obligations.
- **Assets:** Assets represent the economic resources that a company owns and can use to generate future economic benefits. Assets can be classified as current or non-current. Current assets are assets that can be converted into cash within one year, such as cash and accounts receivable. Non-current assets are assets that are expected to provide economic benefits for more than one year, such as property, plant, and equipment.

Balance Sheet

- **Liabilities:** Liabilities represent the company's financial obligations or debts that must be paid to creditors or other parties. Liabilities can also be classified as current or non-current. Current liabilities are obligations that must be paid within one year, such as accounts payable and short-term debt. Non-current liabilities are obligations that are due in more than one year, such as long-term debt.
- **Equity:** Equity represents the residual interest in the assets of a company after deducting its liabilities. It represents the owner's claim on the company's assets and can be calculated as the difference between assets and liabilities.
- Shareholders' equity = Assets – Liabilities
- Total assets = Total liabilities + Preferred stock + Stockholders' equity

Income Statement

An income statement is a financial statement that shows a company's revenue and expenses over a period of time. It starts with revenues and deducts the cost of goods sold and operating expenses to arrive at the net profit or loss. It helps to assess a company's financial performance and profitability over a specific period.

The income statement is an essential tool for assessing a company's financial performance over a specific period. It helps stakeholders to evaluate a company's revenue generation, expenses, and profitability. It also enables comparisons between different companies or different periods for the same company.

Net sales	Rs 6,000.0
Operating costs excluding depreciation and amortization	5,232.4
Earnings before interest, taxes, depreciation, and amortization (EBITDA)	Rs 767.6
Depreciation	Rs 200.0
Amortization	0
Depreciation and amortization	Rs 200.0
Earnings before interest and taxes (EBIT)	Rs 567.6
Less: Interest	176.0
Earnings before taxes (EBT)	Rs 391.6
Less: taxes @40%	156.6
Net income before preference dividends	Rs 235.0
Preferred dividends	8.0
Net income	Rs 227.0
Common dividend	Rs 115.0
Addition to retained earnings	Rs 112.0
Per share data:	
Common stock price	Rs 460
Earnings per share (EPS)	Rs 22.7
Dividends per share (DPS)	Rs 11.5
Book value per share (BVPS)	Rs 179.2
Cash flow per share (CFPS)	Rs 42.7

Corporate Income Tax

- Corporate income tax refers to the tax to be paid by a corporation on its taxable income. The taxable income of a corporation is calculated by deducting all deductible expenses, including depreciation and interest, from revenues.
- In Nepal, corporations are required to pay a flat 25 percent tax on their annual taxable income. In addition to allowable deductions, following considerations are necessary to determine taxable income of a corporation.

1. After-tax dividend income = Before-tax dividend – Taxes

2. Before-tax income required to pay a dividend = $\frac{\text{Dividend}}{1 - \text{Tax Rate}}$

3. After-tax income = [EBIT – Dep. – I] [1 – t]

Cash Flow from Assets

- Cash flow from assets refers to the cash generated by using firm's assets.
- It has three components— **operating cash flows**, **capital spending** and **change in net working capital**.
- Operating cash flow (OCF) is the cash flow generated from day to day production and sales operation of the firm.
- It is calculated as earnings before interest and taxes plus depreciation minus taxes.

I. $OCF = EBIT + Depreciation - Taxes$

Cash Flow from Assets

➤ Another component of cash flow from asset is the net capital spending It refers to the net cash flow resulted from purchase and sale of fixed assets.

II. Net capital spending = (Ending net fixed assets – Beginning net fixed assets) + Depreciation

➤ Net working capital (NWC) refers to the difference between current assets and current liabilities. The change in net working capital is the difference between ending net working capital and beginning net working capital.

III. Change in NWC = Ending NWC – Beginning NWC

Cash Flow to Creditors

- Cash flow to creditors refers to the **net cash paid to creditors** during the year. Firm has to pay interest on outstanding amount of debt. So, interest is the basic **cash flow to creditors**.
- The firm might have used cash to repay some portion of debt or might have obtained additional amount of debt during the year.

$$\diamond \text{ Cash flow to creditors} = \text{Interest paid} + \text{Debt repaid} - \text{Net new borrowing}$$

Cash Flow to Shareholder

- Cash flow to shareholder refers to the net cash paid to shareholder during the year. Firm has to pay dividend on outstanding shares of common and preferred stock.
 - Dividend is the basic cash flow to creditors. Besides, the firm might have used cash to repay some portion of preferred stock or to repurchase equity or it might have issued additional equity during the year.
-
- $\text{Cash flow to shareholder} = \text{Dividend paid} - \text{Net new equity}$

Financial Ratios

- Financial ratios are quantitative metrics that are used to *analyze and evaluate a company's financial performance*.
- These ratios are calculated by dividing one financial number by another and are used to assess the *company's financial health, efficiency, profitability, liquidity, and solvency*.
- The quantitative *relationship between two or more sets of financial data* derived from income statement and balance sheet.

Types of Ratios

- A. Liquidity ratios
- B. Assets management ratios
- C. Debt management ratios
- D. Profitability ratios
- E. Market value ratios

A. Liquidity ratios

- Liquidity ratios are a type of financial ratio used to *measure a company's ability to pay its short-term obligations*.
- The primary focus of liquidity ratios is to determine the *company's ability to meet its current obligations as they come due*. Some commonly used liquidity ratios include:
 1. **Current ratio:** measures the company's ability to pay its current liabilities with its current assets
 - Current Assets = They include cash, inventories, accounts receivable, bank balance, prepaid expenses, marketable securities and so on.
 - Current Liabilities = They include accounts payable, bank overdraft, notes payables, accruals and so on.

$$\text{Current Ratio(CR)} = \frac{\text{Current Assets (CA)}}{\text{Current Liabilities (CL)}}$$

- As a conventional rule, the ratio of **2:1** is employed as a standard.

2. **Quick ratio:** measures the company's ability to pay its current liabilities with its most liquid assets (cash, marketable securities, and accounts receivable)

$$\text{Quick Ratio(QR)} = \frac{\text{Quick Assets}}{\text{Current Liabilities}}$$

❖ As a conventional rule, the quick ratio of 1:1 is considered as a standard

3. **Cash ratio:** measures the company's ability to pay its current liabilities with just its cash and cash equivalents.

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

higher the ratio better the solvency position of company vice versa.

B. Assets Management Ratios

- These ratios measure how efficiently the company is utilizing its assets to generate revenue.
- These ratios look at the amount of various types of assets and then attempt to determine if they are too high or too low with reference to current level of operation.

1. Inventory turnover ratio

- Inventory turnover is a ratio that measures the *number of times inventory is sold* or consumed in a given time period. In general, the **higher the inventory turnover ratio** of a company in a given year, the **better** it is for the company's future.

$$\text{Inventory Turnover Ratio(ITOR)} = \frac{\text{Cost of Goods sold(COGS)}}{\text{Average inventory}}$$

In the absence of cost of goods sold and average inventory data the following relationship can be used to calculate the inventory turnover ratio.

$$\text{ITOR} = \frac{\text{Sales}}{\text{inventory}}$$

2. The Receivables Turnover Ratio

- The ratio that indicates the *number of times the firm collects its accounts receivable during the year*. The higher the turnover, the faster the business is collecting its receivables.

$$\text{The receivables turnover ratio} = \frac{\text{Annual Credit Sales}}{\text{Average Account Recievable}}$$

- A low receivable turnover ratio indicates that the firm is making excessive investment in receivables or it is unable to make timely collection of credit sales.

3. Days Sales Outstanding (DSO)

- Average length of time that a firm takes to realize in cash after credit sales has been made. It measures how quickly the accounts receivable are being converted into cash.

$$DSO = \frac{\text{Receivable}}{\text{Average daily sales}} \quad \text{or} \quad DSO = \frac{\text{Receivable} \times 360}{\text{Annual sales}} \quad \text{or} \quad DSO = \frac{360}{\text{RTOR}}$$

- A higher average collection period indicates that customers are not paying their bills on time. However, the DSO must be evaluated in the light of firm's credit terms.

4. Fixed asset turnover ratio

The **fixed asset turnover ratio** is an efficiency **ratio** that measures how well a company *uses its fixed assets to generate sales*. It is calculated by dividing net sales by the net of its property, plant, and equipment.

A higher **ratio** implies that management is using its **fixed assets** more effectively.

$$\text{Fixed asset turnover} = \frac{\text{Sales}}{\text{Net Fixed assets}}$$

5. Asset turnover ratio

- The asset turnover ratio measures the **efficiency of a company's assets in generating revenue or sales**. The higher the ratio, the better is the company's performance.

$$\text{Total assets turnover} = \frac{\text{Net Sales}}{\text{Total Assets}}$$

6. Working capital turnover ratio

- The working capital turnover ratio measures how well a company is utilizing its working capital to support a given level of sales. ...
- A high turnover ratio indicates that management is being extremely efficient in using a firm's short-term assets and liabilities to support sales.

$$\text{Working capital turnover} = \frac{\text{Sales}}{\text{Net working capital}}$$

C. Debt Management Ratios

- The debt management ratios, also known as leverage ratios, indicate the extent to which debt financing is being used by a firm. **It is the measure of long-term solvency of a firm.**

1. Debt assets ratio

- Total-debt-to-total-assets is a leverage ratio that defines the **total amount of debt relative to assets owned by a company**. The higher the ratio, the greater the degree of leverage and financial risk.

$$\text{Debt Ratio} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

2. Debt-to-equity ratio

- The debt-to-equity ratio shows the proportion of equity and debt a company is using to finance its assets and signals the extent to which shareholder's equity can fulfill obligations to creditors, in the event of a business decline.
- The more a company's operations are funded by borrowed money, the greater the risk of bankruptcy, if the business hits hard times.
- Debt can also be helpful, in facilitating a company's healthy expansion.

$$\text{Debt/Equity Ratio} = \frac{\text{Total Debt}}{\text{Total Equity}}$$

$$\text{Debt/Equity Ratio} = \frac{\text{DA}}{1 - \text{DA}}$$

$$\text{Debt/Equity Ratio} = \frac{\text{DE}}{(1 + \text{DE})}$$

3. Equity multiplier

- The equity multiplier is a risk indicator that measures the portion of a company's assets that is financed by stockholder's equity rather than by debt.
- It is calculated by dividing a company's total asset value by its total shareholders' equity. ... A low equity multiplier means that the company has less reliance on debt

$$\text{Equity Multiplier} = \frac{\text{Total Assets}}{\text{Total equity}} \quad \text{or} \quad EM = \frac{1}{1-DA} \quad \text{or} \quad EM = 1 + DE$$

4. Long-Term Debt to Total Assets Ratio

- Long-term debt to total assets ratio represents the relationship between long-term debts to total assets of a firm. It is another way to express the use of long-term debt capital in comparison to total assets of the firm.

$$\text{Long term debt ratio} = \frac{\text{Long term debt}}{\text{Total Assets}}$$

5. Interest coverage ratio

- It measures the extent to which interest on debt capital is covered by EBIT High ratio is preferable.

$$\text{TIE ratio} = \frac{\text{EBIT}}{\text{Interest}}$$

6. Cash coverage ratio

- The cash coverage ratio is an accounting ratio that is used to measure the ability of a company to cover their interest expense and whether there are sufficient funds available to pay interest and turn a profit

$$\text{Cash coverage ratio} = \frac{\text{EBIT} + \text{Depreciation}}{\text{Interest}}$$

D. Profitability Ratios

- Profitability ratios assess a company's ability to earn profits from its sales or operations, balance sheet assets, or shareholders' equity.
- Profitability ratios indicate how efficiently a company generates profit and value for shareholders.
- Higher ratio results are often more favorable, but these ratios provide much more information when compared to results of similar companies, the company's own historical performance, or the industry average.

Net profit margin

- ❖ Net profit margin measures how much net income is generated as a percentage of revenues received.
- ❖ Net profit margin helps investors assess if a company's management is generating enough profit from its sales and whether operating costs and overhead costs are being contained.

$$\text{Net profit Margin} = \frac{\text{Net profit}}{\text{Sales}}$$

Gross profit margin

Gross profit margin is an analytical metric expressed as a company's net sales minus the cost of goods sold (COGS).

Gross profit margin is often shown as the gross profit as a percentage of net sales.

$$\text{Gross profit Margin} = \frac{\text{Gross profit}}{\text{Sales}}$$

Operating profit ratio

Operating net profit ratio is calculated by dividing the **operating net profit** by sales. This **ratio** helps in determining the ability of the management in running the business.

$$\text{OPR} = \frac{\text{Operating profit (EBIT)}}{\text{Sales}}$$

Basic earning power ratio

Basic earning power (BEP) ratio is a measure that calculates the **earning power** of a business before the effect of the business' income taxes and its financial leverage. It is calculated by dividing **earnings before interest and taxes** (EBIT) by total assets.

$$\text{Basic earning power Ratio} = \frac{\text{Operating profit (EBIT)}}{\text{Total assets}}$$

Return on Assets (ROA)

The return on assets ratio, often called the return on total assets, is a profitability ratio that measures the net income produced by total assets during a period by comparing net income to the average total assets.

$$\text{Return on Assets (ROA)} = \frac{\text{Net Profit}}{\text{Total assets}}$$

Return on Equity

The return on equity ratio or ROE is a profitability ratio that measures the ability of a firm to generate profits from its shareholders investments in the company.

In other words, the return on equity ratio shows how much profit each dollar of common stockholders' equity generates.

$$\text{Return on Equity (ROE)} = \frac{\text{Net Profit}}{\text{Total Equity}}$$

E. Market Value Ratios

- Market value ratios are used to evaluate the current share price of a publicly-held company's stock. ... Calculated as the total dividends paid per year, divided by the market price of the stock. This is the return on investment to investors if they were to buy the shares at the current market price.

Price earnings ratio

P/E Ratio ... The P/E ratio is calculated by dividing the market value price per share by the company's earnings per share. Earnings per share (EPS) ...

$$\text{Price earnings ratio(P/E)} = \frac{\text{Market price per share}}{\text{Earning price per share}}$$

Market to Book ratio

- The Market to Book ratio (also called the Price to Book ratio), is a financial valuation metric used to evaluate a company's current market value relative to its book value.

$$\text{Market to Book ratio} = \frac{\text{Market price per share}}{\text{Book value per share}}$$

Du-Pont Equation

The DuPont analysis is a framework for analyzing fundamental performance originally popularized by the DuPont Corporation.

Return on Assets (ROA)

Return on Assets(ROA) = Profit margin × Total assets turnover ratio

$$\text{Return on Assets(ROA)} = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}}$$

Return on Equity (ROE)

Return on Equity(ROE) = ROA × Equity Multiplier

$$\text{Return on Equity(ROE)} = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

Problems

Q. 2.1

PP Corporation has current assets of Rs 3,000 million, net fixed assets of Rs 6,000 million, Current liabilities of Rs 900 million and long-term debt of Rs 5,000 million.

What is the value of shareholders' equity account for this firm? How much is the net working capital?

Given information

Current assets = Rs 3,000

Net Fixed assets = Rs 6,000

Current Liabilities = Rs 900

Long term debt = Rs 5,000

a.What is the value of Shareholder equity?

b.How much is the net working capital?

Solution

$$\begin{aligned} \text{a. Total Assets} &= (\text{Current assets} + \text{Fixed assets}) \\ &= \text{Rs } 3,000 + \text{Rs } 6,000 = \text{Rs } 9,000 \end{aligned}$$

$$\begin{aligned} \text{Total Liabilities} &= (\text{Current liabilities} + \text{long term dept}) \\ &= \text{Rs } 900 + \text{Rs } 5,000 = \text{Rs } 5,900 \end{aligned}$$

$$\begin{aligned} \text{Shareholder's equity} &= \text{Total assets} - \text{Total Liabilities} \\ &= \text{Rs } 9,000 - \text{Rs } 5,900 = \text{Rs } 3,100 \end{aligned}$$

Balance Sheet

Assets	Amount	Liabilities	Amount
Current Assets	Rs 3,000	Current Liabilities	Rs 900
Fixed Assets	Rs 6,000	Long term Debt Equity/ balancing figure	Rs 5,000 Rs 3,100
Total Assets	Rs 9,000	Total Liabilities	Rs 9,000

b. Net working capital = **Current Assets – Current liabilities**
Rs 3,000- Rs 900 = Rs 2,100

Q. 2.2

Butwal Hydro Power Company had sales of Rs 500,000, cost of goods sold of 60 percent of sales, administrative and selling expenses of Rs 50,000, depreciation of Rs 100,000, and interest expense of Rs 10,000. If the corporate tax rate is 40 percent:

- a) What is the net income for the firm?
- b) What is the operating cash flow of the firm?
- c) What is its net cash flow?
- d) Interpret the answers in part (a) to (c).

a.	Income Statement	
	Sales	Rs 500,000
	Less: Cost of goods sold (COGS)	Rs 300,000
	Less: Depreciation	Rs 100,000
	Less: Administrative cost and selling cost	Rs 50,000
	EBIT	Rs 50,000
	Less interest expenses	Rs 10,000
	EBT	Rs 40,000
	Less: taxes @ 40%	Rs 16,000
	Net Income	Rs 24,000

b. Calculation of operating cash flow (OCF)

$OCF = EBIT + \text{Depreciation} - \text{Taxes}$

Rs 50,000 + Rs 100,000 - Rs 16,000

$OCF = \text{Rs } 134,000$

c. Calculation of net cash flow

$NCF = \text{Net Income} + \text{Depreciation}$

Rs 24,000 + Rs 100,000

$\text{Rs } 124,000$

- d.** Income statement reports *Rs 24,000 net income of the firm* for the year. Net income is calculated by charging all non-cash and financing cost. The operating cash flow is the cash flow available from normal business operation of the firm. We do not charge the depreciation because it is non-cash item.

Similarly, we also do not treat interest while calculation OCF it is financing expense. However, in calculating NCF, interest is also treated as cash outflow. Therefore, the difference in the amount OCF and NCF represents the interest expense paid.

Q.4 A company's December 31, 2012, balance sheet showed net fixed assets of Rs 3.1 million, and the December, 31, 2013 balance sheet showed net fixed asset of Rs 3.5 million. The company's 2013 income statement showed a depreciation expense of Rs 850,000. What was its net capital spending for 2013?

SOLUTION

Calculation of Net Capital Spending for the year 2013

Ending net fixed assets	Rs 3,500,000
Less - Beginning net fixed asset	Rs 3,100,000
Add: Depreciation	Rs 850,000
Net Capital spending	Rs 1,250,000

Q.5

Fewa Industries had the following operating results for 2012: sales Rs 1,220,000; cost of goods sold Rs 900,000; depreciation expense Rs 160,000; interest expense Rs 20,000; dividend paid Rs 30,000.

At the beginning of the year, net fixed assets were Rs 800,000, current assets were Rs 200,000, and current liabilities were Rs 150,000.

At the end of the year, net fixed assets were Rs 840,000, current assets were Rs 310,000, and current liabilities were Rs 180,000. The tax rate for 2012 was 34 percent.

- a. What is net income for 2012?
- b. What is the operating cash flow for 2012?
- c. What is cash flow from assets for 2012? Is this possible? Explain.
- d. If no new debt was issued during the year, what is the cash flow to creditors? What is cash flows to stockholders? Interpret your results in (a) through (d).

Preparation of income statement for 2012

Sales	1,220,000
Less - Cost of goods sold	900,000
Less - Depreciation	160,000
EBIT	160,000
Less: Interest paid	20,000
EBT	140,000
Less: Taxes @ 34%	47,600
Net income	92,400
Dividend paid	30,000
Additions to retained earnings	62,400

Change in Net Working Capital

b. Operating Cashflow for 2012:

$$\text{OCF} = \text{EBIT} + \text{Depreciation} - \text{Taxes}$$

$$\text{Rs } 160,000 + \text{Rs } 160,000 - \text{Rs } 47,600$$

$$= \text{Rs } 272,400$$

Ending net working capital (Rs 310,000 – Rs 180,000)	Rs130,000
- Beginning net working capital (Rs 200,000 – Rs 150,000)	Rs 50,000
Change in net working capital	Rs 50,000
	Rs 80,000

c. Calculation of cash flow from assets for 2012:

Net Capital Spending

Ending net fixed assets	Rs 840,000
Less - Beginning net fixed asset	Rs 800,000
Add: Depreciation	Rs 160,000
Net Capital spending	Rs 200,000

Now We work out Cash flow from assets as follows:

Operating Cash flow	Rs 272,400
- Net Capital Spending	Rs 200,000
- Change in net working Capital	Rs 80,000
Cash flow from assets	(Rs 7,600)

It is possible for a growing company to have negative cash flow from assets. It implies that firm has raised more money by borrowing and by issuing new shares than it paid to creditors and stockholders.

D. If no new debt was issued during the year, the cash flow to creditors is equal to amount of Interest paid Rs 20,000.

The cash flow to stockholders is worked out as follows:

Cash flow to stockholders = Cash flow from assets – Cash flow from creditors

$$= - \text{Rs } 7,600 - \text{Rs } 20,000$$

$$= - \text{Rs } 27,600$$

The negative cash flow to stockholders implies that the company raised in equity Rs 27,600 in excess of the amount of dividend paid to stockholders. In other words, company raised $\text{Rs } 27,600 + \text{Rs } 30,000 = \text{Rs } 57,600$ in new equity during the year.

Q.8 ABC Inc. has net working capital of Rs 105 million, current liabilities of Rs 430 million and inventory of Rs 130 million. What is the current ratio? What is the quick ratio?

We know,

$$\text{Net working Capital (WC)} = \text{CA} - \text{CL}$$

$$\text{or, } \text{Rs } 105 = \text{CA} - \text{Rs } 430$$

$$\text{or, } \text{CA} = \text{Rs } 535 \text{ million}$$

Now,

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

$$\text{Current ratio} = \frac{\text{Rs } 535}{\text{Rs } 430} = 1.24 \text{ Times}$$

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current Liabilities}}$$

$$\text{Quick ratio} = \frac{\text{Rs } 535 - \text{Rs } 130}{\text{Rs } 430} = 0.94 \text{ Times}$$

Q.10 Bheri Ltd. has current assets of Rs 1 million and current liabilities of Rs 600,000.

- a. What is the company's current ratio?
- b. What would be its current ratio if each of the following occurred, holding all other things constant?
 - i. A machine costing Rs 100,000 is paid for with cash.
 - ii. Inventories of Rs 120,000 are purchased and financed with trade credit.
 - iii. Accounts payable of Rs 50,000 are paid off with cash
 - iv. Accounts receivable of Rs 75,000 are collected
 - v. Long-term debt of Rs 200,000 is raised for investment in inventories Rs 100,000 and to pay down short-term borrowings Rs 100,000.

Given, Information

Current assets (CA) = Rs 1 million

Current liabilities (CL) = Rs 600,000

a. Current ratio = ?

We have,

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

$$\begin{aligned}\text{Current ratio} &= \frac{\text{Rs } 1,000,000}{\text{Rs } 600,000} \\ &= 1.67 \text{ Times}\end{aligned}$$

Therefore, the company's current ratio is 1.67 times.

b. i. Current assets decline by Rs 100,000 and there is no change in current liabilities.

$$\text{Current ratio} = \frac{\text{Rs } 1,000,000 - \text{Rs } 100,000}{\text{Rs } 600,000} = 1.5 \text{ times}$$

Working note:

Machine ↑ Fixed assets ↑ — no effect

Cash ↓ CA ↓ — Rs 100,000

ii. Current assets and current liabilities each increases by Rs 120,000.

$$\text{Current ratio} = \frac{\text{Rs } 1,000,000 + \text{Rs } 120,000}{\text{Rs } 600,000 + \text{Rs } 120,000} = 1.56 \text{ times}$$

Working note:

Inventories ↑ CA ↑ — Rs 120,000

Accounts payable ↑ CL ↑ — Rs 120,000

iii. Current assets and current liabilities each decline by Rs 50,000.

$$\begin{aligned} \text{Current ratio} &= \frac{Rs 1,000,000 - Rs 50,000}{Rs 600,000 - Rs 50,000} \\ &= 1.73 \text{ times} \end{aligned}$$

iv. Accounts receivable of Rs 75,000 are collected

Neither current assets nor current liabilities are affected

$$\text{Current ratio} = \frac{Rs 1,000,000}{Rs 600,000} = 1.67 \text{ times}$$

Working note:

Cash \uparrow CA \uparrow — Rs 75,000

Accounts Receivable \downarrow CA \downarrow — Rs 75,000

Long-term debt of Rs 200,000 is raised for investment in inventories Rs 100,000 and to paydown short-term borrowings Rs 100,000.

$$\begin{aligned} \text{Current ratio} &= \frac{Rs 1,000,000 + 200,000 + 100,000 - 100,000 - 100,000}{Rs 600,000 - Rs 100,000} \end{aligned}$$

working Note

LTD \uparrow CA \uparrow CASH \uparrow — Rs 200,000

INVENTORIES \uparrow CA \uparrow — Rs 100,000

CASH \downarrow CA \downarrow — Rs 100,000

Short Term Borrowing \downarrow CL \downarrow — Rs 100,000

CASH \downarrow CA \downarrow — Rs 100,000

2-11.

The National Lube Oil Corporation has Rs 875,000 in current assets and Rs 350,000 in current liabilities. Its initial inventory level is Rs 250,000, and it will raise funds as additional notes payable and use them to increase inventory.

How much can the firm's short-term debt (notes payable) increase without violating a current ratio 2 to 1?

What will be the firm's quick ratio after it has raised the maximum amount of short-term funds?

2.11

Given information

Current assets CA = Rs 875,000

Current liability CL = RS 375,000

Initial inventory level = Rs 250,000

Current ration CR = 2:1

We Know,

Let us suppose that Rs X be the amount to be raised in additional notes payable to increase inventory of equal amount.

New CA = Rs 875,000 + x

New CL = Rs 350,000 + x

New inventory = Rs 250,000 + x

If the firm wants to maintain a current ratio of 2 to 1, then the value of X is given by:

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

$$2 = \frac{\text{Rs } 875,000 + X}{\text{RS } 375,000 + X}$$

$$X = \text{Rs } 175,000$$

- Hence, the firm can increase its notes payable by Rs 175,000 to maintain a current ratio of 2.
- Calculation of quick ratio after the firm has raised the maximum amount of short-term funds.

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{inventory}}{\text{Current Liabilities}}$$

$$\text{Quick ratio} = \frac{\text{Rs } 850,000 - \text{Rs } 250,000}{\text{RS } 375,000 + \text{Rs } 175,000} = 1.19$$

Hence, the firm's quick ratio will be 1.19 times after it has raised the maximum amount of short-term funds.

Problem 2-12. The following data have been supplied to you about Koshi Gas (Pvt.) Ltd.

Assets
management
ratios

Koshi Gas (Pvt.) Ltd.	
Assets and Liabilities of December 31, 2011 (in '000)	
	2011
Assets	
Cash	Rs 700
Accounts receivable	2,000
Inventory	4,000
Fixed assets	18,000
Total assets	Rs 24,700
Liabilities and Equity	
Accounts payable	Rs 2,200
Notes payable	700
Other current liabilities	200
Long-term debt	3,000
Owners' equity	18,600
Total liabilities and equity	Rs 24,700
Sales and cost of goods sold during the year:	
Sales	Rs. 28,000
Cost of goods sold	11,600

- Calculate assets management ratios - total assets turnover ratio, inventory turnover ratio and receivables turnover ratio and interpret them.
- Assume that the industry averages for total assets turnover, inventory turnover, and receivables turnover were 2 times, 4 times and 20 times respectively. Comment on the assets management efficiency of Koshi Gas (Pvt.) Ltd.

2.12

a. i. Total assets turnover

$$\text{TATOR} = \frac{\text{Sales}}{\text{Total Assets}}$$

$$\text{TATOR} = \frac{28,000}{24,750} = 1.13 \text{ times}$$

- The firm's total assets turnover ratios indicate that the firm turned over its total assets 1.13 times in 2011.

ii. Inventory turnover:

$$\text{ITOR} = \frac{\text{Cost Of Goods Sold}}{\text{Inventory}}$$

$$\text{ITOR} = \frac{\text{Rs } 11,600}{\text{Rs } 4,000} = 2.9 \text{ times}$$

- The firm's inventory turnover ratio indicates that the firm turned over its inventory 2.9 times in 2011.

iii. Receivables turnover:

We have,

$$\text{Current ratio} = \frac{\text{Annual Credit Sales}}{\text{Account Receivable}}$$

$$\text{Current ratio} = \frac{\text{Rs } 28,000}{2,000} = 14 \text{ Times}$$

Receivable turnover ratio was 14 times in 2011 implying that annual credit sale was 14 times of the account receivables in 2011.

b. The total assets turnover ratio of Koshi Gas is 1.13 times against the industry average of 2 times. Similarly, inventory turnover ratio and receivable turnover ratios are also lower than the industry averages.

These ratios indicate that Koshi Gas Pvt. Ltd has not been able to use its assets as effectively as the industry.

2.15

- The South-Western Company had a quick ratio of 1.4, a current ratio of 3.0, and inventory turnover of 6 times, total current assets of Rs 810,000, and cash and marketable securities of Rs 120,000 in 2010. What were company's annual sales and DSO for that year? Assume there are 365 days in a year.

Given,

Quick ratio = 1.4 times

Current ratio = 3 times

Inventory turnover = 6 times

Total current assets (CA) = Rs 810,000

Cash and marketable securities = Rs 120,000

Annual sales = ?

Days sales outstanding (DSO) = ?

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

$$3 = \frac{\text{Rs } 810,000}{\text{Current Liabilities}}$$

Current liabilities (CL) = Rs 270,000

Again,

$$\text{Quick Ratio} = \frac{\text{Quick Asset}}{\text{Current Liabilities}}$$

$$1.4 = \frac{\text{Quick Asset}}{\text{Rs } 270,000}$$

Quick assets = Rs 378,000

Again,

Quick assets = Current assets – Inventory

or, Rs 378,000 = Rs 810,000 – Inventory

Inventory = Rs 432,000

Again,

Quick assets = Cash and marketable securities
+ Accounts receivable

or, 378,000 = 120,000 + Accounts receivable

Accounts receivable = Rs 258,000

Now,

Calculation of annual sales and DSO:

We have,

$$\text{Inventory Turnover} = \frac{\text{Annual Sales}}{\text{Inventory}}$$

$$6 = \frac{\text{Annual Sales}}{\text{Rs } 432,000}$$

Annual sales = Rs 2,592,000

Again,

$$DSO = \frac{\text{Receivable} \times 360 \text{ Days}}{\text{Annual sales}}$$

$$DSO = \frac{\text{Rs } 258,000 \times 360 \text{ Days}}{2,592,000} = 36.33 \text{ days}$$

Hence, the firm has annual sales of Rs 2,592,000 and 36.33 days of sales in accounts receivables

2.16

Bishal Trading Company had earnings per share of Rs 4 last year, and it paid a Rs 2 dividend. Total retained earnings increased by Rs 12 million during the year, while book value per share at year-end was Rs 40. Company has no preferred stock, and no new common stock was issued during the year. If company's year-end debt (which equals its total liabilities) was Rs 120 million, what was its year-end debt/assets ratio?

Given

Earnings per share (EPS) = Rs 4

Dividend per share (DPS) = Rs 2

Total increase in retained earnings = Rs 12 million

Book value per share = Rs 40

Total debt at the end = Rs 120 million

Year-end debt/assets ratio = ?

$$\text{Debt Ratio} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

$$\text{Debt Ratio} = \frac{\text{Rs } 120 \text{ m}}{\text{Rs } 360 \text{ m}} = 0.33 \text{ or } 33\%$$

Working notes:

i. Retained earnings per share = EPS – DPS = Rs 4 – Rs 2 = Rs 2

ii. Total R/E = R/E per share × No. of shares outstanding

or, Rs 12 million = Rs 2 × No. of shares outstanding

No. of shares outstanding = 6 million

iii Book value per share:

$$\text{Book Value} = \frac{\text{Equity}}{\text{umber of Share Outstanding}}$$

$$40 = \frac{\text{Equity}}{6m}$$

Equity = 240 million

iv. Total assets = Total debt + equity

$$\text{Rs } 120\text{m} + 240 \text{ m} = 360 \text{ m}$$

2.17

For the most recent year Sunder Steel Ltd. had sales of Rs 380,000, cost of goods sold of Rs 110,000, depreciation expense of Rs 32,000, and additions to retained earnings of Rs 41,620. The firm currently has 30,000 shares of common stock outstanding, and the previous year's dividends per share were Rs 1.50. Assuming a 34 percent income tax rate, what was the times interest earned ratio?

Given

Sales = Rs 380,000

Cost of goods sold = Rs 110,000

Depreciation = Rs 32,000

Addition to retained earnings = Rs 41,620

Number of common stock outstanding = 30,000 shares

Previous year's dividend per share = Rs 1.50

Tax rate = 34%

Times interest earned ratio = ?

we, have,

gross profit= Sales – Cost of good sold

$$\text{Rs } 380,000 - \text{Rs } 110,000 = \text{Rs } 270,000$$

EBIT = Gross profit - Depreciation

$$\text{Rs } 270,000 - \text{Rs } 32,000 = \text{Rs } 238,000$$

Net income = Total dividend + Additions to retained earnings

$$= (30,000 \text{ shares} \times \text{Rs } 1.50) + \text{Rs } 41,620 = \text{Rs } 86,620$$

$$EBT = \frac{\text{Net Income}}{1 - \text{Tax rate}}$$

$$EBT = \frac{\text{Rs } 86,620}{1 - 0.34} = \text{Rs } 131,242$$

$$\begin{aligned}\text{Interest} &= EBIT - EBT = \text{Rs } 238,000 - \text{Rs } 131,242 \\ &= \text{Rs } 106,758\end{aligned}$$

Now, (time interest earning ratio)

$$\text{TIE ratio} = \frac{\text{EBIT}}{\text{Interest}} = \frac{\text{Rs } 238,000}{\text{Rs } 106,758} = 2.23 \text{ times}$$

2.18

The Pashchimanchal Wood Corporation (PWC) has Rs 500,000 of debt outstanding, and it pays an interest rate of 10 percent annually. PWC's annual sales are Rs 2 million, its average tax is 30 percent and its net profit margin on sales is 5 percent. If the company does not maintain a times interest earned (TIE) ratio of at least 5 times, its bank will refuse to renew the loan and bankruptcy will result.

- What is PWC's TIE ratio? Is the bank likely to renew the loan?
- By what percentage, net profit margin should increase in order to get loan renewed?

calculation of net income

$$\text{Profit margin} = \frac{\text{Net profit}}{\text{Sales}}$$

$$0.05 = \frac{\text{Net profit}}{\text{Rs } 2,000,000} \quad \text{or} \quad \text{net profit} = \text{Rs } 100,000$$

Calculation of earnings before tax:

We know,

$$EBT = \frac{\text{Net Income}}{(1 - \text{tax})} \quad \text{or} \quad \frac{\text{Rs } 100,000}{(1 - 0.30)} = \text{Rs } 142,857$$

Calculation of interest:

$$\text{Interest} = 0.10 \times \text{Debt} = 0.10 \times \text{Rs } 500,000 = \text{Rs } 50,000$$

Calculation of EBIT:

$$\text{EBIT} = \text{EBT} + \text{Interest} = \text{Rs } 142,857 + \text{Rs } 50,000 = \text{Rs } 192,857$$

Now we have,

Times interest earned ratio:

$$\text{TIE ratio} = \frac{\text{EBIT}}{\text{Interest}} = \frac{\text{Rs } 192,857}{\text{Rs } 50,000} = 3.86 \text{ times}$$

The bank is not likely to renew the loan because times interest earned ratio of the firm is less than 5 times.

b. The required amount of EBIT to get the loan renewed is given by:

$$\text{TIE ratio} = \frac{\text{EBIT}}{\text{Interest}}$$

$$\text{or } 5 = \frac{\text{EBIT}}{\text{Rs } 50,000} \text{ or } \text{EBIT} = \text{Rs } 250,000$$

Required net income = (EBIT – Interest) (1 – T)

$$= (\text{Rs } 250,000 - \text{Rs } 50,000) (1 - 0.3) = \text{Rs } 140,000$$

$$\text{Required Profit Margin} = \frac{\text{Net Profit}}{\text{Sales}} \text{ Or } \frac{\text{Rs } 140,000}{2,000,000}$$

- Hence, the profit margin should increase from current 5 percent level to 7 percent level to get the loan renewed.

that is required percentage increased

$$\frac{7-5}{5} = 40\%$$

Note (19)

EBDIT = EBIT + Depreciation

$$\text{Cash coverage ratio} = \frac{\text{EBDIT}}{\text{Interest}}$$

20

Calculation of net income: Net income = Sales x Profit margin = Rs 32 x 0.07 = Rs 2.24 million

calculation of ROA

$$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$$

$$ROA = \frac{\text{Rs } 2.24}{\text{Rs } 43} = 5.21\%$$

$$ROE = \frac{\text{Net Income}}{\text{Total Equity}}$$

$$ROE = \frac{2.24}{35} = 6.59$$

Where, Equity = Total assets – Total debt = Rs 43 – Rs 9 = Rs 34 million

2-19.

A Grocery Shop has following information derived from financial statements of the year 2011:

Net income for the year = Rs 600,000

Tax rate = 40 percent

Interest expenses = Rs 200,000

Depreciation expenses = Rs 100,000

Calculate:

- Times interest earned ratio.
- Cash coverage ratio.

Given,

Net income = Rs 600,000

Tax rate (T) = 40%

Interest expenses = Rs 200,000

Depreciation = Rs 100,000

a. Calculation of times interest earned ratio: We have,

$$\text{EBT} = \frac{\text{Net Income}}{(1 - T)} = \frac{\text{Rs } 600,000}{(1 - 0.4)} = \text{Rs } 1,000,000$$

$$\text{EBIT} = \text{EBT} + \text{Interest}$$

$$= \text{Rs } 1,000,000 + \text{Rs } 200,000$$

$$= \text{Rs } 1,200,000$$

$$(\text{TIE}) \text{ Ratio} = \frac{\text{Net Income}}{\text{Interest}} = \frac{\text{Rs } 1,200,000}{\text{Rs } 200,000} = 6$$

Hence, the firm's times interest earned ratio for the year was 6 times.

b. Calculation of cash coverage ratio:

$$\text{EBDIT} = \text{EBIT} + \text{Depreciation}$$

$$= \text{Rs } 1,200,000 + \text{Rs } 100,000 = \text{Rs } 1,300,000$$

$$\text{Cash coverage ratio} = \frac{\text{EBDIT}}{\text{INTERES}} = \frac{1,300,000}{\text{Rs } 200,000)$$

6.5 Times

Problem 2-20.

XYZ Inc. has sales of Rs 32 million, total assets of Rs 43 million, and total debt of Rs 9 million. If profit margin is 7 percent, what is its net income? What is ROA? What is ROE?

Calculation of net income:

$$\text{Net income} = \text{Sales} \times \text{Profit margin} = \text{Rs } 32 \times 0.07 = \text{Rs } 2.24 \text{ million}$$

Calculation of ROA:

$$\text{ROA} = \frac{\text{Net income}}{\text{Total assets}} = \frac{\text{Rs } 2.24}{\text{Rs } 43} = 0.0521 \text{ or } 5.21\%$$

Calculation of ROE:

$$\text{ROE} = \frac{\text{Net income}}{\text{Equity}} = \frac{\text{Rs } 2.24}{\text{Rs } 34} = 0.0659 \text{ or } 6.59\%$$

Where,

$$\text{Equity} = \text{Total assets} - \text{Total debt} = \text{Rs } 43 - \text{Rs } 9 = \text{Rs } 34 \text{ million}$$

2-21.

General Stores Ltd. has sales of Rs 6 million, an asset turnover ratio of 6 times and net profits of Rs 120,000.

- a. What is the company's return on assets or earning power?
- b. The company is planning to install new point of sales cash registers throughout its stores. This equipment is expected to increase efficiency in inventory control, reduce clerical errors, and improve record keeping throughout the system. The new equipment will increase the investment in assets by 20 percent and is expected to increase the net profit margin from 2 percent now to 3 percent. No change in sales is expected. What is the effect of the new equipment on the return on assets or earning power?

Given

Sales = Rs 6 million

Assets turnover Ratio = 6 times

Net profit = Rs 120,000

- a. Return on assets (ROA) or earning power= ?

$$\text{Assets turnover ratio} = \frac{\text{Sales}}{\text{Total Assets}}$$
$$6 = \frac{\text{Rs } 6,000,000}{\text{Total Assets}}$$

Total assets = Rs 1,000,000

$$\text{ROA} = \frac{\text{Net Profit}}{\text{Total Assets}} = \frac{\text{Rs } 120,000}{\text{Rs } 1,000,000} = 12\%$$

Therefore, the company's return on assets or earning power is 12 percent

- b. Total assets = Rs 1,000,000 + 20% of Rs 1,000,000 = Rs 1,200,000

Net profit = 3% of sales = 3% of Rs 6,000,000 = Rs 180,000

$$\text{ROA} = \frac{\text{Net Profit}}{\text{Total Assets}} = \frac{\text{Rs } 180,000}{\text{Rs } 1,200,000} = 15\%$$

Problem 2-22.Debt ratio and
return on equity

Sheraton Ltd. has sales of Rs 200,000, a net income of Rs 15,000, and the following balanced sheet:

Cash	Rs <u>10,000</u>	Accounts payable	Rs <u>30,000</u>
Receivables	Rs <u>50,000</u>	Other current liabilities	Rs <u>20,000</u>
Inventories	Rs <u>150,000</u>	Long-term debt	Rs <u>50,000</u>
Net fixed assets	Rs <u>90,000</u>	Common equity	Rs <u>200,000</u>
Total assets	Rs <u>300,000</u>	Total liabilities and equity	Rs <u>300,000</u>

The company's new owner thinks that inventories are excessive and can be lowered to the point where the current ratio is equal to the industry average, 2.5 times, without affecting either sales or net income. If inventories are sold off and not replaced so as to reduce the current ratio to 2.5 times, if the funds generated are used to reduce common equity (Stock can be re-purchased at book value), and if no other changes occur, by how much will

- the debt ratio change?
- the return on equity change?

We have

Total debt = Account payable + Other Current liabilities + Long term debt

$$\text{Debt Ratio} = \frac{\text{Total Debt}}{\text{Total Assets}} = \frac{\text{Rs } 100,000}{\text{Rs } 300,000} = 33.33\%$$

Now suppose Rs x be the new level of inventory that makes current ration equal to 2.5 times,

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

$$2.5 = \frac{\text{Rs } 10,000 + \text{Rs } 50,000 + X}{\text{Rs } 30,000 + \text{Rs } 20,000}$$

$$X = \text{Rs } 65,000$$

Therefor fund can be generated from the sale of inventory is given by:

$$\text{Rs } 150,000 - \text{Rs } 65,000 = \text{Rs } 85,000$$

New level of common equity after the repurchase = $\text{Rs } 200,000 - \text{Rs } 85,000 = \text{Rs } 115,000$

$$\begin{aligned}\text{New total assets} &= \text{New level of equity} + \text{Total debt} \\ &= \text{Rs } 115,000 + \text{Rs } 100,000 = \text{Rs } 215,000\end{aligned}$$

$$\text{New debt ratio} = \frac{\text{Total Debt}}{\text{Total Assets}} = \frac{\text{Rs } 100,000}{\text{Rs } 215,000} = 46.51\%$$

$$\text{Increase in debt ratio} = 46.51\% - 33.33\% = 13.18\%$$

b. We have

$$\text{Return on equity (ROE)} = \frac{\text{Net Income}}{\text{Equity}} = \frac{\text{Rs } 15,000}{\text{Rs } 200,000} = 7.5\%$$

$$\text{Return on New equity (ROE)} = \frac{\text{Net Income}}{\text{Equity}} = \frac{\text{Rs } 15,000}{\text{Rs } 115,000} = 13.04\%$$

$$\text{Increase in ROE} = 13.04\% - 7.5\% = 5.54\%$$

2. 23.

Lumbini Construction Company (LCC), which is recently formed, needs Rs 1 million of assets, and it expects to have a basic earning power ratio of 20 percent. LCC will own no securities, so all of its income will be operating income. If it chooses to, LCC can finance up to 50 percent of its assets with debt, which will have an 8 percent interest rate. Assuming a 40 percent tax rate on all taxable income, what is the difference between its expected ROE if LCC finances with 50 percent debt versus its expected ROE if it finances entirely with common stock?

Given

Assets = Rs 1,000,000

Basic earning power = 20%

For common stock financing

$$EBIT = 0.20 \times \text{Rs } 1,000,000 = \text{Rs } 200,000$$

$$ROE = \frac{EBIT(1-TAX)}{Equity} = \frac{\text{Rs } 200,000(1-0.4)}{\text{Rs } 1,000,000} = 12\%$$

for 50% debt financing

$$ROE = \frac{(EBIT - Interest)(1-TAX)}{Equity}$$

$$ROE = \frac{(\text{Rs } 200,000 - \text{Rs } 40,000)(1 - 0.4)}{0.5 \times \text{Rs } 1,000,000} = 19.2\%$$

Difference in ROE = 19.2% – 12% = 7.2%

Hence if the firm uses debt financing, its ROE will be higher by 7.2 percentage points than that under equity financing.

2.24. Asian Food Corporation had additions to retained earnings for the year just ended of Rs 275,000. The firm paid out Rs 150,000 in cash dividends, and it has ending total equity of Rs 6 million. If the firm currently has 125,000 shares of common stock outstanding, what are earnings per share? Dividends per share? Book value per share? If the stock currently sells for Rs 95 per share, what is the market-to-book ratio? The price-earnings ratio?

Given

Additions to retained earnings = Rs 275,000

Cash dividend paid = Rs 150,000

Ending equity = Rs 6 million

No. of shares outstanding = 125,000 shares

Earnings per share (EPS) = ?

Dividend per share (DPS) = ?

Book value per share = ?

Current market price of stock = Rs 95 per share

Market to-book ratio = ?

Price-earning ratio = ?

We have,

Net income = Cash dividend paid + Additions to retained earnings

= Rs 150,000 + Rs 275,000 = Rs 425,000

Now,

$$\text{EPS} = \frac{\text{Net income}}{\text{No. of shares outstanding}}$$

$$\text{EPS} = \frac{\text{Rs } 425,000}{125,000} = \text{Rs } 3.40$$

$$DPS = \frac{\text{Total Dividend}}{\text{No. of shares outstanding}}$$

$$= \frac{\text{Rs } 150,000}{\text{125,000}} = \text{Rs } 1.20$$

$$\text{Book value per share} = \frac{\text{Equity}}{\text{No. of shares outstanding}}$$

$$\text{Book value per share} = \frac{\text{Rs } 6,000,000}{\text{125,000}} = \text{Rs } 48$$

$$\text{Market-to-book ratio} = \frac{\text{Equity}}{\text{No. of shares outstanding}}$$

$$\text{Market-to-book ratio} = \frac{\text{Rs } 95}{\text{Rs } 48} = 1.98 \text{ times}$$

$$\text{Price-earning ratio} = \frac{\text{MPS}}{\text{EPS}} = \frac{\text{Rs } 95}{\text{Rs } 3.40} = 27.94 \text{ Times}$$

Problem 2-25. Preparing balance sheet

Complete the balance sheet and sales information of Himalayan Brewery using the following financial data:

Debt ratio	50%	Quick ratio	0.80x
Total assets turnover	1.5x	Days sales outstanding	36 days
Gross profit margin	25%	Inventory turnover	5 times

Balance Sheet		
Cash	...	Accounts payable
Accounts receivable	...	Long-term debt
Inventories	...	Common stock
Fixed assets	...	Retained earnings
Total Assets	Rs 300,000	Total liabilities and equity
Sales	-	Cost of goods sold

$$\text{Debt Ratio} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

$$0.50 = \frac{\text{Total Debt}}{300,000}$$

$$\text{Total Debt} = \text{Rs } 150,000$$

Again,

$$\begin{aligned}\text{Total debt} &= \text{Accounts payable} + \text{long-term debt} \text{ or,} \\ \text{Accounts payable} &= \text{Total debt} - \text{Long-term debt} = \text{Rs } \\ &150,000 - \text{Rs } 60,000 = \text{Rs } 90,000\end{aligned}$$

We have,

$$\text{Total assets turnover} = \frac{\text{Sales}}{\text{Total Assets}}$$

$$1.5 = \frac{\text{Sales}}{300,000} = \text{Sales} = \text{Rs } 450,000$$

$$DSO = \frac{\text{Account Receivable} \times \text{Days in Year}}{\text{Sales}}$$

$$36 = \frac{\text{Account Receivable} \times 360}{\text{Rs } 450,000}$$

Account receivable = Rs 45,000

Again,

$$\begin{aligned}\text{Cost of goods sold} &= \text{Sales} - \text{Gross profit} \\ &= \text{Rs } 450,000 - 25\% \text{ of Rs } 450,000 = \text{Rs } 337,500\end{aligned}$$

$$ITOR = \frac{\text{Cost of Goods sold}}{\text{Inventory}}$$

$$5 = \frac{\text{Rs } 337,500}{\text{Inventory}}$$

Inventory = Rs 67,500

$$Quick Ratio = \frac{\text{Quick assets}}{\text{Current Liabilities}}$$

$$0.8 = \frac{\text{Quick assets}}{\text{Rs } 90,000}$$

Quick assets = Rs 72,000

Again,

Quick assets = Cash + Accounts receivable
or,

$$\begin{aligned}\text{Cash} &= \text{Quick assets} - \text{Accounts receivable} \\ &= \text{Rs } 72,000 - \text{Rs } 45,000 = \text{Rs } 27,000\end{aligned}$$

$$\begin{aligned}\text{Fixed assets} &= \text{Total assets} - (\text{Cash} + \text{Accounts receivable} + \text{Inventory}) \\ &= \text{Rs } 300,000 - \text{Rs } 27,000 - \text{Rs } 45,000 - \text{Rs } 67,500 \\ &= \text{Rs } 160,500\end{aligned}$$

$$\begin{aligned}\text{Common stock} &= \text{Total assets} - (\text{A/c payable} + \text{Long-term debt} + \text{R/E}) \\ &= \text{Rs } 300,000 - (\text{Rs } 90,000 + \text{Rs } 60,000 + \text{Rs } 97,500) \\ &= \text{Rs } 52,500\end{aligned}$$

Assets		Liabilities	
Cash	Rs 27,000	Accont Payable	Rs 90,000
Account Receivable	45,000	Long term debt	60,000
Inventories	67,500	common stock	52,500
Fixed Assets	160,500	Retaining earnings	97,500
Total Assets	<u>300,000</u>	Total liability and Equity	<u>300,000</u>
Sales	450,000	Cost of good sold	337,500

2.27 (Tu 2021)

The following data apply to Sagarmatha Company (Rs. in million)

Cash and marketable securities Rs 100.00

Sales Rs 1,000

Fixed assets Rs 283.50

Net income Rs 50.00

Quick ratio 2.0 ×

Current ratio 3.0 ×

Days sales outstanding (DSO) 40 days

Return on equality (ROE) 12%

Calculation is based on a 360 days.

Sagarmatha has not issued any preferred stocks. The company's liabilities consist only common equity, current liabilities and long-term debt.

- a. Find Sagarmatha's (1) account receivable, (2) current liabilities, (3) current assets, (4) total assets, (5) ROA,(6) common equity, and (7) long-term debt.
- b. In part (a) you should have found Sagarmatha's accounts receivable = Rs 111.1 million. If Sagarmatha could reduce its DSO from 40 days to 30 days while holding other things constant, how much cash would it generate? If this cash were used to buy back common stock (at book value), thus reducing the amount of common equity, how would this affect (1) the ROE, (2) the ROA and (3) the total debt/total assets ratio?

a. 1. Accounts receivable:

We have

$$DSO = \frac{\text{Account Receivable} \times \text{Days in Year}}{\text{Sales}}$$

$$40 = \frac{\text{Account Receivable} \times 360}{\text{Rs } 1,000}$$

account receivable = 111.10 million

2. Current liabilities:

$$\text{Quick Ratio} = \frac{\text{Quick assets}}{\text{Current Liabilities}}$$

$$QR = \frac{\text{Cash and Marketable securities} + \text{Receivable}}{\text{Current Liabilities}}$$

$$2 = \frac{\text{Rs } 100 + \text{Rs } 111.11}{\text{Current Liabilities}}$$

current liabilities = Rs 105.5 m

3. Current assets:

We have,

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

$$3 = \frac{\text{Current Asset}}{105}$$

current asset = 316.5

4. Total assets: We have,

Total assets = Current assets + Fixed assets

$$= \text{Rs } 316.5 + \text{Rs } 283.5 = \text{Rs } 600 \text{ million}$$

5. Return on assets (ROA)

We have,

$$\text{Return on Assets (ROA)} = \frac{\text{Net Profit}}{\text{Total assets}}$$

$$\text{Return on Assets (ROA)} = \frac{50}{600} = 8.33\%$$

6. Common equity:

We have,

$$\text{Return on Equity (ROE)} = \frac{\text{Net Profit}}{\text{Common Equity}}$$

$$0.12 = \frac{50}{\text{Common Equity}}$$

Common equity = 416.7 million

7. Long-term debt:

We have,

Total assets = Current liabilities + Long-term debt + Common equity

or,

$$\text{Long-term debt} = \text{Total assets} - (\text{Current liabilities} + \text{Common equity})$$

$$= \text{Rs } 600 - (\text{Rs } 105.5 + \text{Rs } 416.7)$$

$$= \text{Rs } 77.8 \text{ million } \square$$

Long-term debt = Rs 77.8 million

b. Sagarmatha and Company's sales per day were Rs 1,000/360 = Rs 2.8 million.

Its DSO was 40 days, so A/R = $40 \times \text{Rs } 2.8 = \text{Rs } 111.1$ million.

Its new DSO of 30 days would cause A/R = $30 \times \text{Rs } 2.8 = \text{Rs } 83.3$ million.

The reduction in receivables would be Rs 111.1 – Rs 83.3 = **Rs 27.8 million**, which would equal to the amount of cash generated.

1. New equity = Old equity – Stock bought back

$$= \text{Rs } 416.7 - \text{Rs } 27.8 = \text{Rs } 388.9 \text{ million}$$

New

$$(\text{New ROE}) = \frac{\text{New income}}{\text{New Equity}} = \frac{\text{Rs } 50}{\text{Rs } 388.9} = 12.86\%$$

New total assets = Old total assets – Reduction in AR

$$= \text{Rs } 600 - \text{Rs } 27.8 = \text{Rs } 572.2 \text{ million}$$

$$\text{Return on Assets (ROA)} = \frac{\text{Net Income}}{\text{New Total assets}}$$

$$\text{Return on Assets (ROA)} = \frac{50}{572.2}$$

$$= 0.0874 \text{ or } 8.74\% \text{ (versus old ROA of } 8.33\%)$$

3. Old total debt = Total assets – Equity

$$= \text{Rs } 600 - \text{Rs } 416.7 = \text{Rs } 183.3 \text{ million}$$

The new debt is the same as the old debt.

$$\frac{\text{Old debt}}{\text{Old total assets}} = \frac{118.3}{600} = 30.55\%$$

$$\frac{\text{New debt}}{\text{New total assets}} = \frac{118.3}{572.2} = 32.02\%$$

2-30.

Assume you are given the following relationship for the Bhaktapur Brick Corporation:

Sales / assets = 1.5x

Return on assets (ROA) = 3%

Return on equity (ROE) = 6%

Calculate Bhaktapur Brick Corporation's

- a. Profit margin
- b. Debt ratio.

Given

Sales/Total assets = 1.5

Return on assets (ROA) = 3%

Return on equity (ROE) = 6%

Profit margin = ?

Debt ratio = ?

According to Du–Pont equation,

we know that

ROA = Profit margin × Sales/total assets

or, 0.03 = Profit margin × 1.5

Profit margin = $\times 1.5 / 0.03 = 0.02$ or 2%

Again, according to Du–Pont equation We have,

ROE = ROA × Equity multiplier

$$(ROE) = ROA \times \frac{1}{1 - \text{Debt ratio}}$$

$$0.06 = 0.03 \times \frac{1}{1 - \text{Debt ratio}}$$

or $0.06 - 0.03 = 0.03$ or,

or $0.06 / 0.03 = 2$

Debt ratio = $0.03 / 0.06 = 0.5$ or 50%

Hence, Bhaktapur Brick Corporation's profit margin and debt ratio is 2 percent and 50 percent respectively.

2.32

Consider the following industry average and financial statements for Himalayan Automobile Corporation.

Balance Sheet as of December 31, 2011			
Accounts payable	Rs 60,000	Cash	Rs 60,000
Notes payable	60,000	Marketable securities	44,000
Other current liabilities	28,000	Account receivables	88,000
Long-term debt	32,000	Inventories	212,000
Common stock	252,000	Fixed assets	300,000
Retained earnings	168,000	Accumulated depreciation	(104,000)
Total	Rs 600,000	Total	Rs 600,000

Income statement for the year ended December 31, 2011

Sales revenue	Rs 10,60,000
Less: Cost of goods sold	880,000
Gross profit	Rs 180,000
Less: Operating expenses	114,000
Net income before interest and taxes	Rs 66,000
Less: interest	6,000
Net income before tax	Rs 60,000
Less: Tax @ 50%	30,000
Net income	Rs 30,000

Industry Average Ratios			
Current ratio	= 2 times	Fixed assets turnover	= 6 times
Debt ratio	= 30%	Total assets turnover	= 3 times
Times interest earned	= 7 times	Profit margin	= 3%
Inventory turnover	= 10 times	Return on assets	= 9%
DSO	= 24 days	Return on equity	= 12.9%

- Calculate all those necessary ratios to make a comparison to industry average ratios.
- Construct a Du-Pont equation for the firm, and compare the company's ratios to the composite ratios for the industry as a whole.
- Do the balance sheet accounts or income statement figures seem to be primarily responsible for low profit?
- Which specific accounts seem to be most out of line in relation to other firm's in the industry?

- a. Calculation of necessary ratios to make a comparison:
- i. current ratio = CA/CL = $404,000/148,000 = 2.73$ times.
- CA = Cash + M/S + A/R + Inventories**
- $$= \text{Rs } 60,000 + \text{Rs } 44,000 + \text{Rs } 88,000 + \text{Rs } 212,000$$
- $$= \text{Rs } 404,000$$
- CL = A/P + N/P + Other CL**
- $$= \text{Rs } 60,000 + 60,000 + \text{Rs } 28,000 = \text{Rs } 148,000$$
- ii. **debt ratio = TD/TA** = $\text{Rs } 180,000/\text{Rs } 600,000$
 $= 0.3$ or 30%
- Total debt (TD) = $\text{Rs } 32,000 + \text{Rs } 148,000 = \text{Rs } 180,000$
- iii. Times interest earned ratio = EBIT/Interest
 $\text{Rs } 66,000/6,000 = 11$ times
- iv. Inventory turnover ratio = COGS/ Inventory
 $\text{Rs } 880,000/\text{Rs } 212,000 = 4.15$ times
- v. $\text{DSO} = \frac{\text{A/R} \times \text{Days in a year}}{\text{credit sales}}$
- $\text{DSO} = \frac{\text{Rs } 88,000 \times 360}{\text{Rs } 1,060,000} = 29.89$ or 30 days
- vi. Fixed assets turnover = $\frac{\text{Sales}}{\text{Net Fixed assets}}$
- $\frac{\text{Rs } 1060,000}{\text{Rs } 196,000} = 5.41$ times
- Net fixed assets =
Gross fixed assets – Accumulated depreciation
 $= \text{Rs } 300,000 - \text{Rs } 104,000 = \text{Rs } 196,000$
- vii. Total assets turnover
- $\frac{\text{Sales}}{\text{Total assets}} = \frac{\text{Rs } 1,060,000}{\text{Rs } 600,000} = 1.78$ times

viii. Profit margin = $\frac{\text{Net Income}}{\text{Sales}}$

or $\frac{\text{Rs } 30,000}{\text{Rs } 1,060,000} = 0.283 \text{ or } 2.83\%$

ix. Return on assets = $\frac{\text{Net Income}}{\text{Total Assets}}$

or $\frac{\text{Rs } 30,000}{\text{Rs } 600,000} = 0.05 = 5\%$

x. Return on equity = $\frac{\text{Net Income}}{\text{Equity}}$

$\frac{\text{Rs } 30,000}{\text{Rs } 420,000} = 0.0714 = 7.14\%$

b. Construction of Du-Pont equation for the firm:

ROE = Profit margin × Total assets turnover × Equity margin

$$\text{ROE} = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

$$\text{ROE} = \frac{\text{Rs } 30,000}{\text{Rs } 1,060,000} \times \frac{\text{Rs } 1,060,000}{\text{Rs } 600,000} \times \frac{\text{Rs } 600,000}{\text{Rs } 420,000}$$

 $= 0.0714 \text{ or } 7.14\%$

Equity = Common stock + R/E

$= \text{Rs } 252,000 + \text{Rs } 168,000$
 $= \text{Rs } 420,000$

Ratios	Himalayan Automobile Corporation	Industry Average	Comments
Current ratio	2.73 times	2 times	Good
Debt ratio	30%	30%	Good
TIE	11 times	7 times	Good
Inventory turnover	4.15 times	10 times	Poor
DSO	30 days	24 days	Poor
Fixed assets turnover	5.41 times	6 times	Poor
Total assets turnover	1.78 times	3 times	Poor
Profit margin	2.83%	3%	Poor
ROA	5%	9%	Poor
ROE	7.14%	12.9%	Poor

Unit 3 Time Value Of Money



- Money available today is worth more than the same amount of money available in the future.
- Money has a time value because it can be invested or earn interest, and therefore has the potential to grow in value over time.
- The time value of money is based on factors such as inflation and the opportunity cost of investing or spending money.
- The concept is important in various financial decisions such as determining the value of investments and evaluating the cost of borrowing money.
- It is used to calculate the present value of future cash flows and to determine the rate of return required for an investment to be profitable.



Investment Decision:

- The time value of money helps investors evaluate the potential return on investment and the opportunity cost of alternative investments.
- It is used to calculate the present value of future cash flows and to determine the rate of return required for an investment to be profitable.
- Investors use time value of money calculations to compare the value of investments with different payment structures, time periods, and risk levels.



Financing Decision:

- The time value of money helps companies evaluate the cost of borrowing money and the impact of interest rates on future cash flows.
- It is used to calculate the present value of future payments, which is important in determining the cost of debt financing and the appropriate level of debt for a company.
- Companies also use time value of money calculations to evaluate financing options, such as leasing vs. buying equipment or issuing bonds vs. taking out a bank loan.



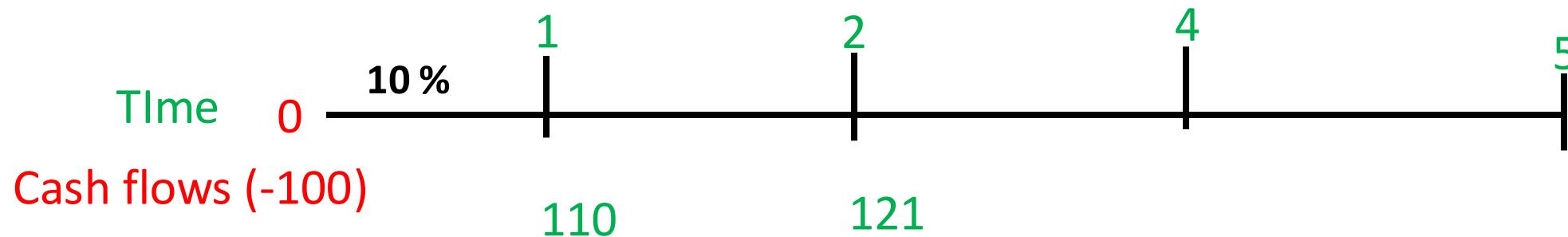
Cash Flow Line

- Cash flow time line is an important tool used to understand the timing of cash flows.
- It is a graphical presentation of cash flows occurring at different points of time, and is helpful for analyzing the time value of cash flows.



- Time 0 represents today or just now or at **the beginning of Period 1**.
- Time 1 denotes the end of Period 1
- Time 2 denotes the end of Period 2, and so on,
- it should be noted that the end of any period also means the beginning of the succeeding period.
- Time period denoted in the scale has generally a length of one year from 0 to 1, from 1 to 2, from 2 to 3 and so on

- The negative sign represents the cash outflows, which means that Rs 100 is deposited or paid or cost incurred at Time 0
- All other cash flows in time 1, 2, 3, 4 and 5 have positive signs. Positive sign is used to denote the cash inflows, which means a cash receipt in the given time periods correspondingly.



- The interest rate is placed in between two corresponding time periods. The interest rate 10% percent placed in between the Time 0 and 1.
- invested today will earn 10 percent interest in Year 1 so that it grows to Rs 110 at the end of Year 1.
- Similarly, Rs 110 at the beginning of Year 2 earns 10 percent interest during the Year 2 so that it grows to Rs 121 at the end of Year 2 and so on.

Future Values and Compound Interest

- The concept of future value compounding is based on the principle that the value of an investment increases over time due to the effects of compounding.
- Compounding occurs when the earnings generated by an investment are reinvested, thus generating additional earnings in subsequent periods.
- The future value of an investment that compounds can be calculated using the following formula.

$$FV_n = PV (1 + i)^n$$

Where:

FV_n = future value of a sum of money at the end of period n.

PV = present value or the sum of money today.

r = annual rate of interest

n = number of compounding periods

When the interest is paid more than once in a year

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

M = number of compounding periods in a year

For example, if you invest \$1,000 today at an annual interest rate of 5%, compounded annually for 5 years, the future value of your investment can be calculated as follows:

present value (PV) = Rs 1,000

Number of year (n) = 5 years

Future Value (FV) = ?

future value compounding

we know,

$$FV_n = PV (1 + i)^n$$

$$FV_5 = \text{Rs } 1,000 \times (1 + 0.05)^5$$

$$FV_5 = \text{Rs } 1,276.28$$

This means that your investment will be worth **Rs 1,276.28** at the end of the **5-year** period, assuming that the interest rate remains constant and that no withdrawals are made from the account.

3.2 Given,

What is the value of Rs 76,355 today in three years from now with the interest rate of 19%?

Present value (PV) = Rs 76,355

Number of years (n) = 3 years

Interest rate (i) = 19%

Future value (FVn) = ?

$$FVn = PV (1 + i)^n$$

$$= \text{Rs } 76,355 (1+ 0.19)^3$$

$$= \text{Rs } 76,355 \times 1.6852 = \text{Rs } 128,673.45$$

Again,

What is the value of Rs 183,796 today in seven years from now with the interest rate of 5% present?

Present value (PV) = Rs 183,796

Number of years (n) = 7 years

Interest rate (i) = 5%

Future value (FVn) = ?

$$FVn = PV (1 + i)^n$$

$$= \text{Rs } 183,796 (1+0.05)^7$$

$$= \text{Rs } 183,796 \times 1.4071 = \text{Rs } 258,619.35$$

Tabular Solution

$$FV_n = PV (FVIF_{i,n})$$

Again using Tabular solution

$$FV_3 = PV (FVIF_{5\%, 7 \text{ year}})$$

(Referring FVIF table, we find 5% interest in seven years that is equal to 1.4071)

so,

$$= Rs 183,796 \times 1.4071 = Rs 258,619.35$$

Present Value and Discounting

- Present value and discounting are financial concepts used to evaluate the value of future cash flows in today's dollars.
- Present value is the value of a future payment or stream of payments, discounted to reflect the time value of money.
- Discounting is the process of calculating the present value of a future payment or stream of payments by applying a discount rate.

The basic formula for calculating present value is:

$$PV = \frac{FV_n}{(1 + i)^n}$$

Tabular Solution

$$PV = FV_n (PVIF_{i,n})$$

$PVIF_{i,n}$ = Present value interest factor

Examples

Problem 3-1.

Work out present value for each of the following:

Present values

Present value	Years	Interest rate	Future value
?	5	4%	Rs 15,451
?	8	12	51,557

A. Given information

Future Value (FV) = Rs 15,451

Number of year (n) = 5 years

Interest rate (I) = 4 %

present value PV₅ = ?

$$PV = \frac{FV_n}{(1+i)^n} = \frac{\text{Rs } 15,451}{(1+0.04)^5} = 12,699.$$

B. Given information

Future Value (FV) = Rs 51,557

Number of year (n) = 8 years

Interest rate (I) = 12 %

present value PV₈ = ?

$$PV = \frac{FV_n}{(1+i)^n} = \frac{\text{Rs } 51,557}{(1+0.12)^8} = 20,822.$$

Tabular Solution

$$PV = FVn \times PVIF_{i,n} \quad PV = \text{Rs } 51,557 \times 0.40388$$

When interest is paid more than one time a year

$$PV = \frac{FV_n}{(1 + \frac{i}{m})^{n \times m}}$$

Where (m) = number of compounding period in a year

Finding the Interest Rates

$$i = \left[\frac{FV_n}{PV} \right]^{\frac{1}{n}} - 1$$

Annuity

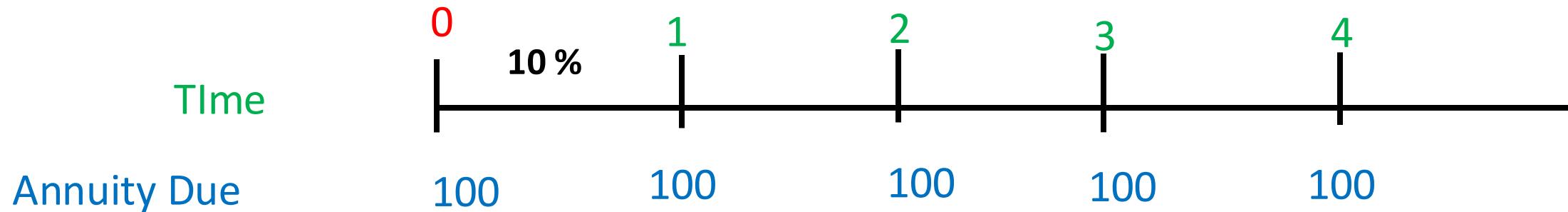
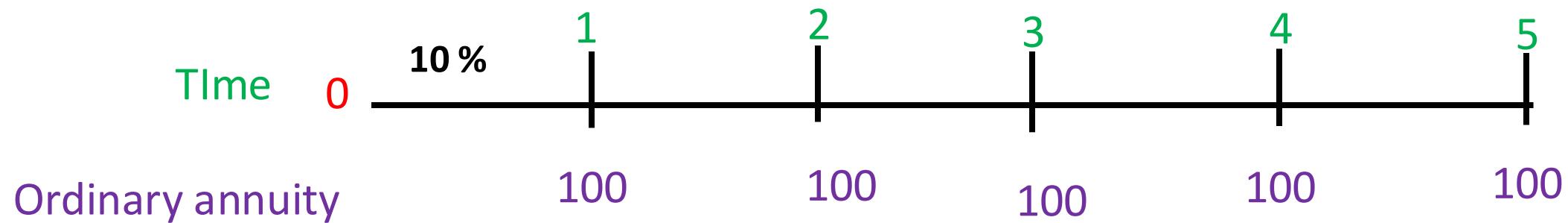
- An annuity is defined as a series of payment or receive of fixed amount at each specified interval of time for a given number of periods.
- An annuity can be an ordinary annuity or annuity due.

Ordinary Annuity:

- ❖ An ordinary annuity, each equal payment is made at the end of each interval of time throughout the period.

Annuity Due

- annuity due equal payments are made at the beginning of each interval throughout the periods.
- For example, if an individual promises to pay Rs 100 at the end of each year for three years to amortize a loan, then it is called an ordinary annuity. If it were the annuity due, each payment would be made at the beginning of each year for three years.



Future Value of an Ordinary Annuity

The future value of an ordinary annuity is the value of a series of equal payments or cash flows made at the end of each period over a specific time period, compounded at a given rate of interest.

$$FVA_n = PMT \times \left[\frac{(1 + i)^n - 1}{i} \right]$$

FVAn = future value of an ordinary annuity for 'n' years

PMT = Annual amount of equal payment

n= number of compounding periods.

i = Annual rate of interest.

Table Method

$$FVA_n = PMT [FVIFA_{i,n}]$$

FVIFA_{i,n}= Future Value Interest Factor
Annuity

i = interest

n = number of period

Future Value of an Annuity Due

$$FVA_{n\text{ Due}} = PMT \times \left[\frac{(1 + i)^n - 1}{i} \right] (1 + i)$$

Present Value of an Ordinary Annuity

- The present value of an ordinary annuity is the current value of a series of equal payments or cash flows made at the end of each period over a specific time period, discounted at a given rate of interest.
- It is calculated by multiplying the periodic payment amount by the present value interest factor of an ordinary annuity, which can be found in a table or calculated using a formula.

Formulas

Present Value Ordinary Annuity

$$PVA = PMT \times \left[\frac{1 - \frac{1}{(1+i)^n}}{i} \right]$$

Present Value Annuity Due

$$PVA = PMT \times \left[\frac{1 - \frac{1}{(1+i)^n}}{i} \right] (1 + i)$$

Table Method

$$PVA = PMT \times PVIFA_{i \% \text{ n year}}$$

$$PVA = PMT \times PVIFA_{i \% \text{ n year}} (1 + i)$$

Perpetuity

- An infinite stream of equal payment.
- perpetuity is a stream of equal payment made at the end of equal interval of time to indefinite period.
- It is the stream of level cash payments that never ends.

$$PV_{\text{PERPETUITY}} = \frac{\text{Payment}}{\text{Interest rate}} = \frac{PMT}{i}$$

Growing Annuities and Perpetuities

IT refers to the annuity payments that grow at a constant rate every period for a given maturity.

$$PVA_{\text{GROWING}} = PMT \times \frac{1 - [(1+g)/(1+i)]^n}{i-g}$$

PV Growing Perpetuity

$$PV_{\text{Growing Perpetuity}} = \frac{PMT}{i - g}$$

Present Value of Uneven Cash Flow Stream

$$PV = \frac{CF_1}{(1+i)^1} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \dots + \frac{CF_n}{(1+i)^n}$$

PV = Present value of uneven cashflow

CF₁ = Cash flow in year 1.

i = Interest rate / discount rate

CF_n = Cash flow in n year.

Future Value for uneven cashflow

$$FV_n = CF_1(1+i)^{n-1} + CF_2(1+i)^{n-2} + CF_3(1+i)^{n-3} + \dots + CF_n(1+i)^{n-n}$$

Problem 4.2

Suppose you had just celebrated your 19th birthday. A rich uncle set up a trust fund for you that will pay Rs 100,000 when you turn 25 years. If the relevant discount rate is 11 percent, how much is this fund worth today?

Given information

Future value (FV) = Rs 100,000

Number of year (25 - 19) (n) = 6 years

discount rate (i) = 11%

Present value annuity PVA =?

we know,

present value annuity for Lump sum

$$PVA = \frac{FV_n}{(1+i)^n} = \frac{\text{Rs } 100,000}{(1+0.11)^6} = \text{Rs } 53,464.08$$

The fund worth today is **Rs 53,464.08**

Q. 4.3

An enterprise had sales last year of only Rs 0.5 million. However, a stock market analyst is bullish on the company and predicts that sales will double each year for 4 years. What are projected sales at the end of this period?

Given information

last years sales = Rs 0.5 million

sales double each year

number of year n = 4 years

what is the future value of sales in 4 year

$$FV_n = PV (1 + i)^n$$

$$FV_4 = \text{Rs } 0.5 \text{ million } (1 + 1)^4$$

$$FV_4 = \text{Rs } 0.5 \text{ million } 16$$

$$FV_4 = \text{Rs } 8 \text{ million}$$

4.9

Solve for interest rate in each of the following:

Present value	Years	Interest rate	Future value
Rs 39,000	15	?	Rs 136,771
46,523	30	?	255,810

Given,

Present value (PV) = Rs 39,000

Number of years (n) = 15 years

Future value (FV_n) = Rs 136,771

Interest rate (i) = ?

Calculation of interest rate:

$$\begin{aligned} \text{Interest rate (i)} &= (FV_n/PV)^{1/n} - 1 \\ &= (\text{Rs } 136,771 / \text{Rs } 39,000)^{1/15} - 1 \\ &= 1.0872 - 1 = 0.0872 \text{ or } 8.72\% \end{aligned}$$

Given,

Present value (PV) = Rs 46,523

Number of years (n) = 30 years

Future value (FV_n) = Rs 255,810

Interest rate (i) = ?

Calculation of interest rate:

$$\begin{aligned} \text{Interest rate (i)} &= (FV_n/PV)^{1/n} - 1 \\ &= (\text{Rs } 255,810 / \text{Rs } 46,523)^{1/30} - 1 \\ &= 1.0585 - 1 = 0.0585 \text{ or } 5.85\% \end{aligned}$$

3.11

Shital Nagar Oil Corporation's 2011 sales were Rs 12 million. Sales were Rs 6 million 5 years earlier (in 2006).

- To the nearest percentage point, at what rate have sales been growing?
- Suppose someone calculated the sales growth for MC corporation in part a as follows: "Sales doubled in 5 years."

This represents a growth of 100 percent in 5 years, so dividing 100 percent by 5, we find the growth rate to be 20 percent per year." Explain what is wrong with this calculation.

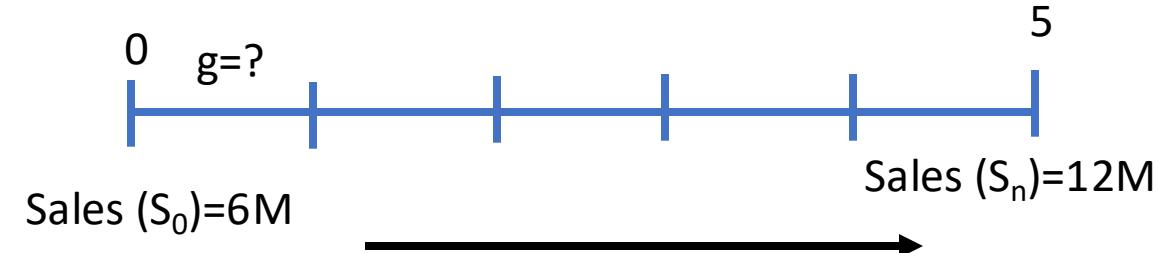
Given,

$$\text{Sales in 2006 } (S_0) = \text{Rs. 6 million}$$

$$\text{Sales in 2011 } (S_n) = \text{Rs. 12 million}$$

$$\text{No. of periods (n)} = 5 \text{ years}$$

$$\text{Growth rate (g)} = ?$$



The formula,

$FV_n = PV (1 + i)^n$ can be rearranged as

$S_n = S_0(1 + g)^n$ to compute growth rate.

$$S_n = S_0(1 + g)^n$$

$$\text{Rs. } 12m = \text{Rs. } 6 (1 + g)^5$$

$$(1 + g)^5 = 2$$

$$1 + g = (2)^{1/5}$$

$$g = 0.1487 \text{ or } 14.87\%$$

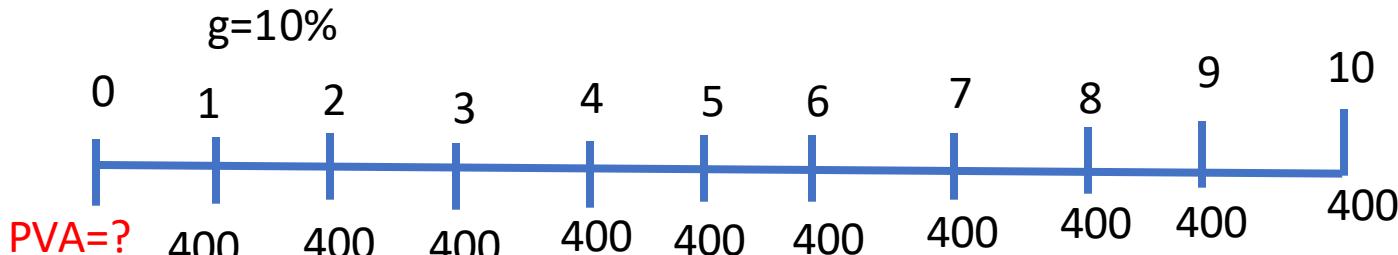
Hence, the sales have been growing at 14.87 percent annually over past 5 years of period.

(b) This calculation ignores the time value of money or compounding impact. It is simply arithmetic calculation.

3.13

Find the present value of the following ordinary annuities:

- Rs 400 per year for 10 years at 10 percent.
- Rs 200 per year for 5 years at 5 percent.
- Rs 400 per year for 5 years at 0 percent.
- Now rework parts a, b and c assuming that payments are made at the beginning of each year; that is, they are annuities due.



$$PVA = PMT \times \left[\frac{1 - \frac{1}{(1+i)^n}}{i} \right]$$

$$PVA = \text{Rs. } 400 \times \left[\frac{1 - \frac{1}{(1+0.10)^{10}}}{0.10} \right]$$

$$PVA = \text{Rs. } 400 \times 6.1446 = \text{Rs. } 2,457.84$$

Table method

$$PVA = PMT \times PVIFA_{i \% \text{ n year}}$$

$$\text{Rs. } 400 \times PVIFA_{10\%, 10 \text{ years}}$$

$$PVA = \text{Rs. } 400 \times 6.1446 = \text{Rs. } 2,457.84$$

Given,

Period equal payment (PMT) = Rs. 400

Number of periods (n) = 10 years

Interest rate (i) = 10%

Present value of an annuity (PVA) = ?

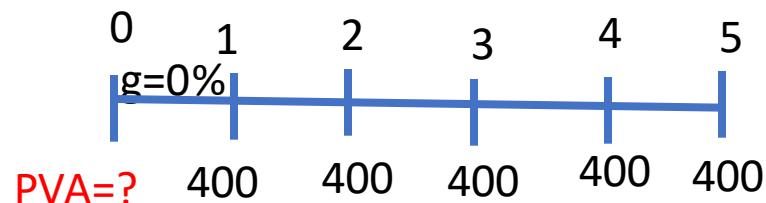
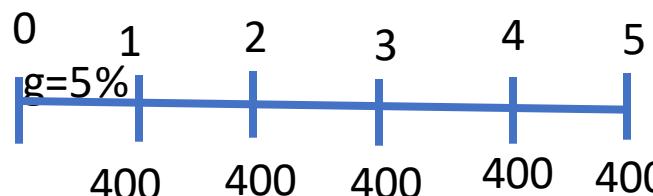
3.13

b

Period equal payment (PMT) = Rs. 200

Number of years (n) = 5 years

Interest rate (i) = 5%



PVA = PMT × PVIFA_{i % n year}

Rs. 400 × PVIFA_{5%, 5 years}

Rs. 400 × 4.3295 = Rs. 865.90

c. Given,

Periodic equal payment (PMT) = Rs. 400

No. of periods/years (n) = 5

Interest rate (i) = 0%

Present value of annuity (PVA) = ?

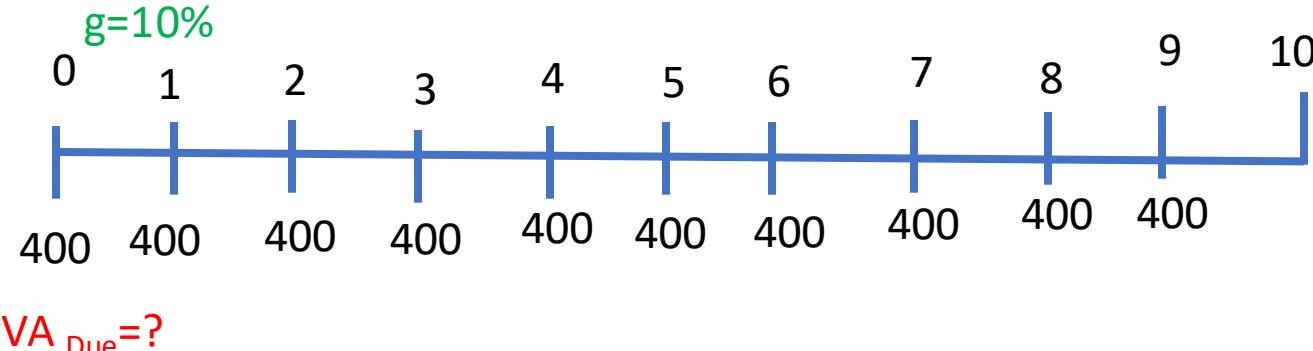
$$\begin{aligned} \text{PVA} &= \text{PMT} \times \text{No. of payment} \quad [\dots i = 0\%] \\ &= \text{Rs. } 400 \times 5 = \text{Rs. } 2,000 \end{aligned}$$

d

.i Periodic equal payment (PMT) = Rs. 400

No. of periods (n) = 10 years

Interest rate (i) = 10%



3.13

$$PVA = PMT \times \left[\frac{1 - \frac{1}{(1+i)^n}}{i} \right] (1+i)$$

$$PVA = \text{Rs. } 400 \times \left[\frac{1 - \frac{1}{(1+0.10)^{10}}}{0.10} \right] (1+0.10)$$

$$PVA = \text{Rs. } 400 \times 6.1446 \times 1.1 = \text{Rs. } 2,703.62$$

ii

Periodic equal payments (PMT) = Rs. 200

No. of periods (n) = 5 years

Interest rate (i) = 5%

PVA_{due} = ?

$$\begin{aligned} PVA_{\text{due}} &= PMT \times PVIFA_{i \% \text{ n year}} (1+i) \\ &= \text{Rs. } 200 \times PVIFA_{5 \% \text{ 5 year}} (1+0.05) \end{aligned}$$

$$\begin{aligned} PVA_{\text{due}} &= \text{Rs. } 200 \times 4.3295 \times 1.05 \\ &= \text{Rs. } 909.20 \end{aligned}$$

iii

Periodic equal payment (PMT) = Rs. 400

No. of periods (n) = 5 years

Interest rates (i) = 0%

$$\begin{aligned} PVA(\text{due}) &= PMT \times \text{No. of payments} \\ &= \text{Rs. } 400 \times 5 = \text{Rs. } 2000 \end{aligned}$$

3.15

To complete your last year in business school and then go through law school, you will need Rs 100,000 per year for 4 years, starting next year (that is you will need to withdraw the first Rs 100,000 one year from today).

Your rich uncle offers to put you through school, and he will deposit in a bank paying 7 percent interest a sum of money that is sufficient to provide the four payments of Rs 100,000 each. His deposit will be made today.

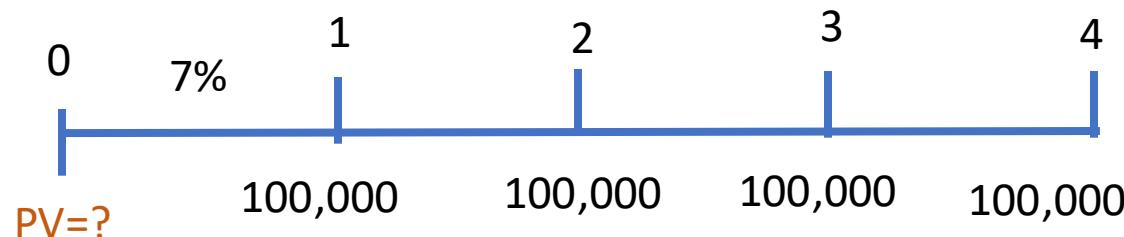
- How large must the deposit be?
- How much will be in the account immediately after you make the first withdrawal? After the last withdrawal?

Given,

Periodic equal payment (PMT) = Rs. 100,000 per year

Number of payments (n) = 4

Interest rate (i) = 7%



$$PVA = PMT \times PVIFA_{i \% n \text{ year}}$$

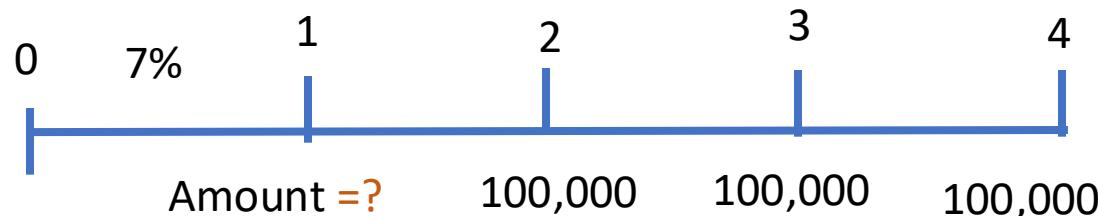
$$PVA = PMT \times PVIFA_{7 \% 4 \text{ year}}$$

$$= \text{Rs. } 100,000 \times 3.3872 = \text{Rs. } 338,720$$

Amount of deposit must be Rs. 338,720.

3.15

b. Amount after 1st withdrawal:



Initial deposit = Rs 338,720

FV in 1 year = Rs 338,720 (1.07) = Rs 362,430.40

Balance after first withdrawal

= Rs 362,430.40 – Rs 100,000 (PMT)

= Rs 262,430.40.

After the last withdrawal bank balance will be nil.

3.16

While Mr. A.K. Kshetree was a student at the Tribhuvan University, he borrowed Rs 12,000 in student loans at an annual interest rate of 9 percent. If Mr. Kshetree repays Rs 1,500 per year, how long, to the nearest year, will it take him to repay the loan?

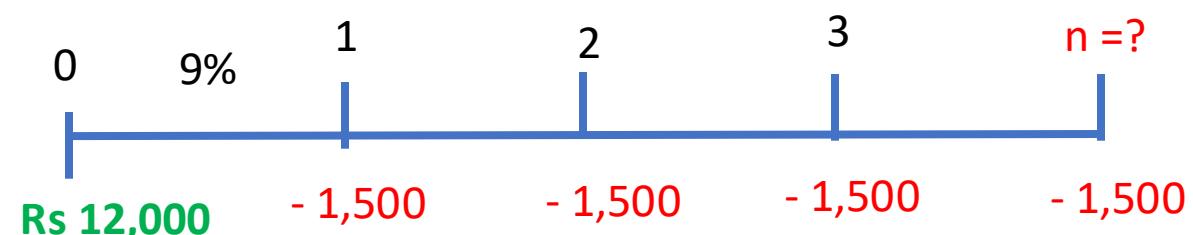
Given,

Present value of an annuity (PVA) = Rs. 12,000

Annual interest rate (i) = 9%

Periodic equal payment (PMT) = Rs. 1,500 per year

Number of years (n) = ?



$$PVA = PMT \times \left[\frac{1 - \frac{1}{(1+i)^n}}{i} \right]$$

$$12,000 = 1,500 \times \left[\frac{1 - \frac{1}{(1 + 0.09)^n}}{0.09} \right]$$

$$\text{or, } \text{Rs } 12,000 = \text{Rs } 1,500 \left[\frac{1 - \frac{1}{(1.09)^n}}{0.09} \right]$$

$$\frac{\text{Rs } 12,000}{\text{Rs } 1,500} \times 0.09 = 1 - \frac{1}{(1.09)^n}$$

$$0.72 = 1 - \frac{1}{(1.09)^n}$$

$$\frac{1}{(1.09)^n} = 0.28$$

$$\frac{1}{0.28} = (1.09)^n$$

$$\text{or, } (1.09)^n = 3.5714$$

Taking log both sides

$$n \log 1.09 = \log 3.5714$$

$$n = \frac{\log 3.5714}{\log 1.09} = 14.77 \text{ or } 15 \text{ years}$$

3.17

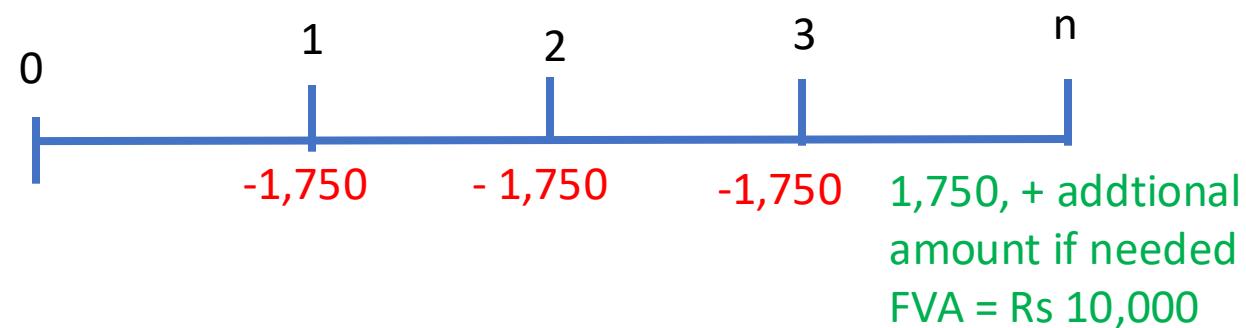
You need to accumulate Rs 10,000. To do so, you plan to make deposits of Rs 1,750 per year, with the first payment being made a year from today, in a bank account which pays 6 percent annual interest. Your last deposit will be more than Rs 1,750 if more is needed to round out to Rs 10,000. How many years will it take you to reach your Rs 10,000 goal, and how large will the last deposit be?

Given,

Future value of an annuity (FVA) = Rs. 10,000
 Periodic equal payment (PMT) = Rs. 1750 per year.
 Annual interest rate (i) = 6%

Last deposit will be more than Rs. 1750 if needed to round out to Rs. 10,000.

Number of periods per year (n) = ?



$$FVA_n = PMT \times \left[\frac{(1+i)^n - 1}{i} \right]$$

$$Rs\ 10,000 = 1,750 \times \left[\frac{(1 + 0.06)^n - 1}{0.06} \right]$$

$$\frac{Rs\ 10,000 \times 0.06}{Rs\ 1,750} = (1.06)^n - 1$$

$$\text{or, } 0.3429 = (1.06)^n - 1$$

$$\text{or, } 1.3429 = (1.06)^n$$

Taking log both sides

$$\log 1.3429 = n \log 1.06$$

$$n = \frac{\log 1.3429}{\log 1.06} = 5.06 \text{ or 5 years}$$

However last deposit must be some what above Rs. 1,750 as actual value of n is slightly more than 5.

Future value of 1st four payments

$$= PMT \times FVIFA\ i, n (1 + i)$$

$$= Rs.\ 1,750 \times FVIFA\ 6\%, 4 (1 + 0.06) \text{ (this is for last payment % 5th)}$$

$$= Rs.\ 1,750 \times 4.3746 \times 1.06$$

$$= Rs.\ 8114.9$$

Hence, amount of last deposit to accumulate Rs. 10,000 should be Rs 1,885.10

i.e. (Rs. 10,000 - 8114.9).

3.18

Find the interest rates, or rates of return, on each of the following:

- a. You borrow Rs 700 and promise to pay back Rs 749 at the end of 1 year.
- b. You borrow Rs 85,000 and promise to pay back Rs 201,229 at the end of 10 year.
- c. You borrow Rs 9,000 and promise to make payments of Rs 2,684.80 per year for 5 years.

Solution

a

Given that,

Present value (PV) = Rs. 700

Number of year (n) = 1 year

Future value (FV) = Rs. 749

Interest rate (i) = ?

We know,

$$FV = PV (1 + i)^n$$

$$\text{or, } \text{Rs. } 749 = \text{Rs. } 700 (1 + i)^1$$

$$\text{or, } 1 + i = 1.07$$

$$\text{or, } i = 0.07$$

Interest rate (i) = 7%

b

Given,

Present value (PV) = Rs. 85,000

Number of year (n) = 10 year

Future value (FV) = Rs. 201,229

Interest rate (i) = ?

We have, $FV = PV (1 + i)^n$

$$\text{or, } \text{Rs. } 201,229 = \text{Rs. } 85,000 (1 + i)^{10}$$

or, $(1 + i)^{10} = 2.3674$

or, $1 + i = (2.3674)^{1/10}$

or, $1 + i = 1.09$

or, $i = 0.09$

Required interest rate (i) = 9%

c. Given,

Present value of annuity (PVA) = Rs. 9,000 Periodic equal payment (PMT) = Rs. 2,684.80

Number of years (n) = 5

year Interest rate (i) = ?

PVA= PMT (PVIFA i% n)

or, $\text{Rs. } 9,000 = \text{Rs. } 2684.80 \times \text{PVIFA } i\%, 5$

or, $\text{PVIFA } i\% 5 = 3.3522 \square$

According to PVIFA table, the value of 3.3522 at 5 periods lies at 15 percent.
Therefore, the required interest rate is 15 percent.

3.21

The following cash flow streams need to be analyzed:

Cash flow stream	End of year				
	1	2	3	4	5
A	Rs 100	Rs 200	Rs 200	Rs 300	Rs 300
B	600	-	-	-	-
C	-	-	-	-	1,200
D	100	100	100	100	100

- a. Calculate the future (terminal) value of each stream at the end of year 5 with a compound annual interest rate of 10 percent.
- b. Compute the present value of each stream if the discount rate is 14 percent.

a. Future value ($FV = ?$)

For cash flow stream A

$$FV = CF_1 (1 + i)^{n-1} + CF_2 (1 + i)^{n-2} + \dots + CF_n (1 + i)^{n-n}$$

$$= \text{Rs } 100 (1.1)^{5-1} + \text{Rs } 200 (1.1)^{5-2} + \text{Rs } 200 (1.1)^{5-3} + \text{Rs } 300 (1.1)^{5-4} + \text{Rs } 300 (1.1)^{5-5}$$

$$= \text{Rs } 146.40 + \text{Rs } 266.20 + \text{Rs } 242.00 + \text{Rs } 330.00 + \text{Rs } 300$$

3.21

For cash flow stream B

$$\begin{aligned} FV &= CF_1 (1 + i)^{n-1} \\ &= \text{Rs } 600 (1.1)^{5-1} \\ &= \text{Rs } 878.40 \end{aligned}$$

For cash flow stream C

$$\begin{aligned} FV &= CF_5 (1 + i)^{n-5} \\ &= \text{Rs } 1,200 (1.1)^{5-5} \\ &= \text{Rs } 1,200 \end{aligned}$$

For cash flow stream D

$$\begin{aligned} FVA_n &= PMT \times \left[\frac{(1+i)^n - 1}{i} \right] \\ &= 100 \times \left[\frac{(1 + 0.10)^5 - 1}{0.10} \right] \\ &= \text{Rs } 100 \times 6.1051 \\ &= \text{Rs } 610.51 \end{aligned}$$

b. Present value (PV) = ?

For cash flow stream A

$$PV = \frac{CF_1}{(1+i)^1} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \dots + \frac{CF_n}{(1+i)^n}$$

$$\begin{aligned} PV &= \frac{100}{(1+0.14)^1} + \frac{200}{(1+0.14)^2} + \frac{200}{(1+0.14)^3} + \frac{300}{(1+0.14)^4} \\ &\quad + \frac{300}{(1+0.14)^5} \end{aligned}$$

$$\begin{aligned} &= \text{Rs } 87.72 + \text{Rs } 153.89 + \text{Rs } 135.00 + \text{Rs } 177.62 \\ &\quad + \text{Rs } 155.81 = \text{Rs } 710.04 \end{aligned}$$

For cash flow stream B

$$PV = \frac{CF_1}{(1+i)^1} = PV = \frac{600}{(1+0.14)^1} = \text{Rs } 526.32$$

For cash flow stream C

$$PV = \frac{CF_5}{(1+i)^5} = \frac{1200}{(1+0.14)^5} = \text{Rs } 623.24$$

years	CFx	CFy	PVIF AT 8%	PV _x	PV _y
1	Rs 100	Rs 300	0.9259	Rs. 92.59	Rs. 277.77
2	400	400	0.8573	342.92	342.92
3	400	400	0.7938	317.52	317.52
4	400	400	0.7350	294.00	294.00
5	300	100	0.6806	204.18	68.06
				1,251.2	Rs 1,300.27

b. Present value of each cash flow stream at 0% interest rate.

Present value of cash flow stream X:

$$= \text{Rs. } 100 \times 1 + \text{Rs. } 400 \times 1 + \text{Rs. } 400 \times 1 + \text{Rs. } 400 \times 1 + \text{Rs. } 300 \times 1 = \text{Rs. } 1,600$$

Present value of cash flow stream Y:

$$= \text{Rs. } 300 \times 1 + \text{Rs. } 400 \times 1 + \text{Rs. } 400 \times 1 + \text{Rs. } 400 \times 1 + \text{Rs. } 100 \times 1 = \text{Rs. } 1,600$$

c. Calculation of future value at 8 percent rate of compounding

years	CFx	CFy	FVIF at 8% = $(1 + i)^{n - t}$	PVX	PVY
1	Rs 100	Rs 300	1.3605	Rs. 136.05	Rs. 408.15
2	400	400	1.2597	503.88	503.88
3	400	400	1.1664	466.56	466.56
4	400	400	1.0800	432.00	432.00
<u>5</u>	300	100	1.0000	300.00	100.00
				Rs 1338.39	Rs 1,910.59

3.27

You plan to make a series of deposits in an interest bearing account. You will deposit Rs 100,000 today, Rs 200,000 at the end of year 2 and Rs 800,000 at the end of year 5. If you withdraw Rs 300,000 at the end of year 3 and Rs 500,000 at the end of year 7.

- How much will you have at the end of eight years if the interest rate is 9 percent?
- What is the present value of this cash flow?

years	CFx	FVIF at 9% = $(1 + i)^{n-t}$	FV
0	Rs 100,000	$(1+0.09)^8 = 1.9926$	Rs 199,260
2	200,000	$(1+0.09)^6 = 1.6771$	335,420
3	-300,000	$(1+0.09)^5 = 1.5386$	-461,580
5	800,000	$(1+0.09)^3 = 1.2950$	1,036,000
7	500,000	$(1+0.09)^1 = 1.0900$	-545,000
			Rs 564,100

- Calculation of present value of given cash flows at 9 percent discount rate

$$PV = \frac{FV_8}{(1+i)^8} = \frac{\text{Rs } 564,100}{(1+0.09)^8} = \text{Rs } 283,103$$

Find the present values of Rs 500 due in the future under each of the following conditions:

- a. 12 percent simple interest rate, compounded annually, discounted back 1 year.
- b. 12 percent simple rate, semiannual compounding, discounted back 5 years.
- c. 12 percent simple rate, quarterly compounding, discounted back 5 years.
- d. 12 percent simple rate, monthly compounding, discounted back 1 year.

Given,

Future value (FV) = Rs. 500

Interest rate (i) = 12%, compounded annually

Present value (PV) = ?

We know,

$$PV = \frac{FV}{(1+i)^n} = \frac{\text{Rs } 500}{(1+0.12)} = \text{Rs. } 446.43$$

b.

Future value (FV) = Rs. 500

Interest rate (i)= 12%, semiannual compounding
number of compounding (m) =2

Number of year (n) = 5 years

Present value (PV) = ?

we have,

$$PV = \frac{FV_n}{(1+\frac{i}{m})^{n \times m}} = \frac{\text{Rs. } 500}{(1+\frac{0.12}{2})^{5 \times 2}} = \text{Rs. } 279.20$$

do it similarly

just change the m.

3.31

You just started your first job, and you want to buy a car within 3 years. You are currently saving for the down payment. You plan to save Rs 50,000 the first year. You also anticipate the amount you save each year will rise by 10 percent a year as your salary increases over time.

Interest rates are assumed to be 7 percent, and all saving occurs at year end. How much money will you have for a down payment in 3 years?

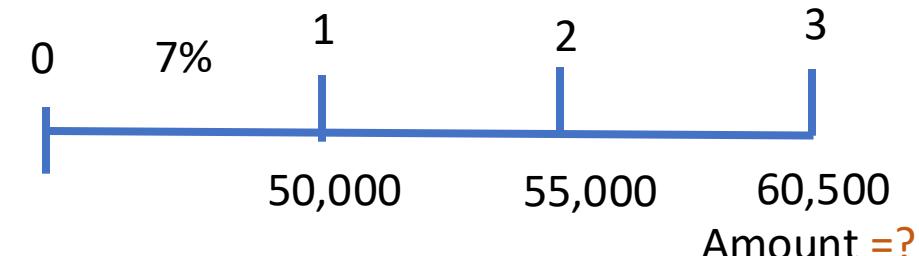
How much money will you have for a down payment in 3 years if interests were compounded quarterly?

Given information

first year installment = Rs 50,000

second year PMT = Rs 55,000 ($50,000 + 10\% \text{ of } 50,000$)

Third year PMT = $60,500$ ($55,000 + 10\% \text{ of } 55,000$)



year	Cash Flow	FVIF at 7% = $(1 + i)^{n - t}$	FV
1	50,000	$(1.07)^2 = 1.1449$	57,245
2	55,000	$(1.07)^1 = 1.0700$	58,850
3	60,500	$(1.07)^0 = 1.0000$	60,500
			Rs 176,595

You would have Rs 176,595 available for down payment of car in 3 years.

if interest were compounded quarterly, the appropriate discount rate would be:

$$\text{EAR} = (1 + \text{periodic rate})^m - 1$$
$$= [1 + (0.07/4)]^4 - 1 = 7.19\%$$

Therefore, the future value of given cash flow stream is:

$$\text{FV} = \text{CF}_1 (1 + i)^{n-1} + \text{CF}_2 (1 + i)^{n-2} + \text{CF}_n (1 + i)^{n-n}$$
$$= \text{Rs } 50,000 (1.0719)^{3-1} + \text{Rs } 55,000 (1.0719)^{3-2}$$
$$+ \text{Rs } 60,500 (1.0719)^{3-3}$$
$$= \text{Rs } 50,000 \times 1.1490 + \text{Rs } 55,000 \times 1.0719 + \text{Rs } 60,500 \times 1$$
$$= \text{Rs } 176,904.50$$

If interest rate were compounded quarterly, you would have Rs 176,904.50 available for down payment in 3 years.

3.31

You just started your first job, and you want to buy a car within 3 years. You are currently saving for the down payment. You plan to save Rs 50,000 the first year. You also anticipate the amount you save each year will rise by 10 percent a year as your salary increases over time.

Interest rates are assumed to be 7 percent, and all saving occurs at year end. How much money will you have for a down payment in 3 years?

How much money will you have for a down payment in 3 years if interests were compounded quarterly?

Given information

first year installment = Rs 50,000

second year PMT = Rs 55,000 (50,000 + 10% of 50,000)

Third year PMT = 60,500 (55,000+ 10% of 55,000)

3.34

Find the effective annual rate (EAR) in each of the following cases:

Annual Percentage rate (APR)	Number of times compounded	Effective rate (EAR)
12%	Quarterly	?
8	Monthly	?
7	Daily	?
16	Infinite	?

Effective rate for APR 12 percent compounded quarterly:

$$\begin{aligned}\text{EAR} &= [1 + (\text{APR}/4)]^4 - 1 \\ &= [1 + (0.12/4)]^4 - 1 = 12.55\%\end{aligned}$$

Effective rate for APR 8 percent compounded monthly:

$$\begin{aligned}\text{EAR} &= [1 + (\text{APR}/12)]^{12} - 1 \\ &= [1 + (0.08/12)]^{12} - 1 = 8.30\%\end{aligned}$$

Effective rate for APR 7 percent compounded daily:

$$\begin{aligned}\text{EAR} &= [1 + (\text{APR}/365)]^{365} - 1 \\ &= [1 + (0.07/365)]^{365} - 1 = 7.25\%\end{aligned}$$

Effective rate for APR 16 percent compounded infinitely (continuous compounding):

$$\text{EAR} = e^{\text{APR}} - 1 = e^{0.16} - 1 = 17.35\%$$

3.35

Find the annual percentage rate (APR), or stated rate, in each of the following cases:

Annual Percentage rate (APR)	Number of times compounded	Effective rate (EAR)
?	Quarterly	7.2%
?	Monthly	9.1
?	Daily	18.5
?	Infinite	28.3

To solve for APR from the given EAR, we restate the EAR formula as follows

$$\text{APR} = [(1 + \text{EAR})^{1/m} - 1] m$$

APR for EAR 7.2 percent compounded quarterly:

$$\begin{aligned}\text{APR} &= [(1 + \text{EAR})^{1/m} - 1] m \\ &= [(1 + 0.072)^{1/4} - 1] 4 \\ &= 7.01\%\end{aligned}$$

APR for EAR 9.1 percent compounded monthly:

$$\begin{aligned}\text{APR} &= [(1 + \text{EAR})^{1/m} - 1] m \\ &= [(1 + 0.091)^{1/12} - 1] 12 = 8.74\%\end{aligned}$$

APR for EAR 18.5 percent compounded daily:

$$\begin{aligned}\text{APR} &= [(1 + \text{EAR})^{1/m} - 1] m \\ &= [(1 + 0.185)^{1/365} - 1] 365 \\ &= 16.98\%\end{aligned}$$

APR for EAR 28.3 percent compounded infinitely (continuous compounding):

$$EAR = e^{APR} - 1$$

$$0.283 = e^{APR} - 1$$

$$e^{APR} = 1.283$$

$$(2.71828)^{APR} = 1.283$$

Taking log into both sides

$$APR \log 2.71828 = \log 1.283$$

$$APR 0.4343 = 0.1082$$

$$APR = 0.1082 / 0.4343 = 24.91\%$$

3.36

You have recently finished your MBA at School of Management, Tribhuvan University (SOMTU). Now you must purchase a new Suzuki Auto. The car costs Rs 2,100,000. Global IME Bank quotes an interest rate of 15 percent APR for a 72-month loan with 10 percent down payment. You plan to trade the car in for a new one in two years. What will your monthly payment be? What is the effective interest rate on the loan? What will the loan balance be when you trade the car in?

Solving for monthly payment:

The car costs Rs 2,100,000, but we have to make 10 percent of it in down payment.

Thus our loan amount is 90 percent of the costs of car.

$$\text{Loan} = 0.90 \times \text{Rs } 2,100,000 = \text{Rs } 1,890,000$$

Again we know that the loan is to be repaid in 72 monthly installments.

Therefore, the monthly rate of interest applicable is $15\% / 12 = 1.25\%$

Now, the monthly payment on the loan is given by:

$$PVA = PMT \times PVIFA i \% n \text{ year}$$

$$\text{Rs } 1,890,000 = PMT \times PVIFA 1.25 \% 72 \text{ month}$$

$$PMT = \frac{\text{Rs } 1,890,000}{PVIFA 1.25 \% 72 \text{ month}} = PMT = \frac{\text{Rs } 1,890,000}{47.2925} =$$

$$\left[\frac{1 - \frac{1}{(1+0.0125)^{72}}}{0.0125} = 47.2925 \right]$$

Rs 39,964.05

Solving for effective interest rate:

$$EAR = (1 + \text{Monthly rate})^{12} - 1$$

$$= (1.0125)^{12} - 1 = 16.08\%$$

Solving for Loan balance in two years:

In two years, when we trade in car for new one, we would have paid 24 monthly installments out of 72.

Thus we will have only $72 - 24 = 48$ more installments to pay.

Thus loan balance in two years is the present value of 48 installment payments.

$$PVA = PMT \times (PVIFA_{1.25\%, 48})$$

$$= \text{Rs } 39,964.05 \times 35.9315 = \text{Rs } 1,435,968.26$$

Where,

$PVIFA_{1.25\%, 48} = [1 - (1/1.0125)^{48}] / 0.0125 = 35.9315$ Thus, we will Rs 1,435,968.26 in loan balance to pay after 2 years.

3.38

Mr. Dhakal invested Rs 150,000 eighteen months ago. Currently, the investment is worth Rs 168,925. Mr. Dhakal knows the investment has paid interest every three months, but he does not know what the yield on his investment is. Help Mr. Dhakal. Compute both the annual percentage rate (APR) and the effective annual rate of interest.

Number of periods (n) = 18 month i.e. 1.5 yrs.

Present value (PV) = Rs. 150,000

Future value (FV) = Rs. 168,925

If interest is paid every three months i.e. number of compounding period in a year (m) = 4

Annual percentage rate (APR) = ?

Effective annual rate of interest (EAR) = ?

$$FV = PV \left(1 + \frac{I_{\text{simple}}}{m}\right)^{n \times m}$$

$$\text{Rs. } 168925 = \text{Rs. } 150,000 \left(1 + \frac{I_{\text{simple}}}{4}\right)^{1.5 \times 4}$$

$$\left(1 + \frac{I_{\text{simple}}}{4}\right)^{1.5 \times 4} = 1.1262$$

$$\left(1 + \frac{I_{\text{simple}}}{4}\right) = (1.1262)^{1/6}$$

$$\left(1 + \frac{I_{\text{simple}}}{4}\right) = 1.02$$

$$I_{\text{simple}} = 0.02 \times 4$$

$$i_{\text{simple}} = 0.08 = 8\%$$

$$\text{Annual percentage rate (APR)} = 8\%$$

Again, Effective annual rate (EAR) =

$$\left(1 + \frac{I_{\text{simple}}}{m}\right)^m - 1$$

$$\left(1 + \frac{0.08}{4}\right)^4 - 1 = 0.0824 = 8.24\%$$

Hence, the annual percentage rate on the investment is 8 percent and the effective annual rate is 8.24 percent.

3.40

The Himalayan Bank pays 7 percent interest, compounded annually, on time deposits. The NB bank pays 6.5 percent interest compounded quarterly.

- a. Based on effective interest rates, in which bank would you prefer to deposit your money?
- b. Could your choice of banks be influenced by the fact that you might want to withdraw your funds during the year as opposed to at the end of the year? In answering this question, assume that funds must be left on deposit during the entire compounding period in order for you to receive any interest.

Here,

Bank 'A' 's interest rate (i) = 8%

Bank 'B' 's quoted rate (i) = ?

Now, We have,

$$\text{Effective annual rate (EAR)} = \left(1 + \frac{i_{\text{simple}}}{m}\right)^m - 1$$

If Bank 'A' pays 8% interest, compounded quarterly Then,

$$\left(1 + \frac{0.08}{4}\right)^4 - 1 = 0.0824 = 8.24\%$$

Then, Bank B must have the same effective annual rate i.e. 8.24%

3.40

$$\text{EAR of bank 'B'} = \left(1 + \frac{i}{12}\right)^{12} - 1$$

$$0.0824 = \left(1 + \frac{i}{12}\right)^{12} - 1 \text{ (B's interest pay monthly)}$$

$$1.0824 = \left(1 + \frac{i}{12}\right)^{12}$$

$$(1.0824)^{1/12} = \left(1 + \frac{i}{12}\right)$$

$$i = 7.92\%$$

Hence, Bank B must quote 7.92 percent simple rate.

3.41

You have just joined the investment banking firm of Security Inc. They have offered you two different salary arrangements. You can have Rs 300,000 per year for next two years or Rs 200,000 at the end of the second year, along with a Rs 300,000 signing bonus today. If the interest rate is 12 percent compounded quarterly, which option do you prefer?

First Alternative Payment

(PMT) = Rs 30,000

Time Period (n) = 2 years

Interest rate (i) = 12%

First, we calculate the effective annual rate as follows: where, m= 4 times

$$EAR = (1 + 0.12/4)^4 - 1 = 0.1255 \text{ or } 12.55\%$$

The present value of first alternative if it compounded quarterly

$$PV = \frac{PMT_1}{(1 + EAR)^1} + \frac{PMT_2}{(1 + EAR)^2}$$
$$PV = \frac{300000}{(1 + 0.1255)^1} + \frac{\text{Rs } 300,000}{(1 + 0.1255)^2} = \text{Rs } 503,374$$

Second alternative

Payment at the year 2 (CF2) = Rs 200,000

Initial Bonus (CF0) = Rs 300,000

Time Period (n) = 2 years

Interest rate (i) = 12%

The present value of alternatively if compounded quarterly

$$PV = CF_0 + \frac{CF_2}{(1+EAR)^2}$$

$$PV = \text{Rs } 300,000 + \frac{\text{Rs } 200,000}{(1 + 0.1255)^2}$$
$$= \text{Rs } 457,884$$

Since the first alternatives is a greater than second so first alternative is accepted

2.43

Madhyamanchal Inc. just borrowed Rs 2,500,000. Loan is to be repaid in equal installments at the end of each of the next 5 years, and the interest rate is 10 percent.

- a. Set up an amortization schedule for the loan.
- b. How large must each annual payment be if the loan is for Rs 5,000,000? Assume that the interest rate remains at 10 percent and the loan is paid off over 5 years.
- c. How large must each payment be if the loan is for Rs 5,000,000, the interest rate is 10 percent, and the loan is paid off in equal installments at the end of each of the next 10 years? This loan is for the same amount as the loan in part b, but the payments are spread out over twice as many periods.

Why are these payments not half as large as the payments on the loan in part b?

a. Given,

Interest rate (i) = 10%

Amortized loan (PVA)= Rs. 2,500,000

Number of periods (n) = 5 years

$$PVA = PMT \times PVIFA i \% n \text{ year}$$

$$Rs 2,500,000 = PMT \times PVIFA 10 \% 5 \text{ year}$$

$$PMT = \frac{Rs 2,500,000}{PVIFA 10 \% 5 \text{ year}} = \frac{Rs 2,500,000}{3.7908} = \text{Rs } 659,491.40$$

Year	Beg Amount	Installment	Interest 4= 2*0.10	Principal Repayment 5 = 3-4	Balance 6= 2-5
1	2	3			
1					
2					
3					
4					
5					

The last payment must be larger to force the ending balance to zero.

b. Here,

b. Here,

Present value (PVA) = Rs. 5,000,000

Interest rate (i) = 10%

Number of periods (n) = 5 years

Annual payment (PMT) = ?

PVA = PMT × PVIFA i % n year

Rs 5,000,000 = PMT × PVIFA 10 % 5 year

$$PMT = \frac{\text{Rs } 5,000,000}{\text{PVIFA } 10 \% \text{ 5 year}} = \frac{\text{Rs } 5,000,000}{3.7908}$$

c. If the loan size is double then payment also double.

Here,

Present value (PV) = Rs. 5,000,000

Interest rate (i) = 10%

Number of periods (n) = 10 yrs.

Annual payment (PMT) = ?

a. Amount of annual Payment

$$PVA = PMT \times PVIFA i \% n \text{ year}$$

$$\text{Rs } 1,500,000 = PMT \times PVIFA 12 \% 4 \text{ year}$$

$$PMT = \frac{\text{Rs } 1500,000}{PVIFA 12 \% 4 \text{ year}} = \frac{\text{Rs } 1,500,000}{3.0373} = \text{Rs } 493,859$$

b. Amortization schedule

Year	Beg Amount	Installment	Interest 4= 2*0.12	Principal Repayment 5 = 3-4	Balance 6= 2-5
1					
1					
2					
3					
4					

c. Percentage principal in year 2 = $\frac{\text{Repayment of principal in year 2}}{\text{Payment}}$

$$= \frac{\text{Rs } 351,522.84}{\text{Rs } 493,859.68} = 0.7118 \text{ or } 71.18\%$$

d. Percentage of interest payment in year 4 = $\frac{\text{Pyament of interest in year 4}}{\text{Payment}}$

$$\text{Percentage of interest payment in year 4} = \frac{\text{Rs } 52947.78}{\text{Rs } 493859.68} = 10.72\%$$

3.45

A 15-year security has a price of Rs 340.4689. The security pays Rs 50 at the end of each of next 5 years, and then it pays a different cash flow amount at the end of each of the following 10 years. Interest rates are 9 percent. What is the annual cash flow amount between 6 and 15 years?

Calculation of annual cash flow amount between 6 and 15 years.

$$PVAn = PMT_1 \times (PVIFA \ 9\%, \ 5\text{years}) + PMT_2 \times (PVIFA \ 9\%, \ 6 \text{ to } 15 \text{ years})$$

$$Rs \ 340.4689 = Rs \ 50 \times 3.8897 + PMT_2 \times 4.171 \quad 145.9839 = PMT_2 \times 4.171$$

$$PMT_2 = 145.9839 / 4.171 = Rs \ 35$$

3.46

Assume that it is now January 1, 2010. On January 1, 2011, you will deposit Rs 1000 into a savings account that pays 8 percent.

- a. If the bank compounded interest annually, how much will you have in your account on January 1, 2014?
- b. What would your January 1, 2014, balance be if the bank used quarterly compounding rather than annual compounding?
- c. Suppose you deposited the Rs 1000 in 4 payments of Rs 250 each on January 1 of 2011, 2012, 2013, and 2014. How much would you have in your account on January 1, 2014, based on 8 percent annual compounding?
- d. Suppose you deposited 4 equal installments in your account on January 1 of 2011, 2012, 2013, and 2014. Assuming an 8 percent interest rate, how large would each of your payments have to be for you to obtain the same ending balance as you calculated in part a?

a. Here,

Present value (PV) = Rs. 1000

Interest rate = 8%

Number of periods (n) = 3 years

Future value (FV) = ?

We have,

$$FV = PV (1 + i)n$$

$$\text{or, } FV = \text{Rs. } 1,000 (1 + 0.08)^3$$

$$\text{or, } FV = \text{Rs. } 1,000 \times 1.2597$$

$$\text{or, } FV = \text{Rs. } 1,259.70$$

b. Here,

Present value (PV) = Rs. 1,000

Interest rate (i) = 8% (quarterly compounding)

Number of periods (n) = 3

Future value (FV) = ?

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

$$FV = Rs\ 1,000 \left(1 + \frac{0.08}{4}\right)^{3 \times 4}$$

or, $FV = Rs.\ 1,000 \times 1.282$

or, $FV = Rs.\ 1,268.20$

c. Here,

Payment period (n) = 4

Periodic payment (PMT) = Rs. 250

Interest rate (i) = 8%

Future value (FV) = ?

$$FVA_n = PMT \times \left[\frac{(1 + i)^n - 1}{i} \right]$$

$$FVA_n = Rs.\ 250 \times \left[\frac{(1 + 0.08)^4 - 1}{0.08} \right] = 1,126.53$$

d. Here,

Interest rate (i) = 8%

Future value (FV) = Rs. 1,259.70

Number of periods (n) = 4 Periodic payment
periodic payment (PMT) = ?

$$FVA_n = PMT \times \left[\frac{(1 + i)^n - 1}{i} \right] =$$

$$Rs.\ 1,259.70 = PMT \times \left[\frac{(1 + 0.08)^4 - 1}{0.08} \right]$$

$Rs\ 1,259.70 = PMT \times 4.5061$

$PMT = Rs.\ 279.55$

3.47

Krishna Nepal is 63 years old and recently retired. He wishes to provide retirement income for himself and is considering an annuity contract with the National Life Insurance Corporation. Such a contract pays him an equal rupee amount each year that he lives. For this cash flow stream, he must put up a specific amount of money at the beginning. According to actuary tables, his life expectancy is 15 years, and that is the duration on which the insurance company bases its calculations regardless of how long he actually lives.

- a. If the Insurance Company uses a compound annual interest rate of 5 percent in its calculations, what must Mr. Nepal pay at the outset for an annuity to provide him with Rs 10,000 per year? (Assume that the expected annual payments are at the end of each of the 15 years)
- b. What would be the purchase price if the compound annual interest rate is 10 percent?
- c. Mr. Nepal had Rs 30,000 to put into an annuity. How much would he receive each year if the insurance company uses a 5 percent compound annual interest rate in its calculation? Assume payments for 15 years only.

Present value of ordinary annuity

$$\begin{aligned} PVA &= PMT \times (PVIFA_i, n) \\ &= Rs10,000 \times (PVIFA 5\%, 15) \\ &= Rs10,000 \times 10.3797 \\ &= Rs103,797 \end{aligned}$$

b. Present value of ordinary annuity if compound annual interest rises to 10 percent $PVA = PMT \times (PVIFA_i, n)$

$$\begin{aligned} &= Rs 10,000 \times (PVIFA10\%, 15) \\ &= Rs 10,000 \times 7.6061 = Rs 76,061 \end{aligned}$$

c. If Mr. Nepal has Rs 30,000 to put into the annuity, the payment he receives every year through 15 years is given by:

$$\begin{aligned} PVA &= PMT \times (PVIFA_i, n) \\ Rs 30,000 &= PMT \times (PVIFA_{5\%, 15}) \\ Rs 30,000 &= PMT \times 10.3797 \\ PMT &= 2890.26 \end{aligned}$$

3.49

Mrs. Dhakal, your late aunty, entitled you to receive Rs 150,000 at the **end of every 2 years for the next two decades**. The first cash flow is two years from now. At 10 percent compound annual interest rate, what is the present value of this cash flow pattern?

There are total 10 periods of 2 years and the 2 years rate of interest at an annual rate of 10 percent compounded for every two years will be equivalent to

$$(1+0.10)^2 - 1 = 0.21 \text{ or } 21 \text{ percent.}$$

Therefore, the present value of this cash flow pattern is given by:

$$PVAn = PMT \times (PVIFA 21\%, 10 \text{ periods})$$

$$= Rs 150,000 \times 4.0541$$

$$= Rs 608,115.$$

- **Financial assets** are non-physical assets that represent a claim to future cash flows or value. They are:
 - **Non-physical:** They have no tangible form, e.g., stocks, bonds, and cash.
 - **Liquid:** They can be quickly converted into cash with minimal loss of value (e.g., stocks traded on the market).
 - **Non-productive:** They don't have inherent ability to produce goods or services (unlike machinery or real estate).
 - **Easily transferable:** Ownership can be transferred quickly, often electronically.
 - **Assets and liabilities:** For the holder, they are assets; for the issuer, they are liabilities (e.g., bonds are assets for investors but liabilities for issuers).

Bond

- A bond is a long-term security or promissory note that promises to pay interest and principal to holders of the bond.
- Bond issuers typically pay a fixed interest payment, known as the coupon, on specific dates each year until the bond matures.
- The borrower pays back the bondholder the bond's face value or par value at maturity, which is usually set at Rs 1,000 per bond.
- An indenture is a legal document that contains the terms and conditions of bond issues and provides the specific terms of the loan agreement.
- The indenture includes a description of the bonds, rights of bondholders, rights of the issuing firm, responsibilities of the trustee, etc.
- A trustee, usually a commercial bank or finance company, is appointed by the bond issuer when the bond is issued.
- The main function of the trustee is to represent and protect the collective interest of the bondholders.

Characteristics of Bond

Face value or par value:

This is the amount that the issuer of the bond promises to pay the bondholder at maturity.

Coupon rate:

This is the interest rate that the issuer promises to pay the bondholder, usually expressed as a percentage of the face value.

Maturity date:

This is the date when the issuer of the bond must repay the face value of the bond to the bondholder.

Issuer credit rating:

This is a measure of the issuer's ability to pay back the bond. It is assigned by credit rating agencies such as Standard & Poor's, Moody's, or Fitch.



Characteristics of Bond

Call provisions:

Some bonds give the issuer the right to call or redeem the bond before maturity. This can be beneficial to the issuer if interest rates have fallen since the bond was issued, but it can be detrimental to the bondholder.

Convertibility:

Some bonds can be converted into shares of stock in the issuing company. This can be beneficial to the bondholder if the company's stock price increases, but it can be detrimental if the stock price falls.

Market price:

Bonds can be bought and sold on the open market, and their prices can fluctuate based on changes in interest rates, credit ratings, and other factors.



Valuation of Bonds

Value of bond is the present value of future cash flows. So, on the basis of cash flows, we deal valuation of three types of bonds namely

1. **perpetual bonds,**
2. **Zero coupon bonds**
3. **Coupon bonds with finite maturity.**

1. Perpetual bonds,

A bond, which is issued without a finite maturity period is called perpetual bond. A perpetual bond, or perpetuity promises to pay interest indefinitely.

Valuation of perpetual bond

$$\text{Value } (V_0) = \frac{I}{K_d}$$

I = Interest K_d = cost of debt

Valuation of Bonds

Zero coupon Bond

A bond without coupon interest and sold at substantial discount.

Value of bond calculation for zero coupon bond.

$$V_0 = \frac{M}{(1 + K_d))^n}$$

where,

M = maturity value of bond

K_d = Cost of debt

V_0 = value of debt

n = Number of period

Valuation of Bonds

$$V_0 = \frac{I_1}{(1+K_d)^1} + \frac{I_2}{(1+K_d)^2} + \frac{I_n}{(1+K_d)^n} + \frac{M}{(1+K_d)^n}$$

or

$$V_0 = I \times \left[\frac{1 - \frac{1}{(1+K_d)^n}}{K_d} \right] + \frac{M}{(1+K_d)^n}$$

V_0 = intrinsic value of bond

I_1 = Coupon interest rate i.e. (Face value \times coupon rate)

K_d = appropriate discount rate

n = remaining time to maturity.

M = maturity value of bond.

TABLE METHOD

$$V_0 = I \times PVIFA K_d \% n \text{ year} + M \times PVIF K_d \% n \text{ year}$$

Bond valuation with semiannual coupon

$$V_0 = I/2 \times PVIFA K_d /2 \% 2n \text{ year} + M \times PVIF K_d /2 \% 2n \text{ year}$$

$$V_0 = I/2 \times \left[\frac{1 - \frac{1}{(1+\frac{K_d}{2})^{2*n}}}{\frac{K_d}{2}} \right] + \frac{M}{(1+\frac{K_d}{2})^{2*n}}$$

Rate of return is total return (coupon interest plus capital gains or loss) divided by investment. It is also called holding period return.

Rate of Return Calculation on Bond

$$\text{Rate of return} = \frac{\text{Coupon payment} + \text{price change}}{\text{investment}}$$

$$\text{Current yield} = \frac{\text{Coupon interest}}{\text{current market price of bond}}$$

$$\text{Capital gain yield} = YTM - \text{Current yield}$$

Yield to Maturity

YTM of bond represents the rate of return investors earn if they buy the bond at a specific price and hold it until maturity.

calculation of approximate YTM

$$\text{Approximate YTM} = \frac{I + \frac{M - V_0}{n}}{\frac{M + 2 \times V_0}{3}}$$

M= maturity value of bond I = coupon interest amount n = number of period

Actual YTM

$$YTM = LR + \frac{TPV_{LR} - V_0}{TPV_{LR} - TPV_{HR}} (HR - LR)$$

LR = lower rate

TPV_{LR} = total present value at lower rate

TPV_{HR} = total present value at higher rate

V_0 = price of bond

Yield to Call (YTC)

YTC of bond represents the rate of return investors earn if they buy the bond at a specific price and received call price at call period.

calculation of YTC

$$YTC = \frac{\frac{I + \frac{P_C - \text{Purchase Price}}{nc}}{P_C + 2 \times \text{Purchase Price}}}{3}$$

P_C = call price

I = coupon interest amount

nc = Call period.

Bond valuation when there is call.

$$V_0 = I \times PVIFA y \% nc \text{ year} + \text{Call price} \times PVIF y \% nc \text{ year}$$

Problem

Compute value of the following bonds.

- a. Rs 1,000 par value 7 percent coupon, perpetual bond if investor requires a 9 percent annual rate of return.
- b. 10-year Rs 1,000, zero coupon bonds, the required return on the bonds is 12 percent.
- c. Rs 1,000 par value bond with 8 years maturity and have a coupon interest rate of 7.5 percent. Investor desires a 12 percent yield to maturity.
- b. Par value of zero coupon bond
(M) = Rs 1,000 Maturity period
(n) = 10 years
Required rate of return (kd) = 12%
Value of bond (V_d) = ?

$$V_0 = \frac{I}{kd} = \frac{Rs\ 70}{0.09} = Rs\ 777.78$$

b. Par value of zero coupon bond

(M) = Rs 1,000 Maturity period
(n) = 10 years

Required rate of return (kd) = 12%
Value of bond (V_d) = ?

$$V_0 = \frac{M}{(1 + K_d)^n}$$

Given,

- a. Par value of perpetual bond Rs 1,000
Coupon rate = 7%
Investor's desired rate of return (k_d) = 9%
Value of bond (V_0) = ?

$$V_0 = \frac{Rs\ 1,000}{(1+0.12)^{10}} = Rs\ 321.97$$

The value of bond is Rs 321.97.

Problems

c. Par value (M) = Rs 1,000

Maturity period(n) = 8 years

Coupon interest rate = 7.5%

Yield to maturity (kd) = 12%

Value of bond (V_0) = ?

Now,

$$(V_0) = I \times PVIFA_{kd}, n \text{ years} + M \times PVIF_{kd}, n \text{ years}$$

$$= \text{Rs } 75 \times PVIFA 12\%, 8 \text{ years} + \text{Rs } 1,000 \times PVIF 12\%, 8 \text{ year}$$

$$= \text{Rs } 75 \times 4.9676 + \text{Rs } 1,000 \times 0.4039$$

$$= \text{Rs } 372.57 + \text{Rs } 403.90$$

$$= \text{Rs } 776.47$$

5.2

Sagarmatha Construction Company has outstanding a Rs 1,000 face value bond with an 8 percent coupon rate and 5 years remaining until final maturity. Interest payments are made semiannually. What value should you place on this bond if your nominal annual required rate of return is (i) 6 percent? (ii) 8 percent (iii) 10 percent?

Given,

Face value of bond (M) = Rs 1,000

Coupon rate = 8%, paid semiannually

Remaining maturity period (n) = 5 years

Required rate of return (kd) (i) 6%, (ii) 8%,
(iii) 10% Value of bond (V_0) = ?

5.3

The Dhaulagiri Company has two bond issues outstanding. Both bonds pay Rs 80 annual interest plus Rs 1,000 at maturity. Bond A has a maturity of 15 years and Bond B a maturity of 1 year.

- What will be the value of each of these bonds when the going rate of interest is (i) 4 percent, (ii) 8 percent, and (iii) 12 percent? Assume that there is only one more interest payment to be made on Bond B.
- Why does the longer-term (15-year) bond fluctuate more when interest rates change than does the shorter-term bond (1-year)?

Given,

Bond A Bond B

Maturity value (M) = Rs 1,000

Annual interest (I) = Rs 80

Maturity period Bond A (n) = 15 yrs.

Maturity period Bond B (n) = 1 year

Value of bond of A (V_0) = ?

Value of bond of (V_0)B = ?

Market rate of interest (interest (k_d) is (i) 4% (ii) 8% (iii) 12%

Value of Bond A when $K_d = 4\%$

$$(V_0) = I \times PVIFA_{K_d \% n \text{ year}} + M \times PVIF_{K_d \% n \text{ year}}$$

$$\begin{aligned} & \text{Rs } 80 \times PVIFA_{4 \% 15 \text{ year}} + \text{Rs } 1,000 \\ & \quad \times PVIF_{4 \% 15 \text{ year}} \end{aligned}$$

$$= \text{Rs } 80 \times 11.1181 + \text{Rs } 1,000 \times 0.5553$$

$$= \text{Rs } 889.45 + \text{Rs } 555.30 = \text{Rs } 1444.75$$

The value of bond A at 4% market interest rate is Rs 1444.75.

Value of Bond A when Kd = 8%

$$(V_0) = I \times PVIFA_{K_d \% \text{ n year}} + M \times PVIF_{K_d \% \text{ n year}}$$

$$Rs\ 80 \times PVIFA_{8 \% \text{ 15 year}} + Rs\ 1,000 \times PVIF_{8 \% \text{ 15 year}}$$

= when there is equal in coupon interest and market interest rate the value of bond is always equal to Rs 1000.

Value of Bond A when Kd = 12%

$$(V_0) = I \times PVIFA_{K_d \% \text{ n year}} + M \times PVIF_{K_d \% \text{ n year}}$$

$$(V_0) = I \times PVIFA_{12 \% \text{ 15 year}} + M \times PVIF_{12 \% \text{ 15 year}}$$

$$(V_0) = Rs\ 727.57$$

Market rate of interest (interest (k_d) is (i) 4% (ii) 8% (iii) 12%

Value of Bond B when $K_d = 4\%$

Maturity period Bond B (n) = 1 year

$$(V_0) = I \times PVIFA_{K_d \% \text{ n year}} + M \times PVIF_{K_d \% \text{ n year}}$$

$$Rs\ 80 \times PVIFA_{4 \% \text{ 1 year}} + Rs\ 1,000 \times PVIF_{4 \% \text{ 1 year}}$$

$$(V_0) = 1038.46$$

Value of Bond B when $K_d = 10\%$

when there is equal in coupon interest and market interest rate the value of bond is always equal to Rs 1000

$$(V_0) = I \times PVIFA_{12 \% \text{ 1 year}} + M \times PVIF_{12 \% \text{ 1 year}}$$

$$(V_0) = Rs\ 964.29$$

The longer the term to maturity, the more a bond's value will fluctuate in response to interest rate changes, because there are more future cash flows that are discounted at the new interest rate.

5.4 Suppose Tata Automobile Limited sold an issue of bonds with a 12-year maturity, a Rs 1,000 par value, a 10 percent coupon rate, and semiannual interest payments.

- a. Two years after the bonds were issued, the going rate of interest on bonds such as these fell to 8 percent. At what price would the bonds sell?
- b. Suppose that, 2 years after the initial offering, the going interest rate had risen to 12 percent. At what price would the bonds sell?
- c. Suppose that the conditions in part (a) existed that is, interest rates fall to 8 percent 2 years after the issue date.

Suppose further that the interest rate remained at 8 percent for the next 10 years. Describe what would happen to the price of the Tata Automobile Company bonds over time?

Given,

Maturity value (M) = Rs 1,000

Coupon rate = 10% Semi-annual interest payments.

- a. Remaining time to maturity (n) = 12 - 2 = 10 years

$$V_0 = \frac{I}{2} \times PVIFA_{\frac{K_d}{2}\% \text{ 2n year}} + M \times PVIF_{\frac{K_d}{2}\% \text{ 2n year}}$$

$$V_0 = \frac{100}{2} \times PVIFA_{\frac{8}{2}\% \text{ 20 year}} + M \times PVIF_{\frac{8}{2}\% \text{ 20 year}}$$

$$= Rs 50 \times 13.5903 + Rs 456.39 = Rs 1,135.90$$

similarly do the part B

- c. The price of bond would decline as it approaches to maturity since coupon rate is greater than the YTM. Ultimately the bond's value at its maturity reaches to Rs 1,000.

5.6

Yeti Trekking Company has outstanding Rs 10 million (par value) bonds that pay an annual coupon rate of 14 percent. Par value of each bond is Rs 1,000.

The bonds are scheduled to mature in 15 years. Because of Yeti's increased risk, investors now require a 12 percent rate of return on bonds of similar quality with 15 years remaining until maturity.

The bonds are callable at 110 percent of par at the end of 8 years.

- a. What price would the bonds sell for assuming investors do not expect them to be called?
- b. What price would the bonds sell for assuming investors expect them to be called at the end of 8th year?

Given,

$$\text{Par value of bond (M)} = \text{Rs } 1,000$$

$$\text{Coupon interest rate} = 14\% \text{ i.e.} = \text{Rs } 140$$

$$\text{Maturity period(n)} = 15 \text{ yrs}$$

$$\text{Investors desired rate of return (kd)} = 12\%$$

a. Value of bond (V_0) = ?

$$V_0$$

$$= I \times PVIFA_{K_d \% \text{ n year}} + M \times PVIF_{K_d \% \text{ n year}}$$

$$V_0$$

$$= 140 \times PVIFA_{12\% 15 \text{ year}} + 1,000 \times PVIF_{12\% 15 \text{ year}}$$

$$= \text{Rs } 140 \times 6.8109 + \text{Rs } 1,000 \times 0.18270$$

$$= \text{Rs } 953.53 + \text{Rs } 182.70$$

$$= \text{Rs } 1,136.23$$

b. Again, The bonds are callable at 110% of par at the end of 8th year

i.e. call price = 110% of Rs 1,000 = Rs 1,100

Value of bond at present

call period n = 8 years

$$V_0 = I \times PVIFA_{K_d \% \text{ n year}} + M \times PVIF_{K_d \% \text{ n year}}$$

$$\begin{aligned} V_0 &= 140 \times PVIFA_{12\% 8 \text{ year}} + 1,100 \times PVIF_{12\% 8 \text{ year}} \\ &= Rs 140 \times 4.9676 + Rs 1,100 \times 0.40388 \\ &= Rs 1,139.73 \end{aligned}$$

The value of bond at present is Rs 1,139.73.

Given,

Par value of bond (M) = Rs 1,000

Coupon interest rate = 14% i.e. = Rs 140

Maturity period(n) = 15 yrs

Investors desired rate of return (kd) = 12%

a. Value of bond (V_0) = ?

$$V_0 = I \times PVIFA_{K_d \% \text{ n year}} + M \times PVIF_{K_d \% \text{ n year}}$$

$$\begin{aligned} V_0 &= 140 \times PVIFA_{12\% 15 \text{ year}} + 1,000 \times PVIF_{12\% 15 \text{ year}} \\ &= Rs 140 \times 6.8109 + Rs 1,000 \times 0.18270 \\ &= Rs 953.53 + Rs 182.70 \\ &= Rs 1,136.23 \end{aligned}$$

5.7

Birat Electronics has 12 percent coupon bonds on the market with 10 years to maturity. The bonds make semiannual payment and currently sell for 95 percent of par. What is the current yield on Birat Electronics bonds? The YTM? The effective annual yield?

Given,

Par value (M) = Rs 1,000

$$\begin{aligned}\text{Selling price } V_0 &= 95\% \text{ of par} = 0.95 \times \text{Rs 1,000} \\ &= \text{Rs 950}\end{aligned}$$

Coupon rate = 12% i.e. = Rs 120

Maturity period (n) = 10 years

Semi-annual coupon payments.

$$\begin{aligned}\text{a. Current yield} &= \frac{\text{Annual Coupon Interest}}{\text{Price of Bond}} \\ &= \frac{\text{Rs 120}}{\text{Rs 950}} = 12.63\%\end{aligned}$$

To calculate YTM, At first we have to calculate approximate semi annual YTM,

$$\begin{aligned}\text{Approximate YTM} &= \frac{\frac{I}{2} + \frac{M-V_0}{2n}}{M+2\times V_0} \\ \text{Approximate YTM} &= \frac{60 + \frac{1,000-950}{2\times 10}}{1,000-2\times 950} = 6.47\%\end{aligned}$$

Try at 6% (Lower Rate)

$$\begin{aligned}PV &= 60 \times PVIFA_{6\%, 20 \text{ year}} + 1,000 \times PVIF_{6\%, 20 \text{ year}} \\ &= \text{Rs } 60 \times 11.4699 + \text{Rs } 1,000 \times 0.3118 \\ &= \text{Rs } 999.99 > \text{Rs } 950\end{aligned}$$

Again, Try at 7% (Higher rate)

$$\begin{aligned}PV &= 60 \times PVIFA_{7\%, 20 \text{ year}} + 1,000 \times PVIF_{7\%, 20 \text{ year}} \\ &= \text{Rs } 60 \times 10.5940 + \text{Rs } 1,000 \times 0.2585 \\ &= \text{Rs } 635.64 + \text{Rs } 258.5 \\ &= \text{Rs } 894.14 < \text{Rs } 950\end{aligned}$$

By interpolation Actual YTM lies between higher and lower rate

$$YTM = LR + \frac{TPV_{LR} - V_0}{TPV_{LR} - TPV_{HR}} (HR - LR)$$

$$YTM = 6\% + \frac{\text{Rs } 999.99 - \text{Rs } 950}{\text{Rs } 999.99 - \text{Rs } 894.14} (7\% - 6\%)$$

$$YTM = 6.47\%$$

$$\text{Annual YTM} = 2 \times 6.47\% = 12.94\%$$

$$\begin{aligned}\text{Effective YTM} &= (1 + \text{semi-annual YTM})^2 - 1 \\ &= (1 + 0.0647)^2 - 1 \\ &= 1.1336 - 1 = 0.1336 \\ &= 13.36\%\end{aligned}$$

5.9

A bond that matures in 10 years sells for Rs 985. The bond has a face value of Rs 1,000 and a 7 percent annual coupon.

- What is the bond's current yield?
- What is the bond's yield to maturity?
- Assume that the yield to maturity remains constant for the next 3 years. What will be the price of the bond 3 years from today?

Given,

Maturity period = 10 years

Selling price of bond = Rs 985

Par value = Rs 1,000

Coupon interest = 7% i.e. = Rs 70

- Current yield = ?

= 13.36%

$$\text{Current yield} = \frac{\text{Coupon interest payment}}{\text{Market interest}} \\ = \frac{\text{Rs } 70}{\text{Rs } 985} = 7.11\%$$

b. Yield to maturity (YTM) = ?

We have,

$$V_0 = I (\text{PVIFA}_{kd \%} n \text{ year}) + M (\text{PVIF}_{kd \%} n \text{ year})$$

or,

$$\text{Rs } 985 = 70 (\text{PVIFA}_{kd}, 10) + \text{Rs } 1000 (\text{PVIF}_{kd}, 10)$$

At first, let us calculate the

$$\text{approximate YTM} = \frac{I + \frac{M - V_0}{n}}{\frac{M + 2V_0}{3}} \\ = \frac{70 + \frac{1,000 - 950}{10}}{\frac{1,000 - 2 \times 950}{3}} \\ = 7.22\%$$

Now, trying at 7%

$$PV = \text{Rs } 70 (\text{PVIFA}7\%, 10 \text{ Ye}) + \text{Rs } 1,000 (\text{PVIF}7\%, 10 \text{ year})$$

$$= \text{Rs } 70 \times 7.0236 + \text{Rs } 1,000 \times 0.5083$$

$$= \text{Rs } 999.95$$

$$\text{Rs } 985 < \text{Rs } 999.95.$$

So try at 8%,

$$PV = \text{Rs } 70 (\text{PVIFA}8\%, 10) + \text{Rs } 1,000 (\text{PVIF}8\%, 10)$$

$$= \text{Rs } 70 \times 6.710 + \text{Rs } 1,000 \times 0.4632$$

$$= \text{Rs } 932.907$$

$$YTM = LR + \frac{TPV_{LR} - V_0}{TPV_{LR} - TPV_{HR}} (HR - LR)$$

$$YTM = 7\% + \frac{\text{Rs } 999.95 - \text{Rs } 985}{\text{Rs } 999.95 - \text{Rs } 932.907} (8\% - 7\%)$$

$$YTM = 7.22\%$$

C. Value of the bond 3-years from today = ?

$$\begin{aligned}V_3 &= I \times PVIFA_{kd}, n + M \times PVIF_{kd}, n \\&= Rs\ 70 \times Rs\ 5.3480 + Rs\ 1,000 \times Rs\ 0.6138 \\&= Rs\ 374 + Rs\ 613.87 \\&\text{Value of bond } V_0 = Rs\ 988.23\end{aligned}$$

2.11

Kantipur Enterprises has bonds outstanding with a Rs 1,000 face value and 10 years left until maturity. The bonds have an 11 percent annual coupon payment. The current price of these bonds is Rs 1,175. The bonds may be called in 5 years at 109 percent of face value.

- a. What is the yield to maturity of these bonds?
- b. What is the yield to call for these bonds, if it is called in 5 years?
- c. Which yield might investors expect to earn on these bonds, and why?

Given,

Face value (M) = Rs 1000

Time to maturity (n) = 10 yrs.

Annual coupon payment (I) = 11% of face value
= 11% of Rs1,000 = Rs 110

Current price = Rs 1175

Call period = 5 years

Call price (P_C) = 109% of Rs 1000 = Rs 1,090

a. Calculation of yield to maturity (YTM)

To calculate YTM, at first, we have to calculate approximate YTM by using following formula

$$\text{approximate YTM} = \frac{\frac{I + \frac{M - V_0}{n}}{M + 2V_0}}{3}$$

$$= \frac{110 + \frac{1,000 - 1175}{10}}{\frac{1,000 - 2 \times 1,175}{3}} = 0.0828 \text{ or } 8.28\%$$

Now, Price = $I \times \text{PVIFA}_{kd, n} + M \times \text{PVIF}_{kd, n}$

Try at 8%

Rs 1,175 = 110 $\times \text{PVIFA}_{8\%, 10}$ + 1,000 $\times \text{PVIF}_{8\%, 10}$ or,

Rs 1,175 = Rs 110 $\times 6.7101$ + Rs 1,000 $\times 0.4632$

Rs 1,175 = Rs 738.11 + Rs 463.20

Rs 1,175 < Rs 1,201.31

try at 9%

Rs 1,175 = Rs 110 $\times \text{PVIFA}_{9\%, 10}$ + Rs 1,000 $\times \text{PVIF}_{9\%, 10}$

Rs 1,175 = Rs 110 $\times 6.4177$ + Rs 1,000 $\times 0.4224$

Rs 1,175 > Rs 1,128.34

$$YTM = LR + \frac{TPV_{LR} - V_0}{TPV_{LR} - TPV_{HR}} (HR - LR)$$

$$YTM = 8\% + \frac{\text{Rs } 1,201.31 - \text{Rs } 1175}{\text{Rs } 1,201.31 - \text{Rs } 1,128.34} (9\% - 8\%)$$

$$YTM = 8.36\%$$

b. Calculation of yield to call (YTC)

call period (nc)= 5 years, call price P_c = Rs 1090

To calculate YTC, at first, we have to calculate approximate YTC by using following formula:

$$YTC = \frac{I + \frac{P_c - \text{Purchase Price}}{nc}}{\frac{P_c + 2 \times \text{Purchase Price}}{3}}$$

$$\frac{110 + \frac{1,090 - 1175}{5}}{\frac{1,090 - 2 \times 1,175}{3}} = 8.11\%$$

Now,

Price = I × PVIFAYTC, nc + Call price × PVIFYTC, nc

Try at 8%

1,175 = 110 × PVIFA8%, 5 n + 1,090 × PVIF8%, 5 n

or, Rs 1,175 = Rs 110 × 3.9927 + Rs 1,090 × 0.6806

or, Rs 1,175 = Rs 439.20 + Rs 741.85

or, Rs 1,175 < Rs 1,181.05

Again,

try at 9%

Rs 1,175 = 110 × PVIFA9%, 5 n + 1,090 × PVIF 9%, 5 n

or, Rs 1,175 = Rs 110 × 3.8897 + Rs 1,090 × 0.6499

or, Rs 1,175 = Rs 427.87 + Rs 708.39

or, Rs 1,175 > Rs 1,136.26

$$YTC = LR + \frac{TPV_{LR} - V_0}{TPV_{LR} - TPV_{HR}} (HR - LR)$$

$$YTC = 8\% + \frac{\text{Rs } 1,181.05 - \text{Rs } 1175}{\text{Rs } 1,181.05 - \text{Rs } 1,136.26} (9\% - 8\%)$$

$$YTC = 8.14\%$$

c.

Investor of this bond might expect to earn only 8.14% i.e. yield to call. Because yield to call is less than yield to maturity and company always try to reduce cost of debt.

Hence, bond yield is expected to be called in 5 years and investor will earn only 8.14% i.e. YTC.

5.12 Asmita new

Problem 5-17.
Bond valuation and
yields

Compute the missing values of following bonds:

Stock	Price	Coupon rate	Maturity	Market Interest
A	?	10%	7	8%
B	Rs 887	?	10	12%
C	920	12%	10	?
D	1,060	8%	?	7.2%
E	500	-	5	?

$$\begin{aligned} i.V_0 &= I \times PVIFA_{kd, n} + M \times PVIF_{kd, n} \\ &= Rs\ 100 \times PVIFA\ 8\%,\ 7 + Rs\ 1,000 \times PVIF\ 8\%,\ 7 \\ &= Rs\ 100 \times 5.2064 + Rs\ 1,000 \times 0.5835 \\ &= Rs\ 520.64 + Rs\ 583.5 \\ &= Rs\ 1,104.14 \end{aligned}$$

ii.

$$\begin{aligned} V_d &= I \times PVIF_A_{kd, n} + M \times PVIF_{kd, n} \\ Rs\ 887 &= I \times PVIFA12\%,\ 10 + Rs\ 1,000 \times PVIF12\%,\ 10 \\ Rs\ 887 &= I \times 5.6502 + Rs\ 1,000 \times 0.322 \\ 5.6502\ I &= 565 \\ I &= 565/5.6502\ or \\ I &= Rs\ 100\ or\ I = 10\%\ (Rs\ 100/Rs\ 1,000) \end{aligned}$$

iii. bond YTM calculation

here coupon interest (I) = 12% ie Rs 120

maturity period n = 10 years

$$YTM = LR + \frac{TPV_{LR} - V_0}{TPV_{LR} - TPV_{HR}} (HR - LR)$$

$$\text{approximate YTM} = \frac{I + \frac{M - V_0}{n}}{\frac{M + 2V_0}{3}}$$

$$= \frac{120 + \frac{1,000 - 920}{10}}{\frac{1,000 - 2 \times 920}{3}} = 13.52\%$$

Now, trying at 13% PV

$$= \text{Rs } 120 \times \text{PVIFA}13\%, 10 \text{ yrs} + \text{Rs } 1,000 \times \text{PVIF}13\%, 10 \text{ yrs}$$

$$= \text{Rs } 120 \times 5.4262 + \text{Rs } 1,000 \times 0.2946 = \text{Rs } 945.74$$

So let us try at 14% PV

$$= \text{Rs } 120 \times \text{PVIFA}14\%, 10 \text{ yrs} + \text{Rs } 1,000 \times \text{PVIF}14\%, 10 \text{ yrs}$$

$$= \text{Rs } 120 \times 5.2161 + \text{Rs } 1,000 \times 0.2697 = \text{Rs } 895.63$$

$$\text{iv. } V_d = I \left[\frac{1 - \frac{1}{(1 + k_d)^n}}{k_d} \right] + \frac{M}{(1 + k_d)^n}$$

$$\text{Rs } 1,060 = \text{Rs } 80 \left[\frac{1 - \frac{1}{(1 + 0.072)^t}}{0.072} \right] + \frac{\text{Rs } 1,000}{(1 + 0.072)^t}$$

$$1,060 = \frac{80 - \frac{80}{(1.072)^t}}{0.072} + \frac{\text{Rs } 1,000}{(1.072)^t}$$

$$1,060 = 1,111.11 - \frac{1,111.11}{(1.072)^t} + \frac{1,000}{(1.072)^t}$$

$$1,060 = \frac{1,111.11 (1.072)^t - 1,111.11 + 1,000}{(1.072)^t}$$

$$1,060 (1.072)^t = 1,111.11 (1.072)^t - 1,111.11 + 1,000$$

$$111.11 = 51.11 (1.072)^t$$

$$\text{or, } (1.072)^t = 2.1739$$

Taking log both sides

$$t \log 1.072 = \log 2.1739$$

$$\therefore t = \frac{\log 2.1739}{\log 1.072} = 11.1 \approx 11 \text{ years}$$

$$\text{v. } V_d = \frac{M}{(1 + k_d)^n}$$

$$\text{or, } \text{Rs } 500 = \frac{\text{Rs } 1,000}{(1 + k_d)^5}$$

$$\text{or, } (1 + k_d)^5 = 2$$

$$\text{or, } k_d = 2^{1/5} - 1$$

$$\therefore k_d = 0.1486 \text{ or } 14.86\%$$

a. $(1 + \text{Real rate}) = \frac{1 + \text{Nominal rate}}{1 + \text{Inflation rate}}$

$$(1 + 0.03) = \frac{1 + \text{Nominal rate}}{1 + 0.05}$$

$$\therefore \text{Nominal rate} = (1.03)(1.05) - 1 = 0.0815 \text{ or } 8.15\%$$

b. $(1 + \text{Real rate}) = \frac{1 + \text{Nominal rate}}{1 + \text{Inflation rate}}$

$$(1 + 0.03) = \frac{1 + 0.085}{1 + \text{Inflation rate}}$$

$$\therefore \text{Inflation rate} = \frac{1.085}{1.03} - 1 = 0.0534 \text{ or } 5.34\%$$

Stock Valuation

- Common stock represents ownership in a corporation.
- Shareholders have the right to vote on certain corporate decisions.
- Shareholders have the potential to earn a return on their investment through dividends or selling shares.
- Common stock comes with risks, such as fluctuations in stock price and poor company performance.
- In the event of bankruptcy, common stockholders are the last to receive payment.

Features of Common stock

- Par value: Common stock has a par value, which is the nominal or face value of each share. This value is typically set low and has little bearing on the actual market value of the stock.
- Maturity period: Unlike bonds or other fixed-income investments, common stock does not have a maturity period or date at which the investment will be repaid.
- Claim on income and assets: Common stockholders have a claim on the company's income and assets, but this claim is subordinate to bondholders and other creditors.

Stock Valuation

- Voting right: Common stockholders typically have the right to vote on important corporate matters, such as the election of board members or major business decisions.
- Preemptive right: In some cases, common stockholders may have the right of first refusal to purchase additional shares of the company's stock if new shares are issued.
- Limited liability: Common stockholders have limited liability, meaning their potential losses are limited to the amount they invested in the stock. They are not personally liable for any debts or obligations of the company beyond their investment.

The Basic Stock Valuation Models

- Valuation of common stock is similar to other financial assets such as bonds and preferred stocks.
- However, it's more difficult due to uncertain future cash flows and variable growth rates.
- There's no uniform approach to determining required rate of return.
- Common stock has no maturity and expected dividends are the basis for valuation.
- The dividend discount model (DDM) is used to calculate the intrinsic value of a share of common stock.
- Intrinsic value is the present value of future dividends.

Dividend discount model

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3} + \dots + \frac{D_\infty}{(1+k_s)^\infty}$$

Where,

P_0 = intrinsic value per share of common stock

D_1 = dividend per share expected at the end of year 1

k_s = investors' required rate of return

Simplifying the Dividend Discount Model for Indefinite Holding Period

1. Zero Growth:

An approach to dividend valuation model that assumes amount of dividend per share remains constant forever.

$$D_0 = D_1 = D_2 = D_n.$$

$$\text{Value of stock } (P_0) = \frac{D}{k_s}$$

where,

D = dividend

k_s = investor required rate

Dividend discount model

2. Constant or Normal Growth

valuation approach that assumes that dividends will grow at a constant rate indefinitely.

$$D_{t+n} = D_t(1+g)^n$$

$$\text{Value of stock } (P_0) = \frac{D_1}{k_s - g}$$

D_1 = Expected dividend

k_s = required rate of investor

g = constant growth rate

P_0 = price of stock today

3. Non-Constant Growth

A dividend valuation approach that allows for a change in the dividend growth rate.

The process of computing value of a non-constant growth stock can be summarized

1. First, find dividend per share (DPS) for the period of non-constant growth i.e. $D_1, D_2 \dots D_n$.
2. Second, find the value of the stock at the end of non-constant growth period or horizon value (P_n).
3. Third, find the present value (PV) of the dividends during the period of non-constant growth.
4. Fourth, find the present value (PV) of the horizon/terminal value of stock (P_n).
5. Finally, add these two values computed in third and fourth steps to find the intrinsic value of the stock (P_0)

Valuation of stock in non constant growth model

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_n}{(1+k_s)^n} + \dots + \frac{P_n}{(1+k_s)^n}$$


PV of dividends during non-constant/Super growth period

PV of the expected stock price at the end of non-constant growth period or horizon value, P_n

$$P_n = \frac{D_n(1+gn)}{k_s - gn}$$

Valuation with finite period

Single period Valuation

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{P_1}{(1+k_s)^1}$$

Multi-Period Valuation

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \dots + \frac{D_n P_n}{(1+k_s)^n}$$

Expected Rate of Return on a Constant Growth Stock

$$\text{Dividend yield} = \frac{D_1}{P_0}$$

$$\text{Capital gain} = \frac{P_1 - P_0}{P_0}$$

$$\text{Cost of capital (Ks)} = \frac{D_1}{P_0} + g$$

Valuation of the Entire Firm

$$\text{Value of total equity} = \frac{\text{Total expected dividend}}{k_s - g}$$

Value of firm = Value of total equity + Value of debt

FCF = NOPAT - Net new investment in operating capital.

$$V = \frac{FCF_1(1 + gn)}{WACC - gn}$$

V = value of the firm

FCF = free-cash flow

WACC = weighted average cost of capital

gn= normal growth

Preferred Stock

A hybrid security with features of both debt and common stock and promises to pay fixed dividend.

[features of preferred stock](#)

Par Value

Fixed Dividend

Maturity

Cumulative feature

Participating Feature

Voting Rights

Claims on Asset and Income

Call Feature

Conversion Features

Sinking Fund

Preferred Stock Valuation

$$V_{PS} = \frac{D_{ps}}{k_{ps}}$$

Where

V_{PS} = current intrinsic value of preferred stock

D_{PS} = current annual cash dividend

k_{ps} = investor's required rate of return

When the preferred stock has maturity period
and

$$D_{ps} \times PVIFA_{kps, n} + M \times PVIF_{kps, n}$$

6.1 Compute value of following stocks,
assuming that investors require 15 percent
return.

- a. A stock that pays dividend Rs 10 per share, which is expected to remain at Rs 10 forever.
- b. A stock that recently paid dividend Rs 40 per share, which is expected to grow at a constant rate of 5 percent per year forever.

Given,

Dividend per share (D_0) = Rs 10

Growth rate (g) = 0

Investors' required rate of return (k_s) = 15%

Value of stock (P_0) = ?

$$\text{Value of stock } (P_0) = \frac{D_0}{k_s} = \frac{\text{Rs } 10}{0.15} =$$

6.1 Compute value of following stocks, assuming that investors require 15 percent return.

- a. A stock that pays dividend Rs 10 per share, which is expected to remain at Rs 10 forever.
- b. A stock that recently paid dividend Rs 40 per share, which is expected to grow at a constant rate of 5 percent per year forever.

Given,

Dividend per share (D_0) = Rs 10

Growth rate (g) = 0

Investors' required rate of return (k_s) = 15%

Value of stock (P_0) = ?

$$\text{Value of stock } (P_0) = \frac{D_0}{k_s} = \frac{\text{Rs } 10}{0.15} =$$

Given,

Dividend per share (D_0) = Rs 40

Growth rate (g) = 5%

Investors' required rate of return (k_s) = 15%

Value of stock (P_0) = ?

$$\text{Value of stock } (P_0) = \frac{D_1}{k_s - g}$$

6.4

Your broker offers to sell you some shares of Himshikhar Public Limited's common stock that paid a dividend of Rs 20 yesterday. You expect the dividend to grow at the rate of 8 percent per year for the next 3 years. You plan to buy the stock and hold it for 3 years and then sell it.

- a. Find expected dividend for each of the next 3 years.
- b. Given that the appropriate discount rate is 15 percent and that the first of these dividend payments will occur 1 year from now, find the present value of the dividend stream.
- c. You expect the price of the stock 3 years from now to be Rs 388.71; that is, you expect P^3 to equal Rs 388.71. Discounted at 15% rate, what is the present value of this expected future stock price? In other words calculate the PV of Rs 388.71.
- d. If you plan to buy the stock, hold it for 3 years, and then sell if for Rs 388.71. What is the most you should pay for it?

- e. Calculate the present value of this stock. Assume that $g = 8\%$, and it is constant.
- f. Is the value of this stock dependent upon how long you plan to hold it? In other words, if your planned holding period were 2 years or 5 years rather than 3 years, would this affect the value of the stock today, P_0 ?

a. Here, calculation of dividend

$$\text{Growth rate (g)} = 8\%$$

$$D_0 = \text{Rs } 20$$

$$D_1 = D_0 (1 + g) = \text{Rs } 20 (1 + 0.08) = \text{Rs } 21.6$$

$$D_2 = D_0 (1 + g)^2 = \text{Rs } 20 (1 + 0.08)^2 = \text{Rs } 23.33$$

$$D_3 = D_0 (1 + g)^3 = \text{Rs } 20 (1 + 0.08)^3 = \text{Rs } 25.19$$

b. Calculation of present value of the dividend stream:

$$PV \text{ of dividend} = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3}$$
$$= \frac{21.6}{(1+0.15)^1} + \frac{23.33}{(1+0.15)^2} + \frac{25.19}{(1+0.15)^3}$$

c. Price of stock 3 years from now (P_3) = Rs 388.71

Discounted rate (k_s) = 15%

Present value of the stock (P_3) = ?

$$PV \text{ of } P_3 = \frac{P_3}{(1+k_s)^3} = \frac{288.71}{(1+0.15)^3}$$

d. Maximum money to be paid = PV of dividend + PV of stock

$$= \text{Rs } 52.98 + \text{Rs } 255.58 = \text{Rs } 308.56$$

f. Present value of the stock = Rs 308.56

g. The value of stock does not depend upon holding period. In other words, if planned holding period were 2 years or 5 years rather than 3 years, this would not affect the value of the stock today.

6.6 The Gandaki Herbal Company has just paid a cash dividend of Rs 20 per share. Investors require a 15 percent return from investments such as this. If the dividend is expected to grow at a steady 5 percent per year,

- a. What is the current value of the stock?
- b. What will the stock be worth in five years?
- c. What would the stock sell for today if the dividend was expected to grow at 10 percent per year for the next three years and then settle down to 5 percent per year, indefinitely?

Given,

Current dividend (D_0) = Rs 20

Growth rate (g) = 5%

Investors required rate (k_s) = 15%

Current value of stock (P_0) = ?

a. value of stock today;

$$P_0 = \frac{D_0(1+g)}{k_s-g} \text{ or } P_0 = \frac{20(1+0.05)}{0.15-0.05} = \text{Rs } 210$$

b. value of stock fivers from now;

$$P_5 = \frac{D_6}{k_s-g} = \frac{D_0(1+g)^6}{k_s-g} = \frac{20(1+0.05)^6}{0.15-0.05} = \text{Rs } 268$$

c. If growth rate for the first three years is 10 percent and there after 5% p.a. forever.

Calculation of dividend for supernormal growth

$$D_1 = D_0 (1 + g_s) = \text{Rs } 16 (1 + 0.10) = \text{Rs } 18.4$$

$$D_2 = D_1 (1 + g_s) = \text{Rs } 18.4 (1 + 0.10) = \text{Rs } 21.16$$

$$D_3 = D_2 (1 + g_s) = \text{Rs } 21.16 (1 + 0.10) = \text{Rs } 23.28$$

$$P_3 = \frac{D_4}{k_s-g} = \frac{D_3(1+0.05)}{0.15-0.05}$$

Value of stock

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3} + \frac{P_3}{(1+k_s)^3}$$

find value

6.7 Sahara Company presently pays a dividend of Rs 16 per share on its common stock. The company expects to increase the dividend at a 15 percent annual rate the first two years and at a 10 percent rate the next three years and then grow the dividend at a 5 percent rate thereafter. This phased-growth pattern is in keeping with the expected life cycle of earnings. You require a 12 percent return to invest in this stock. What value should you place on a share of this stock?

Here,

Dividend per share (D_0) = Rs 16

Growth rate for the first two years (g_1) = 15%

Growth rate for the next three years (g_2) = 10%

Thereafter growth rate forever (g) = 5%

Required rate of return (k_s) = 12%

Required: Value of stock at present (P_0)

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3} + \frac{D_4}{(1+k_s)^4} + \frac{P_5}{(1+k_s)^5}$$

Calculation of dividend in supernormal growth

$$D_1 = D_0 (1 + g_1) = \text{Rs } 16 (1 + 0.15) = \text{Rs } 18.4$$

$$D_2 = D_1 (1 + g_1) = \text{Rs } 18.4 (1 + 0.15) = \text{Rs } 21.16$$

$$D_3 = D_2 (1 + g_2) = \text{Rs } 21.16 (1 + 0.10) = \text{Rs } 23.28$$

$$D_4 = D_3 (1 + g_2) = \text{Rs } 23.28 (1 + 0.10) = \text{Rs } 25.61$$

$$D_5 = D_3 (1 + g_2) = \text{Rs } 25.61 (1 + 0.10) = \text{Rs } 28.17$$

$$D_6 = D_5 (1 + g_s) = \text{Rs } 28.17 (1 + 0.05) = \text{Rs } 29.58$$

value of stock five years from now will be;

stock terminal value is P_5

$$P_5 = \frac{D_6}{k_s - g_s}$$

$$P_5 = \frac{\text{Rs } 29.58}{0.12 - 0.05} = \text{Rs } 422.57$$

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3} + \frac{D_4}{(1+k_s)^4} + \frac{P_5}{(1+k_s)^5}$$

find value

6.11 Kantipur Enterprises recently paid a dividend, D₀, of Rs 12.5. The company expects to have supernormal growth of 20 percent for 2 years before the dividend is expected to grow at a constant rate of 5 percent. The firm's cost of equity is 10 percent.

- a. What year is the terminal, or horizon, date?
- b. What is the stock's horizon, or terminal, value?
- c. What is the stock's intrinsic value today, P₀?

Given,

Last dividend (D₀) = Rs 12.5

Growth rate = 20% for next 2 years

Required rate = 10%

Constant growth rate after 2 years = 5%

- a. The terminal, or horizon, date is the date when the growth rate becomes constant. **This occurs at the end of year 2.**
- b. The horizon, or terminal, value is the **value of stock at the horizon date**

here horizon value or P₂

$$D_1 = D_0 (1 + g_s) = \text{Rs } 12.5 (1 + 0.20) = \text{Rs } 15$$

$$D_2 = D_1 (1 + g_s) = \text{Rs } 15 (1 + 0.20) = \text{Rs } 18$$

$$P_2 = \frac{D_2(1+g)}{k_s - g} = P_2 = \frac{18(1+0.05)}{0.10 - 0.05} = \text{Rs } 387$$

- c. The stock's intrinsic value (P₀) is calculated as the sum of the present value of all dividends during the supernormal growth period plus the present value of the terminal value.

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{P_2}{(1+k_s)^2}$$

find value

6.14. You are considering an investment in the common stock of Shikhar Electronic Company. The stock is expected to pay a dividend of Rs 14 a share at the end of the year. The stock has a beta equal to 1.5. The risk-free rate is 6 percent, and the market risk premium is 4 percent. The stock's dividend is expected to grow at some constant rate, g . The stock currently sells for Rs 200 a share. Assuming the market is in equilibrium, what does the market believe will be the stock price at the end of 3 years?

Given,

Expected dividend per share (D_1) = Rs 14

The stock beta (β) = 1.5 Risk-free rate

(R_f) = 6%

Market risk premium ($R_m - R_f$) = 4%

Current price of stock = Rs 200

Required rate of return (k_s) = $R_f + (R_m - R_f) \beta$

$$6\% + (10\% - 6\%) 1.5 = 12\%$$

We have,

$$P_o = \frac{D_1}{k_s - g} \text{ or } 200 = \frac{14}{0.12 - g}$$

$$g = 0.05 \text{ or } 5\%$$

price of stock at the end of three year

$$P_3 = \frac{D_3(1+g)}{k_s - g} = \frac{15.44(1+0.05)}{0.12 - 0.05} = 231.53$$

Where,

$$\begin{aligned} D_3 &= D_1(1 + g)^2 = \text{Rs } 14 (1 + 0.05)^2 \\ &= \text{Rs } 15.44 \end{aligned}$$

6.17. MT Company's stock recently paid a Rs 20 dividend. This dividend is expected to grow by 25 percent for the next 3 years, and then grow forever at a constant rate, g . The current stock price is Rs 588.8. At what constant rate is the stock expected to grow following year if $k_s = 12\%$?

Given,

Last dividend paid (D_0) = Rs 20

Growth rate for next 3 years(g_s) = 25%

Growth rate after 3 year will be constant

Current price of stock P_0 = Rs 588.8

Investments required rate of return $k_s = 12\%$

Constant growth rate (g_c) = ?

We have,

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3} + \frac{P_3}{(1+k_s)^3}$$

$$D_1 = D_0 (1 + g_s) = \text{Rs } 20 (1 + 0.25) = \text{Rs } 25$$

$$D_2 = D_1 (1 + g_s) = \text{Rs } 25 (1 + 0.25) = \text{Rs } 31.25$$

$$D_3 = D_2 (1 + g_s) = \text{Rs } 31.25 (1 + 0.25) = \text{Rs } 39.06$$

$$P_3 = \frac{D_3(1+g)}{k_s - g} \quad \text{or} \quad P_3 = \frac{39.06(1+g)}{0.12 - g}$$

Again we have, Now,

$$P_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3} + \frac{P_3}{(1+k_s)^3}$$

$$588.8 = \frac{\text{Rs } 25}{(1.12)^1} + \frac{\text{Rs } 31.25}{(1.12)^2} + \frac{\text{Rs } 39.06}{(1.12)^3} + \frac{\frac{39.06(1+g)}{0.12-g}}{(1.12)^3}$$

$$588.8 = 22.32 + 24.91 + 27.80 + \frac{\frac{39.06(1+g)}{0.12-g}}{1.449}$$

$$721.80 = \frac{39.06(1+g)}{0.12-g}$$

$$g = 6.25\%$$

6.18.

Just today, Triveni, Company's common stock paid a Rs 12 annual dividend per share and had a closing price of Rs 157.5. Assume that the market's required return, or capitalization rate for this investment is 13 percent and that dividends are expected to grow at a constant rate forever.

- a. Calculate the implied growth rate in dividends.
- b. What is the expected dividend yield?
- c. What is the expected capital gains yield?

give some clue

6.22. The common stock of NEM paid Rs 8 in dividends last year. Dividends are expected to grow at a 10 percent annual rate for an indefinite number of years.

- If NEM's current market price is Rs 176, what is the stock's expected rate of return?
- If your required rate of return is 14 percent, what is the value of the stock for you?
- Should you make the investment?

a. Given,

Dividend per share (D_0) = Rs 8

Expected growth rate (g) = 10%

Current price of stock (P_0) = Rs 176

Expected rate of return on stock (k_s) = ?

we have $P_0 = \frac{D_1}{k_s - g}$

$$(k_s) = \frac{D_1}{P_0} + g \text{ or } (k_s) = \frac{D_0(1+g)}{P_0} + g$$

$$\text{or } \frac{8(1+0.10)}{176} + 0.10 = 0.15 \text{ or } 15\%$$

b. Given,

dividend (D_0) = Rs 8

Growth rate (g) = 10%

Required rate of return (k_s) = 14%

Value of stock (P_0) = ?

We have,

$$P_0 = \frac{D_1}{k_s - g} = \text{or } \frac{D_0(1+g)}{k_s - g} \text{ or } \frac{8(1+0.10)}{0.14 - 0.10} = \text{Rs } 220$$

c. Since actual selling price of the stock (Rs 176) is less than calculated value of stock (Rs 220), stock is called underpricing. An investor should purchase underpriced stocks.

Capital Budgeting

- The capital budget is an appropriation of resources for acquiring fixed assets, and the decision regarding the investment of resources for acquiring fixed assets is known as capital budgeting or investment decision.
- The process of capital budgeting includes identification of investment opportunities, estimation of relevant costs and benefits, evaluation of projects, approval, and monitoring of projects.
- Capital budgeting involves both substantial investment and risk, as the benefits associated with capital projects are uncertain, and the timing of cash flows is crucial.
- Efficient and effective capital budgeting requires consideration of both timing and riskiness associated with cash flows of the capital projects.

Significant of capital Budgeting

- **Long-term planning:** Capital budgeting helps businesses plan for the long term by identifying and evaluating investment opportunities in fixed assets.
- This enables businesses to allocate resources efficiently and effectively, and to make informed decisions about their long-term growth and profitability.
- **Resource allocation:** Capital budgeting provides a framework for allocating resources among different investment opportunities.
- By evaluating the costs and benefits of different projects, businesses can decide which projects to pursue and which to abandon, thereby maximizing the value of their investments.
- **Risk management:** Capital budgeting helps businesses manage risk by evaluating the potential risks and returns associated with different investment opportunities.
- By considering the timing and riskiness of cash flows associated with different projects, businesses can make better-informed decisions about how to allocate their resources.
- **Financing planning:** Capital budgeting also helps businesses plan their financing needs by estimating the cash flows associated with different projects and identifying potential sources of funding.
- This enables businesses to ensure that they have adequate funding available to finance their investments and to minimize the cost of capital.

Project Classifications

Independent Projects

Independent projects in capital budgeting are investment opportunities evaluated on their own merits without any impact on each other's cash flows.

Each project is evaluated based on its expected cash flows and relevant financial metrics to determine whether it meets the company's investment criteria and generates a positive NPV or IRR. Examples include investing in a new production line or opening a new retail location.

Dependent Projects

- Dependent projects in capital budgeting are investment opportunities that are related to each other, and the cash flows of one project may depend on the success or failure of another project.
- These projects are evaluated together as a package, and the decision to accept or reject one project may depend on whether another related project is accepted or rejected.

Project Classifications

Mutually Exclusive Projects

- Mutually exclusive projects in capital budgeting are investment opportunities that compete with each other for the same resources. This means that if one project is accepted, the other project(s) must be rejected, as there are not enough resources available to invest in all of them.
- In the analysis of mutually exclusive projects, the projects are compared using relevant financial metrics such as net present value (NPV), internal rate of return (IRR), or profitability index (PI), and the project with the highest value is selected.

Replacement Project

- A replacement project in capital budgeting refers to an investment opportunity that involves replacing an existing asset with a new one. The purpose of the replacement project is to maintain or improve the efficiency and profitability of the company's operations.
- In the analysis of replacement projects, the cost of the existing asset and the cost of the new asset are compared, along with other relevant financial metrics such as the expected cash flows, salvage value, and the cost of capital.
- If the cost of the new asset is less than the cost of the existing asset, and the expected cash flows from the new asset are greater than the expected cash flows from the old asset, then the replacement project is deemed feasible.

Project Classifications

Expansion Project

Project that adds the capacity to the existing one to increase the output or increase the distribution channel.

Diversification Projects

The project that either diversifies the products or markets.

Decision on the diversification projects brings about the changes in the fundamental nature of the business, and absorbs the large sum of the funds. So, detail analysis should be carried out before locking the funds in such projects

Process of Capital Budgeting Decision

1. Generation of investment proposals.
2. Estimation of cash flows for the proposals.
3. Evaluation of the proposals.
4. Post completion audits of proposals

Identifying Relevant Cash Flow

NET CASH FLOW: The difference between cash inflows and outflows. It may be either positive or negative. Customarily, we denote cash inflows by positive sign (+), and outflows by negative sign (-).

INCREMENTAL CASH FLOWS: Changes in the firm's total cash flows that occur as a direct result of accepting the project.

The Cash Payback Period

Techniques of Capital Budgeting Decision Rules

- In the process of capital budgeting decision, evaluation process starts after identifying the projects, and estimating the cost and benefits of the identified projects.
- In the sequence of the capital budgeting process, cost and benefits of the project should have to be worked out in the form of cash flows before applying the capital budgeting decision rules.
- We apply different decision rules to make the investment decision.

The expected number of years required to recover the investment of the project.

When there is equal cash flow PBP can be:

$$PBP = \frac{I}{CF_A}$$

I = initial outlay/project cost

CFA = annual cash flow

PBP = payback period

In the case of uneven cash flow PBP can be:

$$PBP = N_{F-1} + \frac{I_F}{CF_F}$$

N_{F-1} = number of years prior to full recovery of investment

I_F = unrecovered cost at start of full recovery year

CF_F = cash flow during full recovery year

Decisions

A project with the PBP less than the set recovery time is acceptable and vice versa.

Discounted Payback Period

Time required to recover the original investment of the project from the discounted cash flow.

$$DPBP = N_{F-1} + \frac{I_F}{DCF_F}$$

N_{F-1} = number of years prior to full recovery of original investment

I_F = unrecovered cost at start of full recovery year

DCF_F = discounted cash flow during full recovery year

decision rules are same as PBP

Accounting Rate of Return

Book rate of return on investment. It is based on the average accounting profit and average investment.

$$ARR = \frac{\text{Average EAT}}{\text{Average Investment}}$$

$$\text{Average EAT} = \frac{\text{Total EAT over project life}}{\text{Project life}}$$

$$\text{Average Investment} = \frac{\text{Initial Cost} + \text{Terminal book value}}{\text{Project life}}$$

- If ARR is greater than the minimum required rate of return, accept the project.
- If ARR is less than the minimum required rate of return, reject the project.

Net Present Value

The amount different between present value of cash inflow and outflow of the project.

$$P_0 = \frac{CF_1}{(1+k_s)^1} + \frac{CF_2}{(1+k_s)^2} + \dots + \frac{CF_n}{(1+k_s)^n} - CF_0$$

CF_N = expected net cash flow at period t

CF_0 = initial cash outlay/investment

n = project life, and

k_s = cost of capital/discount rate

- If cash flows over the project's life constitute annuity,
- $NPV = (\text{Annual CF}) (PVIFA k\%, n) - CF_0$

DECISIONS

- In the case of independent projects, all projects with positive NPV are accepted and negative NPV are rejected.
- We assign the higher rank to the project with the higher NPV and lower rank with lower NPV.
- In the case of mutually exclusive projects, we accept the project with the highest positive NPV.

Internal Rate of Return

The discount rate that makes the present value of cash inflows equal to the present value of the cash outflows of the project.

$$0 = \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \dots + \frac{CF_n}{(1+IRR)^n} - CF_0$$

IRR for Even Cash Flows

Cash flows of the project may be equal throughout the project life. Such cash flows are known as annuity. For annuity, we follow the following steps to work out IRR:

1. First, we calculate the payback period.
2. Second, we find out the discount rate for interpolation by looking at the Present Value Interest Factor for Annuity (PVIFA) Table for nth year, i.e., project life.
3. Finally, we calculate the actual IRR using the following equation.

IRR Calculation

$$IRR = LR + \frac{PVIF_{LR} - PBP}{PVIF_{LR} - PVIF_{HR}} (HR - LR)$$

IRR for Uneven Cash Flows

Step 1: Sum up the annual cash flow and divide it by n to find out the fake annuity. Divide the initial cash outlay by the fake annuity to find out the fake payback period.

Step 2: Find out the discount rate for trial by looking at the Present Value Interest Factor for Annuity (PVIFA) Table for nth period.

Step 3: Based on the pattern of cash flow, adjust the closer discount rate calculated in step 2. Try with the discount rate greater than the discount rate calculated in step 2 if cash flow in earlier period of the project is greater than the average cash flow of the project. And try with discount rate less than that of the discount rate worked out in step 2 if the cash flow in earlier period is less than the average cash flow of the project.

Step :4 Step 3 shows the direction of IRR. The positive NPV shows that the IRR is higher than the tried discount rate. So, try with higher discount rate if tried discount rate results in positive NPV. The negative NPV shows that the IRR is lower than the tried discount rate. So, try with lower discount rate.

Repeat this step 4 until you get negative NPV and positive NPV of the project under consideration.

Step 5: Once you get negative NPV and positive NPV of the project, calculate the IRR by using the following equation:

$$IRR = LR + \frac{PVIF_{LR} - PBP}{PVIF_{LR} - PVIF_{HR}} (HR - LR)$$

Decision Rule

- Accept independent project(s) with IRR exceeding cost of capital.
- In the case of mutually exclusive projects, project with the highest IRR is accepted. Because project with higher IRR contribute more to the wealth of shareholders.

Basic Financial Management Problems

6.1 Annapurna Environment (Pvt.) Ltd. is considering a paper recycle plant. The project will cost Rs 500,000. Annual net cash inflow of the project will be Rs 100,000 for 8 years.

- Calculate payback period of the project.
- Should Annapurna Environment (Pvt.) Ltd. accept this project if the maximum cost recovery time is 5 years?
- What is the discounted payback period of the project? Assume 10% required rate of return

Calculation of payback period:

We have,

$$\frac{I}{CF_A} = \frac{\text{Rs } 500,000}{100,000} = 5 \text{ years}$$

The payback period of the project is 5 years.

- Since the payback period is equal to the maximum cost recovery time, the project is acceptable.
- Calculation of discounted payback period

Year	Net Cash Flows	PV 10%	Discounted CF	Cumulative CF
0	(500,000)	1	(500,000)	(500,000)
1-5	100,000	3.7908	379,080	(120,920)
6	100,000	0.5645	56,450	(64,470)
7	100,000	0.5132	51,320	(13,150)
8	100,000	0.4665	46,650	33,500

We know that DPB is given by

$$DPBP = N_{F-1} + \frac{I_F}{DCF_F}$$

$$DPBP = 7 + \frac{13,150}{46,650} = 7.28 \text{ years}$$

The discounted payback period of the project is 7.28 years.

6.4

Karmacharya Group is considering two independent projects. Project A costs Rs 200,000. The expected annual after tax cash inflow is Rs 48,000. Project B costs Rs 300,000. The expected annual after tax cash inflow is Rs 80,000. Life of both projects is 7 years. The required rate of return of Karmacharya Group is 10 percent. Assume that Karmacharya Group does not have any budget constraints.

- a. Calculate payback period of each project.
- b. Calculate NPV of each project.
- c. Calculate IRR of each project.
- d. Which project (s) should be accepted?

a. Calculation of payback period Project A:

$$\frac{I}{CF_A} = \frac{\text{Rs } 200,000}{48,000}$$

$$\text{Project B: } = \frac{\text{Rs } 300,000}{80,000}$$

b. Calculation of Net Present value

Project A:

$$\begin{aligned} \text{NPV} &= (\text{Annual CF})(\text{PVIFA}10\%, 7) - \text{CF}_0 \\ &= (\text{Rs } 48,000)(4.8684) - \text{Rs } 200,000 \\ &= \text{Rs } 233,683.20 - \text{Rs } 200,000 \\ &= \text{Rs } 33,683.20 \end{aligned}$$

Project B:

$$\begin{aligned} \text{NPV} &= (\text{Annual CF})(\text{PVIFA}10\%, 7) - \text{CF}_0 \\ &= (\text{Rs } 80,000)(4.8684) - \text{Rs } 300,000 \\ &= \text{Rs } 389,472 - \text{Rs } 300,000 \\ &= \text{Rs } 89,472 \end{aligned}$$

c. Calculate of IRR

Project A:

1. Payback period as calculated in (a) is 4.17 years.
2. Looking the PVIFA Table across 7 periods, we find 4.17 in between 4.2883 and 4.1604 which correspond to 14 percent and 15 percent respectively.
3. We work out IRR by using the following equation:

$$IRR = LR + \frac{PVIF_{LR} - PBP}{PVIF_{LR} - PVIF_{HR}} (HR - LR)$$

$$IRR = 14 + \frac{4.2883 - 4.17}{4.2883 - 4.1604} (15 - 14) \\ = 14.92\%$$

Project B:

1. Payback period as calculated in (a) is 3.75 years.
2. Looking the PVIFA Table across 7 periods, we find 3.75 in between 3.8115 and 3.6046 which correspond to 18 percent and 20 percent respectively.
3. We work out IRR by using the following equation:

$$IRR = 18 + \frac{3.8115 - 3.75}{3.8115 - 3.6046} (20 - 18)$$

$$IRR = 18.59\%$$

- d Both Project A and Project B have the payback period less than the project life, positive NPV and IRR greater than the required rate of return. So, both projects should be accepted.

6.5

Payback, NPV and IRR

Birgunj Sub-Municipal Corporation is planning to purchase Suction Vehicle for cleaning the septic tank. There are two types of vehicle—one with jetting machine and next without jetting machine. Suction vehicle with jetting machine costs Rs 15,000,000. Birgunj Sub-Municipal Corporation charges for its service. It estimates that it will generate the annual net cash flows of Rs 2,500,000 for 10 years. The second type of vehicle costs Rs 12,000,000 and generates the annual net cash flows of Rs 1,800,000 for next 10 years. Required rate of return of Birgunj Sub-municipal Corporation is 8 percent.

- a. Calculate NPV, IRR and payback period for each project.
- b. If these vehicles are considered as independent vehicles which vehicle(s) should be purchased?
- c. If these vehicles are mutually exclusive, which vehicle should be purchased?

Calculation of payback period:

$$PBP = \frac{CF_0}{CFA}$$

Now,

PB of Suction Vehicle **with** Jetting machine

$$PBP = \frac{\text{Rs } 15,000,000}{\text{Rs } 2,500,000} = 6 \text{ YEARS}$$

PB of Suction Vehicle **without** Jetting machine:

$$PBP = \frac{\text{Rs } 12,000,000}{\text{Rs } 1,800,000} = 6.67 \text{ YEARS}$$

The payback period of Suction vehicle with Jetting machine is 6 years and without jetting machine is 6.67 years.

Calculation of NPV:

We know, $NPV = CFA \times PVIFA_k, n - CF_0$

NPV of Suction Vehicle with Jetting machine:

$$NPV = 2,500,000 \times PVIFA8\%, 10 - 15,000,000$$

$$= \text{Rs } 2,500,000 \times 6.7101 - \text{Rs } 15,000,000$$

$$= \text{Rs } 1,775,250$$

NPV of Suction Vehicle without Jetting machine:

$$NPV = 1,800,000 \times PVIFA8\%, 10 - 12,000,000$$

$$= \text{Rs } 1,800,000 \times 6.7101 - \text{Rs } 12,000,000$$

$$= \text{Rs } 78,180$$

The NPV of Suction Vehicle with Jetting machine is Rs. 1,775,250 and without Jetting machine is Rs. 78,180.

Calculation of IRR:

IRR of Suction Vehicle with Jetting machine:

- i. Payback period as calculated above is 6 years.
- ii. Looking at PVIFA table across 10 periods, we find 6 in between 6.1446 and 5.8892 which correspond to 10 percent and 11 percent respectively.

$$IRR = LR + \frac{PVIF_{LR} - PBP}{PVIF_{LR} - PVIF_{HR}} (HR - LR)$$

$$IRR = 10 + \frac{6.1446 - 6}{6.1446 - 5.8892} (11 - 10)$$

$$IRR = 10.57\%$$

IRR of Suction Vehicle without Jetting machine:

- I. Payback period as calculated above is 6.67 years.
- II. Looking at PVIFA table across 10 periods, we find 6.6667 in between 6.7101 and 6.4177 which correspond to 8 percent and 9 percent respectively.

$$III. IRR = LR + \frac{PVIF_{LR}-PBP}{PVIF_{LR}-PVIF_{HR}} (HR - LR)$$

$$IRR = 8 + \frac{6.7101 - 6.67}{6.7101 - 6.6667} (9 - 8)$$

$$IRR = 8.15\%$$

The IRR of Suction Vehicle with Jetting machine is 10.57 percent and without Jetting machine is 8.15 percent.

b. Both Suction Vehicle with Jetting machine and Suction Vehicle without jetting machine have payback period less than their lives, positive NPV and IRR greater than required rate of return. So, if these vehicles are independent Pokhara sub-municipal corporation should purchase both vehicles.

c. If these vehicles are mutually exclusive, Pokhara sub-municipal corporation should purchase Suction Vehicle with Jetting machine because it has lower payback period, higher NPV and higher IRR.

There are two projects: project A and project B. Each of the project has the cost of Rs 100,000 and cost of capital for each project is 12 percent. The project's expected net cash flows are as follows:

Year	Project A	Project B
0	Rs (100,000)	Rs (100,000)
1	65,000	35,000
2	30,000	30,000
3	30,000	30,000
4	10,000	10,000

- a. Calculate NPV for each project. Which project or projects should be accepted if they are independent?
- b. Calculate IRR for each project. Which project should be accepted if they are mutually exclusive?

a. Calculation of net present value:

For project A:

Years	Cash flows (Rs)	PV factor @ 12%	Present value (PV)
0			
1			
2			
3			
4			

Calculation of net present value:

For project A:

Years	Cash flows (Rs)	PV factor @ 12%	Present value (PV)
0			
1			
2			
3			
4			

Based on the NPV method, Project A should be selected because it has positive NPV.

a. Calculation of IRR for A:

Years	Cash flows (Rs)	PV factor @ 18%	PV	PV factor @ 19%	PV
0					
1					
2					
3					
4					

We know that the IRR is given by

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$IRR = 18 + \frac{50}{50 + 1,406} (19 - 18)$$

$$IRR = 18.03$$

LR = Lower discount rate

HR = Higher discount rate

NPV_{LR} = Net present value
at lower discount rate

NPV_{HR} = Net present value
at higher discount rate

a. Calculation of IRR for B:

Years	Cash flows (Rs)	PV factor @ 3%	PV	PV factor @ 2%	PV
0	-100,000	1	-100,000	1	-100,000
1	35,000	0.9709	33,982.00	0.9804	34,314.00
2	30,000	0.9426	28,278.00	0.9612	28,836.00
3	30,000	0.9151	27,453.00	0.9423	28,269.00
4	10,000	0.8885	8,885.00	0.9238	9,238.00
			$NPV_{HR} = -1402$		$NPV_{LR} = 657$

We know that the IRR is given by

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$IRR = 2 + \frac{657}{657 + 1,402} (3 - 2)$$

$$IRR = 2.32$$

Based on the IRR method, Project A should be selected because its IRR is higher than 12% cost of capital

6.10

Following are the cash flows of equally risky Project X and Project Y:

Year	0	1	2	3	4	5
Project X (Rs)	(500,000)	120,000	120,000	120,000	120,000	120,000
Project Y (Rs)	(350,000)	150,000	100,000	80,000	60,000	90,000

Suppose you are the Project Manager and you have to recommend one of these projects for the approval of the Board of Directors. The required rate of return on these projects is 10 percent.

- a. Calculate the payback period, NPV and IRR of each project.
- b. Which project would you accept? Why?
- c. Does any conflict exist in the results given by the above ranking methods? Which decision criterion would you follow if the conflict exists? Why?

Calculation of payback period: For Project 'X'

$$PBP = \frac{\text{Investment}}{\text{average CFAT}} \text{ or } = \frac{Rs\ 500,000}{Rs\ 120,000} = 4.17 \text{ year}$$

PBP for project B with investment Rs 350,000

YEAR	CFAT	Cumulative C.F
1	150,000	150,000
2	100,000	250,000
3	80,000	330,000
4	60,000	390,000
5	90,000	480,000

$$\text{Min year} + \frac{\text{Amount to Recover}}{\text{C.F in max year}}$$

$$3 + \frac{350,000 - 330,000}{60,000} = 3.33 \text{ years}$$

Calculation of net present value : Project X

We know,

$$\begin{aligned} \text{NPV} &= \text{CFA} \times \text{PVIFA}_{k\%}, n - \text{Investment} \\ &= \text{Rs } 120,000 \times \text{PVIFA } 10\%, 5 \text{ year} - \text{Rs } 500,000 \\ &= \text{Rs } 120,000 \times 3.7908 - \text{Rs } 500,000 \\ &= \text{-Rs } 45,104 \end{aligned}$$

For Project Y

Years	Net cash flows	PV factor at 10%	PV
1	150,000	0.9091	136,365
2	100,000	0.8264	82,640
3	80,000	0.7513	60,104
4	60,000	0.683	40,980
5	90,000	0.6209	55,881

TPV = Rs 375,970

NC0 = Rs 350,000

NPV =

The net present value of Project X is **(Rs45,104)**

and that of Project Y is Rs 25,970.

Calculation of IRR:

Project X:

$$\text{Payback period} = \frac{\text{Rs } 500,000}{\text{Rs } 120,000} = 4.1667 \text{ year}$$

Looking at PVIFA table across 5 years, we find 4.1667 in between **4.2124** and **4.1002** which correspond to **6** percent and **7** percent respectively

$$IRR = LR + \frac{PVIF_{LR} - PBP}{PVIF_{LR} - PVIF_{HR}} (HR - LR)$$

$$IRR = LR + \frac{4.2124 - 4.1667}{4.2124 - 4.1002} (7 - 6)$$

$$IRR = 6.41\%$$

Project Y:

i. Fake annuity $= \frac{\text{Total CFAT}}{\text{No of year}}$

or $\frac{\text{Rs } 480,000}{5} = \text{Rs } 96,000$

ii. Fake Payback peri $= \frac{\text{Rs } 350,000}{\text{Rs } 96,000} = 3.645 \text{ years}$

iii. Looking at PVIFA table across 5 periods, we find **3.6458** is closest to **3.6048** which correspond to **12 percent**. Since the cash **inflows in the earlier years are larger** than average cash flows, the IRR should be greater than 12 percent.

iv) Trial and error table.

Years	Net cash flows(Rs)	PV factor at 13%	PV	PV factor at 14%	PV
0	(Rs 350,000)	1	(Rs 350,000)	1	(Rs 350,000)
1	150,000	0.885	132,750	0.8772	131,580
2	100,000	0.7831	78,310	0.7695	76,950
3	80,000	0.6931	55,448	0.675	54,000
4	60,000	0.6133	36,798	0.5921	35,526
5	90,000	0.5428	48,852	0.5194	46,746
			NPV = Rs 2,158		NPV = (Rs 5,198)

Now, we know that the project's IRR lies in between 12 percent and 14 percent. So, let us interpolate using the following equation:

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$IRR = 13 + \frac{2,158}{2158 + 5198} (14 - 13)$$

The IRR of Project X is 6.41 percent and that of Project Y is 12.29 percent.

- b. The NPV of Project X is negative and its IRR is less than required rate of return, so it is not acceptable. Project Y's NPV is positive and it's IRR is also greater than required rate of return, so this project is acceptable. Thus, Project Y is recommended to the board of directors for approval..
- c. There is no confliction among above ranking methods, because all the methods have given consistent result, that is, acceptance of Project Y. However, if conflict exists, we adopt the decision as per NPV method, because this is the superior method among all.

7.10 Lumbini Transportation (Pvt.) Ltd. is considering to run micro bus service from Butwal to Pokhara. A micro bus costs Rs 2,000,000 and it will ply daily for 5 years to come. Annual net cash inflows for five years will be as follows:

Year	1	2	3	4	5
Cash Flows (Rs)	800,000	700,000	650,000	600,000	800,000

- a. What is the payback period of the project?
- b. Should Lumbini Transportation (Pvt.) Ltd. run micro bus service from Butwal to Pokhara if its maximum cost recovery period is 4 years?
- c. The required rate of return of the project is 10 percent. What is the NPV of the project?
- d. Based on your calculation in (c), should Lumbini Transportation (Pvt.) Ltd. not to run micro bus service?
- e. What is the IRR of the project? Should Lumbini Transportation (Pvt.) Ltd. run micro bus service from Butwal to Pokhara?
- f. What is the discounted payback period of the project? Assume 10 percent required rate of return.

percent and 9 percent respectively.

years	Net Cash Flow	Cumulative C.F
0	Rs (2,000,000)	(2,000,000)
1	800,000	(1,200,000)
2	700,000	(500,000)
3	650,000	150,000
4	600,000	750,000
5	800,000	1,550,000

We know that payback period is given by:

$$PBP = N_F - 1 + \frac{I_F}{CF_F}$$

$$PBP = 2 + \frac{500,000}{650,000} = 2.77 \text{ years}$$

b. Lumbini Transportation (Pvt.) Ltd. should run micro bus service from Butwal to Pokhara. Since it can recover its investment within the maximum cost recovery period. In other words, PBP is less than the maximum cost recovery period.

Year	Cash Flows	PVIF10%, t	PV
1	Rs 800,000	0.9091	Rs 727,280
2	700,000	0.8264	578,480
3	650,000	0.7513	488,345
4	600,000	0.683	409,800
5	800,000	0.6209	496,720
		Total present value	Rs 2,700,625
		Less: Initial investment	2,000,000
		Net present value	Rs 700,625

d. No, Lumbini Transportation (Pvt.) Ltd. should run tourist bus service. Since NPV of the project is positive.

Calculation of NPV at 20 percent and 24 percent discount rates:

year	CFAT	PVIF 20%	PV	PVIF 24%	PV
1	800,000				
2	700,000				
3	650,000				
4	600,000				
5	800,000				
		TOTAL	2,139775		19,68085
Less: Investment			2,000000		2,000000
		NPV	139,775		(31,915)

Now, we know that IRR for project lies in between 20 percent and 24 percent. So, let us interpolate using the following equation:

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

percent and 24 percent discount rates.

We work out DPBP by using the following equation:

$$IRR = 20 + \frac{139,775}{139,775 + 31,915} (24 - 20)$$

$$PBP = N_F - 1 + \frac{I_F}{CFF}$$

$$IRR = 23.26\%$$

$$PBP = 3 + \frac{-205,895}{409,800} = 3.5 \text{ years}$$

f. Discounted Cash Flow

Year	Net Cash Flows	PVIF _{10%,t}	Discounted Cash	Cumulative Discounted Cash
0	(2,000,000)	1	(2,000,000)	(2,000,000)
1	800,000	0.9091	727,280	(1272720)
2	700,000	0.8264	578,480	(694240)
3	650,000	0.7513	488,345	(205,895)
4	600,000	0.6831	409,800	203,905
5	800,000	0.6209	496,720	700,625

Problem 7-12.PBP, AAR, NPV
and PI

Annapurna Trading Ltd. is evaluating two mutually exclusive projects: Project A and Project B . The company will require Rs 100,000 for Project A and Rs 140,000 for Project B. The net cash flows of these projects are as follows:

Year	Cash Flows	
	A	B
	–Rs 100,000	–Rs 140,000
Profit after taxes		
1	Rs 10,000	Rs 25,000
2	15,000	25,000
3	20,000	25,000
4	25,000	25,000
5	35,000	25,000

Both projects will be depreciated on straight line over a five-year life and cost of capital of the company is 12 percent.

- Calculate the PBP of each project. If firm has set a maximum payback period of three years, suggest as to which project is preferred.
- What are the average rate of returns of both projects?
- Evaluate the projects on the basis of their NPV.
- What are the profitability indexes of both projects?

• a. Calculation of PBP For Project A:

Year	EAT	Add: Dep.	Cash flow	Cumulative CF
1	10,000	Rs 20,000	Rs 30,000	Rs 30,000
2	15,000	20,000	35,000	65,000
3	20,000	20,000	40,000	105,000
4	25,000	20,000	45,000	150,000
5	35,000	20,000	55,000	205,000

$$PBP = N_F - 1 + \frac{I_F}{CF_F}$$

$$PBP = 2 + \frac{100,000 - 65,000}{40,000} = 2.88 \text{ years}$$

For project B: Annual cash flow

= Annual EAT + Annual depreciation

$$25,000 + \frac{140,000}{5} = \text{Rs } 53,000$$

$$PBPB = \frac{i}{CFA} = \frac{140,000}{53,000} = 2.64 \text{ YEAR}$$

If the projects are mutually exclusive, the project "B" is preferable because it has lower PBP.

b. Calculation of Average Rate of Return (ARR)

Year	A	B
1	Rs 10,000	Rs 25,000
2	15,000	25,000
3	20,000	25,000
4	25,000	25,000
5	35,000	25,000
Total	Rs 105,000	Rs 125,000
Average EAT	Rs 21,000	Rs 25,000

$$ARR_A = \frac{\text{Average EAT}}{\text{Average investment}} = \frac{21,000}{100,000/2} = 42\%$$

$$ARR_B = \frac{\text{Average EAT}}{\text{Average investment}} = \frac{25,000}{140,000/2} = 35.71$$

c. Calculation of net present value (NPV)

For Project A:

Year	Cash flow	12% PVIF	PV
0	(Rs 100,000)	1	(100,000)
1	30,000	0.8929	26,787
2	35,000	0.7972	27,902
3	40,000	0.7118	28,472
4	45,000	0.6355	28,598
5	55,000	0.5674	31,207
		NPV _A	42,966

d. Calculation of profitability index (PI)

For Project A

$$PI_A = \frac{Initial\ Cost + NPV}{Initial\ cost} = \frac{100,000 + 42,966}{100,000} = 1.43$$

$$PI_B = \frac{140,000 + 51,054}{140,000} = 1.36$$

For Project B:

$$NPVB = Annual\ CF \times (PVIFA12\%, 5) - Initial\ costs$$

$$= Rs\ 53,000 \times 3.6048 - Rs\ 140,000$$

$$= Rs\ 191,054 - Rs\ 140,000$$

$$= Rs\ 51,054$$

Based on NPV method, project "B" is acceptable because it has the highest positive NPV

7.15

Following are the cash flows of equally risky Project X and Project Y:

Year	0	1	2	3	4	5
Project X (Rs)	(500,000)	120,000	120,000	120,000	120,000	120,000
Project Y (Rs)	(350,000)	150,000	100,000	80,000	60,000	90,000

Suppose you are the Project Manager and you have to recommend one of these projects for the approval of the Board of Directors. The required rate of return on these projects is 10 percent.

- a. Calculate the payback period, NPV and IRR of each project.
- b. Which project would you accept? Why?
- c. Does any conflict exist in the results given by the above ranking methods? Which decision criterion would you follow if the conflict exists? Why?

Calculation of payback period: For Project 'X'

$$PBP = \frac{\text{Investment}}{\text{average CFAT}} \text{ or } = \frac{Rs\ 500,000}{Rs\ 120,000} = 4.17 \text{ year}$$

PBP for project B with investment Rs 350,000

YEAR	CFAT	Cumulative C.F
1	150,000	150,000
2	100,000	250,000
3	80,000	330,000
4	60,000	390,000
5	90,000	480,000

$$\text{Min year} + \frac{\text{Amount to Recover}}{\text{C.F in max year}}$$

$$3 + \frac{350,000 - 330,000}{60,000} = 3.33 \text{ years}$$

Calculation of net present value : Project X

We know,

$$\begin{aligned} NPV &= CFA \times PVIFA_{k\%}, n - \text{Investment} \\ &= Rs\ 120,000 \times PVIFA\ 10\%, 5 \text{ year} - Rs\ 500,000 \\ &= Rs\ 120,000 \times 3.7908 - Rs\ 500,000 \\ &= -Rs\ 45,104 \end{aligned}$$

For Project Y

Years	Net cash flows	PV factor at 10%	PV
0	(Rs 350,000)	1	(Rs 350,000)
1	150,000	0.9091	136,365
2	100,000	0.8264	82,640
3	80,000	0.7513	60,104
4	60,000	0.683	40,980
5	90,000	0.6209	55,881
			NPV = Rs 375,970

The net present value of Project X is **(Rs45,104)**

and that of Project Y is Rs 25,970.

Calculation of IRR:

Project X:

$$\text{Payback period} = \frac{\text{Rs } 500,000}{\text{Rs } 120,000} = 4.1667 \text{ year}$$

Looking at PVIFA table across 5 years, we find 4.1667 in between **4.2124** and **4.1002** which correspond to **6** percent and **7** percent respectively

$$IRR = LR + \frac{PVIF_{LR} - PBP}{PVIF_{LR} - PVIF_{HR}} (HR - LR)$$

$$IRR = LR + \frac{4.2124 - 4.1667}{4.2124 - 4.1002} (7 - 6)$$

$$IRR = 6.41\%$$

Project Y:

i. Fake annuity $= \frac{\text{Total CFAT}}{\text{No of year}}$

or $\frac{\text{Rs } 480,000}{5} = \text{Rs } 96,000$

ii. Fake Payback peri $= \frac{\text{Rs } 350,000}{\text{Rs } 96,000} = 3.645 \text{ years}$

iii. Looking at PVIFA table across 5 periods, we find **3.6458** is closest to **3.6048** which correspond to **12 percent**. Since the cash **inflows in the earlier years are larger** than average cash flows, the IRR should be greater than 12 percent.

iv) Trial and error table.

Years	Net cash flows(Rs)	PV factor at 13%	PV	PV factor at 14%	PV
0	(Rs 350,000)	1	(Rs 350,000)	1	(Rs 350,000)
1	150,000	0.885	132,750	0.8772	131,580
2	100,000	0.7831	78,310	0.7695	76,950
3	80,000	0.6931	55,448	0.675	54,000
4	60,000	0.6133	36,798	0.5921	35,526
5	90,000	0.5428	48,852	0.5194	46,746
			NPV = Rs 2,158		NPV = (Rs 5,198)

Now, we know that the project's IRR lies in between 12 percent and 14 percent. So, let us interpolate using the following equation:

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$IRR = 13 + \frac{2,158}{2158 + 5198} (14 - 13)$$

The IRR of Project X is 6.41 percent and that of Project Y is 12.29 percent.

- b. The NPV of Project X is negative and its IRR is less than required rate of return, so it is not acceptable. Project Y's NPV is positive and it's IRR is also greater than required rate of return, so this project is acceptable. Thus, Project Y is recommended to the board of directors for approval..
- c. There is no confliction among above ranking methods, because all the methods have given consistent result, that is, acceptance of Project Y. However, if conflict exists, we adopt the decision as per NPV method, because this is the superior method among all.

Exam Question 2021

18. You are a financial analyst for the Nepal Press. The director of capital budgeting has asked you to analyze two proposed capital investments: Project X and Project Y. Each project has a cost of Rs 1,500,000, and the cost of capital for each project is 12 percent. The expected net cash flows are as follows:

Year	Expected Net Cash Flows (in '000)	
	Project X	Project Y
0	(Rs 1,500)	(Rs 1,500)
1	500	400
2	500	500
3	500	800
4	500	800

- Calculate each project's payback period, net present value and internal rate of return.
- Which project or projects should be accepted if they are independent?
- Which project should be accepted if they are mutually exclusive?

/8+1+1]

Given information

project cost = 1,500,000

cost of capital = 12%

a. calculation of Net present Value X project

year	Project X (000)	PVIF 12%	PV
0	-1,500	1	-1500
1	500	0.8929	446.43
2	500	0.7972	398.60
3	500	0.7118	355.89
4	500	0.6355	317.76
	NPV		18.67

NPV of project Y calculation

year	Project Y(000)	PVIF 12%	PV
0	-1,500	1	-1500
1	400	0.8929	357.14
2	500	0.7972	398.60
3	800	0.7118	569.42
4	800	0.6355	508.41
		NPV	333.58

calculation of IRR for project x

year	Project X	PVIF 12%	PV	PVIF13%	PV
0	-1,500	1.0000	-1500	1.0000	-1500
1	500	0.8929	446.43	0.8850	442.48
2	500	0.7972	398.60	0.7831	391.57
3	500	0.7118	355.89	0.6931	346.53
4	500	0.6355	317.76	0.6133	306.66
		NPV	18.67	NPV	-12.76

again interpolation of higher rate and lower rate

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$IRR = 12 + \frac{18.67}{18.67 + 12.76} (13 - 12)$$

$$IRR = 12.59\%$$

year	Project Y	PVIF 20%	PV	PVIF 21%	PV
0	-1,500	1.0000	-1500	1.0000	-1500.00
1	400	0.8333	333.33	0.8264	330.58
2	500	0.6944	347.22	0.6830	341.51
3	800	0.5787	462.96	0.5645	451.58
4	800	0.4823	385.80	0.4665	373.21
		NPV	29.321	NPV	-3.13

NPV of project Y calculation

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$IRR = 20 + \frac{29.321}{29.321 + 3.13} (20 - 21)$$

$$20.90\%$$

NPV of project X = Rs 18.67

IRR of project X= 12.59

NPV of project Y = Rs 333.58

IRR of project Y= 20.90

decisions:

- if the projects are independent both projects are acceptable.
- if the projects are mutually exclusive then project Y with higher NPV and IRR is accepted

Exam Questions - 2019

18. You are analyzing two proposed capital investments: Project Alpha and Project Beta. Each project has a cost of Rs 800,000, and the cost of capital for each project is 10 percent. The expected net cash flows are as follows:

Year	Expected Net Cash Flows	
	Project Alpha	Project Beta
0	(Rs 8,00,000)	(Rs 8,00,000)
1	3,00,000	4,00,000
2	3,00,000	3,50,000
3	3,00,000	2,50,000
4	3,00,000	1,50,000

- Calculate each project's payback period and net present value.
- Which project or projects should be accepted if they are independent? Which project should be accepted if they are mutually exclusive?
- Calculate IRR of the Project Alpha. Should the project be accepted on the basis of IRR?
- What are advantages and disadvantages of payback period and net present value method?

[4+2+2+2]

PAYBACK PERIOD OF A

$$PBP = \frac{INVESTMENT}{CFA} = \frac{800,000}{300,000}$$

PAY BACK PERIOD OF PROJECT B

YEAR	Project Y	Cumulative Cf
0	-800,000	-800,000
1	400,000	-400,000
2	350,000	-50,000
3	250,000	200,000
4	150,000	350,000

$$PBP = N_F - 1 + \frac{I_F}{C_{F_F}}$$

$$PBP = 2 + \frac{-50,000}{250,000} = 2 \text{ years}$$

NPV of project X

year	Project X	PVIF 10%	PV
0	-800,000	1	-800000
1	300,000	0.9091	272727.27
2	300,000	0.8264	247933.88
3	300,000	0.7513	225394.44
4	300,000	0.6830	204904.04
		NPV	111204.80

NPV of project Y

year	Project X	PVIF 10%	PV
0	-800,000	1	-800000
1	400,000	0.9091	363636.36
2	350,000	0.8264	289256.20
3	250,000	0.7513	187828.70
4	150,000	0.6830	102452.02
		NPV	109433.49

IRR of project X

year	Project x	PVIF 19%	PV	PVIF18%	PV
0	-800,000	1.0000	-800000	1.0000	-800000
1	300,000	0.8403	252100.8	0.8475	254237.288
2	300,000	0.7062	211849.4	0.7182	215455.329
3	300,000	0.5934	178024.7	0.6086	182589.262
4	300,000	0.4987	149600.6	0.5158	154736.663
		NPV	-8424.344	NPV	7018.54141

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$IRR = 18 + \frac{7018.541}{7018.541 + 8424.344} (19 - 18)$$

$$IRR = 18.45\%$$

IRR of project Y

year	Project X'	PVIF 19%	PV	PVIF 20%	PV
0	-800,000	1	-800000	1.	-800000
1	400,000	0.8403	336134.5	0.8333	333333.33
2	350,000	0.7062	247157.7	0.6944	243055.56
3	250,000	0.5934	148354	0.5787	144675.93
4	150,000	0.4987	74800.31	0.4823	72337.96
	NPV	6446.407	NPV	-6597.22	
	IRR	19.49%			

IRR of project Y

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$IRR = 19 + \frac{6446.407}{6446.407 + 6597.2222} (20 - 19)$$

$$IRR = 19.49\%$$

354 Business Finance

Problem 7-18. Followings are the cash flows of two mutually exclusive equally risky Projects A and B:
PBP, DPBP, NPV
and IRR

Year	Project A	Project B
0	(Rs 180,000)	(Rs 18,000)
1	10,000	10,000
2	25,000	5,000
3	25,000	3,000
4	380,000	2,000

Suppose you are the Project Manager and you have to recommend one of these projects for the approval of Board of Directors. The required rate of return on both projects is 15 percent.

- a. If you apply the payback criterion, which project will you recommend? Why?
- b. If you apply the discounted payback criterion, which project will you choose? Why?
- c. If you apply NPV criterion, which project will you choose? Why?
- d. If you apply IRR criterion, which project will you choose? Why?
- e. Which project will you finally choose if NPV and IRR give the conflicting results? Why?

Calculation of Payback period

Year	Project-A		Project-B	
	Cash Flow	Cumulative CF	Cash Flow	Cumulative CF
1	Rs 10,000	Rs 10,000	Rs 10,000	Rs 10,000
2	25,000	35,000	5,000	15,000
3	25,000	60,000	3,000	18,000
4	380,000	440,000	2,000	20,000

$$PBP = N_F - 1 + \frac{I_F}{CFF}$$

Project A is given by:

$$PBP = 3 + \frac{180,000 - 60,000}{380,000} = 3.32 \text{ years}$$

For project B, the Table shows that initial investment of Rs 18,000 is exactly recovered in 3 years.

Therefore, the PBP of project B is 3 years
Based on PBP criterion Project B is better because it has lower PBP

Calculation of discounted payback period:

Years	Cash flows	PV factor at 15%	PV	Cumulative PV
1	Rs 10,000	0.8696	Rs 8,696.	Rs 8696.00
2	25,000	0.7561	18,902.50	27,598.50
3	25,000	0.6575	16,437.50	44,036.00
4	380,000	0.5718	217.28	261320
			TPV=	
			261320	

Now, Discounted PBP of project A is given by:

Now, Discounted PBP of project A is given by:

$$DPBP = N_F - 1 + \frac{I_F}{CF_F}$$

$$PBP = 3 + \frac{180,000 - 44,036}{217.28} = 3.63 \text{ years}$$

For Project B

Years	Cash flows	PV factor at 15%	PV	Cumulative PV
1	Rs 10,000	0.8696	Rs 8,696.00	Rs 8696.00
2	5,000	0.7561	3,780.50	12,476.50
3	3,000	0.6575	1,972.50	14,449.00
4	2,000	0.5718	1,143.60	15,592.60

$$TPV = 15,592.60$$

The initial investment of project B is Rs 18,000 and the Table shows that the discounted cash flow of the project B does not cover this initial investment during its 4 years of life. Therefore, Project A is better from discounted PBP criterion.

Calculation of net present value:

For Project A: $NPVA = TPV - \text{Initial Cost}$

$$= \text{Rs } 261,320 - \text{Rs } 180,000 = \text{Rs } 81,320$$

For Project B:

$NPVB = TPV - \text{Initial Cost}$

$$= \text{Rs } 15,592.60 - \text{Rs } 18,000$$

$$= -\text{Rs } 2,407.40$$

Project A offers positive NPV, so that it is better according to NPV method.

Calculation of IRR For project A:

As calculated in part c, NPV of project A at 15 percent is positive by significant amount, try at some higher rates. Let us try at 27 percent and 28 percent.

Years	Cash flows	PV factor at 27%	PV at 27%	PV factor at 28%	PV at 28%
0	(Rs 180,000)	1	(Rs 180,000)	1	(Rs 180,000)
1	10,000	0.7874	7,874	0.7813	7,813
2	25,000	0.62	15,500	0.6104	15,260
3	25,000	0.4882	12,205	0.4768	11,920
4	380,000	0.3844	146,072	0.3725	141,550
			NPV = 1,651		NPV = (3,457)

We know that the IRR is given by:

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

DO ACCORDINGLY PROJECT B

E. if there are conflicts between NPV and IRR methods, we prefer NPV method.

- It is because; NPV represents the real increase in shareholders wealth, it does not violate the
- value additivity principles, it does not give multiple ranking of the projects and it assumes
- that future cash flows from the projects are reinvested at cost of capital

7.20. ABC (Pvt.) Ltd. is considering to install a plastic recycle plant. It will cost Rs 500,000 and generate Rs 200,000 revenue for 8 years. Its operating cost will be Rs 100,000. It will follow straight line depreciation method to depreciate the plant.

The plant will last for 8 years. The expected book salvage value will be zero but the market value will be Rs 20,000. Marginal corporate tax rate applicable to the company is 20 percent.

- a. What will be initial investment outlay of the project?
- b. What will be annual depreciation of the purposed plant?
- c. What will be the operating cash flows of the project?
- d. What will be terminal cash flow?

Given,

Cost of recycle plant = Rs. 500,000

Annual sales revenue = Rs. 200,000

Life of plant = 8 years

Annual operating cost = Rs. 100,000

Method of depreciation = SLM

Book salvage value at end = Nil

Cash salvage value at end = Rs. 20,000

Corporate tax rate = 20%

a. Calculation of initial investment outlay

Cost of recycle plant (Rs. 500,000)

Initial investment outlay (Rs. 500,000)

b. Calculation of annual depreciation:

$$\text{Dep} = \frac{\text{Total cost} - \text{Book salvage value}}{\text{life of Plant}}$$

$$\text{Dep} = \frac{500,000 - 0}{8} = \text{Rs } 62,500 \text{ per year}$$

c. Calculation of annual operating cash flow

Annual sales revenue	Rs. 200,000
Less: Annual operating cost	100,000
Earnings before depreciation and tax (EBDT)	100,000
Less: Annual depreciation	62,500
Earnings before tax (EBT)	37,500
Less: Taxes at 20%	7,500
Earnings after tax (EAT)	30,000
Add back: Annual depreciation	62,500
Annual operating cash flows	Rs. 92,500

d. Calculation of terminal cash flow:

Cash salvage value of recycle plant	Rs. 20,000
Tax on gain from the sale of plant (20,000 × 0.2)	-4,000
Terminal cash flow	16,000

7.21 XYZ (Pvt.) Ltd. is contemplating to purchase a machine for Rs 100,000. It will cost Rs 20,000 for its installation. It will need another Rs 20,000 for working capital. The machine is cost effective. It will save annually Rs 40,000 operating cost. The economic life of the machine is 5 years and it falls in 3-year life class. The machine will have Rs 20,000 salvage value. Marginal tax rate applicable to this company is 20 percent.

Answer to the following questions:

- What will be the initial investment outlay of the project?
- What will be annual depreciation of the purposed plant?
- What will be the operating cash flows of the project?
- What will be terminal cash flow?
- e. What will be the net cash flows of the project?

a. Initial investment outlay

Cost of machine	100,000
Installation cost	20,000
Working capital	20,000
Initial investment outlay	140,000

b. Annual depreciation

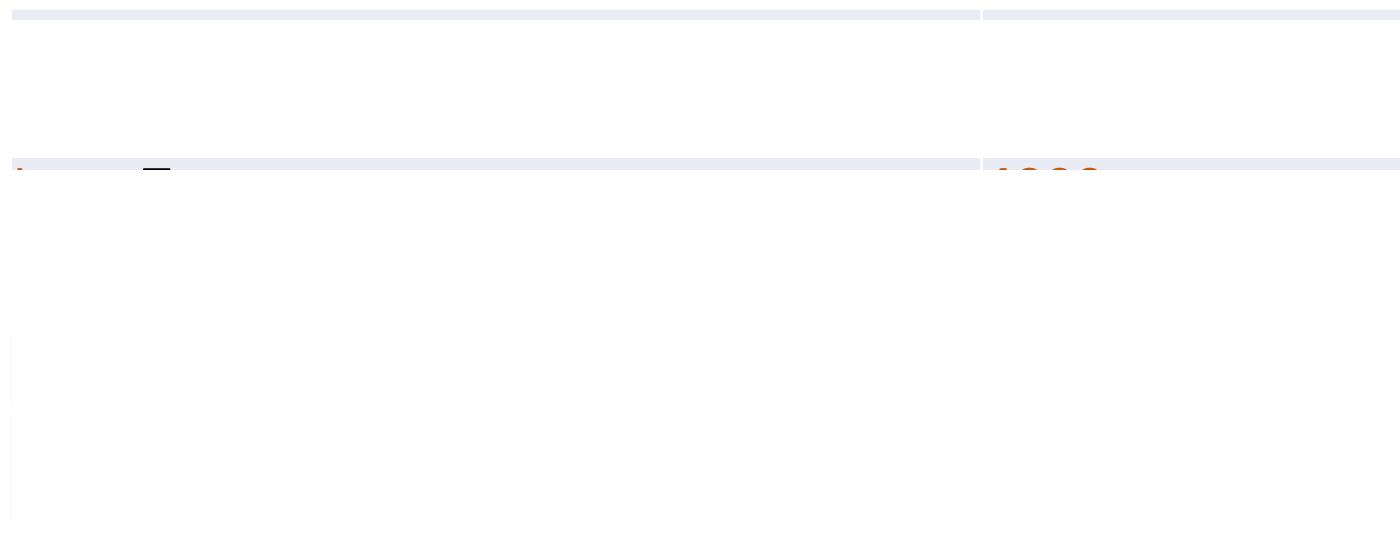
Year	Cost	Recovery Rate	Depreciation	Book Value
1	120,000	0.3333	39,996	80,004
2	120,000	0.4444	53,328	26,676
3	120,000	0.1482	17,784	8,892
4	120,000	0.0741	8,892	-

Here original cost is Rs 120,000 this will be decrease over time with depreciation and at 4th year the book value will be zero.

c. Operating Cash flow

Years	Cost saving	Dep	EBT	Taxes(20%)	NI=(EBT- Tax)	OCF = (NI+DEP)
1						
2						
3						
4						
5						

d. Terminal Cash Flow



e. Annual Net Cashflow

years	Rs
1	39,999.20
2	42,665.60
3	35,556.80
4	33,778.40
5	68,000

National Paper Company is contemplating the replacement of one of its bottling machines with a newer and more efficient one. The old machine has a book value of Rs 600,000 and a remaining useful life of five years. The firm does not expect to realize any return from scrapping the old machine in five years, but it can sell the machine now to another firm in the industry for Rs 265,000. The old machine is being depreciated toward a zero salvage value, or by Rs 120,000 per year, using the straight-line method.

The new machine has purchase price of Rs 1,175,000, an estimated useful life of five years, and an estimated salvage value of Rs 145,000. It is expected to economize on electric power, usage labor and repair costs and to reduce the number of defective bottles. In total, an annual saving of Rs 225,000 will be realized if the new machine is installed. The company's marginal tax rate is 34 percent and it has a 12 percent cost of capital. The depreciation values of new machine from year 1 through 5 would be calculated as 20 percent, 32 percent, 19 percent, 12 percent, and 11 percent of the cost of the asset.

- a. What is the initial cash outlay required for the new machine?
- b. Calculate the change in the annual depreciation expenses if the replacement is made.
- c. What are the operating cash flows in years 1 through 5?
- d. What is the cash flows from the salvage value in year 5?
- e. Should the company purchase the new machine? Support your answer.

Given informations

Information about New machine

New machine cost = Rs 1,175,000

life of machine = 5 years

Estimated salvage value = Rs 145,000

Annual saving by new machine = Rs 225,000

Marginal tax rate = 34%

cost of capital = 12%

Depreciation (1-5) = 20%, 32%, 19%, 12%, 11 %

Old machine

Book value of old machine = Rs 600,000

Remaining useful life = 5 years

Now the firm can sell it = **Rs 265,000 cash salvage value**

annual depreciation = Rs 120,000

salvage value = 0

a. Calculation of initial cashoutlay

Purchase price of the new machine-	1,175,000
Cash salvage value of old machine	-265,000
Tax shield ($\text{Rs } 600,000 - \text{Rs } 265,000$) $\times 0.34$	-113,900
Initial costs	796,100

b. Calculation of annual incremental depreciation and tax shield

Year	Rate of dep on new.	Dep. on new	Dep. on old	Incremental Dep	Tax shield @34% of (Inc. Dep)
1	20% of (1,175,000)	Rs 235,000	Rs 120,000	Rs 115,000	Rs 39,100 (34% 115,000)
2	32 %	376,000	120,000	256,000	87,040
3	19 %	223,250	120,000	103,250	35,105
4	12 %	141,000	120,000	21,000	7,140
5	11 %	129,250	120,000	9,250	3,145
	94%	1,104,500	600,000		

c. Calculation of annual incremental operating cash flows

Year	CFBT	NI=CFBT (1- t)	Tax shield	CFAT (NI+D)
1	Rs 225,000	Rs 148,500	Rs 39,100	Rs 187,600
2	225,000	148,500	87,040	235,540
3	225,000	148,500	35,105	183,605
4	225,000	148,500	7,140	155,640
5	225,000	148,500	3,145	151,645

d. Calculation of terminal cash flows

Cash salvage value of new assets	Rs 145,000
Tax liabilities (Rs 145,000 – Rs 70,500*) x 0.34	-25,330
Terminal cash flow in year 5	Rs 119,670

Final book Value of new assets = Original costs – Total depreciation
= **Rs 1,175,000 – Rs 1,104,500 = Rs 70,500**

e. Calculation of net present value

Year	Cash Flow	12% PVIF	PV
0	796,100)	1	796,100)
1	187,600	0.8929	167,508
2	235,540	0.7972	187,772
3	183,605	0.7118	130,690
4	155,640	0.6355	98,909
5	271,315	0.5674	153,944
			NPV = -57277

Captial Structure and Leverage

Capital Structure refers to the way a company finances its assets through a combination of debt (loans, bonds) and equity (stocks, retained earnings). It represents the specific mixture of long-term debt, short-term debt, common equity, and preferred equity used by a company to fund its operations and growth.

Leverage refers to the use of borrowed funds (debt) in a company's capital structure. It involves using debt to increase the potential return on investment for shareholders. However, while leverage can amplify profits if the company performs well, it also increases financial risk, as the company is obligated to repay the debt regardless of its financial performance.

Capital Structure: The mix of debt and equity used to finance a company.

Leverage: The degree to which a company uses debt in its capital structure to magnify its potential returns.

1. Operating Leverage (OL)

Operating leverage measures how a company's fixed costs impact its operating income. Businesses with higher fixed costs and lower variable costs have **higher operating leverage**, meaning a small change in sales can significantly impact profits.

Formula for Operating Leverage:

$$\text{Degree of Operating Leverage (DOL)} = \frac{\% \text{ Change in EBIT}}{\% \text{ Change in Sales}}$$

Or,

$$DOL = \frac{\text{Contribution Margin}}{\text{EBIT}}$$

Where:

Where:

- **Contribution Margin** = Sales Revenue – Variable Costs
- **EBIT (Earnings Before Interest & Taxes)** = Operating Profit

Example:

If sales increase by 10% and EBIT increases by 25%, the DOL is:

$$DOL = \frac{25\%}{10\%} = 2.5$$

This means that a 1% increase in sales will result in a 2.5% increase in EBIT.

Formula for Operating Leverage:

$$\text{Degree of Operating Leverage (DOL)} = \frac{\% \text{ Change in EBIT}}{\% \text{ Change in Sales}}$$

Or,

$$DOL = \frac{\text{Contribution Margin}}{\text{EBIT}}$$

Where:

- **Contribution Margin** = Sales Revenue – Variable Costs
- **EBIT (Earnings Before Interest & Taxes)** = Operating Profit

Example:

If sales increase by 10% and EBIT increases by 25%, the DOL is:

$$DOL = \frac{25\%}{10\%} = 2.5$$

This means that a 1% increase in sales will result in a 2.5% increase in EBIT.

2. Financial Leverage (FL)

Financial leverage shows how much a company relies on debt to finance its operations. Higher financial leverage means a company has more debt, which can magnify earnings but also increase financial risk.

Formula for Financial Leverage:

$$\text{Degree of Financial Leverage (DFL)} = \frac{\% \text{ Change in EPS}}{\% \text{ Change in EBIT}}$$

Or,

$$DFL = \frac{\text{EBIT}}{\text{EBIT} - \text{Interest}}$$

Example:

If EBIT increases by 20% and Earnings Per Share (EPS) increases by 40%, then:

$$DFL = \frac{40\%}{20\%} = 2$$

This means a 1% increase in EBIT leads to a 2% increase in EPS.

3. Combined (Total) Leverage (CL)

Combined leverage considers both **operating leverage** and **financial leverage**, measuring how sensitive net income is to changes in sales. It is the combined effect of fixed operating costs and fixed financial costs.

Formula for Combined Leverage:

$$\text{Degree of Combined Leverage (DCL)} = DOL \times DFL$$

Or,

$$DCL = \frac{\% \text{ Change in EPS}}{\% \text{ Change in Sales}}$$

Or,

$$DCL = \frac{\text{Contribution Margin}}{\text{EBIT} - \text{Interest}}$$

Example:

If a company has a **DOL of 2.5** and a **DFL of 2**, then:

$$DCL = 2.5 \times 2 = 5$$

This means a 1% increase in sales leads to a 5% increase in EPS.

8.1. The firm A and B are identical except for their leverage ratios and interest rates on debt. Each has Rs 20 million in assets, earned Rs 4 million before interest and taxes in 2022, and has a 40 percent tax rate. Firm A, however, has a leverage ratio of 50 percent and pays 12 percent interest on its debt, whereas B has a 30 percent leverage ratio and pays only 10 percent interest on debt.

- a) Calculate the rate of return on equity for each firm.
- b) Observing that A has a higher return on equity, B's treasurer decides to raise the leverage ratio from 30 to 60 percent, which will increase B's interest rate on all debt to 15 percent.
- c) Calculate the new rate of return on equity for B?

	Firm -A	Firm -B
Total assets	Rs 20 million	Rs 20 million
EBIT	Rs 4 million	Rs 4 million
Tax rate (T)	40%	40%
Debt asset ratio	50%	30%
Interest on debt	12%	10%
Debt	$Rs 20 \times 0.5 = Rs 10 \text{ million}$	$Rs 20 \times 0.3 = Rs 6 \text{ million}$
Equity	$Rs 20 - Rs 10 = Rs 10 \text{ million}$	$Rs 20 - Rs 6 = Rs 14 \text{ million}$
Interest	$Rs 10 \times 0.12 = Rs 1.2 \text{ million}$	$Rs 6 \times 0.10 = Rs 0.6 \text{ million}$

Calculation of Rate of Return On Equity

Particulars	Firm A	Firm B
EBIT	Rs 4,000,000	Rs 4,000,000
Less: Interest	Rs 1,200,000	Rs 600,000
EBT	Rs 2,800,000	Rs 3,400,000
Less: Taxes (@40%)	Rs 1,120,000	Rs 1,360,000
Net Income	Rs 1,680,000	Rs 2,040,000
Equity	Rs 10,000,000	Rs 14,000,000
ROE	16.80%	14.57%

b. if the firm B raises the leverage ratio from 30 to 60 percent, and its interest rate on all debt rises to 15 percent the new rate of return on equity for B is:

Particulars	Firm B
Total assets	Rs 20 million
EBIT	Rs 4 million
Tax rate (T)	40%
Debt asset ratio	60%
Interest on debt	15%
Debt	$Rs 20 \times 0.6 = Rs 12 \text{ million}$
Equity	$Rs 20 - Rs 12 = Rs 8 \text{ million}$
Interest	$Rs 12 \times 0.15 = Rs 1.8 \text{ million}$

Now the Rate of Return on equity for Firm B

Particulars	Firm B
EBIT	Rs 4,000,000
Less: Interest	Rs 1,800,000
EBT	Rs 2,200,000
Less: Taxes @ 40%	Rs 880,000
Net income	Rs 1,320,000
Equity	Rs 8,000,000
ROE	16.5%

No. of units sold for product A in 2019

$$\text{Net income} = [Q(S - V) - FC] - \text{Int.} (1 - T)$$

$$600,000 = [Q(35 - 19) - 200,000] - 36,000 (1 - 0.4)$$

$$600,000 = [16Q - 236,000] 0.6$$

$$1,000,000 = 16Q - 236,000$$

$$Q = 1,236,000$$

= 77,250 units

Degree of financial leverage:

$$DFL = \frac{EBIT}{EBT}$$

$$DFL = \frac{1,036,000}{1,000,000} = 1.06. \text{ times}$$

Where:

EBT = EBIT - Interest

$$1,036,000 - 36,000 = \text{Rs } 1,000,000$$

Degree of Operating Leverage:

$$DOL = \frac{Q(S-V)}{Q(S-V)-FC}$$

$$DOL = \frac{77,250 (35 - 19)}{77,250 (35 - 19) - 200,000} = 1.19 \text{ times}$$

Degree of combined leverage:

$$DCL = \frac{\text{Contribution Margin}}{EBT}$$

$$DFL = \frac{1236,000}{1,000,000} = 1.23 \text{ times}$$

C. performa Income Statement

Particulars	Amount (Rs)
Sales (Rs 35 × 77,250)	Rs 2,703,750
Less: Variable cost (Rs 19 × 77,250)	Rs 1,467,750
Contribution margin	Rs 1,236,000
Less: Fixed costs	Rs 200,000
EBIT	Rs 1,036,000
Less: Interest (0.12 × Rs 1,000,000)	Rs 120,000
EBT	Rs 916,000
Less: Tax @ 40%	Rs 366,400
Net Income	Rs 549,600

Degree of combined leverage (DCL) $\frac{\text{Contribution Margin}}{\text{EBT}} = \frac{1236,000}{916,000} = 1.35 \text{ times}$



Unit -8

Working Capital Management

Working Capital

- Working capital management refers to the management of a company's short-term assets and liabilities to ensure its day-to-day operations run smoothly.
- It involves monitoring and controlling the levels of current assets and current liabilities to optimize the company's liquidity, profitability, and overall financial health.
- Current assets typically include cash, accounts receivable, inventory, and short-term investments.
- These assets are essential for the company's operations and are expected to be converted into cash within one year.
- On the other hand, current liabilities consist of accounts payable, accrued expenses, and short-term debt. These are obligations that need to be settled within a year.
- The primary goal of working capital management is to maintain a balance between current assets and current liabilities. The management of working capital focuses on the following key aspects:
 - **Cash Flow Management:** Ensuring adequate cash is available to meet daily operational needs, such as paying suppliers, covering payroll, and managing other short-term expenses.
 - **Inventory Management:** Efficiently managing inventory levels to avoid excess stock, minimize holding costs, and prevent shortages that may disrupt production or sales.
 - **Accounts Receivable Management:** Monitoring and controlling the collection of outstanding customer payments to minimize the average collection period and reduce the risk of bad debts.

Working Capital

- Accounts Payable Management: Managing payment terms with suppliers to optimize cash flow by extending payment periods while maintaining good relationships and credit terms.
- Short-term Financing: Evaluating and arranging appropriate short-term financing options, such as bank loans, lines of credit, or trade credit, to meet short-term cash needs.

Component of Working Capital

The two main components of working capital are current assets and current liabilities. Let's take a closer look at each of them:

1. Current Assets: Current assets are assets that are expected to be converted into cash or consumed within one year or within the operating cycle of the business. They are typically more liquid than fixed assets. Some common examples of current assets include:

a. Cash and Cash Equivalents:

This includes cash on hand, demand deposits in bank accounts, and highly liquid investments that can be readily converted into cash.

b. Accounts Receivable:

These are amounts owed to the company by its customers for goods or services provided on credit. Accounts receivable represent a claim on future cash flows.

Working Capital

- c. **Inventory:** It refers to the goods or products that a company holds for sale or for use in production. Inventory can include raw materials, work-in-progress, and finished goods.
- d. **Short-term Investments:** These are investments with a maturity period of less than one year. They can include marketable securities or other highly liquid investments.

2 Current Liabilities: Current liabilities are the obligations that a company is expected to settle within one year or within the operating cycle. They represent the claims of creditors against the company's assets. Some examples of current liabilities include:

- a. **Accounts Payable:** These are amounts owed by the company to its suppliers or vendors for goods or services received on credit.
- b. **Short-term Debt:** This includes loans or borrowings that are due for repayment within one year.

- c. **Accrued Expenses:** These are expenses that have been incurred but not yet paid. Examples include salaries payable, interest payable, and taxes payable.
- d. **Unearned Revenue:** It represents advance payments received from customers for goods or services that are yet to be delivered or rendered.

Objective of Working Capital management

The objectives of working capital management revolve around ensuring the company has sufficient liquidity to support its day-to-day operations while maximizing profitability and minimizing risks. The key objectives of working capital management include:

Maintaining Adequate Liquidity: One of the primary objectives is to ensure that the company has enough cash and liquid assets to meet its short-term obligations as they become due. This involves managing cash flows, optimizing cash balances, and having access to short-term financing when needed.

Optimizing Working Capital Levels: Working capital management aims to strike a balance between the levels of current assets and current liabilities. By effectively managing inventory, accounts receivable, and accounts payable, the company can minimize tied-up capital in non-productive assets and reduce financing costs.

Maximizing Operational Efficiency: Efficient working capital management helps streamline operational processes. By effectively managing inventory levels, the company can prevent stockouts and shortages, reducing disruptions to production and sales. Similarly, by managing accounts receivable, the company can ensure timely collection of payments, improving cash flows and reducing bad debt risks.

Objective of Working Capital management

Minimizing Financing Costs: Working capital management aims to minimize the cost of financing short-term needs. By optimizing the levels of current liabilities and effectively negotiating payment terms with suppliers, the company can reduce the need for expensive short-term financing options and potentially benefit from early payment discounts.

Enhancing Profitability: Effective working capital management can contribute to overall profitability. By minimizing the amount of capital tied up in non-productive assets, the company can free up funds for investment in growth opportunities or other value-generating activities.

Mitigating Risks:

Working capital management helps identify and mitigate various risks associated with liquidity, credit, and operational inefficiencies. By monitoring and managing working capital components, the company can identify potential liquidity gaps, manage credit risks, and avoid disruptions in the supply chain.

Maintaining Financial Stability:

A stable working capital position is essential for the financial health and stability of a company. By ensuring sufficient liquidity, optimizing working capital levels, and managing cash flows, the company can enhance its ability to weather financial downturns and unforeseen challenges.

Nature and Purpose of Receivable Management

- An aspect of firm's current assets management, which is concerned with promoting company's sales and profit to the extent where return on investment in accounts receivable remains greater than the costs of receivable CREDIT POLICY A credit decision policy of the firm, which provides guidelines for determining whether to extend credit to a customer and how much credit to extend

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Determinants of Investment in Receivables

Accounts receivable = Average daily credit sales x
Average collection period

$$\text{Investment in receivables} = \frac{\text{FC} + \text{VC}}{\text{Days in year}} \times \text{DSO}$$

$$\text{Investment in receivables} = \frac{\text{VC}}{\text{Days in year}} \times \text{DSO}$$

Investment in receivables

$$= \frac{\text{Annual credit sales}}{\text{Days in year}} \times \text{VRR} \times \text{DSO}$$

Analyzing Credit Policy

Opportunity cost of receivables

= Investment in receivables × Opportunity cost (k)

Bad debt losses = Annual credit sales x Percentage of default customer

Discount cost = Annual credit sales × % discount customer x % cash discount

Nature of Inventory Management

Demand and Supply Variability:

Inventory management recognizes that both customer demand and supplier deliveries can be subject to variability. Therefore, inventory management aims to strike a balance between having enough stock to meet customer demand while minimizing the costs associated with excess inventory or stockouts.

Lead Time Considerations:

Inventory management takes into account the time it takes for suppliers to deliver goods or for internal production processes to produce finished goods. Lead time is an essential factor in determining the optimal inventory levels to ensure uninterrupted production and customer satisfaction.

ABC Analysis:

Inventory management often employs the ABC analysis technique to categorize inventory items based on their value and importance. It classifies items as A, B, or C, with A items being the most valuable and requiring closer monitoring and control, while C items have lower value and may have looser inventory control.

Safety Stock and Reorder Point:

Inventory management recognizes the need for safety stock—a buffer stock held to protect against unexpected demand variability or lead time fluctuations. Reorder point is the inventory level at which a new order should be placed to replenish stock and maintain the desired service level.

Just-in-Time (JIT) and Lean Principles:

Inventory management aligns with JIT and lean principles, which emphasize minimizing inventory levels and waste throughout the supply chain. This approach focuses on improving production and delivery processes to reduce lead times and eliminate non-value-added activities.

Nature of Inventory Management:

Technology and Automation: Inventory management leverages technology and automation tools to optimize inventory control and accuracy. These tools can include inventory management software, barcode scanners, real-time tracking systems, and demand forecasting tools to improve efficiency and decision-making.

Supply Chain Collaboration: Effective inventory management often involves collaboration with suppliers and other partners in the supply chain. Sharing information, coordinating demand forecasts, and implementing vendor-managed inventory (VMI) or consignment inventory systems can improve inventory visibility, reduce stockouts, and enhance overall supply chain performance.

- Continuous Improvement: Inventory management is an ongoing process that requires continuous monitoring, analysis, and improvement. Regular review of inventory performance metrics, such as inventory turnover, fill rate, and days of supply, helps identify areas for optimization and supports informed decision-making.

Basic Inventory Costs.

There are several inventory management models used to satisfy the objectives of inventory management. One of such models is the EOQ model that we discuss in next section.

However, using EOQ model, first requires to understand the different types of costs associated with inventory. Therefore, in this section, we attempt to describe two components of total inventory cost: the carrying cost and the ordering cost.

- Continuous Improvement: Inventory management is an ongoing process that requires continuous monitoring, analysis, and improvement. Regular review of inventory performance metrics, such as inventory turnover, fill rate, and days of supply, helps identify areas for optimization and supports informed decision-making.

Carrying Costs

The costs of holding inventory in stocks

$$\text{Total carrying costs (TCC)} = (C).(A)$$

Where

carrying cost per unit is calculated as percentage carrying costs (C) multiplied by price per unit (P) and average inventory is calculated as order size (Q) divided by 2.

They are expressed as follows:

9.1 Dhaulagiri Electronics Ltd. is concerned about managing cash efficiently. On average, inventories have an average age of 75 days, and accounts receivable are collected in 40 days. Accounts payable are paid approximately after 35 days. The firm spends Rs 50 million operating cycle investments each year, at a constant rate.

Assuming a 360-day year:

- Calculate the firm's operating cycle.
- Calculate the firm's cash conversion cycle.
- Calculate the amount of negotiated financing required to support the firm's cash conversion Cycle.
- Discuss how management might be able to reduce the cash conversion cycle.

Given:

Inventory conversion period (ICP) = 75 days

Receivable conversion period (RCP) = 40 days

Payable deferral period (PDP) = 35

Operating cycle annual investment = 50 million

Working days in a year

= 360 days

a. Firm's operating cycle (OC)

= ICP + RCP = 75 days + 40 days = 115 days

b. Firm's cash conversion cycle

= Operating cycle - PDP

= 115 days - 35 days = 80 days

c. Financial required to support the CCC.

Amount of negotiated financing required = (Total investment in operating cycle ÷ 360) x CCC
= (Rs 50,000,000 / 360) x 80 days = Rs 11,111,111.11

Thus, the firm needs funds of Rs 11,111,111.11 from external financing in order to support the CCC of 80 days.

d. The management can reduce cash conversion cycle by shortening ICP/RCP or lengthening the PDP or a combination of these can reduce the cash conversion cycle.

Chandra Agarbatti Company has an inventory turnover of 12 times each year, an average collection period of 45 days, and an average payment period of 40 days. The firm spends Rs 1 million on operating cycle investments each year.

Assuming a 360-day year:

- a. Calculate the firm's operating cycle.
- b. Calculate the firm's cash conversion cycle.
- c. Calculate the amount of negotiated financing required to support the firm's cash conversion cycle.
- d. If the firm's operating cycle were lengthened, without any change in its average payment period, how would this affect its cash conversion cycle and negotiated financing need?

Inventory turnover ratio = 12 times

Receivable conversion period= 45 days

Payable deferral period = 40 days

Yearly operating cycle investment = Rs 1 million

Working day's = 360 days

$$ICP = \frac{360}{ITOR} = \frac{360}{12} = 30 \text{ DAYS}$$

a. Operating cycle

$$= ICP + RCP$$

$$= 30 \text{ days} + 45 \text{ days} = 75 \text{ days}$$

b. Cash conversion cycle = Operating cycle - PDP

$$= 75 \text{ days} - 40 \text{ days} = 35 \text{ days}$$

C. Financial requirement to support the firm's CCC

Resources needed

$$= (\text{Annual operating cycle investment} \div 360) \times \text{CCC}$$

$$= (\text{Rs } 1,000,000 \div 360 \text{ days}) \times 35 \text{ days} = \text{Rs } 97,222.22$$

Thus, the Chandra Agarbatti Company needs funds of Rs 97,222.22 from external financing in order to support the CCC of 35 days.

d. If the firm's operating cycle were lengthened without change in average payment period (APP), this will increase. CCC and negotiated financing need will also increase.

9.6 Vishal Cosmetics (VC) Ltd. is a leading producer of cosmetics. It turns out 1,500 tubes of 50 g. beauty cream a day at a cost of Rs 6 per tube for materials and labor. It takes the firm 22 days to convert raw materials into finished goods. V.C. allows its customers 40 days to pay for their credit purchase and it generally pays to suppliers in 30 days.

- a) What is the length of V.C.'s cash conversion cycle?
- b) If V.C. always produces and sells 1,500 tubes a day, what amount of working capital must it finance? What is its working capital turnover? Assume 360 days in a year.
- c) By what amount could V.C. reduce its working capital financing needs if it was able to stretch its payables deferral period to 35 days?

d. V.C.'s management is trying to analyze the effect of a proposed new production process on the working capital investment. The new production process would allow V.C. to decrease its inventory conversion period to 20 days and to increase its daily production to 1,800 tubes.

However, the new process would cause the cost of materials and labor to increase to Rs 7.

Assuming the change does not affect the receivables collection period (40 days) or the payables deferral period (30 days), what will be the length of the cash conversion cycle add We working capital financing requirement if the new production process is implemented? What would be its working capital turnover?

a. Cash conversion cycle:

$$\text{CCC} = \text{ICP} + \text{RCP} - \text{PDP} = 22 \text{ days} + 40 \text{ days} - 30 \text{ days} = 32 \text{ days}$$

b. Working capital = $1,500 \times \text{Rs } 6 \times 32 \text{ days}$
= Rs 288,000

Working capital turnover

$$= \frac{\text{Annual cost of sale}}{\text{Working Capital}} = \frac{1500 \times \text{Rs } 6 \times 360}{\text{Rs } 288,000}$$
$$= 11.25 \text{ times}$$

c. If payable deferral period increases to 35 days, the cash conversion cycle will reduce by 5 days so that 5 days working capital requirement will reduce.

reduction in working capital

$$= 5 \text{ days} \times 1500 \times \text{Rs } 6 = \text{Rs } 45,000$$

d. CCC = ICP + RCP – PDP

$$20 \text{ days} + 40 \text{ Days} - 30 \text{ days} = 30 \text{ days}$$

$$\text{working capital} = 1800 \times \text{Rs}7 \times 30 \text{ days} = \text{Rs } 378,000$$

working capital turnover =

annual cost of sales / working capital

$$= \frac{1800 \times \text{Rs } 7 \times 360}{\text{Rs } 378,000} = 12 \text{ times}$$