Financial Analytics

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Edited by:
Dr. Nitin Gupta

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Edited By
Dr. Nitin Gupta

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Unit 01: Building Basic Financial Statements

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Objectives

After studying this unit, you will be able to:

• Understand usages and purpose of basis financial statements

• Understand and prepare Income Statement.

• Understand and prepare Balance Sheet.

• Understand and prepare common size Income Statement

• Understand and prepare common size Balance Sheet

• Understand and prepare Cash Flow Statement

Introduction

Financial statements are essential reports that provide an overview of a company's financial performance and position. They are crucial tools for stakeholders, such as investors, creditors, and management, to understand the financial health and make informed decisions. The three primary types of financial statements are:

Income Statement (Profit and Loss Statement): An income statement is a financial statement that shows the company's income and expenditures. It shows whether a company is making profit or loss for a given period. The income statement is also known as: Profit and loss statement, Statement of operation, Statement of financial result or income, or earnings statement.

Balance Sheet (Statement of Financial Position): The balance sheet provides a snapshot of a company's assets, liabilities, and shareholders' equity as of a specific date. It offers insights into the company's financial health, solvency, and liquidity. The balance sheet follows the accounting equation:

Assets = Liabilities + Shareholders' Equity

Key components of a balance sheet include:

Assets: These are the resources owned by the company, such as cash, accounts receivable, inventory, property, equipment, investments, etc., arranged in order of liquidity (how quickly they can be converted into cash).

Liabilities: These are the company's obligations to pay debts or fulfill commitments to external parties, such as loans, accounts payable, accrued expenses, etc.

Shareholders' Equity: This represents the residual interest in the company's assets after deducting liabilities. It includes common stock, retained earnings, and additional paid-in capital.

Cash Flow Statement: The cash flow statement reports the inflows and outflows of cash and cash equivalents during a specific period. It provides information on how cash is generated and used by a company and helps assess its liquidity and ability to meet financial obligations. The cash flow statement is divided into three main categories:

a. Operating Activities: Cash flows from core business operations, including cash receipts from sales, payments to suppliers, employees, and other operational expenses. b. Investing Activities: Cash flows related to the purchase and sale of long-term assets, such as property, equipment, and investments. c. Financing Activities: Cash flows from activities involving the company's capital structure, such as issuing or repurchasing stock, taking loans, or paying dividends.

These financial statements are crucial for investors and other stakeholders to evaluate a company's performance, make investment decisions, and assess its financial health and stability.

1.1 Understand and prepare Income Statement

The income statement shows a company's revenues, expenses, and net profit or loss over a specific period, usually a quarter or a year. It highlights the company's ability to generate revenue, control costs, and ultimately, its profitability. The basic formula for an income statement is:

Revenues - Expenses = Net Income (or Net Loss)

Key components of an income statement include:

Revenues (Sales): The total income generated from selling goods or providing services.

Cost of Goods Sold (COGS): The direct costs associated with producing or delivering goods or services.

Gross Profit: The difference between revenues and COGS, representing the company's profitability before considering operating expenses.

Operating Expenses: The costs incurred to run the day-to-day operations, such as salaries, rent, utilities, marketing, etc.

Operating Income: Gross profit minus operating expenses, indicating the profit earned from core operations.

Other Income and Expenses: Additional revenues or expenses not directly related to core operations, such as interest income, interest expenses, gains, or losses from asset sales, etc.

Net Income (Net Profit) or Net Loss: The final result after considering all revenues and expenses, representing the company's overall profitability for the period.

Importance of an income statement:

- P/L Account measures net income by matching revenues and expenses according to the accounting principles.

- A businessman may have other sources of income. Trading Account does not take into consideration the other operating expenses incurred during the course of running the business.

- Profit and Loss Account considers all such expenses and incomes and gives the net profit made or net loss suffered by a business during a particular period.

Proforma of the P/L Account:

Table1.1

PROFIT AND LOSS ACCOUNT
For the year ended ....

Dr.   Cr.

Particulars	Rs.	Particulars	Rs
To Gross Loss b/d To Management Expenses To Selling and Distribution Expenses To Depreciation and maintenance To Financial Expenses To net profit transferred to Capital A/c		By Gross Profit b/d By other income By non-trading income By abnormal gains By Net Loss transferred to Capital Account	

The different expenses can be tabularised as follows:

Table 1.2

Management Expenses	Selling and Distribution Expenses	*Financial Expenses*
Rent and Taxes Heating and Lighting Office Salaries Printing and Stationery Postage and Telegrams Telephone charges Legal Charges	Advertisement Travelers' Salaries Expenses and Commission Warehouse Rent Export expenses Carriage outwards Bank Charges Agent's Commission Upkeep of motor	Discount allowed Interest on loans Discount on bills To abnormal losses Loss by fire (not covered by insurances) Loss on sale of Fixed Assets Loss on sale of Investments
		Depreciation and maintenance Expenses

Audit Fees	lorries	Depreciation
Insurance		Repairs & Maintenance
General Expenses		

The different incomes can be tabularised as follows:

Table 1.3

By other income	*By non-trading income*	*By abnormal gains*
Discount received	Bank interest	Profit on sale of machinery
	Rent of property let-out	
Commission received	Dividend from shares	Profit on sale of investment

Once we substitute all the various income referred in the table 1.2 and expenses mentioned in table 1.3 into the table 1.1, the table 1.2 will now look as follows:

PROFIT AND LOSS ACCOUNT			
For the year ended …….			
Dr.			Cr.
Particulars	Amt (Rs.)	Particulars	Amt (Rs.)
To Gross Loss b/d		**By Gross Profit b/d**	
To Management Expenses		By other income	
Rent, Rates and Taxes		Discount received	
Heating and Lighting		Commission received	
Office Salaries			
Printing and Stationery		**By non-trading interest**	

Postage and Telegrams		Bank interest	
Telephone charges		Rent of property let-out	
Legal Charges		Dividend from shares	
Audit Fees			
Insurance		**By abnormal gains**	
General Expenses		Profit on sale of machinery	
		Profit on sale of investment	
To Selling and Distribution Expenses			
Advertisement			
Travelers' Salaries			
Expenses and Commission			
Godown Rent			
Export expenses			
Carriage outwards			
Bank Charges			
Agent's Commission			
Upkeep of motor lorries			
To Depreciation and maintenance			
Depreciation			
Repairs & Maintenance			

To Financial Expenses			
Discount allowed			
Interest on loans			
Discount on bills			
To abnormal losses			
Loss by fire (not covered by insurances)			
Loss on sale of Fixed Assets			
Loss on sale of Investments			
To net profit transferred to Capital A/c		**By Net Loss transferred to Capital Account**	

Exercise: From the following particulars of Ghanshayam Das Garorimal and Sons, prepare P/L Account for the year ending 31st December 2015.

Particulars	Amt.(Rs.)		Amt.(Rs.)
Gross Profit	2,10,500	Discount allowed	3000
Trade Expenses	2000	Lighting	780
Carriage on sales	10000	Commission received	840
Office Salaries	15,800	Bad-debts	1200
Postage and Telegram	720	Discount (Cr.)	600
Office Rent	7500	Interest on loan	2200
Legal Charges	400	Stable expenses	1400
Audit Fee	1600	Export duty	2300
Donation	1100	Miscellaneous receipts	500
Sundry expenses	360	Unproductive expenses	4100

Selling expenses	5320	Traveling expenses	2500

Solution:

Ghanshayam Das Garorimal

PROFIT AND LOSS ACCOUNT

For the year ended 31st December 1993.

Particulars	Rs.	Particulars	Rs
To Trade Expense	2000	By Gross Profit	2,10,500
Carriage on sales	10000	Commission received	840
Office Salaries	15,800	Discount (Cr.)	600
Postage and Telegram	720	Miscellaneous receipts	2200
Office Rent	7500		
Legal Charges	400		
Audit Fee	1600		
Donation	1100		
Sundry expenses	360		
Selling expenses	5320		
Discount allowed	3000		
Lighting	780		
Bad-debts	1200		
Interest on loan	2200		
Stable expenses	1400		
Export duty	2300		
Unproductive expenses	4100		
Traveling expenses	2500		
To Net Profit transferred to Capital Account	1,50,160		
	2,12,440		2,12,440

Balance Sheet

After ascertaining the net profit or loss of business enterprise, the businessman would like to know the exact financial position of his business. For this purpose a statement is prepared which contains all the assets and liabilities of the business enterprise.

A balance sheet is a financial statement that contains details of a company's assets or liabilities at a specific point in time. It serves as reference documents for investors and other stakeholders to get an idea of the financial health of an organization.

A balance sheet enables to compare current assets and liabilities to determine the business's liquidity, or calculate the rate at which the company generates returns. Comparing two or more balance sheets from different points in time can also show how a business has grown.

A balance sheet has been defined as:

According to J.R.Batliboi – "A balance sheet is a statement prepared with a view to measure the exact financial position of the business on a certain fixed date.

According to Karlson – "A business form showing what is owed and what the proprietor is worth is called a Balance Sheet."

According to A. Palmer – "The balance sheet is a statement at a particular date showing on one side, the trader's property and possession and on the other hand, the liabilities"

1.2   Elements of A Balance Sheet

A balance sheet consists of two main headings: assets and liabilities.

Assets

An asset is something that the company owns and that is beneficial for the growth of the business. Assets can be classified based on convertibility, physical existence, and usage.

Liabilities

Liabilities are what the company owes to other parties. This includes debts and other financial obligations. Companies settle their liabilities by paying them back in cash or providing an equivalent service to the other party.

Classification of Assets

Assets can be classified based on

- Convertibility,
- Physical Existence and
- Usage.

Convertibility

This basis of classification describes as to whether the asset can be easily converted to cash. Based on convertibility, assets are further classified into

- Current Assets and
- Fixed Assets.

Current assets: Assets which can be easily converted into cash or cash equivalents within a duration of one year. Examples include short-term deposits, marketable securities, and stock.

Fixed assets: Assets which cannot be easily or readily converted to cash. For example, buildings, machinery, equipment, or trademarks.

Physical Existence

On the basis of physical existence Assets can be classified into following two types:

- Tangible and

- Intangible

Tangible assets: Assets which you can see and feel, like office supplies, machinery, equipment, and buildings.

Intangible assets: Assets which do not have physical existence, like patents, brands, and copyrights.

Usages

On the basis of usages, Assets can be classified into following two types

- Operating and
- Non-operating assets.

Operating assets: Assets which are necessary to conduct business operations. For example, buildings, machinery, and equipment.

Non-operating assets: Short-term investments or marketable securities that are not necessary for daily operations.

Classification of Liabilities

Liabilities can be classified as:

- Current liabilities
- Fixed liabilities

Current liabilities

These include debts or obligations that have to be fulfilled within a year. Current liabilities are also called short-term assets, and they include accounts payable, interest payable, and short-term loans.

Fixed liabilities

These are debts or obligations for which the due date is more than a year. Non-current liabilities, also called long-term liabilities, include bonds payable, long-term notes payable, and deferred tax liabilities.

Proforma of a Balance Sheet

Liabilities	Rs.	Assets	Rs.
Current Liabilities:		**Current Assets:**	
Bank Overdraft		Cash in hand	
Bills Payable		Cash at Bank	
Sundry Creditors		Bills receivable	
Outstanding Expenses		Short Term Investments	
Unearned Income		Sundry Debtors	
		Closing Stock	

Fixed Liabilities:		Prepaid Expenses	
Long Term Loans		Accrued Income	
Reserves:		**Fixed Assets:**	
Capital:		Furniture	
Add: Net profit		Loose Tools	
Less: Drawings		Motor Vehicle	
Less: Income Tax		Long Term Investments	
Less: Life Insurance Premium		Plant and Machinery	
		Land and Buildings	
		Patents	
		Goodwill	

Exercise

From the following balances of Siya Ram Saree Bhandar, prepare a balance sheet Balance sheet as on 31st Dec., 2013

Particular	Dr.	Cr.
Plant and Machinery	80,000	
Land and Building	60,000	
Furniture	15,000	
Cash in hand	2,000	
Bank overdraft		18,000
Debtors and Creditors	32,000	24,000
Bills receivable and Payable	10,000	6000
Closing stock	40,000	
Investment (Short term)	8,000	
Capital		1,50,000

Drawings	13,000	
Net Profit		62,000
Total	2,60,000	2,60,000

Solutions

BALANCE SHEET of Siya Ram Saree Bhandar			
as on 31st Dec., 2013			
Assets	Amount(Rs.)	Liabilities	Amount(Rs.)
Cash in hand	2,000	Bank overdraft	18,000
Bill receivable	10,000	Bills Payable	6,000
Investment (short term)	8,000	Creditors	24,000
Debtors	32,000	Capital 1,50,000	1,99,000
Closing Stock	40,000	Add: Net Profit 62,000	
Furniture	15,000	Less Drawing 13,000	
Plant and Machinery	80,000		
Land and Building	60,000		
	2,47,000		**2,47,000**

Common Size Income Statement

Common Size Income Statement income statement is an income statement in which each line item of a traditional income statement is expressed as a percentage of total sales or revenue. In "Common Size Income Statement" each of the line items in the income statement of the subject company is presented as a percentage of the total sales.

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1.3   Analysis types of common Size Statement

Common size income statement is used for the two types of analysis.

• Vertical Analysis

• Horizontal Analysis (Trend Analysis)

Vertical Analysis

Vertical Analysis is used to compare the performance of companies with a varying scale of operations because this technique eliminates the base effect by expressing the figures in terms of percentages. Following is an example of two companies say company A and company B.

	Company A	*Company B*
Sales / Revenue (in Crore)	500	50000
Marketing Expense (in Crore)	60	5000
Marketing Expense (in %age)	12.00%	10.00%
Net Profit (in Crore)	50	3000
Net Profit (in %age)	10.00%	6.00%

Explanation: By looking at the data in the above example one can understand that

a.   The size of the company A and company B are different and their sales/Revenue is 500 Cr and 5000 Cr respectively.

b.   Marketing Expense of Company A 60 Cr whereas that of company B is 5000 Cr. But once analysed in terms of percentage company B is more efficient in terms of managing marketing expenses which is 10% as compared to 12% to that of Company B.

c.   Net profit of Company A 50 Cr whereas that of company B is 3000 Cr. But once analysed in terms of percentage company A is more efficient in terms of net profit which is 10% as compared to 6% to that of Company B.

Thus, by the Vertical Analysis method performance of the companies at different levels can be measured.

Horizontal Analysis

Horizontal Analysis is used to assess the trend in the performance of a company across time periods. It also enables the establishment of the relationship between each of the cost accounts in the income statement and the total sales, and how each cost impacts the overall profitability of a company.

Particulars	Income Statement in Crores (Rs.)		
	2021	2020	2019
Total Revenue	500343	485873	482130
Cost of Sales	373396	361256	360984
Selling, General and Administrative Expenses	106510	101853	97041
Operating Income	20437	22764	24105
Net Interest Expense			
Provision for Income Tax	4600	6204	6558
Net Income	10523	14293	15080

Particulars	Income Statement in Crores (Rs.)	Common Size Statement
	2019	2019
Total Revenue	482130	100%
Cost of Sales	360984	75%
Selling, General and Administrative Expenses	97041	20%
Operating Income	24105	5%
Net Interest Expense	2467	1%
Provision for Income Tax	6558	2%
Net Income	15080	3%

Particulars	Income Statement in Crores (Rs.)	Common Size Statement
	2020	2020
Total Revenue	485873	100%
Cost of Sales	361256	74%
Selling, General and Administrative Expenses	101853	21%
Operating Income	22764	5%
Net Interest Expense	2267	0%
Loss on Extinguishment of Debt	0	0%
Provision for Income Tax	6204	1%
Net Income	14293	3%

Particulars	Income Statement in Crores (Rs.)	Common Size Statement
	2021	2021
Total Revenue	500343	100%
Cost of Sales	373396	75%
Selling, General and Administrative Expenses	106510	21%
Operating Income	20437	4%
Net Interest Expense	2178	0%
Loss on Extinguishment of Debt	3136	1%
Provision for Income Tax	4600	1%
Net Income	10523	2%

Analysis:

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Particulars	Income Statement in Crores (Rs.)			Common Size Statement	Common Size Statement	Common Size Statement
	2021	2020	2019	2021	2020	2019
Total Revenue	500343	485873	482130	100.0%	100.0%	100.0%
Cost of Sales	373396	361256	360984	74.6%	74.4%	74.9%
Selling, General and Administrative Expenses	106510	101853	97041	21.3%	21.0%	20.1%
Operating Income	20437	22764	24105	4.1%	4.7%	5.0%
Net Interest Expense	2178	2267	2467	0.4%	0.5%	0.5%
Loss on Extinguishment of Debt	3136	0	0	0.6%	0.0%	0.0%
Provision for Income Tax	4600	6204	6558	0.9%	1.3%	1.4%
Net Income	10523	14293	15080	2.1%	2.9%	3.1%

From the above extracts from the tables we can observe the followings:

The operating income margin has been declining gradually over the last three financial years primarily due to an increase in operating and SG&A expenses. The decline in net income in 2020 is in line with that of operating income, while in 2021 the decline was primarily fuelled by the one-time loss on extinguishment of debt.

Advantages of Common Size Statements:

Common Size Statements facilitate comprehending the impact of all line items of the income statement on the company's profitability as it expresses them in terms of the percentage of total sales. It helps in assessing the trend in each line item of the income statement with respect to across time periods. Any unusual variation can be easily identified through this technique. It can also be used to compare the financial performances of different entities irrespective of the scale of operation as it is expressed in terms of percentage

Limitations of Common Size Statements:

Certain experts find common size income statements to be useless as there is no approved standard benchmark for the proportion of each item. A comparative study based on a common size income statement will be misleading if there is a lack of consistency in its method of preparation. One can't write-off the risk of window dressing of financial statements as the actual figures are not required since the analysis is limited to percentage. At times it also fails to identify the qualitative elements during the evaluation of the performance of a company. It can be misleading for a business that is impacted by seasonal fluctuations.

1.4   Common-size Balance Sheet

A statement that shows the percentage relation of each asset/liability to the total assets/total of equity and liabilities, is known as a Common-size Balance Sheet. Common-size Balance Sheet is the vertical analysis of Balance Sheet in which Total Assets is taken as 100 and each item of Asset is expressed as percentage of the Total Assets.

To express the amounts as the percentage of the total, the total assets or total equity and liabilities are taken as 100. Whereas each item of Equity and Liabilities is expressed as percentage of total amount of Equity and Liabilities.

Common size balance sheets are similar to common size income statements. Each line item on this accounting balance sheet is expressed as a percentage of total assets. Total assets are the overall base figure.

Objectives of Common Size Balance Sheet

The basic objective of a Common-size Balance Sheet is to analyse the changes in the individual items of a Balance Sheet. It is also prepared to see the trends of different items of assets, equity and liabilities of a Balance Sheet. It is prepared for the assessment of the financial soundness of the organisation and to understand its financial strategy.

Usages of Common size balance sheet

- A Comparative Common-size Balance Sheet of different periods can help an analyst to highlight the trends in different items.

- A Common-size Balance Sheet prepared for the industry facilitates the assessment of the relative financial soundness and helps in understanding the financial strategy of the organisation.

Proforma of Common Size Balance Sheet

Exercise:

From the following Balance Sheet of Shreya Ltd. as at 31st March 2020, prepare a Common-size Balance Sheet:

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Balance Sheet of Soroga Ltd. as on 31st March 2020

Particulars	Note No.	31st March 2020 (₹)	31st March 2019 (₹)
I. Equity and Liabilities:			
1. Shareholder's Funds:			
a) Share Capital		10,00,000	4,00,000
b) Reserves and Surplus		1,00,000	50,000
2. Non-current Liabilities			
a) Long-term Borrowings		6,00,000	2,50,000
3. Current Liabilities:			
a) Trade Payables		3,00,000	2,50,000
Total		20,00,000	10,00,000
II. Assets:			
1. Non-current Assets			
a) Property, Plant and Equipment, and Intangible Assets			
i) Property, Plant, and Equipment		10,00,000	6,00,000
2. Current Assets			
a) Inventories		4,80,000	7,00,000
b) Cash & Cash Equivalents		20,000	1,00,000
Total		20,00,000	10,00,000

Solution:

Common-size Balance Sheet of Soroga Ltd. as on 31st March 2020

Particulars	Note No.	Absolute Amounts		Percentage of Balance Sheet Total	
		31st March 2020 ₹	31st March 2019 ₹	31st March 2020 %	31st March 2019 %
I. Equity and Liabilities:					
1. Shareholder's Funds:					
a) Share capital		4,00,000	10,00,000	40	70
b) Reserves & Surplus		50,000	1,00,000	5	5
2. Non-current Liabilities:					
a) Long-term Borrowings		2,50,000	6,00,000	25	30
3. Current Liabilities:					
a) Trade Payables		2,50,000	3,00,000	25	15
Total		10,00,000	20,00,000	100	100
II. Assets					
1. Non-Current Assets					
a) Property, Plant and Equipment and Intangible Assets					
i) Property, Plant and Equipment		6,00,000	10,00,000	30	35
2. Current Assets					
a) Inventories		4,80,000	9,50,000	48	47.50
b) Cash & Cash Equivalents		1,00,000	50,000	10	1.50
Total		10,00,000	20,00,000	100	100

Observations:

Liabilities Side

- Share Capital has increased from 5%
- Long term borrowings have increased by 5%
- Trade Payable have decreased by 10%

Asset Side

- Inventories have increased by 7.5%

- Cash and Cash equivalents have decreased by 7.5%

1.5 Cash Flow Statement

The cash flow statement (CFS), is a financial statement that summarizes the movement of cash and cash equivalents (CCE) that come in and go out of a company. The CFS measures how well a company manages its cash position i.e., how well the company:

- Generates cash to pay its debt obligations and

- Fund its operating expenses.

A cash flow statement is an important tool used to manage finances by tracking the cash flow for an organization. The cash flow statement shows the source of cash and helps to monitor incoming and outgoing money.

Importance /benefits of a cash flow statement

Gives details about spending: A cash flow statement gives a clear understanding of the principal payments that the company makes to its creditors. It also shows transactions which are recorded in cash and not reflected in the other financial statements. These include purchases of items for inventory, extending credit to customers, and buying capital equipment.

Helps maintain optimum cash balance: A cash flow statement helps in maintaining the optimum level of cash on hand. It is important for the company to determine if too much of its cash is lying idle, or if there's a shortage or excess of funds. If there is excess cash lying idle, then the business can use it to invest in shares or buy inventory. If there is a shortage of funds, the company can look for sources from where they can borrow funds to keep the business going.

Helps you focus on generating cash: Profit plays a key role in the growth of a company by generating cash. But there are several other ways to generate cash. For instance, when a company finds a way to pay less for equipment, it is actually generating cash. Every time it collects receivables from its customers quicker than usual, it is gaining cash.

Useful for short-term planning: A cash flow statement is an important tool for controlling cash flow. A successful business must always have sufficient liquid cash to fulfill short-term obligations like upcoming payments. A financial manager can analyse incoming and outgoing cash from past transactions to make crucial decisions. Some situations where decisions have to be made based on the cash flow include foreseeing cash deficit to pay off debts or establishing a base to request for credit from banks.

Preparation of Cash Flow Statement

Operating activities: The operating activities on the CFS include any sources and uses of cash from business activities. It reflects how much cash is flowing from a company's account for receipt and delivery of products or services. Example Receipts from sales of goods and services, Interest payments, Income tax payments, Payments made to suppliers of goods and services used in production, Salary and wage payments to employees, Rent payments and Any other type of operating expenses.

Investing Activities: Investing activities include any sources and uses of cash from a company's investments. Purchases or sales of assets, loans made to vendors or received from customers, or any payments related to mergers and acquisitions (M&A) are included in this category. Changes in cash from investing are usually considered cash-out items because cash is used to buy new equipment, buildings, or short-term assets such as marketable securities. Whereas when a company divests an asset, the transaction is considered cash-in for calculating cash from investing.

Financing Activities: Cash from financing activities includes the sources of cash from investors and banks, as well as the way cash is paid to shareholders. Dividends, payments for stock repurchases, and repayment of debt principal (loans) that are made by the company, comes under Financing activities category.

Changes in cash from financing are cash-in when capital is raised and cash-out when dividends are paid. If a company issues a bond to the public, the company receives cash financing. However, when interest is paid to bondholders, the company is reducing its cash.

Prepare a cash flow statement on the basis of the data given:

XYZ COMPANY
STATEMENT OF CASH FLOW
FINANCIAL YEAR END - 20XX

Cash Flow From Operating Activities

Net earnings	$ 3,000,000
Depreciation	15,000
Decrease in accounts receivable	20,000
Increase in accounts payable	20,000
Increase in taxes payable	3,000
Increase in inventory	(40,000)
Net cash from operations	**3,018,000**

Cash Flow From Investing

Equipment	(500,000)

Cash Flow From Financing

Notes payable	10,000
Cash flow for financial year 2018	**$ 2,528,000**

Solution:

Sample cash flow statement

Cash flows from (used in) operating activities		
Cash receipts from customers	9,500	
Cash paid to suppliers and employees	(2,000)	
Cash generated from operations (**sum**)	**7,500**	
Interest paid	(2,000)	
Income taxes paid	(3,000)	
Net cash flows from operating activities		2,500
Cash flows from (used in) investing activities		
Proceeds from the sale of equipment	7,500	
Dividends received	3,000	
Net cash flows from investing activities		10,500
Cash flows from (used in) financing activities		
Dividends paid	(2,500)	
Net cash flows used in financing activities		(2,500)
Net increase in cash and cash equivalents		10,500
Cash and cash equivalents, beginning of year		1,000
Cash and cash equivalents, end of year		$11,500

Limitations of the Cash Flow Statement

Negative cash flow should not automatically raise a red flag without further analysis. Poor cash flow is sometimes the result of a company's decision to expand its business at a certain point in time, which would be a good thing for the future. Analysing changes in cash flow from one period to the next gives the investor a better idea of how the company is performing, and whether a company may be on the brink of bankruptcy or success.

Summary

- An income statement is a financial statement that shows the company's income and expenditures. It shows whether a company is making profit or loss for a given period.

- A balance sheet is an important reference document for investors and stakeholders for assessing a company's financial status. This document gives detailed information about the assets and liabilities for a given time. By analyzing balance sheet, company owners can understand the financial health of their business and take necessary actions needed.

- Common size income statement helps in making the task of performance comparison much easier. It helps the analyst to identify the cost items that primarily drive the variation in profit year over year. It also facilitates peer comparison and trend analysis across time periods.

- Common size Balance Sheet statement helps in making the task of performance comparison much easier. It helps the analyst to identify the line items of Balance Sheet.

- A cash flow statement is a valuable document for a company, as it shows whether the business has enough liquid cash to pay its dues and invest in assets.

Keywords

Income Statement, Balance Sheet, Cash Flow Statement, Common-Size Statement, Income Statement as a Percentage of Revenue, Balance Sheet as a Percentage of Total Assets, Cash Flow Statement as a Percentage of Total Cash Flows, Percentage Analysis, Vertical Analysis

Self Assessment

1. The term 'Financial Statement' covers:

A. Profit & Loss Statement

B. Balance sheet and Profit & Loss Statement appropriation account

C. Profit & Loss Statement and Balance sheet

D. All of above are false

2. The form of balance sheet is

A. Vertical

B. Horizontal

C. Horizontal and vertical

D. Horizontal or vertical

3. The term current asset doesn't cover

A. Car

B. Debtors

C. Stock

D. Prepaid expenses

4. P&L statement is also known as

A. Statement of operations

B. Statement of income

C. Statement of earnings

D. All of the above

5. Which of the following is true about financial statements?

A) Financial statement gives a summary of accounts.

B) Financial statements can be stated as recorded facts.

A. Only A

B. Only B

C. Both A and B

D. None of the above

6. Which of the following statements are true?

A) Financial statements are only interim report.

B) Financial statements are also known as annual records.

C) Financial statements are historic.

A. Both A and B

B. Both A and C

C. Both B and C

D. A, B, C

7. Which report gives a review on the profitability of a business?

A. Statement of changes in equity

B. Cash flow statement

C. Balance sheet

D. Income statement

8. Main objective of Common Size statement is:

A. To present the changes in various items

B. To provide for a common base for comparison

C. To establish relationship between various items

D. All of the Above

9. Main objective of Common Size Balance Sheet is:

A. To establish relationship between revenue from operations and other items of statement of profit & loss

B. To present changes in assets and liabilities

C. To present changes in various items of income and expenses

D. All of the Above

10.   Common Size Statements are prepared

A. In the form of Ratios

B. In the form of Percentages

C. In both of the Above

D. None of the Above

11.   Main objective of Common Size Statement of Profit & Loss is:

A. To present changes in assets and liabilities

B. To judge the financial soundness

C. To establish relationship between revenue from operations and other items of statement of Profit & Loss

D. All of the Above

12.   In the Statement of Profit & Loss of a Common Size Statement:

A. Figure of net revenue from operations is assumed to be equal to 100

B. Figure of gross profit is assumed to be equal to 100

C. Figure of net profit is assumed to be equal to 100

D. Figure of assets is assumed to be equal to 100

13.   In the Balance Sheet of a Common Size Statement:

A. Figure of share capital is assumed to be 100

B. Figure of current liabilities is assumed to be 100

C. Figure of fixed assets is assumed to be 100

D. Figure of total assets is assumed to be 100

14.   Main objective of Trend Analysis is

A. To make comparative study of the financial statements for a number of years

B. To indicate the direction of movement

C. To help in forecasts of various items

D. All of the Above

15.   The objective of common size Statement of Profit & Loss is not to

A. Present Changes in Various items of incomes and expenses

B. Judge the cost items

C. Establish relationship between revenue from operations and other items of statement of profit & loss

D. Judge the relative financial soundness for different enterprises

Answers for Self Assessment

1.	C	2.	C	3.	A	4.	B	5.	C
6.	C	7.	D	8.	D	9.	B	10.	B
11.	C	12.	A	13.	D	14.	D	15.	D

Review Questions

1. What are the three main types of financial statements, and how do they contribute to a comprehensive view of a company's financial performance?
2. How do you calculate the net income of a company from its income statement, and what does this figure represent in the overall financial health of the business?
3. How does the cash flow statement differ from the income statement and balance sheet, and what unique insights can it provide about a company's cash-generating activities?
4. What are some key indicators in the financial statements that can help assess a company's operational efficiency and profitability?
5. What is a common-size statement, and how is it different from traditional financial statements?
6. How can common-size statements help in comparing the financial performance of companies operating in different industries or of different sizes?
7. How can common-size income statements be used to identify trends in a company's revenue and expense structure over time?
8. How can common-size statements be used as a tool for financial analysis and decision-making by investors and creditors?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

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Unit 02: Cash Budget

Objectives

After studying this unit, you will be able to:

- Understand Cash Budget
- Objectives and Importance of Cash Budget.
- Motives of Holding Cash
- Understand and prepare Cash Flow Forecast
- Preparation of Cash Budget
- Understand Cash Surplus and its efficient usages.

Introduction

A cash budget is an estimate of cash receipt and cash payments for a future period of time. It is prepared to forecast the cash requirements for a given period and indicates the surplus or shortage of cash during the budget period. A cash budget is a quantified estimation of cash inflows and outflows over a specific period of time. A cash budget is a document that estimates a business' cash flows over certain periods, such as weekly, monthly or annually.

2.1   What is Cash?

The term cash includes coins, currency notes, cheques, bank drafts, demand deposits with bank. It also includes "near-cash assets" like marketable securities and time deposits with

banks because they can be readily converted into cash. Near-cash assets are included under cash because surplus cash is required to be invested in near cash for the time being.

2.2 Importance of Cash Budget

A cash budget is very important for any organization to continue its smooth functioning. It can be decocted on the basis of following:

- Helpful in Estimating the Future Cash Requirement
- Helpful in Selection of Proper Source of Finance
- Helpful in the Investment of Surplus Cash.
- Helpful in Getting Cash Discount
- Helpful in Planning for Purchase of Assets
- Helpful in Determination of Proper Dividend Policy.
- Restricts Overspending
- Effective Control on Cash

2.3 Objectives of Cash Budget

This basic objective of cash budget is as follows:

- To maintain optimum cash balance
- To keep the optimum cash balance requirement at minimum level.

Maintain optimum cash balance: Maintaining an optimum cash balance is a crucial financial management strategy for a firm. It involves striking a balance between holding enough cash to meet day-to-day operational requirements and avoiding excess cash that could be invested elsewhere for better returns.

Optimum cash balance requirement at minimum level: Keeping the optimum cash balance at a minimum level involves efficiently managing cash flow while ensuring that the firm has enough liquidity to meet its short-term obligations. The goal is to reduce excess cash that is not actively being used for investment or growth opportunities.

2.4 Motives of Holding Cash

Transaction motive

Precautionary motive

Speculative motive

Compensating motive.

Transaction motive of holding cash: The transaction motive of holding cash refers to the primary reason why individuals and businesses keep a certain level of cash on hand. It is based on the need to facilitate day-to-day transactions and cover routine expenses. It includes Facilitating Payments, Meeting Immediate Needs, Smoothing Cash Flows etc.

Precautionary motive of holding cash: The precautionary motive of holding cash refers to the reason why individuals and businesses keep cash reserves as a precautionary measure to address unforeseen or unexpected financial needs or emergencies. It involves holding cash as a safety net to ensure financial stability and to cope with potential contingencies. It includes Emergency Fund, Uncertainty and Risk Mitigation, Contingency Planning etc.

Speculative motive of holding cash: The speculative motive of holding cash refers to the reason why individuals and businesses keep cash reserves with the intention of taking advantage of potential investment opportunities or capitalizing on expected future price

movements in financial assets. The speculative motive is driven by the desire to profit from financial transactions. It includes Capitalizing on Investment Opportunities, Timing Market Movements, Opportunity Cost Consideration etc.

Compensating motive of holding cash: The compensating motive of holding cash refers to the reason why individuals and businesses keep cash reserves to compensate for various financial factors and market conditions that affect their cash needs and opportunities. It includes Meeting Unexpected Cash Demands, Taking Advantage of Discounts, Flexibility in Economic Downturns etc.

2.5   Components of Cash Budget

- Cash Receipts
- Cash Payments

Cash Receipts: Cash receipts refer to the money a company receives in the form of cash payments from its customers or other sources. Cash receipts represent the actual cash inflows into the business during a specific period, and they are an essential component of a company's cash flow. E.g., receipts from cash sales, collections from debtors, income from investments etc.

Cash Payments: Cash payments refer to the money a company disburses or spends in the form of cash to various parties or for different purposes. Cash payments represent the actual cash outflows from the business during a specific period and are an integral part of a company's cash flow. E.g., Payments for cash purchases, payment to creditors, payment for expenses etc.

Exercise on Cash Budget:

Following are the income and expenditure forecasts for the month of March to July 2000.

Month	Sales	Purchases	Wages	Manufacturing Exp.	Indirect Exp.
March	50,000	32,000	8,000	5,000	6,000
April	60,000	36,000	10,000	7,000	8,000
May	68,000	40,000	11,000	8,000	8,500
June	75,000	45,000	12,500	10,000	7,000
July	90,000	48,000	12,500	9,000	9,000

Prepare Cash budget for the month of May, June and July on the basis of following information:

- Cash balance as on 1st May 2000 was Rs.12,000
- Sale and purchase all are on credit. Period of credit allowed to debtors is ONE month and allowed by creditors are TWO months.
- Lag in payment of Manufacturing Expenses is one month.
- Lag in payment of Indirect Expenses is ½ month.
- Plant and Machinery Costing Rs.20,000 is due for delivery in July, Payable 20% on delivery and the balance after 3 months
- Advance tax of Rs.6,000 is payable in June and September.

Solution:

Financial Analytics

CASH BUDGET (MAY to July 2000)			
	May	June	July
Opening Balance	12,000	13,750	11,500
Receipts			
Collected from Debtors	60,000	68,000	75000
Total Receipts	**72,000**	**81,750**	**86,500**
Payments			
Payment to creditors	32000	36000	40000
Wages	11000	12500	12500
Manufacturing Expenses	7000	8000	10000
Indirect Expenses	8250	7750	8000
Plant and Machinery (20% of Rs. 20,000 paid in July)	-----		4000
Advance Tax	-----	6000	-----
Total Payments (B)	**58250**	**70250**	**74500**
Closing Balance (A - B)	13,750	11,500	12,000

Working Notes:

Lag (time gap) in the payment of indirect expenses is half month, half the indirect expenses of April and half the indirect expenses of May will be paid in May and so on. Hence the calculation is as follows:

Indirect Expenses Calculation		
May	= ½ of 8,000 + ½ of 8,500	=8,250
June	= ½ of 8,500 + ½ of 7000	=7,750
July	= ½ of 7,000 + ½ of 9,000	=8,000

Calculating the Cash Balance

Cash flow is a record of the money flowing into and out of the business. Cash comes in through customers or clients buying services. Cash flows out through expenses— rent for office space, payments on business loans or outstanding invoices, etc.

Cash Flow Forecast

Business owners may opt to calculate cash flow using a forecast. This helps to predict what will be cash balance in the future. The forecast method can help one to make educated, financial decisions. Decisions pertaining to future business budgeting strategies, investments, or crafting business plans to request funding.

2.6 Calculation of Cash Flow for the Future

Cash at the end of a period can be projected using the following formula:

Ending Cash

=

Beginning Cash + Projected Inflows – Projected Outflows

| Cash balance | **=** | Opening Cash Balance
+ Net Profit Shown by forecasted profit and loss account
+ non-cash expenses
+ Decrease in current assets
+ increase in current liabilities
+ sale of fixed assets
+ issue of shares and debentures etc. | **–** | Increase in current asset
+ Decrease in Current Liabilities
+Purchase of Fixed assets
+Redemption of shares and debentures etc
+Closing Cash Balance |

- **Add in the amount** expected to earn during the set period of forecasting. This cash could come from customers buying your product or service, loans from successful funding requests, or prospective investors.
- **Deduct cash outflow**. To get this number, add up the total amount of cash expected to owe, from sources like rent, payroll, loan payments, or vendors.
- This will create financial transparency and will allow to closely monitor revenue and expenditures, as well as proactively combat financial obstacles.

2.7 Annualized Cash Flow

A company's cash flow equals the cash coming into the business minus the cash going out. If the business' cash flow for a period in known for shorter than a year, such as a month or quarter, one can annualize it to monitor the company's performance. Annualizing the cash flow converts it to an annual amount that one can compare to cash flows from previous years. Annualized cash flow is only an approximation, because it assumes the firm will generate cash flow at the same rate throughout the year. Although actual annual cash flow might differ.

2.8 Preparation of Cash Budget using Adjusted Profit and Loss Method

In this method the cash forecast is prepared by adjusting the amount of profit shown by the forecasted profit and loss account. during the evaluation of the performance of a company. It can be misleading for a business that is impacted by seasonal fluctuations. All non-cash

Financial Analytics

expenses shown in the forecasted profit and loss account (such as depreciation, written off deferred revenue expenditure, written off intangible assets, etc.) decrease in current assets, increase in current liabilities, receipts from sale of fixed assets, issue of

 debenture and shares, opening cash balance are added to the amount of profit shown by the forecasted profit and loss account.

Increase in current assets, decrease in current liabilities, purchase of fixed assets, repayment of Loans, Redemption of Shares and Debentures, and payments of dividends are subtracted from the profit. The resultant figure is closing cash balance.

Example

From the following information prepare a cash budget by adjusted profit and loss method.

BALANCE SHEET	
as on April 1st, 2021	
Particulars	Amount
I. **Equity & Liability**	
Share Capital	1,00,000
Profit and Loss A/c	25,000
Debentures	1,00,000
Trade Payable	50,000
Outstanding Expenses	2,000
	2,77,000
II **Assets**	
Land and Building	80,000
Plant and Machinery	1,00,000
Furniture and Fixtures	15,000
Inventories	20,000
Trade Receivables	40,000
Cash Balance	21,500
Prepaid Expenses	500
	2,77,000

STATEMENT OF PROFIT AND LOSS			
for the year ended 31st March 2022			
Particulars	Amount (Rs.)	Amount (Rs.)	Amount (Rs.)
Revenue from Operations (Sales)			2,40,000
Expenses :			
Purchases		1,78,000	
Change in Inventories (OS – CS)			
(20,000 – 40,000)		20,000	
Employee Benefit Expenses:			
Salary	9,000		
Add: Outstanding	3,000	12,000	
Depreciation on:			
Plant & Machinery	10,000		
Furniture and Fixtures	1,500	11,500	
Administrative Expenses	7,800		
Less: Prepaid	600	7,200	
Selling Expenses		2,300	
Net Profit		27,000	
		2,40,000	2,40,000

Share scheduled to be issued during the year	50,000
On 31st March 2022, the Land and Building is expected to be	1,20,000
Trade receivables	50,000
Prepaid expenses	600
Trade Payable	40,000
Outstanding expenses	3,000

Solution:

CASH BUDGET - (Adjusted Profit and Loss Method)		
Cash Balance as on 1st April 2021		21,500
Addition to Cash:		
Net Profit Shown by estimated statement of Profit and Loss	27,000	
Non-Cash expenses debited in estimated statement of Profit and Loss		
Depreciation	11,500	
Decrease in Current Asset	Nil	
Increase in Current Asset		
Outstanding Expenses	1000	
Sale of Fixed Asset:	Nil	
Issue of Shares during the year	50,000	89,500
		1,11,000
Deductions from Cash:		
Increase in Current Assets:		
Inventories	20,000	
Trade Receivable	10,000	
Prepaid Expenses	100	
Decrease in Current Liabilities		
Trade Payables	10,000	
Purchase of Fixed Assets: Land and Building	40,000	
Redemption of Debentures	Nil	80,100
Cash Balance as on 31st March, 2022		30,900

Interest and Investment of Excess Cash

2.9 Surplus Cash

A cash surplus is the cash that exceeds the cash required for day-to-day operations. It is deciding where to use cash surplus requires planning and better judgment. Two of the most common uses of extra cash are:

- Paying down debt
- Investing the cash surplus

Paying Down Debt: Paying down any debt is generally the first option considered when deciding what to do with a cash surplus. Its because a short-term investment of cash surplus is not likely to yield a return equal to or greater than the rate of interest paid on any of the debt.

For example, it does not make any sense to invest a cash surplus at 5 percent when you can pay down a bank loan that is charging interest at 12 percent. However, the decision to automatically pay down debt may not be correct in all cases. One of the key advantages of managing cash flow is the ability to predict the future cash requirements for the business.

Factors to decide to invest the Cash Surplus

When investing a cash surplus, it's natural to seek the highest rate of return for the investment. There are several factors that play important role in determining the rate of return you receive on your invested cash surplus. Following are the important factors must be considered when making investment decisions:

- Risk
- Liquidity
- Maturity
- Yield

Risk of Investments: The level of risk one is willing to accept ultimately determines the yield of your investment. A higher level of risk will generally provide a higher yield whereas a low level of risk will result in a lower yield on investment. A conservative approach to the level of risk is recommended when investing cash surplus.

Liquidity of Investments: Liquidity describes how easily one can access the cash put into an investment. The liquidity of investments varies greatly. The liquidity of investments also affects the yield of investment. An investment that is highly liquid, such as a checking money market account, will generally result in a lower yield on investment. On the other hand, an investment with a low level of liquidity, such as a CD, will generally provide you with a higher yield.

Maturity of Investments: The maturity of the investments has a direct impact on the yield of investment. A longer maturity will generally provide you with a higher yield. On the other hand, an investment with a shorter maturity or no maturity will result in a lower yield on the investment. The maturities of the investments should occur so that the surplus cash is available when your business needs it.

Yield of Investments: Yield is another factor to consider when making cash surplus investment decisions. For most investments, the yield is determined by three other factors:

risk, maturity and liquidity. Once determined the acceptable level of risk, maturity and liquidity, the type of investment and the yield of the investment are pretty much determined, or at least narrowed various options.

2.10 Investment Opportunities

Following are some of the important opportunities available for Investment:

- Treasury Bills
- Negotiable Certificates of Deposit (CD's)
- Unit 1964 Scheme
- Ready Forwards
- Badla Financing
- Inter-Corporate Deposits
- Bill Discounting
- Investment in Marketable Securities
- Money Market Mutual Funds (MMMF):

Treasury Bills: The treasury bills are issued by RBI on behalf of the Central Government. They are issued on rates announced by RBI every week. These bills are issued only in bearer form and is easily transferable from one investor to another. No interest is paid on the bills but the return is the difference between the purchase price and face (par) value of the bill. These are risk free securities. Treasury bills are one of the popular marketable securities even though the yield on them may be low.

Negotiable Certificates of Deposit (CD's): The money is deposited in a bank for a fixed period of time and marketable receipt is issued. The receipt may be registered or bearer. The bearer

receipt facilitates transactions in the secondary market. On maturity the amount deposited and interests are paid. The CD's are different from the treasury bills which are issued on discount. The short-term surplus funds can be used to earn interest in this method.

Unit 1964 Scheme: The Unit Trust of India's unit 1964 scheme is very popular for making short-term investments. It is an open-ended scheme which allows investors to withdraw their funds on a continuing basis. The purchase and sale value of units is not based on net assets value but it is determined administratively in such a manner that they rise gradually over time.

Ready Forwards: A commercial bank or some other organization may enter into a ready forward deal with a company willing to invest funds for a short period of time. Under this system the bank sells and repurchases the same security (that means that company purchases and sells securities in turn) at predetermined prices.

Badla Financing: Badla financing is used in stock exchange transactions when a broker wants to carry forward his transactions from one settlement period to another. It is the financing of transactions of a broker who wants to carry forward this deal to the other settlement period. Badla financing offers attractive interest rates. However, it becomes risky if the broker defaults in his commitment.

Inter-Corporate Deposits: These are short term deposits with other companies which attract a good rate of return. Inter-corporate deposits are of following types:

Call Deposits: It is a deposit which a lender can withdraw on one day's notice. In practice it takes three days to get this money. The rate of interest may be 14 per cent on these deposits.

Three Months Deposits: These deposits are popular and are used by borrowers to tide over short- term inadequacy of funds. The interest rate on such deposits is influenced by bank overdraft interest rate. The borrowing rate may be 22 per cent per annum.

Six-month Deposits: The lenders may not have surplus funds for a very long period. Six-month period is normally the maximum which lenders may prefer. The interest rate on these deposits may be 24 per cent per annum.

Bill Discounting: In order to raise funds the seller may get the bill discounted with his bank. The bank will charge discount and release the balance amount to the drawer. These bills normally do not exceed 90 days. A company may also discount the bills as a bank does thus using its surplus funds. The bill discounting is considered superior to inter-corporate deposits.

Investment in Marketable Securities: The short- period securities will carry lower rates of interest but these should be preferred. The surplus cash can be invested only for smaller periods because the amount may be required for meeting "operating cash needs" in the short periods. The securities should have a ready market. These investments can be made only in near cash securities.

Money Market Mutual Funds (MMMF): 'Money market mutual fund' means a scheme of a mutual fund which has been set up with the objective of investing exclusively in money market instruments. These instruments include treasury bills, dated Government securities with an expired maturity of up to one year, call and notice money, commercial paper, commercial bills accepted by banks and certificates of deposits. MMMFs are wholesale markets for low risk, high liquidity and short-term securities.

Summary

- A cash budget is a financial planning tool used by businesses and individuals to forecast and manage their cash inflows and outflows over a specific period of time. It helps in estimating how much cash will be available at various points in the future.
- A cash flow forecast is a financial projection that estimates the expected cash inflows and outflows over a specific period of time. It's a tool used by businesses and individuals to anticipate their future cash position, which is crucial for effective financial planning and decision-making. A cash flow forecast focuses on predicting cash movements based on expected transactions and activities.

- A cash surplus, also known as a positive cash balance or cash excess, occurs when the amount of cash inflows exceeds the amount of cash outflows during a specific period. In other words, it's the situation where an individual, business, or organization has more cash on hand than it needs to cover its expenses and financial obligations for that particular period.
- A cash surplus must be used wisely. Without proper planning and discipline, even a surplus can be mismanaged, leading to inefficiencies or missed opportunities.

Keywords

- Cash Budget
- Cash Flow Forecast
- Annualized Cash Flow
- Surplus Cash
- Investment Opportunities.

Self Assessment

1. What is the primary purpose of a cash budget?

A. Tracking expenses
B. Predicting stock market trends
C. Estimating future cash inflows and outflows
D. Calculating tax liabilities

2. A cash budget helps in:

A. Projecting future sales revenue
B. Analyzing competitors' financials
C. Managing cash flows by predicting surpluses and deficits
D. Calculating depreciation expenses

3. In a cash budget, cash inflows may include:

A. Rent payments
B. Employee salaries
C. Loan repayments
D. Supplier payments

4. What does a positive cash balance at the end of a budget period indicate?

A. A cash deficit
B. A financial crisis
C. A cash surplus
D. A negative net income

5. Which of the following categories is NOT typically found in a cash budget?

A. Operating activities

B. Investing activities

C. Marketing strategies

D. Financing activities

6. What does a negative cash balance in a cash budget suggest?

A. Potential for investment

B. Budget error

C. A surplus of cash

D. Cash flow problem

7. Which step is essential when creating a cash budget?

A. Ignoring past financial data

B. Using only estimates for all cash flows

C. Forecasting cash inflows and outflows

D. Focusing solely on one category of cash flow

8. Cash budgeting is particularly useful for:

A. Keeping track of employee attendance

B. Identifying market trends

C. Predicting future stock prices

D. Managing day-to-day expenses and obligations

9. How does a cash budget differ from a cash flow statement?

A. A cash budget includes non-cash items, while a cash flow statement doesn't.

B. A cash budget predicts future cash flows, while a cash flow statement reports historical cash flows.

C. A cash budget is used only by individuals, while a cash flow statement is used by businesses.

D. A cash budget is prepared after the fiscal year ends, while a cash flow statement is prepared

B. during the fiscal year.

10. Which financial aspect does a cash budget help individuals and businesses manage?

A. Market share

B. Employee engagement

C. Customer satisfaction

D. Cash flow

11. In cash flow method for preparing cash budget, payment of dividends and prepaid payments are

A. Deducted from opening balance of cash

B. Added to opening balance of cash

C. Not included in cash budget

D. None of the above

12. As per Cash flow method Increase in current liabilities and decrease in current assets

are

A. Deducted from opening balance of cash

B. Added to opening balance of cash

C. Not included in cash budget

D. None of the above

13. Which of the following method is based on technique of cash flow statement?

A. Cash Accounting Period

B. Projected Balance Sheet Method

C. Project forecast method

D. None of the above

14. Which of the following statements are not true about Projected Balance Sheet Method?

A. It is good for long-term

B. It is appropriate for annual cash forecast

C. It is of extreme use for planning and control

D. None of the above

15. While preparing cash budget from Cash Accounting method, if there is no specific

direction in respect of a particular item, it is assumed that payments or receipts will takec
place in

A. Current month

B. Month of occurrence

C. Insufficient data to decide

D. None of the above

Answers for Self Assessment

1.	C	2.	C	3.	C	4.	C	5.	C
6.	D	7.	C	8.	D	9.	B	10.	D
11.	A	12.	B	13.	C	14.	C	15.	B

Review Questions

1. What a cash budget is and why it's important for financial planning?

2. How does a cash budget differ from other financial statements, such as an income statement or balance sheet?

3. How do you gather the necessary data to create a cash budget?

4. What strategies can businesses employ to manage their cash flow effectively based on the information provided by a cash budget?

5. What role does technology play in the process of creating and managing a cash budget?

6. What is a "cash surplus," and how would you define it in the context of personal finances or a business?

7. What factors can lead to the generation of a cash surplus?

8. In what ways can a cash surplus contribute to effective risk management for an individual or a business?

9. What role does a cash surplus play in preparing for unexpected financial challenges or economic downturns?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

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Unit 03: Financial Statement Analysis

Objectives

After studying this unit, you will be able to:

- Analyze Financial statements
- Understand and calculate different ratios.
    - Liquidity Ratios
    - Efficiency Ratios
    - Coverage Ratios
    - Profitability Ratios
- Understand Leverage
- Use Z Score Model for Financial Distress Prediction

Introduction

Financial Statement Analysis is the process of evaluating and interpreting a company's financial statements to gain insights into its financial performance, position, and overall health. The primary purpose of financial statement analysis is to assist investors, creditors, analysts, and other stakeholders in making informed decisions about the company. It involves examining the company's financial statements, which typically include the balance sheet, income statement, and cash flow statement.

Financial Statement analysis involves a comprehensive examination of the data contained in the financial statements to assess the company's strengths, weaknesses, risks, and opportunities.

The primary objective of analyzing financial statements is to make informed decisions and judgments about the company's financial situation. This process can be conducted by various stakeholders, including investors, creditors, financial analysts, managers, and regulators.

3.1   Ratio Analysis

Ratio analysis is a fundamental technique in financial statement analysis that involves calculating and interpreting various ratios and metrics to assess a company's financial performance, position, and overall health. These ratios provide insights into the relationships between different financial elements, allowing analysts and stakeholders to understand different aspects of a company's operations and its ability to generate profits, manage resources, and meet its obligations.

Ratio analysis involves comparing two or more financial figures from a company's financial statements to generate meaningful insights. These ratios can be categorized into several groups:

- Liquidity Ratios
- Efficiency Ratios
- Coverage Ratios
- Profitability Ratios

Ratios can be classified using the following diagram:

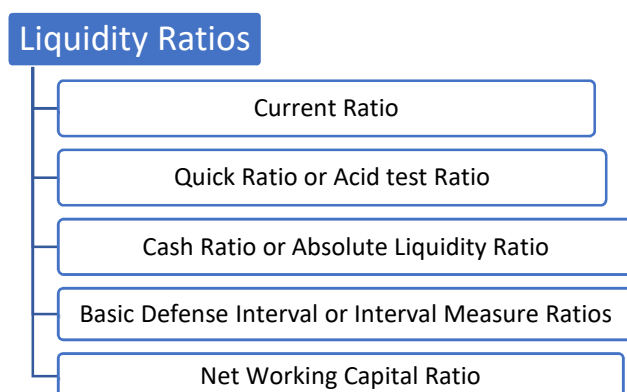**Classification of Ratios**
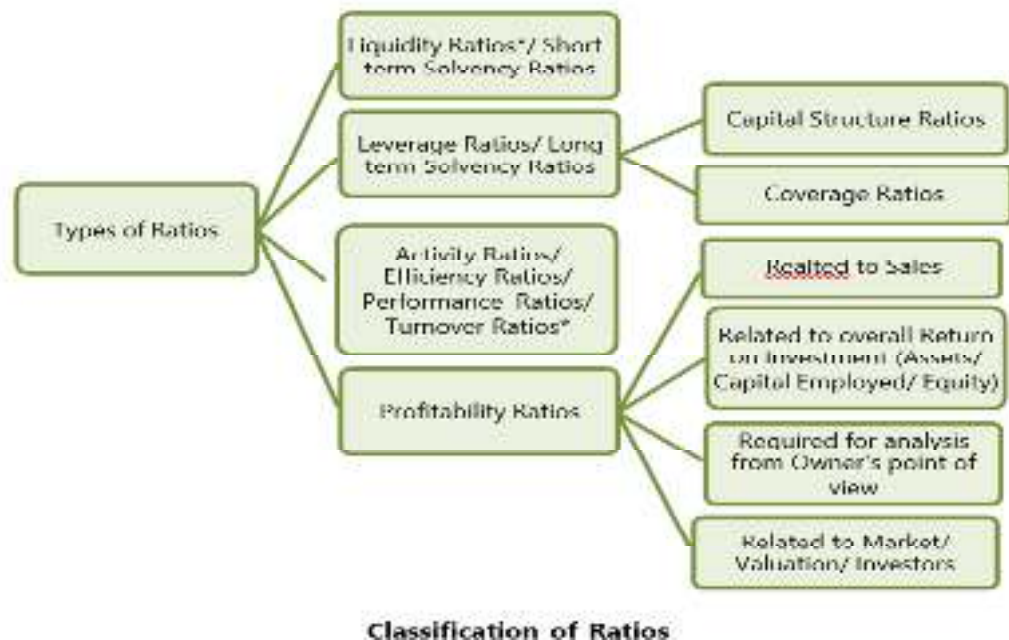
3.2   Liquidity Ratios

Liquidity ratios are a category of financial ratios that measure a company's ability to meet its short-term financial obligations and convert its assets into cash quickly without incurring significant

losses. These ratios provide insight into a company's liquidity and its ability to cover immediate financial needs, such as paying off short-term debts and funding day-to-day operations.

These ratios measure a company's ability to meet its short-term obligations and manage its immediate cash needs. Liquidity ratios are particularly important because they assess a company's short-term financial health and its capacity to handle unexpected cash flow challenges.

Classification of Liquidity Ratios

Liquidity Ratios

- Current Ratio
- Quick Ratio or Acid test Ratio
- Cash Ratio or Absolute Liquidity Ratio
- Basic Defense Interval or Interval Measure Ratios
- Net Working Capital Ratio

Current Ratio: This ratio evaluates a company's ability to cover short-term obligations with its short-term assets. It's calculated by dividing current assets (like cash, accounts receivable, and inventory) by current liabilities (such as accounts payable and short-term debt).

   Current Ratio = Current Assets / Current Liabilities

A current ratio above 1 indicates that the company has more current assets than current liabilities, suggesting it has the potential to meet its short-term obligations. However, an excessively high current ratio might indicate inefficient use of resources.

Quick Ratio (Acid-Test Ratio): This ratio assesses a company's ability to cover short-term obligations without relying on inventory, which can sometimes be difficult to convert into cash quickly. It's calculated by subtracting inventory from current assets and then dividing by current liabilities.

   Quick Ratio = (Current Assets - Inventory) / Current Liabilities

A quick ratio of 1 or higher is generally considered good because it suggests that the company can meet its short-term obligations without relying heavily on the sale of inventory.

Cash Ratio: This ratio measures a company's ability to cover short-term obligations with its most liquid asset: cash and cash equivalents. It's calculated by dividing cash and cash equivalents by current liabilities.

   Cash Ratio = (Cash + Cash Equivalents) / Current Liabilities

A higher cash ratio indicates a stronger ability to meet short-term obligations without relying on other assets.

Basic Defense Interval/ Interval Measure: If for some reason all the company's revenues were to suddenly cease, the Basic Defense Interval would help determine the number of days for which the company can cover its cash expenses without the aid of additional financing. It is measured as follows:

$$\text{Basic Defense Interval} = \frac{\text{Cash and Bank balances} + \text{Marketable Securities}}{\text{Operating Expenses : No. of days (say 360)}}$$

Or

$$\text{Interval Measure} = \frac{\text{Current Assets - Inventories}}{\text{Daily Operating Expenses}}$$

$$\text{Daily Operating Expenses} = \frac{\text{Cost of Goods Sold} + \text{Selling Administration and other General expenses} - \text{Depreciation and other non-cash expenditure}}{\text{No. of days in a year}}$$
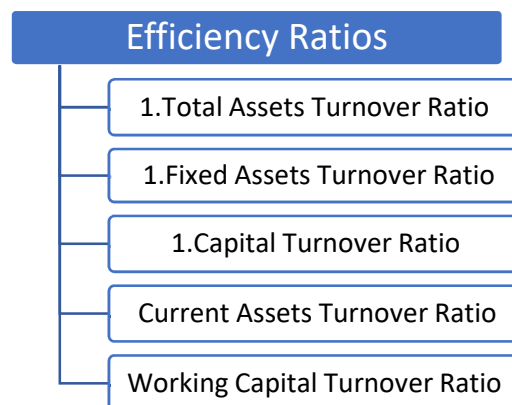
Net Working Capital Ratio: Net working capital is more a measure of cash flow than a ratio. The result of this calculation must be a positive number. Bankers look at Net Working Capital over time to determine a company's ability to withstand financial crises. Loans are often tied to minimum working capital requirements.

3.3   Efficiency Ratios

Efficiency ratios, also known as activity ratios, are a set of financial metrics that assess how effectively a company manages its resources, assets, and liabilities to generate sales, revenue, and profits. These ratios provide insights into the company's operational efficiency, asset utilization, and overall effectiveness in managing its business operations. Efficiency ratios are particularly useful for analyzing a company's operational performance and identifying areas where improvements can be made.
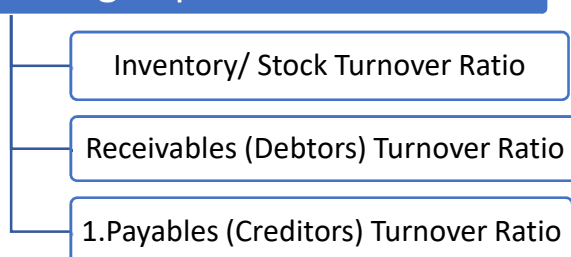
Efficiency ratios evaluate how effectively a company uses its assets and resources to generate revenue.

Types of Efficiency Ratios

Efficiency Ratios

- 1.Total Assets Turnover Ratio
- 1.Fixed Assets Turnover Ratio
- 1.Capital Turnover Ratio
- Current Assets Turnover Ratio
- Working Capital Turnover Ratio

Working Capital Turnover Ratio can further be classified as follows:

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┌─────────────────────────────────────────┐
│      Working Capital Turnover Ratio      │
└─────────────────────────────────────────┘
         │
         ├──── ┌──────────────────────────────────────┐
         │     │   Inventory/ Stock Turnover Ratio    │
         │     └──────────────────────────────────────┘
         │
         ├──── ┌──────────────────────────────────────┐
         │     │  Receivables (Debtors) Turnover Ratio │
         │     └──────────────────────────────────────┘
         │
         └──── ┌──────────────────────────────────────┐
               │  1.Payables (Creditors) Turnover Ratio │
               └──────────────────────────────────────┘
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Total Asset Turnover Ratio: This ratio assesses the efficiency of all assets, including both current and fixed assets, in generating sales. It's calculated by dividing net sales by the average total assets.

   Total Asset Turnover Ratio = Net Sales / Average Total Assets

Fixed Asset Turnover Ratio: This ratio focuses on the efficiency of a company's use of fixed assets, such as property, plant, and equipment, to generate sales. It's calculated by dividing net sales by the average value of fixed assets.

   Fixed Asset Turnover Ratio = Net Sales / Average Fixed Assets

Capital Turnover Ratio: The Capital Turnover Ratio is a financial ratio that measures how effectively a company uses its shareholders' equity to generate sales or revenue. It provides insights into the company's ability to generate sales relative to the amount of equity invested by shareholders.

Capital Turnover Ratio = Net Sales / Average Shareholders' Equity

Where:

- ***Net Sales***: Total revenue generated from sales after deducting any discounts, returns, and allowances.

- ***Average Shareholders' Equity***: The average value of shareholders' equity over a specific period, which is often calculated as the sum of beginning and ending equity divided by 2.

Current Asset Turnover Ratio: The Current Asset Turnover Ratio measures how efficiently a company utilizes its current assets to generate sales or revenue. This ratio provides insights into how effectively a company is managing its short-term assets to support its sales operations.

Current Asset Turnover Ratio = Net Sales / Average Current Assets

Where:

- Net Sales: Total revenue generated from sales after deducting any discounts, returns, and allowances.

- Average Current Assets: The average value of current assets over a specific period, usually calculated as the sum of beginning and ending current assets divided by 2.

Working Capital Turnover Ratio: The Working Capital Turnover Ratio is a financial ratio that assesses how efficiently a company utilizes its working capital to generate sales or revenue. Working capital represents the difference between a company's current assets (such as cash, accounts receivable, and inventory) and its current liabilities (such as accounts payable and short-term debt). This ratio provides insights into how effectively a company manages its working capital to support its sales and operational activities.

Working Capital Turnover Ratio = Net Sales / Average Working Capital

Where:

- *Net Sales*: Total revenue generated from sales after deducting any discounts, returns, and allowances.

- *Average Working Capital*: The average value of working capital over a specific period, typically calculated as the sum of beginning and ending working capital divided by 2.

Inventory Turnover Ratio: This ratio measures how efficiently a company manages its inventory. It's calculated by dividing the cost of goods sold (COGS) by the average inventory during a specific period.

Inventory Turnover Ratio = COGS / Average Inventory

Accounts Receivable Turnover Ratio: This ratio assesses how efficiently a company collects payments from its customers. It's calculated by dividing net credit sales by the average accounts receivable during a certain period.

Accounts Receivable Turnover Ratio = Net Credit Sales / Average Accounts Receivable

Accounts Payable Turnover Ratio: This ratio evaluates how efficiently a company manages its accounts payable (amounts owed to suppliers). It's calculated by dividing net credit purchases by the average accounts payable.

Accounts Payable Turnover Ratio = Net Credit Purchases / Average Accounts Payable

3.4 Coverage Ratios

A coverage ratio assesses a company's ability to cover certain financial obligations with its earnings or cash flows. These ratios are useful for creditors and investors to evaluate the company's capacity to fulfill its commitments and financial obligations. Coverage ratios are commonly used to measure how well a company can meet its interest payments, lease payments, or other fixed financial obligations.

Types of coverage ratios

- Interest Coverage Ratio
- Debt Service Coverage Ratio (DSCR)
- Fixed Charge Coverage Ratio

Interest Coverage Ratio: Also known as the times interest earned (TIE) ratio, this measures a company's ability to cover its interest expenses with its operating earnings before interest and taxes (EBIT). It is calculated as follows:

Interest Coverage Ratio = EBIT / Interest Expenses

A higher interest coverage ratio indicates a better ability to meet interest payments.

Debt Service Coverage Ratio (DSCR): This ratio assesses a company's ability to cover its debt-related obligations, including both interest and principal payments. It's often used in evaluating the ability of companies to service their long-term debt. The formula is:

DSCR = EBITDA / Total Debt Service (Principal + Interest Payments)

A DSCR above 1 indicates that the company generates enough earnings to cover its debt obligations.

Fixed Charge Coverage Ratio: This ratio is similar to the interest coverage ratio but includes other fixed financial obligations, such as lease payments and preferred dividends, in addition to interest expenses. It gives a broader picture of the company's ability to cover all fixed financial commitments. The formula is:

Fixed Charge Coverage Ratio = (EBIT + Lease Payments + Preferred Dividends) / (Interest Expenses + Lease Payments)

A higher fixed charge coverage ratio implies better coverage of fixed financial obligations.

These coverage ratios provide insights into a company's financial stability and its capacity to manage fixed obligations. They offer valuable information to creditors and investors to assess the level of risk associated with lending to or investing in the company. Higher coverage ratios suggest a more secure financial position, as the company has a greater ability to meet its financial commitments. Conversely, lower coverage ratios may indicate financial distress or potential difficulty in meeting obligations.
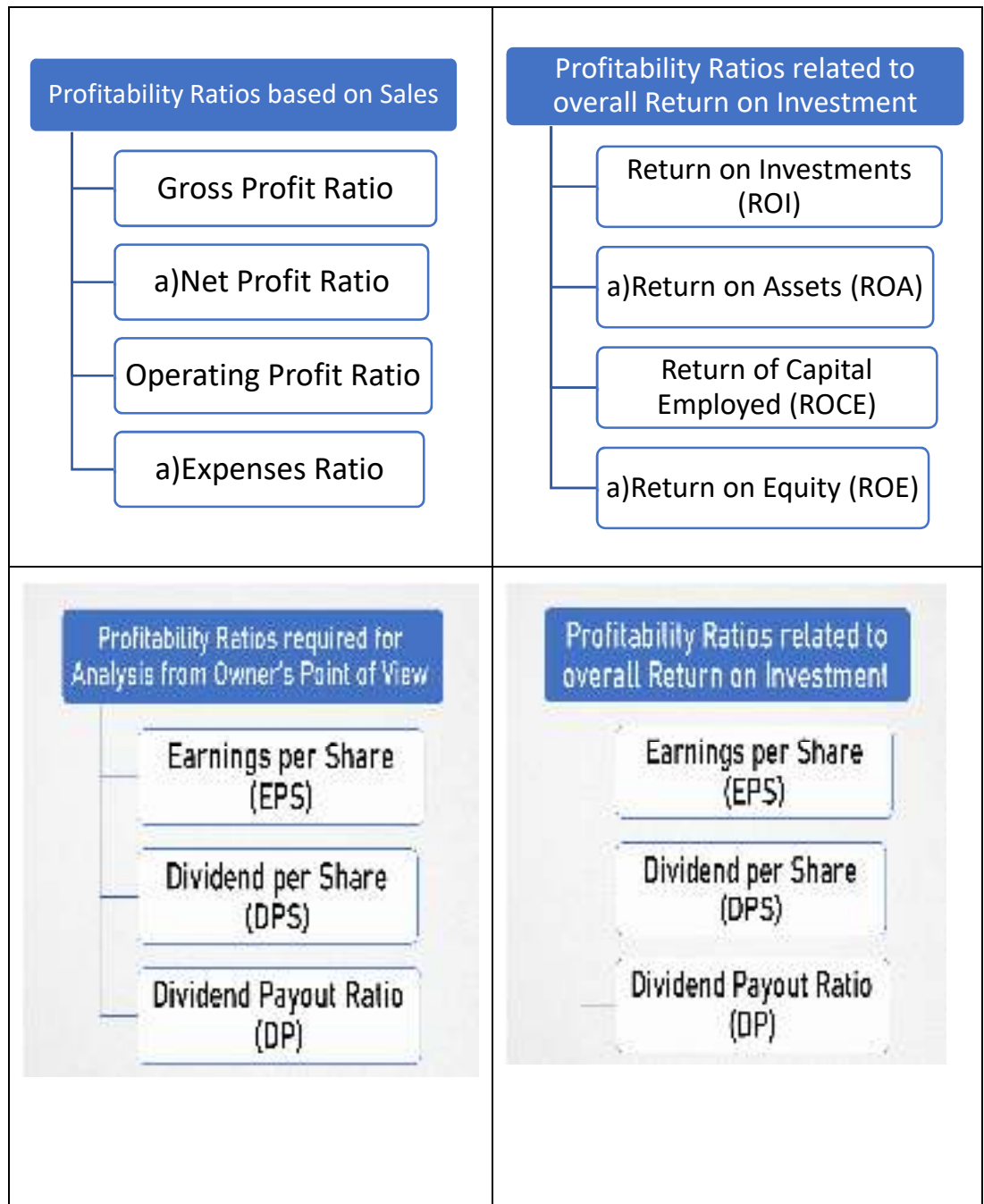
3.5   Profitability Ratios

Profitability ratios are financial metrics that provide insights into a company's ability to generate profits relative to its various financial elements. These ratios are crucial for assessing a company's financial health, performance, and efficiency in terms of generating earnings from its operations. They are commonly used by investors, creditors, and analysts to evaluate the overall financial well-being of a company and make informed decisions about investing or lending.

The profitability ratios measure the profitability or the operational efficiency of the firm. These ratios reflect the final results of business operations. They are some of the most closely watched and widely quoted ratios. Management attempts to maximize these ratios to maximize firm value.

3.6   Classifications of Profitability Ratios

Classification of profitability	i.Profitability Ratios related to Sales
	i.Profitability Ratios related to overall Return on Investment
	i.Profitability Ratios required for Analysis from Owner's Point of View
	i.Profitability Ratios related to Market/ Valuation/ Investors.
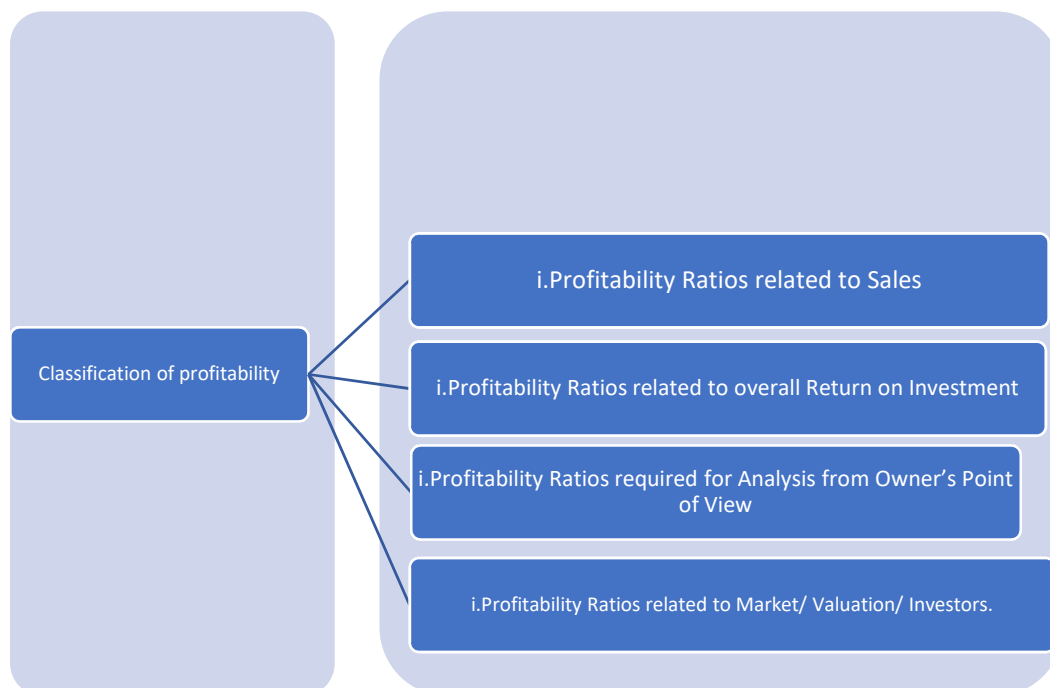
3.7   Profitability Ratios Based on Sales

Gross Profit Margin: This ratio indicates the percentage of revenue that remains after deducting the cost of goods sold (COGS). It helps assess how efficiently a company can produce its products and cover its direct production costs.

*Gross Profit Margin = (Gross Profit / Revenue) * 100*

Net Profit Margin: This ratio shows the percentage of revenue that remains as net profit after all expenses, including operating expenses, interest, taxes, and other costs, are deducted.

*Net Profit Margin = (Net Profit / Revenue) * 100*

Operating Profit Margin: Also known as the operating margin, this ratio measures the profitability of a company's core business operations. It includes both direct costs (COGS) and operating expenses.

*Operating Profit Margin = (Operating Profit / Revenue) * 100*

Expense Ratio: Expenses can be expresses in different variants and the expense ratio can be depicted by the following formula:

(i)	Cost of Goods Sold (COGS) Ratio	$= \dfrac{COGS}{Sales} \times 100$
(ii)	Operating Expenses Ratio	$= \dfrac{Administrative\ exp + Selling\ \&\ Distribution\ OH}{Sales} \times 100$
(iii)	Operating Ratio	$= \dfrac{COGS + Operating\ expenses}{Sales} \times 100$
(iv)	Financial Expenses Ratio	$= \dfrac{Financial\ expenses^*}{Sales} \times 100$

Taxes, loss due to theft, goods destroyed by fire etc. are excluded.

3.8 Profitability Ratios Related to Overall Return on Investment

Return on Investment (ROI): ROI assesses the return generated from an investment relative to its cost. It's often used to evaluate the profitability of specific projects or investments.

*ROI = (Net Profit from Investment / Cost of Investment) * 100*

Return on Assets (ROA): ROA indicates how efficiently a company uses its assets to generate profits. It compares the company's net income to its average total assets.

*ROA = (Net Income / Average Total Assets) * 100*

Return on Capital Employed (ROCE): ROCE is a financial ratio that measures the profitability of a company's capital investments relative to the amount of capital employed to generate those profits. ROCE is a metric for assessing how effectively a company utilizes its capital to generate returns and create value for its shareholders and investors.

*ROCE = (Operating Profit / Capital Employed) * 100*

Return on Equity (ROE): ROE measures the return generated for shareholders based on the equity they have invested in the company. It relates net income to shareholders' equity.

*ROE = (Net Income / Shareholders' Equity) * 100*

3.9 Profitability Ratios required for Analysis from Owner's Point of View

Earnings Per Share (EPS): EPS is a financial metric used to measure the profitability of a company on a per-share basis. It's one of the most commonly cited indicators of a company's financial health and performance.

EPS = (Net Earnings) / (Number of Outstanding Shares)

Dividends Per Share (DPS): DPS which is used to measure the amount of dividends distributed by a company to its shareholders on a per-share basis. Dividends are a portion of a company's profits that are returned to its shareholders as a way to share the company's financial success.

DPS = (Total Dividends Paid) / (Number of Outstanding Shares)

Dividend Payout Ratio (DP): The Dividend Payout Ratio (DPR) is a financial ratio that measures the proportion of a company's earnings that are distributed to shareholders in the form of dividends. It indicates what portion of the company's profits is being returned to investors rather than being retained for internal operations or growth.

*Dividend Payout Ratio = (Dividends per Share / Earnings per Share) * 100*

3.10 Profitability Ratios Related to Market/ Valuation/ Investors

These ratios involve measures that consider the market value of the company's shares. Frequently share prices data are punched with the accounting data to generate new set of information.

Price- Earnings Ratio: The price earnings ratio indicates the expectation of equity investors about the earnings of the firm. It relates earnings to market price and is generally taken as a summary measure of growth potential of an investment, risk characteristics, shareholders orientation, corporate image and degree of liquidity. It is calculated as

$$\text{Price-Earnings per Share (P/E Ratio)} = \frac{\text{Market Price per Share(MPS)}}{\text{Earnings per Share (EPS)}}$$

It indicates the payback period to the investors or prospective investors.

Dividend and Earning Yield: This ratio indicates return on investment. This may be on average investment or closing investment. Dividend (%) indicates return on paid up value of shares. Yield (%) is the indicator of true return in which share capital is taken at its market value.

$$\text{Dividend Yield} = \frac{\text{Dividend} \pm \text{Change in share price}}{\text{Initial share price}} \times 100$$

$$\frac{\text{Dividend per Share (DPS)}}{\text{Market Price per Share (MPS)}} \times 100$$

Also known as Earnings Price (EP) Ratio

Market Value /Book Value per Share (MVBV): It provides evaluation of how investors view the company's past and future performance. This ratio indicates market response of the shareholders' investment. Higher the ratios better is the shareholders' position in terms of return and capital gains.

$$\text{Market value per share/ Book value per share} = \frac{\text{Average share price}}{\text{Net worth} \div \text{No. of equity shares}}$$

Or,

$$\frac{\text{Closing share price}}{\text{Net worth} \div \text{No. of equity shares}}$$

Q Ratio: This ratio is proposed by James Tobin, a ratio is defined as

$$\frac{\text{Market Value of equity and liabilities}}{\text{Estimated replacement cost of assets}}$$

Thus, Profitability ratios offer companies, investors, and analysts a way to assess various aspects of a company's financial health.

3.11 Leverage

Leverage is the ability to magnify the effects of a certain action or resource in order to achieve a larger impact or outcome. Leverage can refer to the strategic use of various resources to maximize the efficiency and effectiveness of operations. This might involve using technology to automate processes, hiring skilled employees to improve productivity, or optimizing the allocation of resources to achieve higher profitability. leverage involves using some form of advantage or resource to achieve a larger impact or result. While leverage can be a powerful tool, it also comes with risks, responsibilities, and potential drawbacks, which need to be carefully considered in any application.
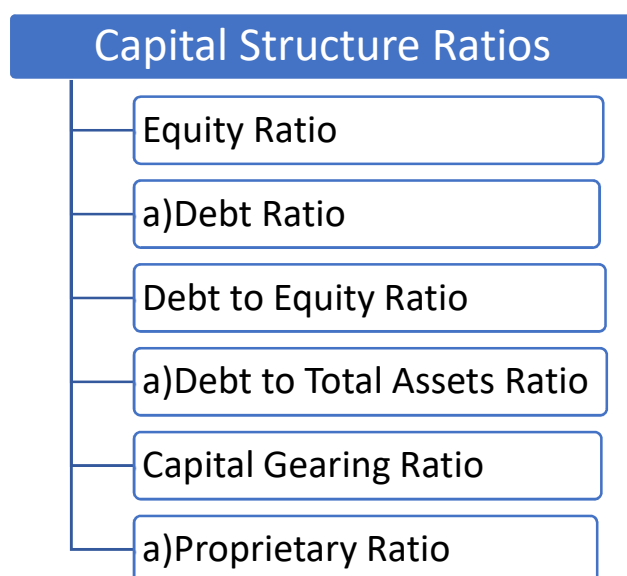
3.12 Leverage Ratios

Leverage ratios or long-term solvency ratios may be defined as those financial ratios which measure the long-term stability and structure of the firm.

These ratios indicate the mix of funds provided by owners and lenders and assure the lenders of the long-term funds with regard to:

(i)   Periodic payment of interest during the period of the loan and

(ii)   Repayment of principal amount on maturity.

Capital Structure ratios provide an insight into the financing techniques used by a business and focus, as a consequence, on the long-term solvency position.

Capital Structure Ratios

- Equity Ratio
- a)Debt Ratio
- Debt to Equity Ratio
- a)Debt to Total Assets Ratio
- Capital Gearing Ratio
- a)Proprietary Ratio

Equity Ratio*:* This ratio indicates proportion of owners' fund to total fund invested in the business. Traditionally, it is believed that higher the proportion of owners' fund lower is the degree of risk. The equity ratio, also known as the equity-to-assets ratio measures the proportion of a company's total assets that are financed by its shareholders' equity. It provides insight into the extent to which a company's operations and assets are funded by its owners' investments rather than by borrowed funds (debt).

The equity ratio is calculated using the following formula:

Equity Ratio = Shareholders' Equity / Total Assets

Debt Ratio*:* The debt ratio, also known as the debt-to-assets ratio, is a financial metric that measures the proportion of a company's total assets that are financed by its liabilities (debts). It provides insights into the extent to which a company's assets are funded through borrowing, indicating the company's level of financial leverage and its ability to cover its obligations.

The debt ratio is calculated using the following formula:

Debt Ratio = Total Liabilities / Total Assets

Total Liabilities: The sum of all the financial obligations and debts that a company owes to external parties, including short-term and long-term liabilities.

Total Assets: The sum of all the resources owned or controlled by the company, including tangible and intangible assets.

Debt to Equity Ratio*:* The debt-to-equity ratio compares a company's total debt to its total shareholders' equity. This ratio is used to assess the company's financial leverage and risk profile by examining the balance between borrowed funds and the investment made by shareholders.

Debt-to-Equity Ratio = Total Debt / Shareholders' Equity

Total Debt: The sum of all the company's liabilities, including both short-term and long-term debt obligations.

Shareholders' Equity: The ownership interest in a company, representing the residual value of assets after deducting liabilities.

Debt to Total Assets Ratio: The debt to total assets ratio provides insight into the proportion of a company's assets that are financed by debt. It helps assess the extent to which a company's operations and investments are funded through borrowed funds compared to its total assets. This ratio is particularly useful for evaluating a company's financial risk and leverage.

Debt to Total Assets Ratio = Total Debt / Total Assets

Total Debt: The sum of all the company's liabilities, including both short-term and long-term debt obligations.

Total Assets: The sum of all the resources owned or controlled by the company, including tangible and intangible assets.

Capital Gearing Ratio: Capital gearing ratio is calculated to show the proportion of fixed interest (dividend) bearing capital to funds belonging to equity shareholders i.e. equity funds or net worth. The capital gearing ratio, also known as the financial leverage ratio that measures the proportion of a company's capital structure that is made up of long-term debt and preference shares (known as "fixed interest" securities) compared to equity (ordinary shares). This ratio provides insights into

the financial risk and leverage of a company by examining the balance between debt and equity financing.

$$\text{Capital Gearing ratio} = \frac{(\text{Preference Share Capital} + \text{Debentures} + \text{Other Borrowed funds})}{(\text{Equity Share Capital} + \text{Reserves \& Surplus} - \text{Losses})}$$

Proprietary Ratio: Proprietary fund includes the sum of Equity Share Capital, Preference Share Capital and Reserve & Surplus. Total assets exclude fictitious assets and losses. It indicates the proportion of total assets financed by shareholders. Proprietary ratio can be calculated as:

$$\text{Proprietary Ratio} = \frac{\text{Proprietary Fund}}{\text{Total Assets}}$$

3.13 Z Score Model

Altman's Z Score model was developed by American finance professor Edward Altman in 1968 as a measure of the financial stability of companies.

Altman's Z-Score model is a numerical measurement that is used to predict the chances of a business going bankrupt in the next two years. Altman's Z-score model is considered an effective method of predicting the state of financial distress of any organization by using multiple balance sheet values and corporate income. The model proved to be an accurate method for predicting bankruptcy on several occasions.

According to studies, the model showed an accuracy of 72% in predicting bankruptcy two years before it occurred, and it returned a false positive of 6%.

Altman used a weighting system alongside other ratios that predicted the chances of a company going bankrupt.

It was specifically designed for public manufacturing companies with assets in excess of $1 million.

In 1983, Model A Z-score was developed specifically for private manufacturing companies whereas Model B was created for non-publicly traded companies.

The 1983 Z-score models comprised varied weighting, predictability scoring systems, and variables.

3.14 Calculation of Altman Z-Score

$$\text{Altman Z-Score} = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E$$

A = working capital / total assets

B = retained earnings / total assets

C = earnings before interest and tax / total assets

D = market value of equity / total liabilities

E = sales / total assets

Private Manufacturing Companies →

Z-Score = 0.717 × X1 + 0.847 × X2 + 3.107 × X3 + 0.42 × X4 + 0.998 × X5

Private General Non-Manufacturing Services Companies →

Z-Score = 6.56 × X1 + 3.26 × X2 + 6.72 × X3 + 1.05 × X4

Emerging Market Companies →

Z-Score = 3.25 + 6.56 × X1 + 3.26 × X2 + 6.72 × X3 + 1.05 × X4

Where:
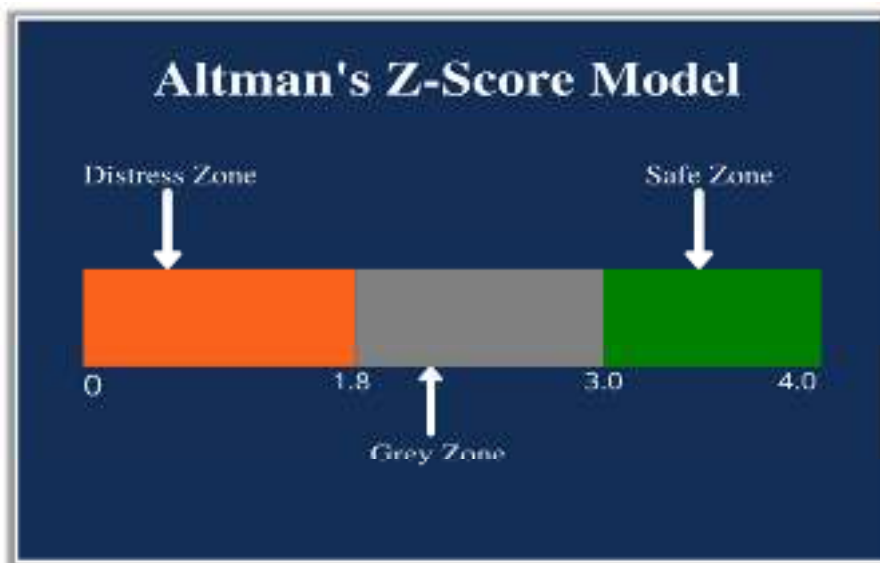
X1 = Working Capital ÷ Total Assets

X2 = Retained Earnings ÷ Total Assets

X3 = EBIT ÷ Total Assets

X4 = Market Capitalization ÷ Total Liabilities

X5 = Sales ÷ Total Assets

3.15 Analysis of Altman Z-Score

Bench mark manufacturing companies:

Z-Score	Interpretation
> 2.99	Safe Zone – Low Likelihood of Bankruptcy
1.81 to 2.99	Grey Zone – Moderate Risk of Bankruptcy
< 1.81	Distress Zone – High Likelihood of Bankruptcy

Bench Mark Manufacturing Companies

Z-Score	Interpretation
> 2.99	Safe Zone – Low Likelihood of Bankruptcy
1.81 to 2.99	Grey Zone – Moderate Risk of Bankruptcy
< 1.81	Distress Zone – High Likelihood of Bankruptcy

Bench Mark Non-Manufacturing Companies

Z-Score	Interpretation
> 2.60	Safe Zone – Low Likelihood of Bankruptcy
1.10 to 2.6	Grey Zone – Moderate Risk of Bankruptcy
< 1.10	Distress Zone – High Likelihood of Bankruptcy

Altman Z-Score Prediction of the 2008 Financial Crisis?

In 2007, Altman's Z-score indicated that the companies' risks were increasing significantly.

The median Altman Z-score of companies in 2007 was 1.81, which is very close to the threshold that would indicate a high probability of bankruptcy. Altman's calculations led him to believe a crisis would occur that would stem from corporate defaults, but the meltdown, which brought about the 2008 financial crisis, began with mortgage-backed securities (MBS)

Corporations soon defaulted in 2009 at the second-highest rate in history.

Summary

Financial statement analysis is the process of evaluating a company's financial statements to assess its financial health, performance, and overall stability. It involves examining various financial ratios, trends, and key metrics derived from the company's balance sheet, income statement, and cash flow statement. The goal of financial statement analysis is to gain insights into a company's operational efficiency, profitability, liquidity, solvency, and potential risks. This analysis is essential for investors, creditors, analysts, and management to make informed decisions. It helps identify strengths, weaknesses, opportunities, and threats, guiding strategic planning and decision-making. However, it's important to consider industry norms, company context, and the limitations of financial statements when interpreting results.

Ratio analysis is a technique in financial analysis that involves evaluating a company's financial performance and health by calculating and interpreting various ratios derived from its financial statements. These ratios provide insights into different aspects of the company's operations, profitability, liquidity, efficiency, and leverage. Common categories of ratios include liquidity ratios, profitability ratios, activity ratios, and leverage ratios. Ratio analysis allows stakeholders, such as investors, creditors, and management, to assess the company's strengths, weaknesses, and trends over time. It helps in making informed decisions, comparing performance with industry standards, and identifying areas that require attention. However, ratio analysis should be used cautiously, considering industry context, company specifics, and potential limitations of the data.

Keywords

1. Balance Sheet: Assets, Liabilities, Equity, Current Assets, Non-Current Assets, Current Liabilities, Non-Current Liabilities, Shareholders' Equity, Working Capital, Net Asset Value
2. Income Statement: Revenue, Sales, Cost of Goods Sold (COGS), Gross Profit, Operating Expenses, Earnings Before Interest and Taxes (EBIT), Net Income, Earnings Per Share (EPS), Operating Income, Non-Operating Income
3. Liquidity Ratios: Current Ratio, Quick Ratio, Cash Ratio, Operating Cash Flow Ratio, Working Capital Ratio, Acid-Test Ratio
4. Profitability Ratios: Gross Margin, Net Margin, Return on Assets (ROA), Return on Equity (ROE), Return on Investment (ROI), Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)
5. Activity Ratios: Inventory Turnover, Accounts Receivable Turnover, Accounts Payable Turnover, Asset Turnover, Days Sales Outstanding (DSO), Days Inventory Outstanding (DIO)
6. Leverage Ratios: Debt to Equity Ratio, Debt Ratio, Equity Ratio, Interest Coverage Ratio, Capital Gearing Ratio

Self Assessment

1. Which financial statement provides a snapshot of a company's financial position at a specific point in time?

A. Income Statement
B. Cash Flow Statement
C. Balance Sheet
D. Statement of Retained Earnings

2. The primary goal of financial statement analysis is to:

A. Calculate taxes owed by the company
B. Determine the company's market share
C. Assess the company's financial performance and health
D. Analyze customer satisfaction levels

3. Which financial ratio measures a company's ability to meet its short-term obligations?

A. Return on Equity (ROE)
B. Debt to Equity Ratio
C. Current Ratio
D. Price to Earnings Ratio (P/E)

4. Return on Equity (ROE) measures:

A. The company's ability to generate profits from its assets
B. The efficiency of the company's operations
C. The company's ability to cover its interest payments
D. The company's ability to meet short-term obligations

5. The Debt to Equity Ratio is calculated as:

A. Total Debt / Total Equity
B. Total Equity / Total Assets
C. Total Debt / Net Income
D. Total Assets / Total Equity

6. Which ratio indicates the number of times a company's inventory is sold and replaced during a period?

A. Inventory Turnover
B. Current Ratio
C. Debt Ratio
D. Earnings Per Share (EPS)

7. The Price to Earnings Ratio (P/E) is used to:

A. Measure the company's liquidity
B. Evaluate the company's solvency
C. Assess the company's growth potential
D. Compare the company's stock price to its earnings per share

8. Which ratio indicates the company's ability to cover interest payments with its operating income?

A. Return on Assets (ROA)
B. Interest Coverage Ratio
C. Debt to Total Assets Ratio
D. Acid-Test Ratio

9. Which ratio measures a company's ability to meet its short-term obligations?

A. Debt to Equity Ratio
B. Return on Assets (ROA)
C. Current Ratio
D. Asset Turnover Ratio

10. Which ratio indicates the efficiency of a company's utilization of its assets to generate sales?

A. Gross Margin
B. Return on Investment (ROI)
C. Asset Turnover Ratio
D. Debt Ratio

11. Return on Equity (ROE) measures:

A. The company's ability to meet short-term obligations
B. The company's efficiency in utilizing its assets
C. The company's ability to generate profits from its equity investments

D. The company's ability to cover its interest payments

12. The Quick Ratio (Acid-Test Ratio) excludes which of the following from current assets?

A. Cash
B. Inventory
C. Accounts Receivable
D. Accounts Payable

13. The Debt Coverage Ratio assesses:

A. The company's ability to cover its short-term obligations
B. The company's ability to meet its long-term debt obligations
C. The company's ability to generate net income
D. The company's efficiency in utilizing its assets

14. Which ratio indicates the percentage of earnings paid out as dividends to shareholders?

A. Dividend Payout Ratio
B. Price to Earnings (P/E) Ratio
C. Debt to Equity Ratio
D. Asset Turnover Ratio

Answers to Self Assessment

1.	C	2.	C	3.	C	4.	A	5.	A
6.	A	7.	D	8.	B	9.	C	10.	C
11.	C	12.	B	13.	B	14.	A	15.	C

Review Questions

1. What are the primary objectives of performing financial statement analysis, and how does it benefit stakeholders such as investors, creditors, and management?
2. How do you assess a company's liquidity using financial statements? What ratios or metrics would you use to evaluate its short-term ability to meet its obligations?
3. Explain what is financial ratio analysis and why it's important for assessing a company's financial health?
4. What are liquidity ratios? Explain with examples commonly used liquidity ratios and explain how they help evaluate a company's short-term financial stability?
5. How do profitability ratios help investors and analysts understand a company's ability to generate profits?
6. Explain the concept of activity ratios. How do they measure a company's efficiency in managing its assets and generating revenue?

7. Discuss the limitations of financial ratio analysis. What challenges can arise when relying solely on ratios to evaluate a company's financial health?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

Web Link

- https://www.wolterskluwer.com/en/expert-insights/
- https://www.investopedia.com/
- https://www.toptal.com/finance/

Unit 04: Financial Forecasting

Objectives

After studying this unit, you will be able to:

- Understand Financial forecasting
- Process of using financial forecasting techniques
    - Purpose
    - Gathering Data
    - Time Frame
    - Method
    - Results
    - Analysis
- Importance of using financial forecasting tools
- Use Z Score Model for Financial Distress Prediction
- Forecasting Balance Sheet

Introduction

Financial forecasting is predicting a company's financial future by examining historical performance data, such as revenue, cash flow, expenses, or sales. Financial forecasting informs

business decision-making regarding hiring, budgeting, predicting revenue, and strategic planning. It helps to maintain a forward-focused mindset.

The use of financial forecasting techniques helps businesses find direction and clearly lays out their goals based on their stage of growth. It also helps them find problem areas where optimization could result in more business and profits. At a macro level, it also makes it more attractive for investors to invest in a company with a high level of clarity.

4.1 Process of Using Financial Forecasting Techniques

The Process of using financial forecasting techniques follows a number of steps which may be named as follows:

- Purpose
- Gathering Data
- Time Frame
- Method
- Results
- Analysis

- *Purpose:* It is vital to understand the purpose for which the elaborate process of analyzing, processing, making changes, and constant monitoring is being implemented.
- *Gathering Data:* Gathering historical sales and marketing data along with financial statements could allow the management to make more informed decisions based on past performance. Adjustments to strategies become easier with past performances in order.
- *Time Frame:* Creating clarity in terms of the length of this process can give the management and the other employees in the company a clear idea of what they are working towards in terms of daily actions supporting the plans.
- *Method:* Choosing a forecasting method that fits the best to the structure of the business and the purpose of the forecast and maintaining all documentation in the same format need to be clearly established to make analyzing more efficient.

- ***Results:*** Regular documentation of happening can help managers assess the results in real-time or at least in regular intervals, which makes the process less time-bound. Therefore, resources also could be mindfully spent
- ***Analysis:*** The final data can be analyzed and it can be clarified if the strategies worked well for the company. Based on the results they can choose an interval after which these checks could be conducted again.

4.2 Importance of Using Financial Forecasting Tools

Financial forecasting in today's business environment is of immense importance. These tools are used for the following purpose:

- New Business Promotion
- Seamless Functioning
- Estimating Financial Requirements
- Control Cash Flow
- Archive Overall Success

New Business Promotion: Financial forecasting helps businesses utilize their funds to promote new business ventures and initiatives. It also helps in determining the success rate of the business they are promoting.

Seamless Functioning: Accurate and effective forecasting of the finances like current revenue, revenue potential, and other expenses helps in the organization's smooth running. The forecast also helps in anticipating future roadblocks.

Estimating Financial Requirements: It helps determine sales and cost of customer acquisition, capital for a specific project, and other expenses required for further management of the business. This pre-emptive forecast helps in making sound business decisions.

Control Cash Flow: It helps in controlling the cash flows of a business. Organizations with a good amount of cash/bank balance are more financially organized and better control their business operations.

Archive Overall Success: Financial forecast is important in achieving overall success for the business as it forms a strong foundation for the complete budgeting of departments across the organization.

4.3 Advantages of Financial Forecasting

- The financial forecast allows businesses to predict future financial performance against set standards. It provides a benchmark against which performance, loopholes, and corrective actions of an organization are monitored.
- It helps in identifying the processes that are most capital consuming. Financial risk can be lowered by pumping out money from such processes and channelizing them towards the profitable ones.
- It helps in predicting the financial viability of new business ventures. It helps prepare the best model for figuring out how a business will perform when specific plans and strategies are worked out.

4.4 Disadvantages of Using Financial Forecasting Techniques

- Despite being the forecasting done by experts and a great process in place, predicting the future accurately is impossible. Markets have a high volatility level, and the number of factors influencing demand keeps changing with time.
- Data gathering, data organizing, and coordination are required for this process, which is very time-consuming. Also, substantial input from the marketing and sales team is required, making it a resource-intensive process.
- Hiring a team of advanced planners is a significant investment. Adding good-quality tools, high-quality talent, and software might prove a costly affair for the forecasting process.

4.5 Financial Forecasting Methods

There are two primary categories of forecasting:

1) Quantitative methods and
2) Qualitative methods

1) *Quantitative Methods:* Quantitative methods of financial forecasting involve using historical data and mathematical models to make predictions about future financial trends, performance, and outcomes. These methods rely on numerical data and statistical techniques to analyze patterns, relationships, and trends within the data. Commonly used quantitative methods of financial forecasting are as follows:
   - Time Series Analysis
   - Regression Analysis
   - Financial Ratios and Metrics
   - Monte Carlo Simulation
   - Neural Networks and Machine Learning
   - Econometric Models
   - Simple Linear Regression
   - Multiple Linear Regression

- **Time Series Analysis:** Time series analysis involves examining historical data over a period of time to identify patterns and trends. Various statistical techniques, such as moving averages, exponential smoothing, and autoregressive integrated moving average (ARIMA) models, are used to forecast future values based on past observations. Time series analysis is particularly useful when dealing with data that has a chronological order, such as stock prices, sales figures, and economic indicators.
- **Regression Analysis:** Regression analysis is used to model the relationship between one or more independent variables and a dependent variable. It's commonly used to forecast outcomes when there's a cause-and-effect relationship between variables. Simple linear regression involves a single independent variable, while multiple regression involves several independent variables. Regression analysis can be applied to financial forecasting by considering factors such as historical sales, marketing expenses, interest rates, and other relevant variables to predict future financial performance.
- **Financial Ratios and Metrics:** Financial ratios and metrics, such as profitability ratios (e.g., return on equity, profit margin), liquidity ratios (e.g., current ratio, quick ratio), and leverage

ratios (e.g., debt-to-equity ratio), provide insights into a company's financial health. These ratios can be used to predict future financial performance based on historical trends and industry benchmarks.

- **Monte Carlo Simulation:** Monte Carlo simulation involves generating a large number of random scenarios based on probability distributions of input variables. This method is particularly useful when dealing with complex financial models and uncertainty. By running simulations, analysts can assess the range of possible outcomes and associated probabilities, helping to make more informed decisions.

- **Neural Networks and Machine Learning:** Advanced machine learning techniques, such as neural networks and deep learning, can be applied to financial forecasting. These techniques are capable of handling complex, nonlinear relationships in the data. Neural networks can learn patterns and relationships from historical data and then make predictions about future financial trends.

- **Econometric Models:** Econometric models incorporate economic theories and statistical methods to forecast financial variables. These models often take into account macroeconomic indicators, industry trends, and specific company data to make predictions about financial performance.

- **Simple Linear Regression:** Simple linear regression forecasts metrics based on a relationship between two variables: dependent and independent. The dependent variable represents the forecasted amount, while the independent variable is the factor that influences the dependent variable.

- **Multiple Linear Regression:** If two or more variables directly impact a company's performance, it turn to multiple linear regression. This results in a more accurate forecast, as it accounts for several variables that ultimately influence performance. For multiple linear regression, a linear relationship must exist between the dependent and independent variables.

The independent variables should not be so closely correlated that it's impossible to tell which impacts the dependent variable.

2) **Qualitative Methods**

Qualitative methods of financial forecasting involve making predictions about future financial trends and outcomes based on subjective judgments, expert opinions, and non-numerical information. These methods are used when historical data is limited, unreliable, or not available, or when external factors like market sentiment, regulatory changes, and technological advancements play a significant role in shaping the future. Following are some commonly used qualitative methods of financial forecasting:

- Expert Opinion
- Delphi Method
- Scenario Analysis
- Market Research and Surveys
- Expert Panels and Focus Groups
- Judgmental Forecasting

- **Expert Opinion:** Expert opinion involves seeking insights and predictions from individuals who have significant knowledge and experience in a particular industry or field. These experts can provide valuable insights into future trends, market conditions, and other relevant factors that may impact financial performance.

- **Delphi Method:** The Delphi method is a structured process that involves collecting opinions from a panel of experts anonymously. In each round of the process, experts provide their predictions and reasoning, which are then compiled and shared with the group. Experts are allowed to revise their opinions in subsequent rounds, and the process continues until a consensus is reached or a predetermined number of rounds are completed.

- **Scenario Analysis:** Scenario analysis involves creating multiple hypothetical scenarios to explore different future outcomes. These scenarios are based on various assumptions and variables, helping decision-makers understand the range of possible outcomes under different conditions. This method is particularly useful for understanding the potential impacts of various external factors on financial performance.

- **Market Research and Surveys:** Conducting market research and surveys can provide insights into consumer behavior, market trends, and changing preferences. This information can be used to forecast demand, sales, and other relevant financial metrics.

- **Expert Panels and Focus Groups:** Expert panels and focus groups bring together a diverse group of individuals to discuss and generate insights about future trends. These discussions can help uncover new perspectives and ideas that may not have been considered through other methods.

- **Judgmental Forecasting:** Judgmental forecasting relies on the intuitive judgments of individuals who are familiar with the industry and its dynamics. These judgments are based on experience, observations, and insights that may not be captured by quantitative models.

Qualitative methods are more subjective and less structured than quantitative methods. While they may lack the precision of quantitative techniques, qualitative methods can be valuable when dealing with uncertain or rapidly changing environments where historical data may not accurately predict future outcomes. Often, a combination of qualitative and quantitative methods can provide a more comprehensive and accurate picture of financial forecasts.

Example:

XYZ Ltd. has collected the following data for the future 5 years. You are requested to draw a comparative financial statement for the next 5 years and determine the company's growth potential.

Year	Sales	Operating Expenses	Non Operating Cost
1	1,000,000	600,000	200,000
2	1,120,000	630,000	224,000
3	1,400,000	787,500	291,200
4	1,960,000	1,102,500	407,680
5	2,195,200	1,234,800	456,602

Out of the above figures, cash sales are 80%, and cash expenses are 75% of the total figure. Assume opening cash as 50,000 and comment on the cash position of the company.

Solution:

Particulars	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Opening	50,000	250,000	505,500	816,475	1,251,840
Add: - Cash Sales	800,000	896,000	1,120,000	1,568,000	1,756,160
Less: - Cash Expenses	600000	640500	809025	1132635	1268551
Cash Position	**250,000**	**505,500**	**816,475**	**1,251,840**	**1,739,449**

Observations:

- Company has a higher percentage of cash sales than cash expenses.
- The cash position is becoming stronger with the increasing sales year by year.
- It can be said that the overall company has good growth potentials.

4.6 Forecasting Balance Sheet

Balance sheet forecasting is one of the most vital tools in making sound financial decisions for business. It allows to see future trends and predict how company will perform financially. One can then use this information to plan company's success.

A balance sheet forecast is a projection of company's financial future. It predicts your company's equity, assets, and liabilities at a specific future date. This information is crucial for making sound business decisions, such as expanding or contracting operations, borrowing money, or investing in new products or services.

Balance Sheet Projection Best Practices

- Roll Balances Forward
- Identify Net Zero Accounts
- Plan for Events That Affect Cash
- Leverage the Power of Automation

- *Roll Balances Forward*: This practice smooths out irregularities and offers a more accurate view of the company's financial state. It addresses the fact that balance sheets rely on cumulative data and that historical performance directly impacts future outcomes.
- *Identify Net Zero Accounts*: While rolling balances forward is necessary for most accounts, some exceptions do exist. Any account with wide variations across each quarter becomes a good candidate for a net-zero start. Accounts payable accounts are typical examples.
- *Plan for Events That Affect Cash*: Whether you plan to spend millions on a new branch or expect venture capital, this significantly impacts cash flow. That will then affect the numbers on your balance sheet. When completing projections, insert a line to account for these events whenever applicable.
- *Leverage the Power of Automation*: Software that automates the forecasting process can save time and ensure accuracy. Choose software this is compatible with your company's financial system that can also handle the volume of data your business generates.

4.7 Forecasting a Balance Sheet

1. **Start the Income Statement**: Create a detailed document up to the point of depreciation expense and interest. This will give you a snapshot of the company's overall financial health so you can determine how much revenue to expect in the future.

2. **Start the Balance Sheet :** Calculate your balance sheet up to retained earnings. These are some of the elements you might need to calculate to arrive at your final figure:

   - Debt

   - Equity

   - Property, plant, and equipment

   - Retained earnings

3. **Finalize the Income Statement Projection**: There are some additional components you need to calculate to finalize the income statement:

   - Estimated tax expense

   - Depreciation

   - Interest

   - Net Income

4. **Finalize the Balance Sheet Projection** : Use the net income finalized with the income statement to complete the projection. Finally, review all the information to ensure accuracy and completeness.

Example:

Forecasting Balance Sheet					
		Projected Years			
	2021	2022	2023	2024	2025
Assets					
Cash and Cash Equivalents	$42,19,625	$40,74,803	$56,88,012	$62,61,749	$81,91,072
Accounts Receivable	$1,25,000	$1,30,479	$1,63,785	$4,18,861	$4,75,461
Total Current Assets	$43,44,625	$42,05,282	$58,51,797	$66,80,610	$86,66,533
Fixed Asset	$55,000	$1,22,579	$1,54,158	$2,20,737	$3,01,039
Accumulated Depreciation	-$8,500	-$23,387	-$65,275	-$1,41,162	-$2,30,211
Net Fixed Assets	$46,500	$99,192	$88,883	$79,575	$70,828
Total Asset	**$43,91,125**	**$43,04,474**	**$59,40,680**	**$67,60,185**	**$87,37,361**
Liabilities					
Accounts Payable	$65,000	$1,63,098	$2,04,731	$4,18,861	$4,75,461
Unearned Revenue	$3,36,125	$1,30,479	$2,45,677	$7,53,950	$8,55,830
Total Current Liabilities	$4,01,125	$2,93,577	$4,50,408	$11,72,811	$13,31,291
Long Term Debt	$25,00,000	$22,56,775	$34,63,550	$27,50,325	$35,11,100
Total Liabilities	**$29,01,125**	**$25,50,352**	**$39,13,958**	**$39,23,136**	**$48,42,391**
Equity					
Common Stock	$40,000	$40,000	$40,000	$40,000	$40,000
Retained Earnings	$14,50,000	$17,14,122	$19,86,722	$27,97,050	$38,54,971
Total Shareholders' Equity	$14,90,000	$17,54,122	$20,26,722	$28,37,050	$38,94,971
Liabilities & Shareholders' Equity	**$43,91,125**	**$43,04,474**	**$59,40,680**	**$67,60,185**	**$87,37,361**

Assumptions:

Assumptions				
	2022	2023	2024	2025
Net Revenue	$32,61,968	$40,94,618	$83,77,218	$95,09,218
Accounts Receivables	4%	4%	5%	5%
Accounts Payable	5%	5%	5%	5%
Unearned Revenue	4%	6%	9%	9%
Net Cash Flow	-$1,44,822	$16,13,209	$5,73,737	$19,29,323
Total Capital Expenditure	$67,579	$31,579	$66,579	$80,302
Total Depreciation	$14,887	$41,887	$75,887	$89,049
Net Income	$2,64,122	$2,72,601	$8,10,328	$10,57,921
Net Borrowings		$ 18,00,000		$ 15,00,000
Debt Payments	$2,43,225	$5,93,225	$7,13,225	$7,39,225

4.8   Regression Analysis

Regression analysis is a set of statistical methods used for the estimation of relationships between a dependent variable and one or more independent variables. It can be utilized to assess the strength of the relationship between variables and for modeling the future relationship between them.
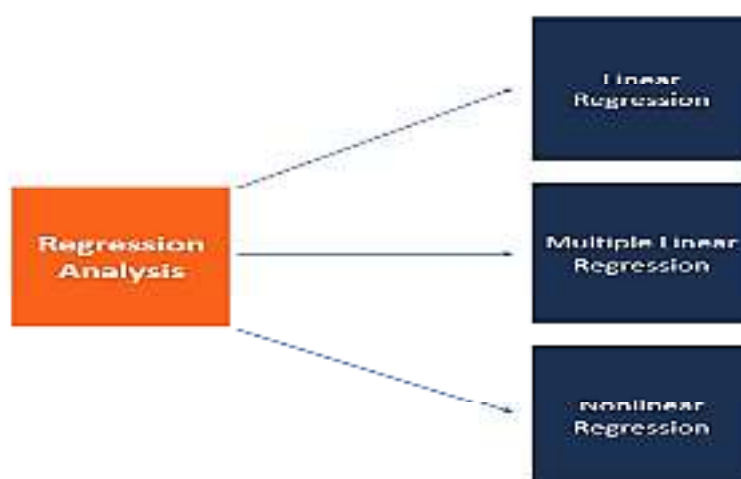
4.9   Variations of Regression Analysis

- Linear Regression Analysis,
- Multiple Linear Regression Analysis and
- Nonlinear Regression Analysis.
- The most common models are simple linear and multiple linear.
- Nonlinear regression analysis is commonly used for more complicated data sets in which the dependent and independent variables show a nonlinear relationship.

- Regression analysis offers numerous applications in various disciplines, including finance.

Assumptions of Linear Model Regression Analysis

- The dependent and independent variables show a linear relationship between the slope and the intercept.
- The independent variable is not random.
- The value of the residual (error) is zero.
- The value of the residual (error) is constant across all observations.
- The value of the residual (error) is not correlated across all observations.
- The residual (error) values follow the normal distribution.

Simple Linear Regression Analysis

Simple linear regression is a model that assesses the relationship between a dependent variable and an independent variable.

The simple linear model is expressed using the following equation:

$$Y = a + bX + \epsilon$$

Where:

Y – Dependent variable or 'outcome' or 'response variable', or a 'label' in machine learning parlance)

X – Independent (explanatory) variable or 'predictors', 'covariates', 'explanatory variables' or 'features'

a – Intercept

b – Slope

ϵ – Residual (error)

Multiple Linear Regression Analysis

Multiple linear regression analysis is essentially similar to the simple linear model, with the exception that multiple independent variables are used in the model. The mathematical representation of multiple linear regression is:

$$Y = a + bX_1 + cX_2 + dX_3 + \epsilon$$

Where:

Y – Dependent variable

X1, X2, X3 – Independent (explanatory) variables

a – Intercept

b, c, d – Slopes

ϵ – Residual (error)

4.10 Regression Analysis in Finance

Regression analysis has several applications in finance. For example, the statistical method is fundamental to the Capital Asset Pricing Model (CAPM). The CAPM equation is a model that determines the relationship between the expected return of an asset and the market risk premium.

The analysis is also used to forecast the returns of securities, based on different factors, or to forecast the performance of a business.

In finance, regression analysis is used to calculate the Beta (volatility of returns relative to the overall market) for a stock. It can be done in Excel using the Slope function.

Beta (β) Calculator

Individual Stock			S&P 500 Index		
Date	Price	Return	Date	Price	Return
1/2/2018	15.78		1/2/2018	2,696	
1/9/2018	16.38	3.8%	1/9/2018	2,751	2.0%
1/16/2018	16.67	1.8%	1/16/2018	2,776	0.9%
1/23/2018	17.17	3.0%	1/23/2018	2,839	2.3%
1/30/2018	17.02	-0.9%	1/30/2018	2,822	-0.6%
2/6/2018	16.31	-4.2%	2/6/2018	2,695	-4.5%
2/13/2018	16.00	-1.9%	2/13/2018	2,663	-1.2%
2/20/2018	16.43	2.7%	2/20/2018	2,716	2.0%
2/27/2018	16.97	3.3%	2/27/2018	2,765	1.8%

When forecasting financial statements for a company, it may be useful to do a multiple regression analysis to determine how changes in certain assumptions or drivers of the business will impact revenue or expenses in the future.

There may be a very high correlation between the number of salespeople employed by a company, the number of stores they operate, and the revenue the business generates.

4.11 Regression Tools

- Excel remains a popular tool to conduct basic regression analysis in finance, however, there are many more advanced statistical tools that can be used.
- Python and R are both powerful coding languages that have become popular for all types of financial modeling, including regression.
- These techniques form a core part of data science and machine learning where models are trained to detect these relationships in data.

Example

Is there a relation between Quantity Sold (Output) and Price and Advertising (Input). OR

Can we predict Quantity Sold if we know Price and Advertising?

Quantity Sold	Price	Advertising
8500	2	2800
4700	5	200
5800	3	400
7400	2	500
6200	5	3200
7300	3	1800
5600	4	900

Solution:

Analysis - R Square

Regression Statistics	
Multiple R	0.981
R Square	0.962
Adjusted R Square	0.943
Standard Error	310.524
Observations	7

R Square equals 0.962, which is a very good fit. 96% of the variation in Quantity Sold is explained by the independent variables Price and Advertising. The closer to 1, the better the regression line (read on) fits the data.

Analysis: F and P-values

ANOVA

	df	SS	MS	F	Significance F
Regression	2	9694299568	4847149.784	50.269	0.001
Residual	4	385700.432	96425.108		
Total	6	10080000.000			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	8536.214	386.912	22.062	0.000	7461.975	9610.453	7461.975	9610.453
Price	-835.722	99.653	-8.386	0.001	-1112.404	-559.041	-1112.404	-559.041
Advertising	0.592	0.104	5.676	0.005	0.303	0.882	0.303	0.882

Significance F and P-values

- To check if your results are reliable (statistically significant), look at Significance F (0.001).
- If this value is less than 0.05, you're OK. If Significance F is greater than 0.05, it's probably better to stop using this set of independent variables.
- Delete a variable with a high P-value (greater than 0.05) and rerun the regression until Significance F drops below 0.05.
- Most or all P-values should be below below 0.05. In our example this is the case. (0.000, 0.001 and 0.005).

Analysis: Coefficient

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	8536.214	386.912	22.062	0.000	7461.975	9610.453	7461.975	9610.453
Price	-835.722	99.653	-8.386	0.001	-1112.404	-559.041	-1112.404	-559.041
Advertising	0.592	0.104	5.676	0.005	0.303	0.882	0.303	0.882

- The regression line is: y = Quantity Sold = 8536.214 -835.722 * Price + 0.592 * Advertising.
- For each unit increase in price, Quantity Sold decreases with 835.722 units.
- For each unit increase in Advertising, Quantity Sold increases with 0.592 units.

Residuals

RESIDUAL OUTPUT

Observation	Predicted Quantity Sold	Residuals
1	8523.008957	-23.00896712
2	4476.047825	223.9521754
3	6265.938227	-465.9382265
4	7160.883427	239.1165726
5	6252.733311	-52.73331119
6	7095.058113	204.9418798
7	5726.330123	-126.3301229

The residuals show you how far away the actual data points are from the predicted data points (using the equation).

For example, the first data point equals 8500. Using the equation, the predicted data point equals 8536.214 -835.722 * 2 + 0.592 * 2800 = 8523.009, giving a residual of 8500 - 8523.009 = -23.009.

Summary

- Financial forecasting is predicting a company's financial future by examining historical performance data, such as revenue, cash flow, expenses, or sales.
- Financial forecasting informs business decision-making regarding hiring, budgeting, predicting revenue, and strategic planning.
- Forecasting the balance sheet is an easy task if done carefully and utilizing the methods to reduce the likelihood of unintended errors.
- A projected balance sheet is a beneficial tool since investors frequently want to know how much cash or debt will accumulate over the anticipated period.
- The balance sheet will demonstrate your creditworthiness and facilitate lending decisions.
- Regression analysis is helpful statistical method that can be leveraged across an organization to determine the degree to which particular independent variables are influencing dependent variables.
- The possible scenarios for conducting regression analysis to yield valuable, actionable business insights are endless.

Keywords

Forecasting Methods, Budgeting, Projections, Time Series Analysis, Forecast Accuracy, ,Cash Flow, Forecasting, Regression Models, Linear Regression, Multiple Regression, Nonlinear Regression, Regression Coefficients, Dependent Variable, Independent Variable, Predictor Variables, Residuals, Regression Equation.

Self Assessment

1. What is the primary goal of financial forecasting?

A. To accurately predict stock prices
B. To analyze historical data for reporting purposes
C. To predict future financial trends and outcomes
D. To calculate historical financial ratios

2. Which method of financial forecasting involves using historical data and mathematical models?

A. Expert opinion
B. Scenario analysis
C. Regression analysis
D. Delphi method

3. Time series analysis is most suitable for forecasting:

A. Expert opinions
B. Political trends
C. Historical sales data
D. Market research results

4. The Delphi method is characterized by:

A. Collecting opinions from experts anonymously

B. Analyzing historical financial ratios

C. Conducting market surveys

D. Using machine learning algorithms for predictions

5. Which qualitative method involves exploring various hypothetical situations to understand potential outcomes?

A. Regression analysis

B. Expert panels

C. Analogous forecasting

D. Scenario analysis

6. Market research and surveys are often used for forecasting:

A. Historical trends

B. Consumer behavior and preferences

C. Financial ratios

D. Quantitative models

7. What is the main advantage of using neural networks for financial forecasting?

A. They require minimal historical data

B. They only rely on expert opinions

C. They can capture complex, nonlinear relationships

D. They are primarily used for qualitative analysis

8. Which forecasting method considers factors such as economic indicators, industry trends, and specific company data?

A. Moving averages

B. Focus groups

C. Econometric models

D. Environmental scanning

9. Which method involves seeking insights and predictions from individuals with expertise in a specific field?

A. Expert opinion

B. Neural networks

C. Monte Carlo simulation

D. Panel data analysis

10. Qualitative data analysis can provide insights into:

A. Historical stock prices

B. Consumer preferences and sentiment

C. Mathematical models

D. Financial ratios

11. What is the primary goal of regression analysis?

A. To predict future financial trends
B. To analyze historical data for reporting
C. To determine causation between variables
D. To identify outliers in a dataset

12. In a simple linear regression, how many variables are involved?

A. One independent variable and one dependent variable
B. Two independent variables and one dependent variable
C. One independent variable and two dependent variables
D. Two independent variables and two dependent variables

13. The coefficient of determination (R-squared) in regression analysis represents:

A. The strength of the linear relationship between variables
B. The magnitude of the dependent variable
C. The percentage of outliers in the dataset
D. The number of independent variables in the model

14. What does the slope coefficient ($\beta1$) in a regression equation indicate?

A. The intercept of the regression line
B. The predicted value of the dependent variable
C. The change in the dependent variable for a one-unit change in the independent variable
D. The standard deviation of the residuals

15. What is the purpose of the residual plot in regression analysis?

A. To identify the independent variables
B. To visualize the distribution of the dependent variable
C. To visualize the pattern of residuals and assess the model's assumptions
D. To plot the dependent variable against time

Answers for Self Assessment

1.	C	2.	C	3.	C	4.	A	5.	D
6.	B	7.	C	8.	C	9.	A	10.	B
11.	C	12.	A	13.	A	14.	C	15.	C

Review Questions

1. Explain the importance of financial forecasting for a business? How does it impact decision-making and strategic planning?

2. What are the key differences between quantitative and qualitative methods of financial forecasting? Can you provide examples of when each approach might be more appropriate?

3. Explain the concept of regression analysis in financial forecasting? How does it help in understanding relationships between variables and making predictions?

4. Explain the concept of sensitivity analysis in financial forecasting? How does it help in understanding the potential impact of changes in variables on forecasted outcomes?

5. What role does technology and software play in your financial forecasting processes? Are there any specific tools or software platforms you prefer to use?

6. What methods and data sources do you use to forecast revenues and expenses for a P&L statement?

7. How do you forecast the different components of a Balance Sheet, such as assets, liabilities, and equity?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)

- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

Web Link

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Unit 05: Break-Even and Leverage Analysis

Objectives

After studying this unit, you will be able to:

- Understand the concept of break-even point
- Learn to calculate the break-even point using the break-even formula
- Understand the contribution margin and its significance in break-even analysis.
- Understand break-even analysis to include CVP analysis and its applications in decision-making.
- Apply concepts of operating and financial leverage, and explain their implications on risk and return.

Introduction

Break-even refers to the point at which the total costs of a business or a project are equal to its total revenue, resulting in neither a profit nor a loss. It's the level of activity or sales volume at which a company's total expenses exactly match its total income. At the break-even point, the company's net income is zero.

To understand break-even, you need to consider two main components:

Fixed Costs (FC): These are costs that remain constant regardless of the level of production or sales. They include expenses like rent, salaries of permanent employees, insurance, and other overhead expenses.

Variable Costs (VC): Variable costs are directly tied to the level of production or sales. As production increases, variable costs increase, and as production decreases, variable costs decrease. These costs include raw materials, direct labor, and other expenses directly associated with production.

Revenue (R): This is the income generated from selling goods or services. It's the product of the quantity sold and the selling price per unit.

The break-even point can be calculated using the following formula:

Once a business reaches its break-even point, any additional units sold or revenue generated will contribute to generating a profit. Conversely, if the company sells fewer units or generates less revenue than the break-even point, it will experience a loss.

Understanding the break-even point is crucial for businesses to make informed decisions about pricing, production levels, cost management, and setting financial goals. It helps business owners

and managers determine how much they need to sell in order to cover their costs and begin making a profit.

5.1 Exercise

A toy store and want to find break-even point in units. Total fixed costs is Rs.6,000 and variable costs per unit is Rs.25. Sales price per unit is Rs.50. Find break-even point in units.

Solution:

Break-even Point Per Unit = Fixed Costs / (Sales Price Per Unit – Variable Costs Per Unit)

= Rs.6,000 / (Rs.50 – Rs.25)

= 240 units

Hence, one needs to sell 240 units to break even

Cost Cutting impact

Variable costs now decreased to $10 per unit, and the fixed costs and sales price per unit stay the same. Find break-even point in units.

Break-even Point Per Unit = Fixed Costs / (Sales Price Per Unit – Variable Costs Per Unit)

= Rs.6,000 / (Rs.50 – Rs.10)

= Rs.6,000 / Rs.40

= 150 units

When you decrease your variable costs per unit, it takes fewer units to break even.

One would need to sell 150 units (instead of 240 units) to break even.

5.2 Graphical Representation of the Break-Even Point

A graphical representation of the break-even point is often shown on a break-even chart or graph. In this graph, the horizontal axis represents the quantity of units sold or produced, and the vertical axis represents the total cost and revenue. The point where the total cost and total revenue lines intersect is the break-even point. Here's what a typical break-even chart might look like:
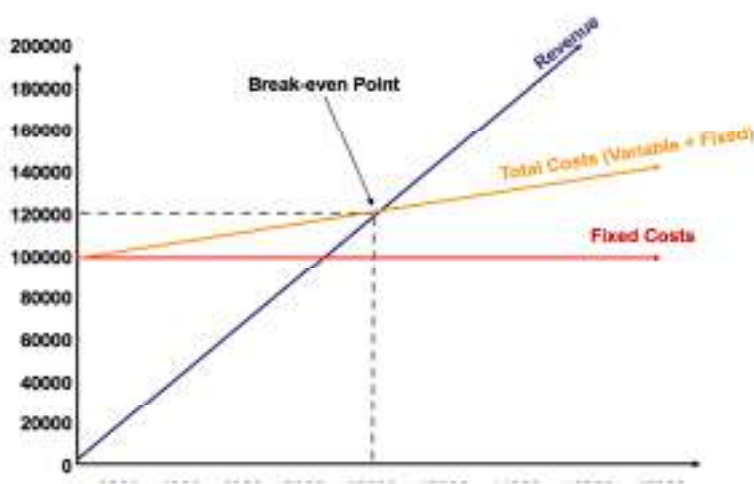
In the graph:

The Total Cost curve starts from the fixed costs and then increases as variable costs are added with increasing production.

The Total Revenue curve starts from zero and rises as the quantity of units sold increases.

The point where the two curves intersect is the break-even point. At this point, the total cost and total revenue are equal.

To the left of the break-even point, the total cost is greater than total revenue, resulting in a loss.

To the right of the break-even point, the total revenue is greater than total cost, resulting in a profit.

As you move to the right of the break-even point, the gap between total revenue and total cost represents the profit margin. This graph provides a visual representation of how changes in production or sales volumes impact a business's profitability and helps managers make decisions about pricing strategies, cost control, and growth plans.

5.3 Importance of the Break Even Point

The break-even point is a crucial concept in business and financial analysis due to its several important implications and uses. Here are some key reasons why the break-even point is important:

Profit Determination: The break-even point helps businesses understand the minimum level of sales or production required to avoid losses. It provides a clear benchmark for profitability, as any sales or production volume above the break-even point contributes to generating a profit.

Pricing Strategies: Knowing the break-even point helps in setting appropriate pricing strategies. Businesses can calculate how changes in selling price affect the break-even point and thus determine optimal pricing to achieve desired profit margins.

Cost Control: Break-even analysis forces businesses to carefully assess their fixed and variable costs. By understanding how changes in costs impact the break-even point, companies can make informed decisions about cost reduction and cost management.

Financial Planning: Businesses use the break-even point to set financial goals and plan their activities accordingly. It provides insights into the level of sales needed to achieve specific profit targets.

Investment Decisions: For businesses considering new projects or expansions, break-even analysis helps evaluate the feasibility of the venture. It provides insights into when the investment will start generating profits and covers its costs.

Risk Assessment: Break-even analysis helps assess the risk associated with different levels of sales or production. Businesses can evaluate how changes in the market, economy, or their operations could impact profitability.

Performance Evaluation: Comparing actual sales or production levels to the break-even point helps assess a company's performance. It can reveal whether the business is operating efficiently and achieving its financial goals.

Resource Allocation: Break-even analysis helps allocate resources effectively. It guides decisions about staffing, production levels, inventory management, and other operational aspects.

Loan Repayment: For businesses that have taken loans or debts, understanding the break-even point is important for ensuring that they can generate enough revenue to cover loan repayments.

Sensitivity Analysis: Break-even analysis can be used in sensitivity analysis, where businesses assess how changes in various factors—such as costs, sales volume, and pricing—impact the break-even point and profitability.

Strategic Decision-Making: Businesses can use break-even analysis to evaluate different strategic options. For instance, it can help in deciding whether to introduce new products, discontinue existing ones, or adjust production levels.

Thus, the break-even point serves as a foundational tool for business planning, decision-making, and financial management. It provides insights into the relationship between costs, revenue, and profitability, enabling businesses to make informed and strategic choices.

5.4 Factors affecting Break-Even Point

The break-even point of a business is influenced by several factors that impact its costs, revenues, and overall financial performance. Understanding these factors is essential for making informed decisions about pricing, production levels, and cost management. Here are some of the key factors that affect the break-even point:

Fixed Costs (FC): The higher the fixed costs, the higher the break-even point. Businesses with significant fixed costs, such as high rent or mortgage payments, will need to sell more units to cover these costs.

Variable Costs (VC): Lower variable costs can lead to a lower break-even point. If the costs of producing each unit are lower, the business can reach the break-even point with fewer sales.

Selling Price per Unit: Higher selling prices lead to a lower break-even point, as each unit sold contributes more towards covering the fixed costs.

Sales Mix: If a business sells multiple products with different profit margins, the sales mix can impact the overall break-even point. Products with higher profit margins contribute more towards covering fixed costs.

Economic Conditions: Economic factors such as consumer demand, market competition, and overall economic health can influence the number of units a business needs to sell to break even.

Seasonality: Businesses with seasonal fluctuations may have higher break-even points during off-peak seasons when sales are lower.

Production Efficiency: More efficient production processes can lead to lower variable costs per unit, reducing the break-even point.

Labor Costs: Changes in labor costs, including wages and benefits, can impact the variable costs and, consequently, the break-even point.

Overhead Costs: Variations in overhead costs like utilities, maintenance, and administrative expenses can affect the overall break-even point.

Technology and Automation: The use of technology and automation can impact both fixed and variable costs, potentially lowering the break-even point.

Interest and Debt Payments: For businesses with loans or debts, interest payments can influence the break-even point, as these are fixed costs that need to be covered.

Tax Rates: Tax considerations can impact a business's net income, which in turn affects the break-even point.

Market Demand: Higher demand for a product can lead to a lower break-even point, as the business can sell more units without incurring additional fixed costs.

Competition and Pricing Pressure: Competitive pressures can impact the pricing strategy, which in turn affects the break-even point.

Marketing and Sales Efforts: Effective marketing and sales efforts can increase demand and lead to a lower break-even point by achieving higher sales volumes.

Product Lifecycle: Different stages of a product's lifecycle (introduction, growth, maturity, decline) can influence pricing, demand, and production levels, affecting the break-even point.

Regulations and Compliance Costs: Regulatory changes and compliance costs can impact the overall cost structure and influence the break-even point.

Businesses should regularly analyze these factors and their impact on the break-even point. This analysis helps in making strategic decisions to optimize pricing, manage costs, and ensure profitability in various scenarios and market conditions.

5.5 How to Reduce the Break-Even Point

Raise product prices: This is something that not all business owners want to do without hesitation, fearful that it may make them lose some customers.

Outsourcing: Profitability may be increased when a business opts for outsourcing, which can help reduce manufacturing costs when production volume increases.

5.6 Leverage Analysis

Leverage analysis refers to the examination of a company's financial leverage, which involves assessing the use of debt to finance its operations and investments. It is a crucial aspect of financial analysis and helps stakeholders, such as investors, creditors, and management, understand the potential risks and rewards associated with a company's capital structure.

There are several key metrics and ratios that are commonly used in leverage analysis:

Debt-to-Equity Ratio (D/E): This ratio indicates the proportion of a company's financing that comes from debt compared to equity. A higher D/E ratio implies higher financial leverage and potentially greater risk, as the company has more debt obligations to fulfill.

Debt Ratio: The debt ratio shows the percentage of a company's assets that are financed by debt. It's calculated by dividing total debt by total assets. A higher debt ratio indicates higher leverage.

Interest Coverage Ratio: This ratio assesses a company's ability to cover its interest expenses with its operating earnings. A higher interest coverage ratio suggests that the company is better equipped to meet its interest obligations.

Leverage Factor or Leverage Multiplier: This metric calculates how much the return on equity (ROE) is amplified due to financial leverage. It helps in understanding the impact of debt on the company's profitability.

Uses of Leverage Analysis

Risk Assessment: High levels of leverage can increase a company's financial risk, as it must consistently generate enough cash flow to cover interest payments and principal repayments.

Return Potential: Debt can magnify returns for shareholders when a company's investments perform well. However, it can also lead to larger losses if investments underperform.

Capital Structure Optimization: Analysis of leverage helps companies determine the optimal mix of debt and equity financing to achieve a balance between risk and return.

Investment Decision-Making: Investors use leverage analysis to evaluate a company's financial health and potential for growth before making investment decisions.

Creditworthiness Evaluation: Creditors and lenders use leverage analysis to assess a company's ability to meet its debt obligations, which influences credit decisions.

It's important to note that while leverage can enhance returns, it also increases the vulnerability of a company during economic downturns or periods of financial stress. Therefore, a careful analysis of a company's leverage is crucial for understanding its overall financial health and making informed decisions.

Types of Leverages

Leverages are classified into three different types which has been depicted by the following diagram:
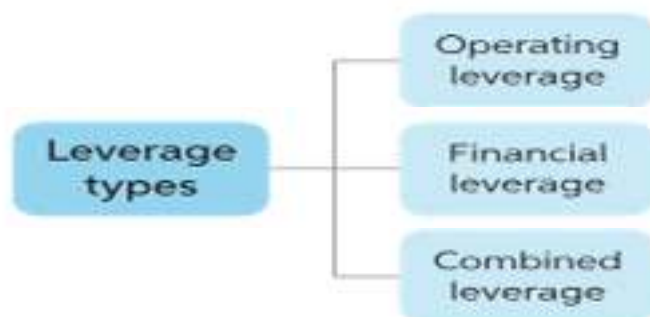
Operating Leverage: Operating leverage measures the fixed versus variable costs in a company's cost structure. A company with higher fixed costs has higher operating leverage, which means changes in revenue can lead to proportionally larger changes in operating income.

Financial Leverage: Financial leverage examines the impact of debt on a company's earnings per share (EPS). It takes into account the fixed interest expense associated with debt and how it affects the company's net income available to common shareholders.

Combined leverage: Combined leverage refers to the total effect of both operating leverage and financial leverage on a company's earnings before interest and taxes (EBIT). It reflects how changes in sales impact a company's profitability by considering both fixed operating costs and fixed financial costs. The concept helps illustrate the interplay between a company's cost structure and its capital structure in influencing overall financial performance.

Operating Leverage

Operating leverage refers to the extent to which a company's fixed operating costs contribute to the variability of its operating income or earnings before interest and taxes (EBIT) as sales fluctuate. A company with high operating leverage has a significant portion of fixed costs in its cost structure, such as fixed salaries, rent, and depreciation. As sales increase, the company's revenue growth can lead to proportionally larger increases in operating income due to the fixed costs remaining constant. Conversely, during sales declines, the impact on operating income is also magnified due to the fixed costs. Operating leverage can enhance profitability during periods of growth, but it also exposes the company to greater risk if sales decrease. Example:

	Company A	Company B
Sell price per unit	10	10
Total Fixed operating Cost	50000	10000
Variable Cost per unit	3	6
Number of Units Sold	50,000	50,000

Let's calculate the operating leverage for both companies using the formula:

Operating Leverage = Contribution Margin / Operating Income

Where:

Contribution Margin = (Total Sales - Total Variable Costs)

Operating Income = Contribution margin - Total Fixed operating Cost

Operating Income is also referred as Earnings Before Interest and Taxes (EBIT)

	Company A	Company B
Sell price per unit	10	10

Total Fixed operating Cost	50000	10000
Variable Cost per unit	3	6
Number of Units Sold	5,000	5,000
Total Sales	50,000 (10*5000)	50,000 (10*5000)
Total Variable Cost	15,000 (3*5000)	30,000 (6*5000)
Contribution margin	35,000 (50,000 – 15,000)	20,000 (50,000 – 30,000)
Operating Income (EBIT)	-15,000 (35,000 – 50,000)	10,000(20,000 – 10000)
Operating Leverage	35,000/-15,000 = -2.33	20,000/10,000 =2.0

Interpretation:

- Company A has an operating leverage of -2.33, indicating that its operating income is highly sensitive to changes in sales. A small decrease in sales could lead to a disproportionately larger decrease in operating income.

- Company B has an operating leverage of 2.00, showing that its operating income is also sensitive to sales changes, but to a lesser extent than Company A.

Operating leverage illustrates how fixed operating costs impact a company's profitability as sales vary. A higher operating leverage indicates higher sensitivity to sales fluctuations, which can affect a company's risk and potential returns.

Financial Leverage:

Financial leverage refers to the use of borrowed funds or debt to increase the potential return on an investment. It involves using debt to amplify the potential gains or losses of an investment beyond what could be achieved with just the investor's own funds. In essence, financial leverage enables individuals or businesses to control a larger asset base with a smaller initial investment.

This is the use of debt to finance investments. When a company uses debt to finance its operations or investments, it is employing financial leverage. By using debt, a company can generate returns on the borrowed money that exceed the cost of borrowing. This can lead to higher profits for shareholders. However, it also increases the risk because the company now has obligations to pay interest and repay principal, regardless of how well the investment performs. Example:

Bob and Jim are both looking to purchase the same house that costs $500,000. Bob plans to make a 10% down payment and take a $450,000 mortgage for the rest of the payment (mortgage cost is 5% annually). Jim wants to purchase the house for $500,000 cash today. Who will realize a higher return on investment if they sell the house for $550,000 a year from today?

	Bob	Jim
Down Payment	50,000	5,00,000
Debt	4,50,000	0
Cost of Debt	22,500 (5% of Debt)	0
Sale of house	5,50,000	5,50,000
Profit (After Debt Paid)	27,500	50,000
Return on Investment	55%	10%

Although Jim makes a higher profit, Bob sees a much higher return on investment because he made 27,500 profit with and investment of 50,000 (while Jim made 50,000 profit with a 5,00,000 investment)

In the example above, if Bob and Jim realize they can only sell the house for $400,000 after a year. Who will see a greater loss on their investment?

	Bob	Jim
Down Payment	50,000	5,00,000
Debt	4,50,000	0
Cost of Debt	22,500 (5% of Debt)	0
Sale of house	4,00,000	4,00,000
Profit (After Debt Paid)	-1,22,500	-1,00,000
Return on Investment	-245%	-20%

Now that the value of the house decreased, Bob will see a much higher percentage loss on his investment (-245%), and a higher absolute dollar amount loss because of the cost of financing. In this instance, leverage has resulted in an increased loss.

Combined Leverage

Combined leverage, also known as operating leverage, financial leverage, and total leverage, refers to the impact of both operating and financial decisions on a company's overall risk and return. It

represents the combined effect of fixed operating costs (operating leverage) and fixed financial costs (financial leverage) on a company's profitability and risk.

The DOL measures the degree to which a company's EBIT (earnings before interest and taxes) changes in response to a change in sales. A company with a high DOL has a lot of fixed costs, so a small change in sales can have a big impact on EBIT.

The DFL measures the degree to which a company's EPS changes in response to a change in EBIT. A company with a high DFL has a lot of debt, so a small change in EBIT can have a big impact on EPS.

Combined leverage can be expressed as follows:

DCL=DOL * DFL

Let's say a company has a DOL of 3 and a DFL of 2. This means that a 10% increase in sales will cause the company's EBIT to increase by 30%, and its EPS to increase by 60%.

Combined leverage can be a double-edged sword. On the one hand, it can magnify the benefits of a company's growth. For example, if a company's sales increase by 10%, its EPS will increase by more than 10% if it has a high combined leverage.

On the other hand, combined leverage can also magnify the risks of a company's operations. For example, if a company's sales decrease by 10%, its EPS will decrease by more than 10% if it has a high combined leverage.

Therefore, companies need to carefully manage their combined leverage in order to maximize their profits while minimizing their risks.

Following are the important points to be kept in mind about combined leverage:

- ✓ It is calculated using the current level of sales and debt. If the company's sales or debt levels change, the combined leverage will also change.
- ✓ It is only a measure of the potential impact of changes in sales on EPS. The actual impact will also depend on other factors, such as the company's cost structure and tax rate.
- ✓ Combined leverage is a useful tool for financial analysis, but it should not be used as the sole basis for making investment decisions.

Summary

- Break-even analysis is a financial tool that is widely used by businesses.
- Break-even analysis is essential in determining the minimum sales volume or minimum sales in amount required to cover total costs and break even.
- It helps businesses make informed decisions about pricing strategies, cost management, and operations.
- Leverage is a powerful tool to enhance capital, but it does not necessarily turn out to be good.
- It paves the way for companies to have funds to build capital and expand their business.
- It might be adverse if they cannot repay the borrowed amount. In some cases, it might cause bankruptcy.

Keywords

- Break-Even Point
- Fixed Costs
- Variable Cost

- Cost-Volume-Profit (CVP) Analysis
- Break-Even Formula
- Break-Even Chart
- Operating Leverage
- Financial Leverage
- Risk and Return
- Break-Even Sales.

Self Assessment

1. What is the primary purpose of break-even analysis in business?

A. To calculate maximum profits
B. To determine when a business will go bankrupt
C. To identify the point at which total revenue equals total costs
D. To assess the market demand for a product

2. Which of the following is NOT a variable cost in break-even analysis?

A. Rent
B. Labor
C. Raw materials
D. Advertising expenses

3. In break-even analysis, the contribution margin per unit represents:

A. The profit earned on each unit sold
B. The total fixed costs
C. The total variable costs
D. The total revenue

4. If a company's break-even point is 1,000 units, and it sells 1,200 units, what can you conclude?

A. The company is operating at a loss
B. The company is operating at its maximum profit
C. The company is earning a profit
D. The company is at its lowest point of profitability

5. Which of the following is a limitation of break-even analysis?

A. It assumes that variable costs remain constant.
B. It cannot be applied to service-based businesses.
C. It does not consider competition.
D. It is only useful for short-term decision making.

6. The margin of safety is calculated as:

A. Total fixed costs divided by total variable costs
B. Total revenue minus total variable costs

C. Total variable costs divided by total revenue

D. Total costs divided by total revenue

7. When the sales volume is below the break-even point, a company's profit is:

A. Positive

B. Zero

C. Negative

D. Indeterminate

8. Which of the following factors can cause a company's break-even point to increase?

A. An increase in fixed costs

B. A decrease in variable costs

C. An increase in selling price

D. A decrease in production volume

9. Break-even analysis is most useful for:

A. Long-term strategic planning

B. Short-term decision making

C. Assessing market share

D. Calculating total revenue

10. A company with a high degree of operating leverage has:

A. Low fixed costs.

B. High variable costs.

C. High sales.

D. Low profit margins.

11. A company's degree of operating leverage can be calculated as:

A. Contribution margin / EBIT.

B. EBIT / net income.

C. Net income / sales.

D. Sales / EBIT.

12. If a company's degree of operating leverage is 2, then a 10% increase in sales will cause the company's EBIT to increase by:

A. 10%.

B. 20%.

C. 30%.

D. 50%.

13. A company with a high degree of operating leverage is more likely to experience:

A. Profits that are more volatile.

B. Profits that are less volatile.

C. A lower break-even point.

D. A higher break-even point.

14. A company can reduce its degree of operating leverage by:

A. Increasing its fixed costs.

B. Decreasing its variable costs.

C. Increasing its sales.

D. Decreasing its debt.

15. A company with a high degree of financial leverage has:

A. Low debt.

B. High debt.

C. High profits.

D. Low interest expenses.

Answers for Self Assessment

1.	C	2.	A	3.	A	4.	C	5.	A
6.	B	7.	C	8.	A	9.	B	10.	A
11.	A	12.	B	13.	A	14.	B	15.	B

Review Questions

1. What is the break-even point in business, and why is it important?
2. What is break-even analysis? Explain its components?
3. What factors can influence changes in the break-even point over time?
4. How is break-even point calculated in terms of units sold and revenue value?
5. Discuss the role of break-even analysis in financial forecasting and planning?
6. What is financial leverage, and how does it differ from operating leverage?
7. What are the benefits of using leverage in business, and what are the potential risks associated with it?
8. Explain with example how leverage can amplify returns for shareholders when a company performs well whereas it can magnify losses for shareholders when a company underperforms.

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle

Edition, by Chandra Sekhar (Author)

Web Link

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Dr. Ajit Kumar, Lovely Professional University

Unit 06: Time Value of Money

CONTENTS	

Objectives

After studying this unit, you will be able to:

- Define the time value of money and explain why money has a different value at different points in time.
- Understand the concepts of present value, future value, interest, and discounting.
- Calculate the present value and future value of a single sum of money.
- Calculate the present value and future value of an annuity.
- Understand the impact of inflation on the time value of money.
- Apply the time value of money concepts to make financial decisions.

Introduction

"Time Value of Money" (TVM) is a fundamental financial principle that reflects the idea that money today is worth more than the same amount of money in the future. It is a key concept in finance and investment analysis because it helps individuals and businesses make informed decisions about the allocation of their financial resources over time.

The core premise of TVM is that the value of money can change over time due to factors like inflation, interest rates, and opportunity costs. In other words, the same amount of money will not have the same purchasing power in the future as it does today.

Hence time value of money is a fundamental concept in finance that recognizes the changing value of money over time due to factors like inflation and the opportunity cost of not using the money elsewhere. It helps individuals and businesses to compare the value of money at different points in time and evaluate the attractiveness of various investment or borrowing opportunities.

Financial Analytics

6.1   <u>Future Value of Money</u>

"Future Value of Money" refers to the value of a sum of money at a specific point in the future. The future value is calculated by taking into account the initial amount of money (present value or PV), the interest rate (also known as the discount rate or rate of return), and the time period over which the money is invested or borrowed.

The Future Value of Money (FV) represents the value of a sum of money at a specific point in the future, taking into account the impact of interest or investment returns. This concept is essential for financial planning, investment analysis, and decision-making.

Example: Investing in a Savings Account

Let's assume that you have Rs.1,000 that you want to invest in a savings account that offers an annual interest rate of 5%. You plan to leave this money in the account for 3 years. You want to know how much your initial Rs.1,000 will grow to over that time period.

To calculate the future value (FV) of your investment, you can use the future value formula:

$$FV = PV \times (1 + r)^t$$

Where:

FV = Future Value

PV = Present Value (the initial amount of money)

r = Annual interest rate (expressed as a decimal)

t = Number of years

By substituting values of the variables are as follows:

PV = Rs.1,000

r = 0.05 (5% annual interest rate as a decimal)

t = 3 years

Now, plug these values into the formula:

$FV = Rs.1,000 \times (1 + 0.05)^3$

$FV = Rs.1,000 \times (1.05)^3$

FV = Rs.1,000 × 1.157625

FV ≈ Rs.1,157.63

So, after 3 years of leaving your Rs.1,000 in the savings account with a 5% annual interest rate, it will grow to approximately Rs.1,157.63.

This means that if you leave your money invested in the savings account for 3 years, you can expect it to accumulate an additional Rs.157.63 in interest, making your total savings Rs.1,157.63 at the end of the period. This is a simple example of how the concept of future value of money works and how it can help you make financial decisions regarding investments and savings.

Multiperiod Compounding

"Multi-period compounding of interest" refers to the process of calculating the future value of an investment or a sum of money over multiple periods, taking into account compounding interest. Compounding interest is the concept where the interest earned or paid in one period becomes part of the principal amount for the next period, leading to exponential growth or accumulation of interest.

The formula for multi-period compounding calculates the future value (FV) of an investment or sum of money over multiple compounding periods, taking into account the interest rate and the

number of compounding periods. The formula is based on the exponential growth of an initial principal (PV) as it earns interest or accumulates over time. Here's the formula:

$$FV = PV \times (1 + r/n)^{t*n}$$

Where:

FV = Future Value

PV = Present Value (the initial amount of money)

r = Annual interest rate (expressed as a decimal)

t = Number of years

n= Frequency of compounding in a year.

Frequency of compounding	Value of n
Quarterly compounding	4
Monthly compounding	12
Half yearly compounding	2

Example

Let's assume that you have Rs.1,000 that you want to invest in a savings account that offers an annual interest rate of 12%. You plan to leave this money in the account for 3 years. You want to know how much your initial Rs.1,000 will grow to over that time period. Assuming the interest is compounded

   a. Half yearly
   b. Quarterly
   c. Monthly

To calculate the future value (FV) of your investment, you can use the future value formula:

$$FV = PV \times (1 + r/n)^{t*n}$$

FV = Future Value

PV = Present Value (the initial amount of money)

r = Annual interest rate (expressed as a decimal)

t = Number of years

n= Frequency of compounding in a year.

Case A (Half yearly)

PV = Rs.1,000

r = 0.12 (12% annual interest rate as a decimal)

t = 3 years

n = 2

$FV = 1000 \times (1 + 0.12/2)^{3*2}$

$\quad = 1000 \times (1+.06)^6$

$\quad = 1000 \times 1.419$

= 1419.

Case B (Quarterly)

PV = Rs.1,000

r = 0.12 (12% annual interest rate as a decimal)

t = 3 years

n = 4

$FV = 1000 \times (1 + 0.12/4)^{3*4}$

$\quad = 1000 \times (1+.03)^{12}$

$\quad = 1000 \times 1.428$

$\quad = 1428.$

Case B (Quarterly)

Try by yourself. (Hint: use the value of n = 12).

Future value factor

The future value factor, often denoted as "FV factor" or "FVIF" (Future Value Interest Factor), represents the factor by which a present sum of money must be multiplied to determine its future value based on a specified interest rate and time period. In simpler terms, it helps calculate how much a certain amount of money will grow or accumulate over time when invested at a specific interest rate.

The formula to calculate the future value factor is:

$FV = PV \times (1 + r)^n$

Where:

- FV represents the future value of the investment.

- PV is the present value or initial sum of money.

- r is the interest rate per period (expressed as a decimal).

- n is the number of periods (usually years) the money is invested or compounded for.

The future value factor is the $(1 + r)^n$ part of the formula. It quantifies the impact of compounding interest on the original sum of money over time. The greater the future value factor, the more an investment will grow over time due to compounding.

Suppose you have Rs.1,000 to invest in a savings account that offers a 5% annual interest rate. You want to know how much this Rs.1,000 will grow to in 3 years. Using the future value factor formula:

$FV = Rs.1,000 \times (1 + 0.05)^3$

$FV = Rs.1,000 \times (1.05)^3$

$FV = Rs.1,000 \times 1.157625$

$FV \approx Rs.1,157.63$

So, the future value of your Rs.1,000 investment after 3 years at a 5% interest rate will be approximately Rs.1,157.63.

The future value factor is a fundamental concept in finance and is used in various financial calculations, such as determining the future worth of investments, loans, annuities, and other

financial instruments. It helps individuals and businesses make informed decisions about their financial investments and savings strategies. The following table depicts future value factor for a single unit. The yellow-colored value which is 2.0122 indicates the future value factor for 6% for a period value of 12.

Future Value Tables   Formula FV = (1+i)^n

n/i	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	1.0100	1.0200	1.0300	1.0400	1.0500	1.0600	1.0700	1.0800	1.0900	1.1000	1.1100	1.1200	1.1300	1.1400	1.1500
2	1.0201	1.0404	1.0609	1.0816	1.1025	1.1236	1.1449	1.1664	1.1881	1.2100	1.2321	1.2544	1.2769	1.2996	1.3225
3	1.0303	1.0612	1.0927	1.1249	1.1576	1.1910	1.2250	1.2597	1.2950	1.3310	1.3676	1.4049	1.4429	1.4815	1.5209
4	1.0406	1.0824	1.1255	1.1699	1.2155	1.2625	1.3108	1.3605	1.4116	1.4641	1.5181	1.5735	1.6305	1.6890	1.7490
5	1.0510	1.1041	1.1593	1.2167	1.2763	1.3382	1.4026	1.4693	1.5386	1.6105	1.6851	1.7623	1.8424	1.9254	2.0114
6	1.0615	1.1262	1.1941	1.2653	1.3401	1.4185	1.5007	1.5869	1.6771	1.7716	1.8704	1.9738	2.0820	2.1950	2.3131
7	1.0721	1.1487	1.2299	1.3159	1.4071	1.5036	1.6058	1.7138	1.8280	1.9487	2.0762	2.2107	2.3526	2.5023	2.6600
8	1.0829	1.1717	1.2668	1.3686	1.4775	1.5938	1.7182	1.8509	1.9926	2.1436	2.3045	2.4760	2.6584	2.8526	3.0590
9	1.0937	1.1951	1.3048	1.4233	1.5513	1.6895	1.8385	1.9990	2.1719	2.3579	2.5580	2.7731	3.0040	3.2519	3.5179
10	1.1046	1.2190	1.3439	1.4802	1.6289	1.7908	1.9672	2.1589	2.3574	2.5937	2.8394	3.1058	3.3946	3.7072	4.0456
11	1.1157	1.2434	1.3842	1.5395	1.7103	1.8983	2.1049	2.3316	2.5804	2.8531	3.1518	3.4785	3.8359	4.2262	4.6524
12	1.1268	1.2682	1.4258	1.6010	1.7959	2.0122	2.2522	2.5182	2.8127	3.1384	3.4985	3.8960	4.3345	4.8179	5.3503
13	1.1381	1.2936	1.4685	1.6651	1.8856	2.1329	2.4098	2.7196	3.0658	3.4523	3.8833	4.3635	4.8980	5.4924	6.1528
14	1.1495	1.3195	1.5126	1.7317	1.9799	2.2609	2.5785	2.9372	3.3417	3.7975	4.3104	4.8871	5.5348	6.2613	7.0757
15	1.1610	1.3459	1.5580	1.8009	2.0789	2.3966	2.7590	3.1722	3.6425	4.1772	4.7846	5.4736	6.2543	7.1379	8.1371
16	1.1726	1.3728	1.6047	1.8730	2.1829	2.5404	2.9522	3.4259	3.9703	4.5950	5.3109	6.1304	7.0673	8.1372	9.3576
17	1.1843	1.4002	1.6528	1.9479	2.2920	2.6928	3.1588	3.7000	4.3276	5.0545	5.8951	6.8660	7.9861	9.2765	10.7613
18	1.1961	1.4282	1.7024	2.0258	2.4066	2.8543	3.3799	3.9960	4.7171	5.5599	6.5436	7.6900	9.0243	10.5752	12.3755
19	1.2081	1.4568	1.7535	2.1068	2.5270	3.0256	3.6165	4.3157	5.1417	6.1159	7.2633	8.6128	10.1974	12.0557	14.2318
20	1.2202	1.4859	1.8061	2.1911	2.6533	3.2071	3.8697	4.6610	5.6044	6.7275	8.0623	9.6463	11.5231	13.7435	16.3665
21	1.2324	1.5157	1.8603	2.2788	2.7860	3.3996	4.1406	5.0338	6.1088	7.4002	8.9492	10.8038	13.0211	15.6676	18.8215
22	1.2447	1.5460	1.9161	2.3699	2.9253	3.6035	4.4304	5.4365	6.6586	8.1403	9.9336	12.1003	14.7138	17.8610	21.6447
23	1.2572	1.5769	1.9736	2.4647	3.0715	3.8197	4.7405	5.8715	7.2579	8.9543	11.0263	13.5523	16.6266	20.3616	24.8915
24	1.2697	1.6084	2.0328	2.5633	3.2251	4.0489	5.0724	6.3412	7.9111	9.8497	12.2392	15.1786	18.7881	23.2122	28.6252
25	1.2824	1.6406	2.0938	2.6658	3.3864	4.2919	5.4274	6.8485	8.6231	10.8347	13.5855	17.0001	21.2305	26.4619	32.9190
26	1.2953	1.6734	2.1566	2.7725	3.5557	4.5494	5.8074	7.3964	9.3992	11.9182	15.0799	19.0401	23.9905	30.1666	37.8568
27	1.3082	1.7069	2.2213	2.8834	3.7335	4.8223	6.2139	7.9881	10.2451	13.1100	16.7386	21.3249	27.1093	34.3899	43.5353
28	1.3213	1.7410	2.2879	2.9987	3.9201	5.1117	6.6488	8.6271	11.1671	14.4210	18.5799	23.8839	30.6335	39.2045	50.0656
29	1.3345	1.7758	2.3566	3.1187	4.1161	5.4184	7.1143	9.3173	12.1722	15.8631	20.6237	26.7499	34.6158	44.6931	57.5755
30	1.3478	1.8114	2.4273	3.2434	4.3219	5.7435	7.6123	10.0627	13.2677	17.4494	22.8923	29.9599	39.1159	50.9502	66.2118

6.2   Present Value

The concept of "Present Value" (PV) is a fundamental principle in finance and is used in the context of the time value of money (TVM). Present value is a financial calculation that helps you determine the current worth or value of a future sum of money, taking into account the opportunity cost of having that money today versus in the future. In essence, it answers the question: "What is the value today of a future cash flow or amount?"

The key idea behind present value is that a sum of money received or paid in the future is worth less than the same sum of money received or paid today. This is because money has the potential to earn interest or generate returns when invested, so having money now is more valuable than having it in the future.

The formula to calculate present value is:

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

Where:

- PV represents the present value.

- FV is the future value or the amount of money you expect to receive or pay in the future.

- r is the discount rate or the rate of return that could be earned on the money if invested elsewhere. It reflects the time value of money.

- n is the number of periods (usually years) between the present and future cash flow.

Example

Suppose you are promised to receive Rs.1,000 one year from now, and you expect to earn a 5% annual return on your investments. To find the present value of this future payment:

PV = Rs.1,000 / (1 + 0.05)^1

PV = Rs.1,000 / 1.05

PV ≈ Rs.952.38

So, the present value of receiving Rs.1,000 one year from now, given a 5% discount rate, is approximately Rs.952.38. This means that the value of receiving Rs.1,000 in the future is less than Rs.1,000 in today's terms.

Present value is a concept used in various financial calculations, including:

1. Valuing investments: It helps investors assess the attractiveness of different investment opportunities by comparing their present values.
2. Pricing bonds and other fixed-income securities: Bond prices are based on the present value of their future coupon payments and principal repayment.
3. Evaluating projects and business decisions: Businesses use present value analysis to assess the profitability of projects, investments, and business ventures.
4. Determining the fair value of assets and liabilities: Accountants and financial analysts use present value to measure the worth of assets and liabilities on a company's balance sheet.
5. Assessing loan and mortgage terms: Borrowers use present value to evaluate the total cost of borrowing over time.

Present Value Factor

The "Present Value Factor" (PV factor or PVIF - Present Value Interest Factor) is a financial concept used in the context of the time value of money (TVM). It represents the factor by which a future sum of money must be multiplied to determine its present value based on a specified interest rate and time period. In other words, it helps calculate how much a future amount of money is worth in today's terms.

The formula to calculate the present value factor is:

PV = FV / (1 + r)^n

Where:

- PV represents the present value or the current worth of a future sum of money.

- FV is the future value or the amount of money you expect to receive or pay in the future.

- r is the discount rate or the rate of return that could be earned on the money if invested elsewhere. It reflects the time value of money.

- n is the number of periods (usually years) between the future cash flow and the present.

Example :

Suppose you are promised to receive $1,000 one year from now, and you expect to earn a 5% annual return on your investments. To find the present value of this future payment:

PV = $1,000 / (1 + 0.05)^1

PV = $1,000 / 1.05

PV ≈ $952.38

So, the present value of receiving $1,000 one year from now, given a 5% discount rate, is approximately $952.38. This means that the value of receiving $1,000 in the future is $952.38 in today's terms.

The present value factor is used in various financial calculations, such as:

1. Valuing investments: It helps investors assess the current value of future cash flows generated by investments.
2. Pricing bonds and other fixed-income securities: Bond prices are based on the present value of their future coupon payments and principal repayment.
3. Discounted cash flow (DCF) analysis: Businesses use the present value factor to evaluate the net present value (NPV) of projects, investments, and business opportunities.
4. Asset and liability valuation: It's used to determine the present value of future cash flows associated with assets and liabilities, like pensions and leases.
5. Loan and mortgage analysis: Lenders and borrowers use the present value factor to evaluate loan terms and assess the cost of borrowing.

In summary, the present value factor is a crucial tool for understanding the time value of money and making informed financial decisions. It allows you to convert future cash flows into today's amount, helping you compare the value of money at different points in time. A table suggesting showing present value factor is as follows. In yellow colored it is shown that value of Re.1.00 received at a discount rate of 8% after 14 period have the present value of Rs.0.3405.

Present Value Tables

Lovely Professional University

6.3 Annuity

An annuity is a financial product or contract that provides a series of periodic payments made at equal intervals. These payments can be made monthly, quarterly, annually, or at any other predetermined frequency. Annuities are typically used as a way to receive a steady income stream over a specific period of time, often during retirement, but they can also serve other financial purposes.

There are several key elements to understand about annuities:

1. Principal: The principal is the initial sum of money that you invest or contribute to the annuity. This can be a lump sum payment or a series of payments over time.

2. Annuity Period: This refers to the duration over which the periodic payments will be made. Annuities can be set up for a fixed period, such as 10, 20, or 30 years, or they can be structured to provide payments for the rest of your life (known as a lifetime annuity).

3. Payment Frequency: Annuity payments are made at regular intervals, and the frequency can vary. Common options include monthly, quarterly, semi-annually, or annually.

4. Payout Phase: This is the period during which you receive payments from the annuity. It can start immediately after you purchase the annuity or be deferred to a future date.

6.4 Types of Annuities

1. Fixed Annuities: In a fixed annuity, the insurer guarantees a fixed interest rate for a specified period. This means that your periodic payments will remain constant and predictable over time.

2. Variable Annuities: With variable annuities, your investments are tied to underlying investment options, such as mutual funds. The value of your annuity can fluctuate based on the performance of these investments, and your payments may vary accordingly.

3. Immediate Annuities: Immediate annuities begin paying out income shortly after you make a lump-sum payment. They are often used to provide immediate retirement income.

4. Deferred Annuities: Deferred annuities allow you to make payments over time and then begin receiving payments at a later date, usually in retirement. These can be fixed or variable.

5. Lifetime Annuities: A lifetime annuity ensures payments for the remainder of your life, regardless of how long you live. This can provide a valuable source of retirement income security.

Annuities can be useful for retirement planning, as they offer a way to convert a lump sum of money into a reliable income stream. However, they also come with fees and complexities, so it's essential to carefully consider your financial goals and understand the terms of the annuity contract before investing in one.

Example:

What amount will accumulate if we deposit Rs.5,000 at the end of each year for the next 5 years? Assume an interest of 6% compounded annually.

Here

CF=5,000
I=6%
n = 5

Year	1	2	3	4	5
Begin	0	5,000.00	10,300.00	15,918.00	21,873.08
Interest	0	300	618	955.08	1,312.38
Deposit	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
End	5,000.00	10,300.00	15,918.00	21,873.08	28,185.46

Calculation of ordinary Annuity using formula

$$FV_{ordianryAnnuity} = CF\left[\frac{(1+r)^n - 1}{r}\right]$$

CF = Cash flow per period

r = interest rate

n = number of payments

$$FV_{oa} = 5000\left[\frac{(1+0.06)^5 - 1}{0.06}\right]$$

$$FV_{oa} = 5000\left[\frac{(1.06)^5 - 1}{0.06}\right]$$

$$FV_{oa} = 5000\left[\frac{1.3382255776 - 1}{0.06}\right]$$

$$FV_{oa} = 5000\left[\frac{0.3382255776}{0.06}\right]$$

$$FV_{oa} = 5000\left[5.63709296\right]$$

$$FV_{oa} = 28185.4648$$

6.5 Annuity Due

An annuity due is one where the payments are made at the beginning of each period. A form of annuity where periodic receipts or payments are made at the beginning of the period and one period of the annuity term remains after the last payment.

What amount will accumulate if we deposit Rs.5,000 at the beginning of each year for the next 5 years? Assume an interest of 6% compounded annually.

CF = 5,000, i = 6% , n = 5

Begin	5,000.00	10,300.00	15,918.00	21,873.08	28,185.46
Deposit	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
Interest	300	618	955.08	1,312.38	1,691.13
End	5,300.00	10,918.00	16,873.08	23,185.46	29,876.59

6.6 <u>Perpetuity</u>

A perpetuity is a financial concept that represents a series of cash flows that continue indefinitely into the future. In essence, it's an investment or financial instrument that provides a constant stream of income or cash flows that never end. The term "perpetuity" is derived from the word "perpetual," which means lasting forever.

Key characteristics of a perpetuity include:

1. Constant Cash Flows: Perpetuities provide a fixed or constant amount of cash flow at regular intervals, typically received annually or semi-annually.

2. Infinite Duration: Unlike most financial instruments, which have a finite term or maturity date, perpetuities have no end date. They continue generating cash flows indefinitely.

3. Fixed Interest Rate: The cash flows from a perpetuity are usually based on a fixed interest rate or rate of return. This rate is often referred to as the "discount rate" or "required rate of return."

The formula for calculating the present value (PV) of a perpetuity is:

PV = C / r

Where:

- PV is the present value of the perpetuity.

- C is the constant cash flow received at regular intervals.

- r is the discount rate or required rate of return.

Perpetuities are often used in financial models to value assets or investments with cash flows that are expected to continue indefinitely, such as certain types of bonds, preferred stocks, or some types of real estate investments.

It's worth noting that while perpetuities provide the advantage of ongoing income, they may not always accurately represent real-world financial situations, as most investments and assets have a limited lifespan. In practice, perpetuity calculations are often used as simplified models for approximation rather than precise valuations.

Numerical example to illustrate the concept of a perpetuity:

Suppose you have just inherited a piece of land that contains a small rental property. This property generates rental income of Rs.10,000 per year. You want to determine the present value of this rental income stream as a perpetuity to understand its current value.

To calculate the present value (PV) of this perpetuity, one need to know the discount rate or the rate of return that you require on this investment. Let's assume you want a 5% return on your investment.

Using the perpetuity formula:

PV = C / r

Where:

- C = Annual cash flow or rental income = Rs.10,000

- r = Discount rate or required rate of return = 5% (0.05 as a decimal)

Now, plug these values into the formula:

PV = Rs.10,000 / 0.05 = Rs.200,000

So, the present value of the perpetuity in this example is Rs.200,000. This means that if you were to invest this amount at a 5% annual rate of return, it would be equivalent to the future stream of Rs.10,000 in rental income per year that you expect to receive indefinitely from the property.

In other words, the perpetuity concept helps you determine how much a constant income stream, like the rental income from your property, is worth in today's dollars. In this example, the perpetuity value of Rs.200,000 represents the estimated current value of your rental property's income stream if you expect it to continue indefinitely and you want a 5% return on your investment.

6.7 Loan Amortization

Loan amortization is the process of spreading out a loan into a series of fixed, regular payments over the loan's term. These payments typically cover both the principal amount borrowed and the interest charged by the lender. Amortization ensures that by the end of the loan term, the borrower has fully repaid the borrowed amount along with all accrued interest.

Important terminologies used in loan amortization:

1. **Principal:** The principal is the initial amount borrowed. Each amortization payment includes a portion of the principal.

2. **Interest:** Lenders charge interest on the outstanding loan balance. The interest amount in each payment decreases as the loan is paid down. This means that in the early stages of the loan, a larger portion of each payment goes toward interest, while in the later stages, more goes toward paying down the principal.

3. **Regular Payments**: Borrowers make regular, fixed payments. These payments are typically made monthly but can be set at other intervals depending on the terms of the loan.

4. **Amortization Schedule:** An amortization schedule is a table or spreadsheet that outlines each payment's breakdown between principal and interest. It also shows the remaining loan balance after each payment.

5. **Decreasing Loan Balance**: With each payment, the outstanding loan balance decreases. As a result, the interest charged on the remaining balance decreases, and more of each payment goes toward reducing the principal.

6. **Loan Term**: The loan term is the period over which the loan is to be repaid. Common loan terms for mortgages, for example, are 15 years or 30 years.

Loan amortization is a common feature in various types of loans, including mortgages, car loans, personal loans, and business loans. It ensures that borrowers systematically pay off their debt over time, making it easier for them to budget for loan payments.

Advantages of Loan Amortization

✓ Predictable Payments: Borrowers know exactly how much they need to pay each month, making it easier to budget.

✓ Gradual Reduction of Debt: Over time, a larger portion of each payment goes toward paying down the principal, helping borrowers build equity or reduce their outstanding balance.

✓ Transparency: The amortization schedule provides a clear breakdown of each payment, helping borrowers understand how their payments contribute to both interest and principal reduction.

Financial Analytics

Loan amortization is a structured approach to repay a loan by making regular payments that cover both the interest and principal. Over time, these payments reduce the outstanding balance until the loan is fully paid off at the end of its term.

Summary

The Time Value of Money (TVM) is a fundamental financial concept that recognizes the idea that a sum of money today is worth more than the same amount of money in the future. It is based on the principle that money has the potential to earn interest or investment returns over time, and as a result, its value changes with the passage of time.

Time Value of Money recognizes that the timing of cash flows significantly impacts their value. It allows for the comparison of financial alternatives, helps with decision-making, and is a fundamental concept in finance and economics. Whether it's assessing the value of future investments or determining the cost of borrowing money, TVM is a crucial tool for making informed financial choices.

An annuity refers to a series of equal periodic payments or receipts made at regular intervals over a specified period. A perpetuity is a financial instrument that involves a continuous series of equal payments or receipts that go on indefinitely, never reaching a specific end date.

Thus, annuities involve a finite series of equal payments over a specific period, while perpetuities consist of infinite, unending payments with no set end date. Both concepts are fundamental in finance and are used for various financial calculations and investment decisions, with annuities being applicable to situations with a fixed time horizon and perpetuities representing the idea of continuous payments into perpetuity.

Keywords

Time Value of Money, Present Value (PV), Future Value (FV), Compound Interest, Discount Rate, Interest Rate, Discounting, Compounding, Cash Flows, Annuity, Perpetuity

Self Assessment

1. What does the Time Value of Money (TVM) concept refer to?

A. Money's worth at different points in time
B. Money's purchasing power over time
C. The interest rate banks pay on savings accounts
D. The value of money adjusted for inflation

2. Which of the following factors is NOT considered in the Time Value of Money calculations?

A. Present value
B. Future value
C. Interest rate
D. Transaction fees

3. Which of the following formulas represents the future value of a single sum of money, taking compounding into account?

A. $FV = PV / (1 + r)$
B. $FV = PV * (1 + r)$
C. $FV = PV + r$
D. $FV = PV - r$

4. What is the concept of the "discount rate" in Time Value of Money calculations?

A. The rate at which money loses value over time

B. The rate at which future cash flows are adjusted to their present value

C. The interest rate offered by a bank on a savings account

D. The rate at which inflation is increasing

5. Which Time Value of Money concept is used to determine how long it will take for an investment to double in value?

A. Present Value

B. Future Value

C. Rule of 72

D. Discounted Cash Flow

6. In the context of Time Value of Money, what does "compounding" refer to?

A. The process of determining the present value of a future cash flow

B. The process of adjusting for inflation

C. The process of calculating interest on interest

D. The process of discounting future cash flows

7. What happens to the present value of a future sum of money when the discount rate increases?

A. It increases

B. It decreases

C. It remains the same

D. It depends on the time period

8. Which of the following cash flow streams represents an annuity?

A. A single lump sum payment

B. A series of equal payments made at regular intervals

C. Irregular payments made over time

D. A combination of both lump sum and regular payments

9. What is the primary purpose of Time Value of Money calculations in finance?

A. To determine the historical value of money

B. To calculate the interest earned on savings accounts

C. To make informed financial decisions by comparing the value of money at different points in time

D. To predict future inflation rates

10. What is an annuity?

A. A single lump-sum payment

B. A series of equal periodic payments or receipts

C. A continuous stream of payments

D. A one-time investment

11. Which of the following is NOT a type of annuity?

A. Ordinary annuity

B. Annuity due

C. Deferred annuity

D. Random annuity

12. An annuity in which the periodic payments occur at the beginning of each period is called:

A. Ordinary annuity

B. Deferred annuity

C. Annuity due

D. Perpetuity

13. A perpetuity is a series of:

A. Equal periodic payments

B. Unequal periodic payments

C. Increasing periodic payments

D. Continuous payments that never end

14. Which type of annuity has periodic payments that occur at irregular intervals?

A. Ordinary annuity

B. Deferred annuity

C. Variable annuity

D. Fixed annuity

15. Which of the following is true regarding the future value of an annuity due compared to an ordinary annuity with the same parameters?

A. The future value of an annuity due is higher.

B. The future value of an annuity due is lower.

C. The future values are the same for both.

D. It depends on the interest rate.

Answers for Self Assessment

1.	A	2.	D	3.	B	4.	B	5.	C
6.	C	7.	B	8.	B	9.	C	10.	B
11.	D	12.	C	13.	D	14.	C	15.	A

Review Questions

1. What is the Time Value of Money (TVM), and why is it a fundamental concept in finance?
2. Explain the difference between compounding and discounting in the context of TVM.
3. What is the present value (PV) of a future cash flow, and how is it calculated?
4. What is the future value (FV) of a present cash flow, and how is it calculated?
5. What is an annuity, and how does it relate to TVM?
6. What is a perpetuity, and how is its present value calculated?
7. What are some practical applications of TVM in personal finance, investment decisions, and business operations?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

Web Link

- https://corporatefinanceinstitute.com/resources/financial-modeling/financial-**forecasting-guide/**
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Unit 07: Cost of Capital

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Objectives

After studying this unit, you will be able to:

- Define the cost of capital and explain its importance to businesses.
- Identify the different components of the cost of capital, such as the cost of debt, the cost of equity, and the cost of preferred stock.
- Calculate the weighted average cost of capital (WACC).
- Discuss the factors that affect the cost of capital, such as the company's risk, the level of interest rates, and the availability of financing.
- Explain how the cost of capital is used to make investment decisions.
- Identify the different methods for estimating the cost of capital.

Introduction

Cost of Capital of a firm is the minimum rate of return expected by its investors. Cost of Capital may be defined as the cost of obtaining the funds, i.e., the average rate of return that the investor in a firm expect, for investing funds in the firm. It is also referred as cut-off rate, target rate, hurdle rate, minimum required rate of return etc.

Definitions:

"The cost of capital is the minimum required rate of earnings or the cut-off rate of capital expenditures."   -Ezra Solomon

"The cost of capital is the minimum rate of return which a firm requires as a condition for undertaking an investment."   -Milton
H. Spencer

"The cost of capital is the rate of return a company must earn on an investment to maintain the value of the company"   -
M.J.Jordan

The cost of capital is important for a number of reasons. First, it helps companies to assess the profitability of potential investments. If the expected return on an investment is lower than the cost of capital, then the investment will not be profitable. Second, the cost of capital is used to calculate the company's valuation. The higher the cost of capital, the lower the company's valuation. Third, the cost of capital is used to set the company's cost of debt and equity.

There are two main types of cost of capital:

Cost of debt: This is the interest rate that the company pays on its outstanding debt.

Cost of equity: This is the return that investors require on their investment in the company's stock.

The weighted average cost of capital (WACC) is a measure of the overall cost of capital for a company. It is calculated by weighting the cost of debt and equity according to their relative proportions in the company's capital structure.

The cost of capital can be affected by a number of factors, including the company's risk, the level of interest rates, and the availability of financing. Companies can try to reduce their cost of capital by taking steps to reduce their risk, such as improving their credit rating. They can also try to negotiate lower interest rates on their debt or raise equity at a lower cost.

7.1   Capital Structure Components

Capital structure components are the different types of financing that a company uses to raise capital. The three major capital structure components are:

Equity: This is the money that is raised by issuing shares of stock to investors. Equity holders are the owners of the company and have a residual claim on the company's assets.

Debt: This is the money that is borrowed from lenders. Debt holders have a prior claim on the company's assets to equity holders in the event of liquidation.

Preferred stock: This is a hybrid security that has some features of equity and some features of debt. Preferred stockholders have a priority claim on dividends over common stockholders, but they have a lower claim on assets than debt holders in the event of liquidation.

The capital structure of a company is the mix of equity, debt, and preferred stock that it uses to finance its operations. The optimal capital structure for a company will vary depending on a number of factors, such as the company's risk, its growth opportunities, and the availability of financing.

Important Factors that company consider when determining their capital structure:

Risk: Companies with higher risk may need to use more debt financing in order to reduce their cost of capital. This is because debtholders are compensated for the higher risk by receiving a higher interest rate.

Growth opportunities: Companies with high growth opportunities may need to use more equity financing in order to have the flexibility to raise capital in the future. This is because equity financing does not have fixed maturity dates, so companies can issue new shares of stock whenever they need to raise capital.

Availability of financing: The availability of financing can also affect the capital structure of a company. If debt financing is difficult to obtain, then the company may need to use more equity financing.

The capital structure of a company is an important decision that can have a significant impact on its financial performance. By carefully considering the factors that are important to their business, companies can choose the capital structure that is right for them.

7.2 Cost of Debt

The Cost of Debt is the minimum rate of return that debt holders require to take on the burden of providing debt financing to a certain borrower. The cost of debt is the effective interest rate that a company is required to pay on its long-term debt obligations, while also being the minimum required yield expected by lenders to compensate for the potential loss of capital when lending to a borrower.

A company may raise the debt in a number of ways. It may borrow funds from the financial institutions or public either in the form of public deposits or debentures (bonds) for a specific period of time at a specific rate of interest.

Categories of Debentures
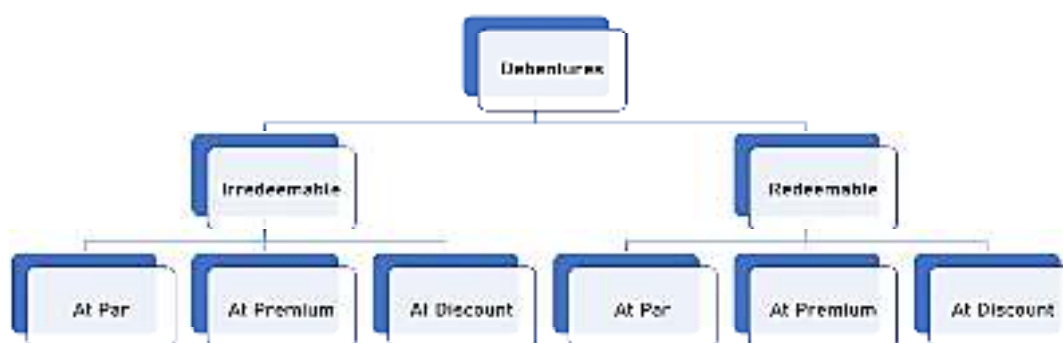
When the company uses debt as a source of finance the amount of interest paid on the debts is a deductible expense in computation of tax. Hence all Cost of Debt may be calculated as before tax and after tax.

Formula and Calculation

Cost of irredeemable debt before tax

$$k_{db} = \frac{I}{NP} \times 100$$

Where

k_{db} = **Cost of Debt before tax**

I = Interest

NP = Net Proceeds

📧 **Example:**

Raman & Co. issues Rs. 15,00,000, 8% debentures

    i.   At par

   ii.   At discount of 7%

  iii.   At premium of 10%

Find out the cost of debt to the company.

Solution:

Case: At Par:

Value of I = 8% of 15,00,000

       = 1,20,000

Net Proceeds (NP) = 15,00,000

K_{db} = (1,20,000 / 15,00,000) * 100

       = 0.08 * 100

       = 8%

Cost of debt is 8%.

Case: At Discount:

Value of I = 8% of 15,00,000

       = 1,20,000

Net Proceeds (NP) = 15,00,000 – 7% of 15,00,000

          =15,00,000 (1-0.07)

          = 15,00,000 *0.93

          = 13,95,000

K_{db} = (1,20,000 / 13,90,000) * 100

       = 0.0860 * 100

       = 8.6%

Cost of debt is 8.6%.

Case: At Premium:

Value of I = 8% of 15,00,000

       = 1,20,000

Net Proceeds (NP) = 15,00,000 + 10% of 15,00,000

          =15,00,000 (1+0,10)

          = 15,00,000 *1.10

          = 16,50,000

K_{db} = (1,20,000 / 16,50,000) * 100

       = 0.0727* 100

       = 7.27%

Cost of debt is 8.6%.

Cost of Irredeemable Debt After Tax

When the company uses debt as a source of finance then it saves a considerable amount in payment of tax because the amount of interest paid on the debts is a deductible expense in computation of tax. Thus, the effective cost of debt is reduced due to savings in tax.

Formula and Calculation

Cost of Irredeemable Debt After Tax

$$k_{da} = \frac{I}{NP} \times 100(1 - t)$$

Where:

k_{da} = Cost of Debt after tax

I = Interest

NP = Net Proceeds

t = tax rate

Example:

Mathew Co. has 8% perpetual debt of Rs. 20,00,000. Find out the cost of capital to the company if debt is issued

 i. At par

 ii. At discount of 10%

 iii. At premium of 10%

Assume the tax rate applicable is 40%.

Case: At Par:

Value of I = 8% of 20,00,000

  = 1,60,000

Net Proceeds (NP) = 20,00,000

Kda = (1,60,000 / 20,00,000) * 100 *(1-0.40)

  = 0.08 * 100 *0.60

  = 4.8%

Cost of debt is 4.8%.

Case: At Discount:

Value of I = 8% of 20,00,000

  = 1,60,000

Net Proceeds (NP) = 20,00,000– 10% of 20,00,000

   =20,00,000 (1-0.1)

   = 20,00,000*0.90

   = 18,00,000

K_{da} = (1,20,000 / 18,00,000) * 100 * (1-0.40)

  = 0.0860 * 100 *0.60

  = 5.16%

Cost of debt is 5.16%.

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Case: At Premium:

Value of I = 8% of 20,00,000

       = 1,60,000

Net Proceeds (NP) = 20,00,000 + 10% of 20,00,000

          = 20,00,000 (1+0.1)

          = 20,00,000*1.10

          = 22,00,000

K_{da} = (1,20,000 / 22,00,000) * 100 * (1-0.40)

       = 0.05455 * 100 *0.60

       = 3.3%

Cost of debt is 3.3%.

Cost of Redeemable Debt

The cost of capital for redeemable debentures refers to the effective rate of return or interest rate that a company incurs when it raises funds by issuing redeemable debentures. Redeemable debentures are long-term debt instruments that a company issues to raise capital. These debentures come with a promise to repay the principal amount at a specified future date, along with periodic interest payments. The cost of capital for redeemable debentures is important for the company because it represents the cost of debt capital, which is one component of the company's overall cost of capital.

Formula and Calculation

Cost of redeemable debt before tax: When a company issues a debt which is redeemable after a certain period of time, such debt are called redeemable debts.

$$k_{db} = \frac{1 + \frac{1}{n}(Rv - NP)}{\frac{1}{2}(Rv + NP)} \times 100$$

k_db = Cost of Debt before tax
I = Interest
NP = Net Proceeds
n = number of years in which debt will be redeemed
Rv = Redeemable value of Debenture/Debt

Cost of Redeemable Debt After Tax:

$$k_{da} = \frac{I + \frac{1}{n}(Rv - NP)}{\frac{1}{2}(Rv + NP)} \times 100(1 - t)$$

k_da = Cost of Debt before tax

I = Interest

NP = Net Proceeds

t = tax rate

n = number of years in which debt will be redeemed

Rv = Redeemable value of Debenture/Debt

Example:

A company issues Rs.5,00,000, 10% redeemable debentures, redeemable after 5 years. Assuming the tax rate is 35%, calculate the before and after tax cost of debt if the debenture is issued

at par

at discount of Rs 10%

at premium of 5%

Solution:

Value of I = 10% of 5,00,000

        = 50,000

Value of NP = 5,00,000

Value of RV = 5,00,000

Value of n = 5

Value of t = 0.35   (note: equal to 35%)

7.3   Cost of Equity

A company's cost of equity refers to the compensation the financial markets require in order to own the asset and take on the risk of ownership. Cost of equity refers to the rate of return that shareholders expect to receive for their investment. It is the minimum return shareholders can expect and is an essential aspect of the capital structure because it assesses the relative attractiveness of investments, including external and internal projects.

Computation of Cost of Equity

The cost of equity capital can be computed by the following methods:

- ✓ Dividend Yield Method
- ✓ Dividend Yield Plus Growth In Dividend Method
- ✓ Earning Yield Method
- ✓ Earning Yield Method Plus Growth In Earning Method
- ✓ Realized Yield Method
- ✓ Capital Asset Pricing Model or CAPM Approach

Dividend Yield Method

This method is based on the assumption that when an investor invests in the equity shares of a company, he expects to get a payment at least equal to the rate of return prevailing in the market. It is also known as Dividend/Price method. It is calculated as:

$$k_e = \frac{D_1}{P_0} \times 100$$

Where,

ke = Cost of Equity capital

$D1$ = Expected Dividend Per Share

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$P0$ = Current Market Price Per Share

Example:

The earning per share of the company is Rs.20 of which 60% is paid in dividends. Company expects to maintain the same in future also. Calculate the cost of equity capital if the market price of equity share is Rs. 150.

Solution:

$$k_e = \frac{D_1}{P_0} \times 100$$

D_1 = 60% of 20

= 12

P_0 = 150

$$k_e = \frac{12}{150} \times 100$$

= 8%.

Dividend yield method of Computation of Cost Of Equity Capital assumes that

    a.   Shareholders give prime importance to dividends and

    b.   Risk in the firm remains unchanged.

Dividend yield method of Computation of Cost Of Equity Capital has the following limitations:

    a. It ignores the growth in the rate of dividend.

    b. It ignores the retained earnings and

    c. It ignores the expectations of shareholders about increase in share prices.

This method is suitable only when the company has stable earning and stable dividend policy.

Dividend Yield Plus Growth In Dividend Method

Shareholders expect growth rate of dividend. Hence, when the dividend of the firms are expected to grow at a constant rate, the method used to compute the cost of capital used is **Dividend Yield Plus Growth in Dividend Method.** Formula to calculate is as follows:

$$k_e = \frac{D_1}{P_0} \times 100 + G$$

Where,

k_e = Cost of Equity capital

D_1 = Expected Dividend Per Share

P_0 = Current Market Price Per Share

G = Rate of Growth in Dividend

Example:

Z Ltd. Pays a dividend of Rs 12 per share initially and the growth in the dividend is expected to be 5%. Compute the cost of equity shares if the current market price of an equity share is Rs.150.

Solution:

$$k_e = \frac{D_1}{P_0} \times 100 + G$$

D_1 = Expected Dividend Per Share

= Rs.12 (1 +.05)

= 12.06

k_e = 12.6 / 150 * 100 + 5%

= 8.4% + 5%

= 13.4%

Dividend yield plus growth in dividend method is based on the following assumptions:

i.   Price earning ration does not change

ii. The pay out ratio (the percentage of earning distributed as dividend) does not change, and

iii. The market price of the company's share increases in proportion to the increase in the rate of dividend.

Limitations

It ignores retained earnings. However, this method is quite suitable when there is a constant growth in dividends.

Earning Yield Method

The cost of equity is calculated by establishing a relationship between earning per share and the current market price of the share. Formula to calculate cost of capital by this method is as follows:

Equation is

$$k_e = \frac{EPS}{P_0} \times 100$$

Where,

k_e = Cost of Equity capital

EPS = Earnings Per Share

P_0 = Current Market Price Per Share

Example:

A company plans to incur an expenditure of Rs.80 lakhs for expanding its operations. The relevant information is as follows:

Number of existing equity shares   = 20 Lakhs

Net earnings   = Rs.160 Lakhs

Market value of the existing share   = Rs. 40

Compute the cost of equity capital.

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Solution

$$k_e = \frac{EPS}{P_0} \times 100$$

EPS = Rs. 160 Lakhs / 20 Lakhs

$\quad\quad$ = Rs. 8

$$k_e = \frac{8}{40} \times 100$$

$\quad\quad$ = 20%

Earning Yield method is based upon the following assumption:

    a.   Earning per share is expected to remain constant in future

    b.   The market's price of the company's share depends only upon earning per share.

    c.   The company can earn on the new projects at the same rate at which it earns on the existing projects.

Earning Yield plus Growth in Earning Method

Earning of a company is usually expected to grow in future. If the EPS of the company is expected to grow at a constant rate, the cost of equity capital can be calculated as:

$$k_e = \frac{EPS}{P_0} \times 100 + G$$

Where,

k_e = Cost of Equity capital

EPS = Earnings Per Share

P_0 = Current Market Price Per Share

G = Rate of Growth In EPS

Example:

The current market price of the equity share of a company is Rs. 60 per share. The expected earning per share after one year is Rs.9 per share. EPS is expected to grow constantly at 4% per annum. Find out the cost of equity capital.

Solution:

$$k_e = \frac{EPS}{P_0} \times 100 + G$$

$$= \frac{9}{60} \times 100 + 4\%$$

$$= 15\% + 4\%$$

$$= 19\%$$

Realized Yield Method

Realized Yield Method assumes that the share holders would expect the same rate of return in future as they have realized in the past. As per this method rate of return realized by shareholders is the past is applied to compute the cost of capital. To compute the realized yield in the past both dividends received by the shareholders in the past as well as appreciation in the value of equity shares are considered.

Computation of cost by Realized Yield Method

    •   Computation of cost of Newly issued Equity shares:

- When the company issues new shares, it is not possible to realize the full market value on the newly issued shares.
- In order to ascertain the cost of capital of new issues floatation cost are deducted from the expected market price.
- In such case P0 (Market Price) will be changed to NP (Net Proceeds) Thus the formula will be

$k_e = \dfrac{D_1}{NP} \times 100$	$k_e = \dfrac{EPS}{NP} \times 100$
$k_e = \dfrac{D_1}{NP} \times 100 + G$	$k_e = \dfrac{EPS}{NP} \times 100 + G$

Example:

R Ltd. wishes to raise funds by issuing 5,00,000 new equity shares of Rs.10 each at a premium of Rs.20 per share. The issue expense will be Re.1 per share. The company has paid dividend @Rs.4 per share consistently. Find out the cost of newly issued equity shares.

$$k_e = \frac{D_1}{NP} \times 100$$

$$= (4/(30\text{-}1)) * 100$$

$$= 13.79\%$$

Capital Asset Pricing Model or CAPM Approach

This model takes Risk-free rate of return (Rf) as the bench mark and to that is added the risk premium required to cover the risk for investing in a specified firm.

Beta (β) of the market is taken as 1.

If the beta(β) of the firm is also 1, it means the return of the firm will change by the same percentage as the returns of the market.

If the firm has a beta (β) of 2, it means that the return changes as much as the twice of the market return either way.

Beta of the individual firm depends on various risk associated with it such as:

- ✓ Cyclical nature of the firm
- ✓ Financial Leverages
- ✓ Entry of new competitors

As per CAPM, The cost of equity is calculated with the help of following equation:

$$k_e = R_f + (\beta)(K_m - R_f)$$

Where

k_e = Cost of equity capital

Rf = Rate of return required on risk free investment

Km = Required rate of return on market folio

β = beta coefficient

Example:

Calculate the cost of equity capital of a company where the beta factor (Risk) is 1.5. Risk free rate of interest on Government Securities is 8%. Return on market portfolio is 12%.

Solution:

k_e = Cost of equity capital

Rf = Rate of return required on risk free investment = 8%

Km = Required rate of return on market folio = 12%

β = beta coefficient = 1.5

$k\_$ = 8% + 1.5 (12% - 8%)

   = 8% + 1.5 * 4%

   = 8% + 6%

   = 14%

7.4 Weighted Average Cost of Capital (WACC)

WACC stands for Weighted Average Cost of Capital. It is a critical financial metric used by companies and investors to evaluate the cost of capital and make important financial decisions. The WACC represents the average cost a company faces when raising funds to finance its operations or new investments.

WACC stands for Weighted Average Cost of Capital. It is a critical financial metric used by companies and investors to evaluate the cost of capital and make important financial decisions. The WACC represents the average cost a company faces when raising funds to finance its operations or new investments. Here's a breakdown of the key components and the concept of WACC:

Cost of Capital Components:

WACC takes into account the various sources of capital that a company uses to fund its operations. These sources typically include:

Equity: This represents the capital raised from issuing common and preferred shares. The cost of equity is the required rate of return demanded by shareholders, often estimated using the Capital Asset Pricing Model (CAPM) or other similar models.

Debt: This includes the cost of borrowing money, such as interest payments on loans, bonds, and other forms of debt. The cost of debt is the interest rate paid on the company's outstanding debt.

Weighting: The "weighted" part of WACC refers to the fact that the cost of each source of capital is multiplied by its proportion in the company's overall capital structure. In other words, it accounts for the relative importance of equity and debt in the company's financial structure. The formula for calculating WACC is as follows:

Weighted Average Cost of Capital

$$\text{WACC Formula} = (E/V * Ke) + (D/V) * Kd * (1 - \text{Tax rate})$$

E/V represents the proportion of equity in the capital structure.

Ke is the cost of equity.

D/V represents the proportion of debt in the capital structure.

Kd is the cost of debt.

Tax Rate is the corporate tax rate (as interest expenses on debt are tax-deductible).

Weighted Average Cost of Capital (WACC) is a fundamental financial metric that helps companies and investors determine the cost of capital and assess the attractiveness of various investment opportunities. It plays a crucial role in financial decision-making, capital allocation, and business valuation.

Example 1

A company's after tax specific cost of capital and capital structure are as follows:

Cost of Capital	
Cost of debt	10%
Cost of preference shares	12%
Cost of equity shares	15%

Capital structure	
Debt	300000
Preference Share capital	200000
Equity Share Capital	500000
	1000000

Calculate the average cost of capital.

Solution:

Computation of Weighted Average Cost of Capital				
Sources of fund	Book Value	Proportion or weightage	Cost %	Weighted Cost [Weightage * Cost Percentage]
Debt	300000	0.30	10.00	3.00
Preference Share capital	200000	0.20	12.00	2.40
Equity Share Capital	500000	0.50	15.00	7.50
	1000000	1.00		12.90

Example 2

Calculate WACC from the following information:

Sources of fund	Amount in Rs.
40,000 Equity Shares (fully paid up)	4,00,000
3,000 6% Debentures	3,00,000
2,000 6% Preference Shares	2,00,000
Retained Earnings	1,00,000

Earning per share has been Re.1 during the past years and equity share is being sold in the market at par. Assume corporate tax at 35%.

Solution:

Cost of Equity Capital $Ke = \dfrac{D}{MP} \times 100$

$= \dfrac{1}{10} \times 100 = 10\%$

Cost of debt:

$Kda = \dfrac{I}{NP} \times 100 (1-t)$

$= \dfrac{6}{100} \times 100 (1-0.35)$

$= 6\% \times (0.65)$

$= 3.9\%$

Calculation of WACC using Book Values

Sources of fund	Value in Rs.	Proportion or weightage	Cost %	Weighted Cost (Weightage * Cost Percentage)
40,000 Equity Shares (fully paid up)	4,00,000	0.40	10.00	4.00
3,000 6% Debentures	3,00,000	0.30	3.90	1.17
2,000 6% Preference Shares	2,00,000	0.20	6.00	1.20
Retained Earnings	1,00,000	0.10	10.00	1.00
				7.37

Ans: The weighted average cost of capital in the given question is 7.37%.

Summary

The cost of capital is the minimum rate of return that a company must earn on its investments in order to satisfy its investors. It is the price that a company pays for the use of money, whether it is raised through debt or equity financing.

The "cost of debt" is the effective interest rate that a company pays on its debt capital. It represents the cost a company incurs for borrowing money through loans, bonds, or other forms of debt instruments. Understanding the cost of debt is essential for businesses because it helps them evaluate the financial implications of taking on debt, make informed financing decisions.

The "cost of equity" is the return that a company is expected to provide to its equity shareholders (common shareholders) in exchange for their investment and the associated risks. It represents the cost or required rate of return that equity investors demand as compensation for investing their capital in the company's shares. Understanding the cost of equity is essential for businesses, as it helps them determine the minimum return they must generate to attract and retain investors.

WACC stands for Weighted Average Cost of Capital. It is a crucial financial metric used by companies, investors, and financial analysts to evaluate the cost of capital and make important financial decisions. WACC represents the average cost a company faces when raising funds to finance its operations or new investments.

Keywords

Cost of Capital, Weighted Average Cost of Capital (WACC), Capital Structure, Cost of Debt, Cost of Equity, Risk-Free Rate, Market Risk Premium, Beta (β)

Self Assessment

1. What does the term "cost of capital" refer to in financial management?

A. The expenses incurred in marketing a company's products

B. The cost of raising funds to finance a company's operations and investments

C. The cost of employee salaries and benefits

D. The cost of raw materials used in production

2. Which of the following components is NOT typically considered when calculating the weighted average cost of capital (WACC)?

A. Cost of equity

B. Cost of debt

C. Cost of preferred stock

D. Cost of inventory

3. What is the primary factor that influences the cost of debt for a company?

A. Stock market conditions

B. The company's credit rating

C. The company's beta coefficient

D. The dividend payout ratio

4. In the context of the Capital Asset Pricing Model (CAPM), what does "beta" measure?

A. The company's historical earnings growth rate

B. The sensitivity of a stock's returns to market movements

C. The rate of inflation in the economy

D. The company's industry sector

5. Why is it important for a company to determine its cost of capital accurately?

A. To minimize the tax liability

B. To maximize employee benefits

C. To evaluate the financial health of the company

D. To make informed investment and financing decisions

6. What is the formula for calculating the weighted average cost of capital (WACC)?

A. WACC = Cost of Equity + Cost of Debt

B. WACC = Cost of Equity - Cost of Debt

C. WACC = (E/V) * Re + (D/V) * Rd * (1 - Tax Rate)

D. WACC = (E/V) * Re * (1 - Tax Rate) - (D/V) * Rd

7. Which type of financing typically has a higher cost in a company's capital structure?

A. Debt financing

B. Equity financing

C. Preferred stock financing

D. Retained earnings

8. How does the cost of equity differ from the cost of debt?

A. The cost of equity is tax-deductible, while the cost of debt is not.

B. The cost of debt is based on the company's stock price, while the cost of equity is based on interest payments.

C. The cost of debt represents the return expected by shareholders, while the cost of equity is the interest rate paid on loans.

D. The cost of equity is typically higher than the cost of debt due to the higher risk associated with equity.

9. What financial metric is used to assess the financial health of a company and its ability to cover its debt obligations?

A. Return on Equity (ROE)

B. Debt-to-Equity Ratio (D/E)

C. Price-to-Earnings Ratio (P/E)

D. Earnings Before Interest and Taxes (EBIT)

10. In which financial decision-making process is the cost of capital particularly important?

A. Setting employee salaries

B. Determining the office layout

C. Evaluating investment opportunities and capital budgeting

D. Selecting a company's logo design

11. What does WACC stand for?

A. Weighted Average Corporate Cost

B. Weighted Asset Cost Calculation

C. Weighted Average Cost of Capital

D. Weighted Asset Capital Calculation

12. Which components are typically included when calculating WACC?

A. Cost of equity and retained earnings

B. Cost of equity and cost of preferred stock

C. Cost of equity, cost of debt, and cost of preferred stock

D. Cost of debt and cost of inventory

13. Which financial concept is used to calculate the cost of equity in the WACC formula?

A. Net present value (NPV)

B. Dividend yield

C. Beta (β)

D. Inventory turnover

14. How does the cost of debt affect the WACC?

A. A higher cost of debt decreases the WACC.

B. A higher cost of debt increases the WACC.

C. The cost of debt has no impact on the WACC.

D. The WACC is calculated separately from the cost of debt.

15. What is the primary goal of a company when it comes to its WACC?

A. To minimize the WACC at all costs

B. To maximize the cost of debt

C. To minimize the cost of equity

D. To minimize the overall cost of capital while maintaining a balanced capital structure

Answers for Self Assessment

1.	**B**	2.	D	3.	B	4.	B	5.	D
6.	C	7.	B	8.	D	9.	B	10.	C
11.	C	12.	C	13.	C	14.	B	15.	D

Review Questions

1. What is the cost of capital, and how does it relate to the capital structure of a company?
2. What is the weighted average cost of capital (WACC), and why is it used in financial decision-making?
3. What is the impact of changes in interest rates on a company's capital structure and overall financial risk?
4. Equity Capital of a company consists of 5,00,000 equity shares of Rs.10 each issued at a premium of Rs.2.50 per share. The average rate of dividend paid by the company has been Rs 3 per share. The market value of the share is Rs.25. Calculate the cost of equity capital.

5. P Ltd. Company's share is quoted in the market at Rs. 20 currently. The company has paid a dividend of Rs. 1 per share and the investor expect a dividend growth rate of 5% per year. Calculate:
   a. Company equity cost of capital
   b. The anticipated growth is 6% p.a., calculate the indicated market price per share.
   c. If the company's cost of capital is 8% and the anticipated growth rate is 5% per annum calculate the indicated market price if the dividend of Rs. 1 per share is to be maintained.

6. A Ltd. Has issued 4,00,000 equity shares of Rs. 100 each. The company has earned a profit of Rs.60,00,000 after tax. Dividend pay out ratio is 80% of profits. Market price of A Ltd.'s share is Rs.125 per share. Calculate the cost of equity capital using:
   a. Dividend yield method
   b. Earning Yield method

7. Q Ltd. issues 1,00,000 equity shares of Rs.10 each at a premium of Rs. 4 per share. The company has incurred Rs.50,000 as issue expenses. The equity shareholders expect dividend 12% p.a. Calculate the cost of capital.

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

Web Link

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Unit 08: Common Stock Valuation

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Objectives

After studying this unit, you will be able to:

- Understand stock valuation it's importance for investors.
- Identify the key factors that influence stock prices.
- Explain the concept of fundamental analysis and its role in stock valuation.
- Explore relative valuation methods and their application
- Discuss the importance of regularly monitoring and updating stock valuations.
- Explore strategies for adjusting investment decisions based on changing market conditions.

Introduction

Stock valuation is the process of determining the intrinsic or fair value of a company's stock or shares in the financial markets. It's a crucial aspect of investment analysis and decision-making for both individual investors and institutional investors such as mutual funds, hedge funds, and pension funds. The primary goal of stock valuation is to assess whether a stock is overvalued, undervalued, or fairly priced, helping investors make informed investment choices.

8.1   Fundamentals of Valuation

Fundamental Analysis:

This approach involves evaluating a company's financial health and performance to estimate its intrinsic value. Key factors considered in fundamental analysis include:

Earnings: Analyzing a company's earnings, such as earnings per share (EPS) and revenue growth.

Dividends: Assessing the company's dividend history and dividend yield.

Financial Statements: Reviewing the balance sheet, income statement, and cash flow statement to understand the company's financial position.

Price-to-Earnings (P/E) Ratio: Comparing a company's stock price to its earnings per share.

Discounted Cash Flow (DCF) Analysis: Projecting a company's future cash flows and discounting them to their present value.

Technical Analysis:

This method involves studying historical price and volume data to identify trends and patterns in stock prices. Technical analysts use tools like charts, moving averages, and various technical indicators to make predictions about future price movements.

Comparative Analysis:

This approach involves comparing a company's financial metrics, such as its P/E ratio or price-to-book (P/B) ratio, to those of similar companies in the same industry or sector. If a stock is trading at a lower valuation compared to its peers, it may be considered undervalued.

Market Sentiment:

Sometimes, investor sentiment and market psychology can drive stock prices. Assessing market sentiment can involve analyzing news, social media, and other sources to gauge how investors perceive a particular stock or the overall market.

Asset-Based Valuation:

This method values a company's assets and liabilities to estimate the intrinsic value of its stock. Common asset-based valuation approaches include the book value (total assets minus total liabilities) and the net asset value (NAV) per share.

Relative Valuation:

This approach compares a company's stock price to a specific financial metric, such as earnings, revenue, or book value. Common relative valuation ratios include the P/E ratio, P/S ratio (price-to-sales), and P/B ratio.

Scenario Analysis:

Evaluating different scenarios, such as best-case, worst-case, and base-case scenarios, to estimate a range of possible stock valuations based on various assumptions.

8.2 Analysis of Beta

Beta, often denoted as β, is a measure of a stock's or investment's sensitivity to changes in the overall market, typically represented by a benchmark index like the Sensex, Nifty, S&P 500 etc.. It is a fundamental concept in finance and is used to assess the level of systematic risk or volatility associated with an investment relative to the broader market.

Interpretation of Beta:

- A beta of 1 indicates that the investment tends to move in line with the market. If the market goes up by 1%, the investment, on average, also goes up by 1%, and if the market goes down by 1%, the investment goes down by 1%.
- A beta greater than 1 suggests that the investment is more volatile or has higher systematic risk than the market. If the market goes up by 1%, the investment might go up by more than 1%, and if the market goes down by 1%, the investment might go down by more than 1%.
- A beta less than 1 implies that the investment is less volatile or has lower systematic risk than the market. If the market goes up by 1%, the investment might go up by less than 1%, and if the market goes down by 1%, the investment might go down by less than 1%.

Calculation of Beta:

Beta is calculated using historical price data. The formula for beta is:

$$Beta = \frac{\text{Covariance between the returns of the investment and the market}}{\text{Variance of the market returns}}$$

- The covariance measures how the returns of the investment move in relation to the returns of the market.
- The variance of the market returns measures the overall volatility of the market.

Uses of Beta:

- Investors use beta as a tool to assess the risk and return characteristics of an investment. For example, conservative investors might prefer stocks or investments with betas less than 1 because they are expected to be less volatile than the market.
- Portfolio managers use beta to balance and diversify their portfolios. A portfolio with a mix of investments with different betas can help manage overall portfolio risk.
- Beta is often employed in the Capital Asset Pricing Model (CAPM), which is used to estimate the expected return on an investment based on its risk relative to the market.

Limitations of Beta:

- Beta is based on historical data and may not accurately predict future performance, especially during periods of market stress or significant economic changes.
- It assumes that historical relationships between the investment and the market will hold in the future, which may not always be the case.
- Beta does not account for non-systematic or company-specific risk factors, such as management decisions or industry-specific events.

8.3 Return on Equity

Return on Equity (ROE) is a financial ratio that measures a company's profitability and efficiency in generating earnings for its shareholders in relation to the shareholders' equity (ownership interest) in the company. It is a fundamental indicator of a company's financial performance and is commonly used by investors, analysts, and management to assess how effectively a company is utilizing its equity to generate profits. ROE can be calculated numerically as follows:

$$ROE = \frac{NetIncome}{Shareholders'Equity}$$

Where:

Net Income represents the company's profit after all expenses, including taxes and interest, have been deducted from its revenues. It is essentially the company's bottom-line profit for a given period, often a year.

Shareholders' Equity, also known as book value or net assets, represents the residual interest in the assets of the company after deducting its liabilities. It is essentially the net worth of the company and can be calculated as:

$$Shareholders'Equity = TotalAssets - TotalLiabilities$$

Features of Return on Equity (ROE)

Profitability Indicator: ROE provides insight into a company's ability to generate profits relative to the equity invested by its shareholders. A higher ROE is generally considered more favorable as it indicates that the company is making more efficient use of its equity.

Leverage Effect: A company can increase its ROE by using leverage (i.e., borrowing money to finance operations or investments). By taking on debt, a company can amplify its returns when its investments or operations are profitable. However, this also increases financial risk, as higher debt levels can lead to increased interest expenses.

Industry Comparison: ROE is most valuable when compared to the industry average or the company's historical ROE figures. Different industries may have varying average ROE levels due to their specific characteristics and capital structures. Comparing a company's ROE to industry peers helps assess its relative performance.

Sustainable ROE: Investors and analysts also assess the sustainability of a company's ROE. A high ROE driven solely by financial engineering (such as excessive debt) may not be sustainable over the long term and could be a sign of increased financial risk.

Limitations of ROE:

ROE should be used in conjunction with other financial metrics and analysis because it has limitations. For example, it doesn't provide a complete picture of a company's financial health and doesn't consider factors like cash flow or the quality of earnings.

8.4   Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) is a widely-used financial model that helps investors and analysts determine the expected return on an investment, typically a stock or a portfolio of stocks. Developed by William Sharpe in the 1960s, the CAPM provides a framework for understanding the relationship between risk and return in the context of the broader financial market.

Key components of the Capital Asset Pricing Model

Expected Return (Re): The CAPM starts with the formula for the expected return on an investment (Re), which is often used as a required rate of return by investors. This expected return represents the compensation an investor expects to receive for taking on the risk associated with a particular investment.

Risk-Free Rate (Rf): The model begins with the risk-free rate (Rf), which is the theoretical return on an investment that carries zero risk. In practice, this is often approximated using the yield on government bonds, such as U.S. Treasury bonds, with similar maturities.

Market Risk Premium (Rm - Rf): The market risk premium represents the excess return an investor expects to receive for investing in the broader market rather than in a risk-free asset. It is calculated as the difference between the expected return of the overall market (Rm) and the risk-free rate (Rf).

Beta (β): Beta measures the sensitivity of an investment's returns to changes in the overall market. It quantifies the systematic risk of the investment relative to the market. An investment with a beta of 1 moves in line with the market, while a beta greater than 1 indicates greater sensitivity to market movements, and a beta less than 1 suggests less sensitivity.

Calculation of Expected return using CAPM formula

$$Re = Rf + \beta(Rm - Rf)$$

Where

- Re = Expected return on the investment.

- Rf = Risk-free rate.
- β (Beta) = Beta of the investment.
- Rm = Expected return of the overall market.
- Rm - Rf = Market risk premium.

Important to know about CAPM

The CAPM assumes that investors are rational and risk-averse, seeking to maximize returns while minimizing risk.

It provides a theoretical framework for determining whether an investment is underpriced (expected return > required return), fairly priced (expected return = required return), or overpriced (expected return < required return).

The CAPM is often used in conjunction with beta to estimate the required rate of return for an investment based on its risk relative to the market.

Limitations of CAPM Model

CAPM Model assumes that the risk-free rate is constant and that asset returns follow a linear relationship with the market. Despite its limitations, the CAPM remains a valuable tool for investors and financial analysts to assess the risk-return trade-off and make informed investment decisions.

8.5   Dividend Discount Models

Dividend Discount Models (DDMs) are a class of financial models used to estimate the intrinsic value of a stock by discounting its future dividend payments. These models are based on the principle that the present value of all expected future dividends represents the fair value of the stock. DDMs are widely used by investors and analysts as a fundamental tool for valuing dividend-paying stocks.

One common form of the Dividend Discount Model is the Gordon Growth Model, also known as the Gordon-Shapiro Model or the Dividend Growth Model.

Functioning of Dividend Discount Model

Assumption of Constant Growth

The Gordon Growth Model assumes that dividends from the company will grow at a constant rate (g) indefinitely. This growth rate is typically assumed to be sustainable and representative of the company's expected future growth.

Formula for the Gordon Growth Model

$$\text{Intrinsic Value (V)} = \frac{D0 \times (1+g)}{r-g}$$

- V represents the intrinsic value or fair value of the stock.
- D0 is the most recent dividend payment.
- g is the constant growth rate of dividends.
- r is the required rate of return or discount rate, which represents the return investors expect to earn for holding the stock.

Explanation of the values:

- If the calculated intrinsic value (V) is higher than the current market price of the stock, it suggests that the stock is undervalued, and an investor might consider it a good buy.

- If the calculated intrinsic value is lower than the current market price, it suggests that the stock is overvalued, and an investor might consider it a sell or avoid it.

Limitations:

- The Gordon Growth Model assumes a constant growth rate, which may not hold true indefinitely for all companies. It is most applicable to mature, stable companies with a history of consistent dividend growth.

- The model does not account for changes in the growth rate, which can be problematic for companies with irregular or unpredictable dividend patterns.

- It is sensitive to the choice of the discount rate (r), which can vary depending on market conditions and the perceived risk of the investment.

Summary

Investors may prefer different valuation methods, and there is no one-size-fits-all approach. Moreover, stock valuation is inherently uncertain and subject to market fluctuations and changes in economic conditions. Therefore, investors should consider multiple factors and approaches while making investment decisions and diversify their portfolios to manage risk effectively.

One can conclude by saying that beta is a measure of how an investment's returns tend to move relative to the market. It is a useful tool for assessing risk and diversifying investment portfolios, but it should be used in conjunction with other analysis methods and not relied upon in isolation.

Return on Equity (ROE) is a financial ratio that measures how effectively a company is using shareholders' equity to generate profits. It is a valuable tool for assessing a company's financial performance and is often used in conjunction with other financial ratios and analysis methods to gain a comprehensive understanding of a company's financial health and prospects.

Dividend Discount Models can be a valuable tool for investors interested in income-generating stocks, especially those with a history of stable and predictable dividend payments. However, they should be used alongside other valuation methods and take into account the specific characteristics of the company being analyzed.

Keywords

Valuation, Intrinsic Value, Earnings, Price-to-Earnings (P/E) Ratio, Market Sentiment, Beta, Asset-Based Valuation, Scenario Analysis.

Self Assessment

1. What is the primary goal of stock valuation?

A. To predict short-term price movements
B. To determine the market sentiment
C. To assess the intrinsic or fair value of a stock
D. To identify the most popular stocks

2. Which of the following is NOT a commonly used stock valuation method?

A. Dividend Discount Model (DDM)
B. Price-to-Earnings (P/E) ratio

C. Moving Average Analysis

D. Discounted Cash Flow (DCF) Analysis

3. In the context of stock valuation, what does the term "intrinsic value" represent?

A. The current market price of the stock

B. The expected future price of the stock

C. The true or real value of the stock based on fundamentals

D. The value of the stock as determined by market sentiment

4. The Price-to-Earnings (P/E) ratio is calculated by dividing the stock's:

A. Earnings per share (EPS) by its market price per share

B. Dividends per share (DPS) by its market price per share

C. Book value per share by its market price per share

D. Market capitalization by its book value

5. What is the primary purpose of using the Capital Asset Pricing Model (CAPM) in stock valuation?

A. To estimate a stock's future earnings growth rate

B. To determine a stock's beta coefficient

C. To calculate the required rate of return for a stock

D. To predict short-term price fluctuations

6. A stock with a beta of 1 is considered to be:

A. Less volatile than the market

B. More volatile than the market

C. Equally volatile as the market

D. Completely unrelated to market movements

7. Which financial ratio is commonly used in the Dividend Discount Model (DDM) to estimate the intrinsic value of a stock?

A. Price-to-Earnings (P/E) ratio

B. Dividend yield

C. Earnings per share (EPS)

D. Market capitalization

8. What does the term "margin of safety" refer to in stock valuation?

A. The difference between the current market price and the intrinsic value of a stock

B. The profit margin of a company

C. The maximum allowable loss in a stock investment

D. The amount of dividends paid by a company

9. In fundamental analysis, what financial metric is used to assess a company's ability to generate profits for its shareholders?

A. Revenue

B. Market capitalization

C. Earnings per share (EPS)

D. Dividend yield

10. Which of the following is NOT a limitation of stock valuation models?

A. They rely on historical data that may not reflect future conditions.

B. They do not consider market sentiment.

C. They provide a precise and guaranteed valuation of a stock.

D. They may not account for changes in a company's growth rate.

11. What is the primary purpose of the Capital Asset Pricing Model (CAPM)?

A. To calculate a company's earnings per share (EPS)

B. To estimate a stock's intrinsic value

C. To determine the required rate of return for an investment

D. To forecast short-term stock price movements

12. In the CAPM formula, what does "Rf" represent?

A. The return on investment in a risk-free asset

B. The market risk premium

C. The expected return of the overall market

D. The dividend yield of a stock

13. Which component of the CAPM formula represents the expected return of the overall market?

A. Beta (β)

B. Risk-free rate (Rf)

C. Market risk premium

D. Company-specific risk

14. A stock with a beta of 1 in the CAPM is expected to:

A. Outperform the market

B. Perform in line with the market

C. Underperform the market

D. Have no correlation with market returns

15. What does the "market risk premium" represent in the CAPM?

A. The total return expected from an investment

B. The additional return required for investing in a risk-free asset

C. The return investors expect from the overall market beyond the risk-free rate

D. The dividend yield of the market index

Answers for Self Assessment

1.	C	2.	C	3.	C	4.	A	5.	C
6.	C	7.	B	8.	A	9.	C	10.	C
11.	C	12.	A	13.	C	14.	B	15.	C

Review Questions

1. What is stock valuation, and why is it important for investors and analysts?
2. Explain the difference between intrinsic value and market value in the context of stock valuation?
3. How does the Dividend Discount Model (DDM) work, and what types of companies is it best suited for?
4. What is the Price-to-Earnings (P/E) ratio, and how can it be used to evaluate a company's stock?
5. Describe the components of the Capital Asset Pricing Model (CAPM) and how it is used to determine the required rate of return for a stock?
6. How do you calculate the Beta of a stock, and what does it signify about the stock's risk in relation to the market?
7. In fundamental analysis, what financial metrics and ratios do you typically consider when evaluating a stock, and why are they important?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

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Dr. Ajit Kumar, Lovely Professional University

Unit 09: Discounted Cash Flow Models of Business Valuation

Objectives

After studying this unit, you will be able to:

- Understand the Concept of DCF
- Perform Basic DCF Calculation
- Understand Discounted Cash Flow Model Variations
- Apply Valuation Ratios
- Understand Market Comparable

Introduction

Business valuation is the process of determining the economic value or worth of a business, company, or an asset. It is a critical financial analysis that helps stakeholders, such as business owners, investors, buyers, and sellers, assess the financial health and attractiveness of a business. Business valuation is used in various contexts, including mergers and acquisitions, financial reporting, estate planning, taxation, litigation, and when a business owner is seeking to sell, buy, or raise capital for their company.

Cash flow models are a fundamental component of business valuation, specifically within the Income Approach. These models are used to estimate the present value of a business's future cash flows, making them a critical tool in determining the intrinsic value of a business or investment. Cash flow models help assess the ability of a business to generate income in the future and are commonly employed in various valuation contexts, including mergers and acquisitions, investment analysis, and financial planning.

Discounted Cash Flow (DCF) models are widely used in business valuation to determine the intrinsic value of a business or an investment. These models are based on the principle that the value of a business is the present value of its expected future cash flows. In other words, they estimate how much a business is worth today based on the cash it is expected to generate in the future, taking into account the time value of money.

9.1   Earnings Models

"Earnings models" in business valuation refer to valuation methods that primarily rely on a company's earnings or profitability as a key indicator of its value. These models focus on various measures of earnings, such as net income, earnings before interest and taxes (EBIT), or earnings before interest, taxes, depreciation, and amortization (EBITDA), to determine the value of a business. Earnings-based valuation models are widely used in assessing the financial health and worth of a business. Following are common earnings-based valuation models:

Price-to-Earnings (P/E) Ratio Model

The P/E ratio model compares a company's market price per share to its earnings per share (EPS). It is one of the simplest and most widely used valuation methods.

P/E Ratio = Market Price per Share / Earnings per Share

This model is commonly used for publicly traded companies. It helps investors understand how much they are willing to pay for each dollar of earnings generated by the company.

Earnings Capitalization Model

This model estimates the value of a business by dividing its expected earnings by the required rate of return (or capitalization rate).

Business Value = Expected Earnings / Capitalization Rate

The earnings capitalization model is often used for privately held companies. It provides a simplified way to estimate the business's value based on its earnings and the perceived risk associated with the investment.

Discounted Earnings Model (Earnings-Based DCF)

The discounted earnings model estimates the present value of a business's future earnings. It accounts for the time value of money and risk.

Business Value = Present Value of Future Earnings

This model is suitable for both publicly traded and privately held companies. It is more comprehensive than the P/E or earnings capitalization models because it involves projecting future earnings and discounting them to their present value.

Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) Multiple Model

The EBITDA multiple model uses the company's EBITDA as the basis for valuation. It compares the company's EBITDA to a similar industry benchmark or to the EBITDA multiples of comparable companies.

Business Value = EBITDA x EBITDA Multiple

This model is often used in mergers and acquisitions and for valuing businesses in industries where EBITDA is a more representative measure of performance than net income.

Earnings Growth Model

This model estimates a company's value based on its current earnings and expected future earnings growth rates.

Business Value = Current Earnings x (1 + Growth Rate) / (Discount Rate - Growth Rate)

The earnings growth model is suitable for companies with consistent growth expectations. It can help estimate the value of businesses that are expected to increase their earnings significantly in the future.

9.2 Free Cash Flow to Firm (FCFF) Model

The Free Cash Flow to Firm (FCFF) model is a valuation approach used to estimate the intrinsic value of a business. FCFF represents the cash generated by a company's core operations that is available to all providers of capital, including both equity and debt holders. This model is considered one of the most comprehensive and widely used methods for valuing a business because it takes into account all cash flows available to investors after operating expenses, taxes, and necessary capital investments have been accounted for. Here's a breakdown of the FCFF model:

Components of the FCFF Model

1. **Operating Income (EBIT):** The starting point for calculating FCFF is the company's operating income or earnings before interest and taxes (EBIT). This represents the profitability of the company's core operations.

2. **Interest Expenses (I):** Interest expenses are subtracted from EBIT because they represent the cost of servicing the company's debt.

3. **Tax Expenses (T):** The model subtracts taxes paid on operating income to arrive at the company's taxable income. The tax rate used is typically the effective tax rate.

4. **Non-cash Expenses (Depreciation and Amortization):** Non-cash expenses like depreciation and amortization are added back to account for the fact that these expenses do not require actual cash outflows.

5. **Capital Expenditures (CapEx):** The model subtracts capital expenditures, representing the cash outflows required to maintain and expand the business's asset base. CapEx includes investments in property, plant, and equipment.

6. **Change in Working Capital (ΔWC):** Working capital is the difference between a company's current assets (e.g., cash, accounts receivable, inventory) and current liabilities (e.g., accounts payable, short-term debt). The change in working capital reflects the cash flows associated with managing these assets and liabilities. An increase in working capital consumes cash, while a decrease generates cash.

The formula for calculating FCFF is as follows:

FCFF = EBIT x (1 - Tax Rate) + Depreciation & Amortization - CapEx - ΔWC

Applications of FCFF

1. **Valuation**: The primary application of the FCFF model is business valuation. By estimating the future FCFF and discounting it to its present value using an appropriate discount rate (often the company's weighted average cost of capital, WACC), analysts can determine the intrinsic value of the business.

2. **Investment Analysis:** Investors and financial analysts use the FCFF model to assess the attractiveness of potential investments. They compare the estimated FCFF with the current market price of the company's equity to determine whether the stock is undervalued or overvalued.

3. **Mergers and Acquisitions:** The FCFF model is commonly used in mergers and acquisitions (M&A) to assess the value of a target company. It helps acquirers determine what they should be willing to pay for the company based on its cash flow potential.

4. **Financial Planning:** Businesses use the FCFF model for financial planning and budgeting purposes. It helps in understanding the cash flows generated by the core operations of the company, which can be used for debt repayment, dividend distributions, or reinvestment in the business.

Example:

Calculate the FCFF ABC Manufacturing company, for a single year. On the basis of the following given data:

Earnings Before Interest and Taxes (EBIT): Rs.500,000

Tax Rate: 30%

Depreciation and Amortization: Rs.50,000

Capital Expenditures (CapEx): Rs.100,000

Change in Working Capital (ΔWC): Rs.20,000 (Increase in working capital, which represents a cash outflow)

Step 1: Taxable Income

Taxable Income = EBIT x (1 - Tax Rate)

Taxable Income = Rs.500,000 x (1 - 0.30) = Rs.350,000

Step 2: FCFF Components

FCFF = Taxable Income + Depreciation & Amortization - CapEx - ΔWC

FCFF = Rs.350,000 + Rs.50,000 - Rs.100,000 - Rs.20,000 = Rs.280,000

Ans: The Free Cash Flow to Firm (FCFF) for ABC Manufacturing for this year is Rs.280,000.

Interpretation:

FCFF represents the cash generated by the company's core operations after accounting for taxes, depreciation, capital expenditures, and changes in working capital.

In this example, ABC Manufacturing generated Rs.280,000 in free cash flow that is available to both equity and debt holders for reinvestment, debt repayment, or distribution to shareholders.

9.3 Free Cash Flow to Equity (FCFE) Model

The Free Cash Flow to Equity (FCFE) model is a financial valuation method used to estimate the cash flow available to a company's equity shareholders after accounting for all operating expenses, taxes, capital expenditures, and changes in working capital. FCFE represents the cash that can be distributed to shareholders in the form of dividends, share buybacks, or reinvestment in the business to support growth. The FCFE model is particularly useful for estimating the intrinsic value of a company's equity.

Components of the FCFE Model

1. **Net Income (NI):** The starting point for calculating FCFE is the company's net income, which can be found on the income statement.

2. **Non-cash Expenses (Depreciation and Amortization):** Non-cash expenses, such as depreciation and amortization, are added back because they do not represent cash outflows.

3. **Change in Working Capital (ΔWC):** Working capital is the difference between current assets (e.g., cash, accounts receivable, inventory) and current liabilities (e.g., accounts payable, short-term debt). The change in working capital accounts for the cash flows associated with managing these assets and liabilities. An increase in working capital consumes cash, while a decrease generates cash.

4. **Capital Expenditures (CapEx):** CapEx represents the cash outflows required to maintain and expand the company's asset base. This includes investments in property, plant, and equipment.

5. **Net Borrowing (Net Debt Issuance/Repayment):** The net change in debt is considered because it impacts the company's cash position. An increase in debt represents cash inflow, while a debt repayment is a cash outflow.

The formula for calculating FCFE is as follows:

FCFE = Net Income + Non-cash Expenses - CapEx - ΔWC + Net Borrowing

Applications of Free Cash Flow to Equity (FCFE) Model

1. **Valuation**: The primary application of the FCFE model is equity valuation. By estimating the future FCFE and discounting it to its present value using an appropriate discount rate (often the company's cost of equity), analysts can determine the intrinsic value of the company's equity.

2. **Dividend Policy**: FCFE is closely related to a company's dividend policy. It helps management determine how much cash is available to distribute to shareholders as dividends while still supporting the company's growth and financial health.

3. **Share Buybacks**: Companies also use FCFE to assess their ability to repurchase shares. If the FCFE is substantial, it can fund share buyback programs, which can enhance shareholder value.

4. **Investment Decisions**: Investors may use the FCFE model to evaluate whether a company is generating enough cash flow to justify their investment. A positive FCFE indicates the company has cash available to support growth and provide returns to shareholders.

Example:

Calculate the Free Cash Flow to Equity (FCFE) model for XYZ Corporation, for a single year on the basis of the following data:

Net Income (NI): $500,000

Depreciation and Amortization: $50,000

Capital Expenditures (CapEx): $100,000

Change in Working Capital (ΔWC): -$20,000 (Decrease in working capital, which represents a cash inflow)

Net Borrowing: $30,000 (Net debt issuance, representing a cash inflow)

Solution:

Step 1: Calculate FCFE Components

FCFE = Net Income + Non-cash Expenses - CapEx - ΔWC + Net Borrowing

FCFE = $500,000 + $50,000 - $100,000 - (-$20,000) + $30,000

Step 2: Compute FCFE

FCFE = $500,000 + $50,000 - $100,000 + $20,000 + $30,000

FCFE = $500,000 + $50,000 - $100,000 + $20,000 + $30,000

FCFE = $500,000 + $50,000 - $100,000 + $20,000 + $30,000

FCFE = $500,000 + $50,000 - $100,000 + $20,000 + $30,000

FCFE = $400,000

Ans: The Free Cash Flow to Equity (FCFE) for XYZ Corporation for the year is $400,000.

Interpretation:

FCFE represents the cash that is available to be distributed to the equity shareholders of XYZ Corporation after accounting for operating expenses, taxes, capital expenditures, changes in working capital, and net borrowing activity.

In this example, XYZ Corporation generated $400,000 in FCFE for the year. This cash can be used to pay dividends to shareholders, repurchase shares, reduce debt, or invest in growth opportunities.

9.3   Relative Valuation

Relative valuations, also known as comparative valuations or relative value analysis, are a set of methods used in finance and investment to assess the value of an asset or security by comparing it to similar assets or securities in the market. The fundamental idea behind relative valuations is that the value of an asset can be determined by looking at how it is priced relative to other assets or a benchmark. This approach is particularly useful when there is limited data or when you want to understand how an asset compares to its peers.

Key Points About Relative Valuations:

1. Comparison with Comparable Assets: Relative valuations involve comparing the valuation metrics of the target asset or security to those of similar assets or a relevant benchmark. The idea is to find comparable assets that are similar in terms of industry, size, growth prospects, risk factors, or other relevant characteristics.

2. Common Metrics: Several common financial metrics are used in relative valuations, including price-to-earnings (P/E) ratios, price-to-book (P/B) ratios, price-to-sales (P/S) ratios, and dividend yields. The choice of metric depends on the specific asset being valued and the industry in question.

3. Relative Valuation Ratios:

   - P/E Ratio: Compares the stock's current market price to its earnings per share (EPS). A higher P/E ratio suggests the market values the company's earnings more favorably.

   - P/B Ratio: Compares the stock's market price to its book value per share. A higher P/B ratio implies a premium valuation compared to the company's net asset value.

   - P/S Ratio: Compares the stock's market price to its revenue per share. It provides insights into how the market values a company's sales.

   - Dividend Yield: Compares a stock's annual dividend payment to its market price. A higher dividend yield may indicate a more attractive income investment.

Advantages of Relative Valuation Method

   - Relative valuations are straightforward and can provide quick insights into how a security or asset is priced compared to others.

   - They are useful for identifying overvalued or undervalued assets relative to their peers.

   - Relative valuations can be applied to a wide range of assets, including stocks, bonds, real estate, and businesses.

Limitations of Relative Valuation method

- Relative valuations do not provide an absolute measure of value; they are only relative to the chosen benchmark.

- The choice of comparable assets or benchmark can significantly impact the valuation results.

- Relative valuations may not account for unique qualities or risks specific to the target asset.

- Market sentiment and trends can influence relative valuation metrics, leading to potential mispricing.

Application of Relative Valuation method

Relative valuations are commonly used in equity analysis and investment management. Investors often compare a company's valuation metrics to those of its industry peers or an index to assess whether a stock is overvalued or undervalued.

Summary

DCF models are considered one of the most fundamental and theoretically sound methods for business valuation because they are based on the cash flows a business is expected to generate. However, they require careful consideration of assumptions and can be sensitive to changes in those assumptions, making them both a powerful tool and a challenging one to use effectively.

Earnings-based valuation models provide a straightforward way to assess a business's value by focusing on its earnings performance. However, they do have limitations and assumptions, such as the choice of appropriate earnings measure, the accuracy of growth rate projections, and the selection of an appropriate discount rate. As with any valuation method, it's essential to use earnings models in conjunction with other methods and consider the specific circumstances and risks associated with the business being valued.

The FCFF model is a powerful tool for estimating the true economic value of a business because it considers both the cash flows generated by operations and the capital requirements needed to sustain and grow the business. However, it requires careful consideration of assumptions, including future growth rates, capital expenditure projections, and the discount rate, to provide accurate and meaningful valuations.

The FCFE model relies on assumptions, including future growth rates, capital expenditure projections, working capital changes, and the discount rate (cost of equity). Accurate FCFE projections require a thorough understanding of the company's financials and a careful analysis of these assumptions. As with any valuation model, the FCFE model is typically used in conjunction with other methods to arrive at a well-informed estimate of the company's equity value.

Overall, relative valuations are a valuable tool in finance for quickly assessing the relative attractiveness of an asset or security within a given context. However, they are typically used in conjunction with other valuation methods to form a more comprehensive view of an asset's true worth.

Keywords

DCF Valuation, Discounted Cash Flow Analysis, Business Valuation Models, Intrinsic Value, Cash Flow Projections, Terminal Value, Valuation Techniques, Finance Valuation, Valuation Metrics, Present Value of Future Cash Flows, Valuation Discount Factor

Self Assessment

1: Which of the following statements about DCF models is false?

A. DCF models value a business based on its future cash flows.

B. DCF models discount future cash flows to their present values.

C. DCF models require a discount rate, which is the required return on investment.

D. DCF models can be used to value both publicly traded and private companies.

2: Which of the following types of cash flows is typically used in a DCF model for valuing a business?

A. Net income

B. Operating cash flow

C. Free cash flow to equity

D. All of the above

3: What is the discount rate used in a DCF model?

A. The cost of capital

B. The required return on investment

C. The interest rate on a risk-free investment

D. All of the above

4: Which of the following is a benefit of using a DCF model to value a business?

A. DCF models are relatively easy to use.

B. DCF models are widely accepted and used by professional valuers.

C. DCF models can be used to value a business based on its future cash flows.

D. All of the above

5: Which of the following is a limitation of using a DCF model to value a business?

A. DCF models can be complex to use and require a lot of data.

B. DCF models are sensitive to the discount rate used.

C. DCF models do not take into account all of the factors that can affect the value of a business.

D. All of the above

6: Which of the following is not a component of FCFF?

A. Operating cash flow

B. Capital expenditures

C. Net working capital

D. Interest payments

7: Which of the following is the most common type of DCF model used to value a business?

A. FCFF model

B. FCFE model

C. WACC model

D. CAPM model

8: Which of the following is a limitation of the FCFF model?

A. The FCFF model is sensitive to the discount rate used.

B. The FCFF model does not take into account all of the factors that can affect the value of a business.

C. The FCFF model can be complex to use and requires a lot of data.

D. All of the above

9: Which of the following is a benefit of using the FCFF model to value a business?

A. The FCFF model is easy to use and does not require a lot of data.

B. The FCFF model is a widely accepted and used valuation method.

C. The FCFF model takes into account the cash flows that are available to all investors in the company.

D. All of the above

10: Which of the following is the formula for calculating FCFF?

A. FCFF = Operating cash flow - Capital expenditures - Change in net working capital

B. FCFF = Operating cash flow - Interest expense - Taxes

C. FCFF = Operating cash flow - Capital expenditures - Net debt

D. FCFF = Operating cash flow - Capital expenditures - Change in net working capital - Interest expense – Taxes

11: What is relative valuation?

A. A method of valuing a company by comparing it to similar companies

B. A method of valuing a company by discounting its future cash flows

C. A method of valuing a company by analyzing its assets and liabilities

D. All of the above

12: What are some of the factors that can be considered when comparing companies in a relative valuation analysis?

A. Industry

B. Size

C. Growth rate

D. All of the above

13: Which of the following is a commonly used relative valuation multiple?

A. Price-to-earnings ratio (P/E)

B. Enterprise value-to-EBITDA ratio (EV/EBITDA)

C. Price-to-book ratio (P/B)

D. All of the above

14: What are some of the benefits of using relative valuation to value a company?

A. It is a relatively simple and straightforward method.

B. It is a widely accepted and used valuation method.

C. It can be used to value companies in a variety of industries.

D. All of the above

15: What are some of the limitations of using relative valuation to value a company?

A. It relies on the assumption that the comparable companies are truly similar.
B. It can be difficult to find comparable companies for some businesses.
C. It does not take into account all of the factors that can affect the value of a company.
D. All of the above

Answers for Self Assessment

1.	**B**	2.	D	3.	D	4.	D	5.	D
6.	D	7.	A	8.	D	9.	B/C	10.	A
11.	A	12.	D	13.	D	14.	D	15.	D

Review Questions

1. What is a Discounted Cash Flow (DCF) model is and how it is used in business valuation?
2. What are the key components of a DCF model, and how do they contribute to the valuation process?
3. What is the significance of choosing an appropriate discount rate in a DCF analysis, and how do you determine the discount rate for a specific valuation?
4. How do you estimate a company's future cash flows when creating a DCF model, and what factors or assumptions do you consider?
5. What are some common challenges or limitations associated with using DCF models in business valuation?
6. What are some factors that could lead to a significant difference between the intrinsic value calculated using a DCF model and the market price of a company's stock?
7. In a DCF analysis, how might you adjust cash flows or discount rates to account for specific risks or uncertainties associated with the business being valued?
8. How would you use DCF modeling to compare the valuation of two companies operating in different industries or with different growth prospects?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

Web Link

- https://corporatefinanceinstitute.com/resources/financial-modeling/financial-**forecasting-guide/**

- **https://www.netsuite.com/portal/resource/articles/financial-management/importance-financial-forecasting.shtml**
- https://www.wallstreetmojo.com/financial-forecasting/
- https://www.investopedia.com/ask/answers/difference-between-financial-forecasting-and-financial-modeling/

Unit 10: Capital Budgeting and Risk Analysis

Objectives

- Understand the concept of capital budgeting and its significance in corporate finance.
- Learn how to identify and evaluate potential investment projects, including both long-term assets and strategic initiatives.
- Apply DCF methods like - net present value (NPV), internal rate of return (IRR), and profitability index (PI) for project evaluation
- Conduct sensitivity analysis to assess how changes in key assumptions impact investment outcomes.
- Learn how to perform scenario analysis to account for different possible future economic scenarios.

Introduction

"Capital budgeting and risk analysis" is a critical process in corporate finance that involves evaluating and selecting investment projects or capital expenditures to allocate a company's financial resources efficiently. This process is essential for making informed decisions about long-term investments in assets, projects, or ventures.

Capital budgeting, often referred to as investment appraisal, is the process by which a company assesses and decides which long-term investment projects to pursue. These projects typically involve substantial financial commitments and are expected to generate cash flows over an extended period. The primary goal of capital budgeting is to maximize the value of the firm by choosing projects that are expected to yield the highest return on investment.

Risk analysis is an integral part of the capital budgeting process, as all investment decisions involve a degree of uncertainty. Companies must assess and manage the risks associated with investment projects to make informed choices.

10.1 Net Present Value

Net Present Value (NPV) is a financial metric used in capital budgeting and investment analysis to evaluate the profitability of an investment or project. It represents the difference between the present value of cash inflows generated by the investment and the present value of cash outflows, including the initial investment cost. In other words, NPV measures the net benefit or value that an investment is expected to generate over its projected lifespan, in terms of today's value.

NPV is calculated by the following formula:

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+r)^t} - C_0$$

Where

- NPV = Net Present Value
- CF_t = Cash flow at time t (can be positive for inflows or negative for outflows)
- r = Discount rate, which represents the required rate of return or the cost of capital
- n = The number of time periods (usually years)
- C_0 = Initial investment cost (negative value)

Interpretation of NPV values

NPV Value	Explanation
Positive (+)	It indicates that the investment is expected to generate more cash inflows than the initial investment cost. The investment is considered financially attractive, and it is expected to add value to the company.
Negative (-)	It suggests that the investment is not expected to generate sufficient cash inflows to cover the initial investment cost. In this case, the project may not be financially viable or may not meet the required rate of return.
Zero (0)	It means that the investment is expected to exactly break even, generating cash flows that just cover the initial investment and the required return.

Following are the important points to consider when using NPV:

Time Value of Money: NPV takes into account the time value of money, which means that future cash flows are discounted back to their present value. This recognizes that money received or spent in the future is worth less than money received or spent today.

Discount Rate: The discount rate (often the company's cost of capital) represents the minimum rate of return required by the company to undertake the investment. It reflects the opportunity cost of capital.

Cash Flows: Accurate estimation of cash inflows and outflows is crucial for NPV calculation. Cash flows should include all relevant costs, revenues, and other financial impacts associated with the investment.

Project Comparison: NPV allows for the comparison of different investment projects by considering their respective NPVs. Projects with higher NPVs are generally preferred because they are expected to create more value for the company.

Consideration of Risk: When assessing NPV, it's important to account for the level of risk associated with the investment. This can be done by adjusting the discount rate or conducting sensitivity and scenario analyses.

Calculation of NPV

A company ABC corporation is considering an investment in a project that requires an initial investment of $100,000 and is expected to generate the following cash flows over a 5-year period:

Year 1: Rs.30,000

Year 2: Rs.40,000

Year 3: Rs.35,000

Year 4: Rs.25,000

Year 5: Rs.20,000

Assume the discount rate (required rate of return or cost of capital) for this project is 10%.

Calculate the NPV and decide about the worth of investing.

Solution:

Formula for NPV is:

$$NPV = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \frac{CF_4}{(1+r)^4} + \frac{CF_5}{(1+r)^5} - C_0$$

Where

- CF_t = Cash flow at time t
- r = Discount rate (10% or 0.10)
- C_0 = Initial investment cost ($100,000)

Substitute the values:

$$NPV = \frac{30,000}{(1+0.10)^1} + \frac{40,000}{(1+0.10)^2} + \frac{35,000}{(1+0.10)^3} + \frac{25,000}{(1+0.10)^4} + \frac{20,000}{(1+0.10)^5} - 100,000$$

NPV =

=	27272.73	+	33057.85	+	26296.02	+	17075.34	+	12418.43	-	100000.00
=	16120.36									

Alternatively it can be calculated using the following table:

CALCULATION OF NPV			
Year	Cash Flow	Present Value Factor	Present Value
C1	C2	C3	C2*C3
Year0	-100000	1	-100000
Year1	30000	0.909	27273
Year2	40000	0.826	33058
Year3	35000	0.751	26296
Year4	25000	0.683	17075
Year5	20000	0.621	12418
		Net Present Value	16120

Remarks:

1. The outflow value has depicted as negative as inflow values have been represented as positive value.
2. To get the present value factor please refer Unit 06 (Time value of money – Present Value calculations)

Analysis:

The value of NPV in the given project is 16120/- which is positive number. Since the NPV is positive, it indicates that the project is expected to generate a net benefit of 16120 in today's value, considering a 10% discount rate. Therefore, this project is financially attractive, as it is expected to create value for the company.

10.2 Internal Rate of Return

The Internal Rate of Return (IRR) is used in capital budgeting and investment analysis to assess the potential profitability and attractiveness of an investment project or series of cash flows. IRR is often expressed as a percentage, representing the discount rate at which the Net Present Value (NPV) of the project's cash flows becomes zero. In other words, it is the rate of return at which an investment breaks even in terms of its present value.

Calculation of IRR:

The formula for IRR is based on the concept that the sum of the present values of cash flows equals zero:

$$0 = \sum_{t=0}^{n} \frac{CF_t}{(1+IRR)^t}$$

Where:

- IRR = Internal Rate of Return (expressed as a percentage)
- CF_t = Cash flow at time t
- n = The number of time periods (usually years)

To find the IRR, one must solve this equation for IRR. This is typically done using numerical methods, financial calculators, or software tools, as it can be complex to solve algebraically.

Interpretation of IRR:

The IRR is interpreted as follows:

The Internal Rate of Return (IRR) is a financial metric used in capital budgeting and investment analysis to assess the potential profitability and attractiveness of an investment project or series of cash flows. IRR is often expressed as a percentage, representing the discount rate at which the Net Present Value (NPV) of the project's cash flows becomes zero. In other words, it is the rate of return at which an investment breaks even in terms of its present value.

Here's how to calculate and interpret the Internal Rate of Return:

Calculation of IRR:

The formula for IRR is based on the concept that the sum of the present values of cash flows equals zero:

$$0 = \sum_{t=0}^{n} \frac{CF_t}{(1+IRR)^t}$$

Where:

- IRR = Internal Rate of Return (expressed as a percentage)
- CF_t = Cash flow at time t
- n = The number of time periods (usually years)

To find the IRR, you must solve this equation for IRR. This is typically done using numerical methods, financial calculators, or software tools, as it can be complex to solve algebraically.

Interpretation of IRR:

The IRR is interpreted as follows:

Relationship between IRR and Cost of Capital	Explanation
IRR> required rate of return or cost of capital or hurdle rate	the project is considered financially attractive. In other words, the project is expected to generate a return higher than what the company expects to earn elsewhere, and it is generally worth pursuing.
IRR = required rate of return or cost of capital or hurdle rate	the project is expected to generate returns exactly equal to the company's cost of capital. In this case, the project is considered borderline, and further analysis may be needed to make a decision.
IRR < required rate of return or the cost of capital or hurdle rate	the project is not financially attractive, as it is expected to generate returns lower than the company's cost of capital. Such projects may be rejected in favor of more profitable opportunities.

Important Points for consideration:

Multiple IRRs: In some cases, there can be multiple IRRs, especially if the project's cash flows change direction (from positive to negative or vice versa) more than once during its lifespan. When dealing with such situations, financial analysts typically use the highest IRR that makes practical sense or rely on other decision criteria.

Non-Conventional Cash Flows: IRR is applicable to both conventional (i.e., a series of cash outflows followed by cash inflows) and non-conventional (i.e., changing cash flow patterns) projects. However, interpreting the IRR in the context of non-conventional cash flows may require additional judgment.

Size of Investment: IRR does not consider the absolute dollar amount of the investment. Therefore, it is important to assess the IRR in conjunction with other financial metrics, such as NPV, to understand the overall value and scale of the project.

Example

Calculate the Internal Rate of Return (IRR) for a XYZ investment project. Consider the project requires an initial investment of 50,000 and is expected to generate the following cash flows over a 5-year period:

Year 1: 15,000

Year 2: 12,000

Year 3: 10,000

Year 4: 9,000

Year 5: 8,000

Calculate IRR:

Enter the data in MS excel as follows:

In the cell B8 enter the formula as '=IRR(B2:B7)

It will look like as follows:

Year	Flow of amount
Year0	-50000
Year1	15000
Year2	12000
Year3	10000
Year4	9000
Year5	8000
	=IRR(B2:B7)

After pressing Enter key you get the result as follows:

Year	Flow of amount
Year0	-50000
Year1	15000
Year2	12000
Year3	10000
Year4	9000
Year5	8000
	3%

Approximate IRR for this investment project is 3.%. This means that if the project can earn a rate of return of 3% or higher, it would make sense to proceed with the investment, as it would generate a positive NPV and be considered financially attractive.

10.3 Pay Back and Discounted Payback Period

The Payback Period and Discounted Payback Period are two financial metrics used in capital budgeting to assess the time it takes for an investment to generate sufficient cash flows to recover its initial cost. These metrics help organizations evaluate the liquidity and risk associated with an investment project.

Payback Period:

The Payback Period is a simple and straightforward metric that calculates the time it takes for an investment to recoup its initial cost from the cash inflows it generates. In other words, it answers the question, "How long does it take to get back the money invested?"

Formula for Payback Period:

$$Payback\,Period = \frac{Initial\,Investment}{Annual\,Cash\,Flow}$$

Where:

Initial Investment is the cost of the investment.

Annual Cash Flow represents the net cash inflow generated by the project on an annual basis.

Interpretation of Payback Period:

A **shorter payback period** is generally preferable because it indicates that the investment recovers its initial cost more quickly.

Longer payback periods may be riskier as they imply a longer time frame for recouping the initial investment, potentially exposing the project to changes in the business environment.

The Payback Period does not consider the time value of money, making it less precise for assessing the profitability of investments with cash flows occurring at different points in time.

Discounted Payback Period

The Discounted Payback Period is an extension of the Payback Period that takes into account the time value of money by discounting future cash flows to their present value before calculating the payback period. This metric provides a more accurate picture of the investment's profitability.

To calculate the Discounted Payback Period, you first discount each cash flow back to its present value using a specified discount rate (usually the project's cost of capital or required rate of return). Then, you determine the time it takes for the cumulative discounted cash flows to equal or exceed the initial investment. The formula involves the following steps:

1. Calculate the present value (PV) of each cash flow using the discount rate:

$$PV = \frac{CF_t}{(1+r)^t}$$

Where:

-   PV is the present value of the cash flow at time t.
-   CF_t is the cash flow at time t.
-   r is the discount rate.
-   t is the time period.

2. Determine the cumulative discounted cash flows by adding the discounted cash flows over time.

3. Find the point at which the cumulative discounted cash flows equal or exceed the initial investment.

10.4 Sensitivity Analysis

Sensitivity Analysis is a financial modeling and risk assessment technique used in various fields, including finance, economics, and engineering, to evaluate how changes in key variables or assumptions can impact the outcomes or results of a model, project, or investment. It helps decision-makers understand the potential risks and uncertainties associated with their decisions by quantifying the sensitivity of these decisions to different factors.

Key Components of Sensitivity Analysis

Variables or Parameters: In a financial model or decision-making context, various variables or parameters are considered, such as revenue, cost, discount rate, growth rate, and more. These variables can be categorized as input variables (those being tested for sensitivity) and output variables (the resulting outcomes or metrics of interest).

Range of Values: Sensitivity analysis involves testing the impact of different values or scenarios for the selected input variables. Typically, you will vary these input variables within a predefined range or set of scenarios. For example, you might test the effect of a 5% increase and a 5% decrease in the discount rate.

Outcome Metrics: Determine the specific outcome metrics or performance indicators that you want to analyze. Common outcome metrics include Net Present Value (NPV), Internal Rate of Return (IRR), payback period, or any other relevant financial or non-financial metric.

Process of Sensitivity Analysis:

Identify Key Variables: Start by identifying the critical input variables that are likely to have a significant impact on your project's outcomes. These are typically variables that involve uncertainty or are subject to change.

Define Assumptions and Scenarios: Clearly specify the range of values or scenarios you want to test for each key variable. This can include optimistic, pessimistic, and base-case scenarios. For instance, you might consider a high, low, and base-case scenario for sales revenue.

Perform Calculations: Run your model or analysis with the different combinations of input values or scenarios, keeping track of how changes in the input variables affect the output metrics. This often involves recalculating NPV, IRR, or other relevant measures for each scenario.

Analyze Results: Examine the results to understand the sensitivity of your project or decision to changes in the input variables. Identify which variables have the most significant impact on the outcomes and how variations in those variables affect the results.

Draw Conclusions: Based on your analysis, draw conclusions about the robustness of your project or decision. Consider which scenarios are more likely to occur and what risk mitigation strategies can be employed if certain variables have a significant impact on the outcomes.

Benefits of Sensitivity Analysis:

Risk Assessment: Sensitivity analysis helps identify and quantify the risks associated with a project or decision by highlighting the sensitivity of outcomes to changes in key variables.

Informed Decision-Making: Decision-makers can make more informed and risk-aware decisions by understanding how different scenarios or assumptions can influence the project's success.

Optimization: Sensitivity analysis can help optimize resource allocation by focusing on areas that have the most significant impact on project performance.

Communication: It facilitates communication and stakeholder engagement by providing a clear picture of the potential risks and uncertainties.

10.5 Scenario Analysis

Scenario Analysis is a strategic planning and risk assessment technique used in various fields, including finance, economics, and business, to evaluate how different sets of assumptions or scenarios can impact the outcomes or results of a project, investment, or decision. It involves developing multiple plausible scenarios or "what-if" situations to assess the range of possible outcomes and their associated risks and opportunities.

Key Components of Scenario Analysis:

Scenarios: In Scenario Analysis, you create several distinct scenarios, each of which represents a different set of assumptions, conditions, or events that could potentially occur in the future. Scenarios are often divided into optimistic (best-case), pessimistic (worst-case), and base-case (most likely) scenarios, but you can create any number of scenarios based on your needs.

Assumptions: Each scenario is built upon a unique set of assumptions that describe the conditions or events that would characterize that particular scenario. These assumptions can cover a wide range of factors, including economic conditions, market trends, regulatory changes, technological advancements, and more.

Outcomes: Determine the specific outcome metrics or performance indicators that you want to analyze for each scenario. These metrics can include financial measures like Net Present Value (NPV), Internal Rate of Return (IRR), profitability, cash flow, or non-financial indicators like market share, customer satisfaction, or project timeline.

Process of Scenario Analysis:

Identify Critical Assumptions: Start by identifying the critical assumptions or factors that are most likely to influence the success or performance of your project, investment, or decision. These are the variables that you will vary in each scenario.

Create Scenarios: Develop a range of scenarios based on different combinations of assumptions. For example, you might create a scenario where the economy is booming (optimistic), one where it's in a recession (pessimistic), and one where it's stable (base case).

Perform Calculations: Run your analysis for each scenario, using the corresponding assumptions. Calculate the outcomes or metrics of interest under each scenario.

Analyze Results: Examine the results to understand how different scenarios affect the outcomes. Pay attention to variations in key metrics and assess the risks and opportunities associated with each scenario.

Draw Conclusions: Based on your analysis, draw conclusions about the potential range of outcomes and the likelihood of different scenarios occurring. Consider risk mitigation strategies and contingency plans based on the insights gained from the analysis.

Benefits of Scenario Analysis:

Risk Assessment: Scenario Analysis helps identify and assess potential risks and uncertainties by considering a range of possible future conditions or events.

Strategic Planning: It aids in strategic planning by allowing decision-makers to explore different strategies and responses for various scenarios.

Robust Decision-Making: Decision-makers can make more robust and adaptive decisions by accounting for the range of possible outcomes and adjusting their strategies accordingly.

Improved Communication: Scenario Analysis facilitates communication with stakeholders by providing a clear picture of the risks and opportunities associated with a project or decision.

Contingency Planning: It helps organizations develop contingency plans and risk management strategies to address adverse scenarios and capitalize on favorable ones.

Summary

Capital budgeting and risk analysis are essential processes in corporate finance that help organizations make informed decisions about allocating their financial resources to long-term investment projects. By evaluating the potential returns and risks associated with these projects, companies can make strategic choices that align with their overall business objectives and maximize shareholder value.

Net Present Value (NPV) is a powerful tool in financial analysis that helps organizations make informed investment decisions by quantifying the expected net financial benefit of an investment project while considering the time value of money and the cost of capital.

Internal Rate of Return (IRR) is a valuable tool for evaluating the potential profitability of investment projects. It helps decision-makers compare the expected returns of different projects and assess whether those returns meet the company's required rate of return, guiding them in making investment decisions.

Payback Period and Discounted Payback Period are valuable tools for assessing the liquidity and risk associated with an investment project. The Payback Period is simple but does not account for the time value of money, while the Discounted Payback Period provides a more accurate evaluation by considering the present value of cash flows. Both metrics should be used alongside other financial metrics for a comprehensive assessment of investment projects.

Sensitivity Analysis is a valuable tool for assessing the impact of changing variables and assumptions on the outcomes of financial models and investment decisions. It allows decision-makers to better understand the risks and uncertainties associated with their choices and make informed decisions that account for various scenarios and potential outcomes.

Scenario Analysis is a valuable tool for assessing the potential impact of different future scenarios on a project, investment, or decision. It provides decision-makers with a more comprehensive view of risks and opportunities, enabling them to make informed and adaptive choices in an uncertain environment.

Keywords

Capital Budgeting, Investment Analysis, Risk Assessment, Discounted Cash Flow (DCF), Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period, Sensitivity Analysis, Scenario Analysis, Risk Management

Self Assessment

1. What is the primary objective of capital budgeting?
A. Maximizing short-term profits
B. Minimizing operational costs
C. Maximizing the value of the firm
D. Achieving market share growth

2. In capital budgeting, what does NPV stand for?
A. Net Profit Value
B. New Project Valuation
C. Net Present Value

D. Nominal Project Valuation

3. Which financial metric accounts for the time value of money in capital budgeting analysis?
A. Payback Period
B. Accounting Rate of Return (ARR)
C. Net Present Value (NPV)
D. Profitability Index (PI)

4. If the IRR of an investment project is higher than the company's required rate of return, the project is considered:
A. Risky
B. Unattractive
C. Financially attractive
D. Infeasible

5. What is the payback period of an investment project that costs 100,000 and generates an annual cash flow of 25,000?
A. 2 years
B. 3 years
C. 4 years
D. 5 years

6. What is the primary purpose of sensitivity analysis in financial modeling?
A. To determine the best-case scenario
B. To identify the worst-case scenario
C. To assess the impact of changes in key variables on outcomes
D. To calculate the Net Present Value (NPV) of a project

7. In sensitivity analysis, which of the following best describes the "base case"?
A. The most optimistic scenario
B. The scenario with the highest risk
C. The scenario with no changes in input variables
D. The most pessimistic scenario

8. When conducting sensitivity analysis, what does it mean if a project is highly sensitive to changes in a particular variable?
A. Changes in that variable have no impact on the project's outcomes
B. Small changes in that variable result in significant changes in the project's outcomes
C. The project is not affected by any changes in variables
D. Sensitivity analysis is not applicable to the project

9. Which of the following is NOT a factor that affects NPV?

A. Discount rate

B. Cash flows

C. Time period

D. Risk

10. Which of the following is the correct formula for calculating NPV?

A. NPV = Present value of cash inflows - Present value of cash outflows

B. NPV = Future value of cash inflows - Future value of cash outflows

C. NPV = Net cash flows / Discount rate

D. NPV = Present value of cash inflows * Discount rate

11. Which of the following is the correct interpretation of a positive NPV?

A. The project is expected to generate a profit.

B. The project is worth investing in.

C. The project is less risky than other projects.

D. The project is more likely to succeed than other projects.

12. Which of the following is the correct interpretation of a negative NPV?

A. The project is expected to generate a loss.

B. The project is not worth investing in.

C. The project is more risky than other projects.

D. The project is less likely to succeed than other projects.

13. Which of the following is the correct interpretation of a zero NPV?

A. The project is expected to break even.

B. The project is worth investing in if the discount rate is lowered.

C. The project is worth investing in if the discount rate is raised.

D. The project is not worth investing in if the discount rate is lowered.

14. What is scenario analysis?

A. A process of identifying and assessing the potential impact of different future events on a business or project.

B. A method of forecasting future financial performance.

C. A technique for managing risk.

D. All of the above.

15. What are the three main types of scenarios?

A. Best-case, worst-case, and most likely scenarios.

B. Upside, downside, and balanced scenarios.

C. Internal, external, and strategic scenarios.

D. All of the above.

Answers for Self Assessment

1.	**C**	2.	C	3.	C	4.	C	5.	C
6.	C	7.	C	8.	B	9.	D	10.	A
11.	B	12.	B	13.	A	14.	D	15.	A

Review Questions

1. How do you calculate Net Present Value (NPV), and what does a positive NPV indicate?
2. Explain the significance of the discount rate in DCF analysis.
3. What is the Internal Rate of Return (IRR), and how is it different from the cost of capital?
4. Describe what sensitivity analysis is and provide an example of how it can be applied in capital budgeting.
5. Explain how scenario analysis differs from sensitivity analysis and when each is most appropriate.
6. Describe the concept of the time value of money (TVM) and its relevance in capital budgeting.

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

Web Link

- https://corporatefinanceinstitute.com/resources/financial-modeling/financial-**forecasting-guide/**
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Dr. Ajit Kumar, Lovely Professional University

Unit 11: Analysis of Bonds and Long Term Financing

Objectives

After studying this unit, you will be able to:

- Calculate the present value of future bond cash flows using discounting techniques.
- Understand the relationship between bond prices, interest rates, and yields.
- Calculate and interpret the yield to maturity (YTM) and yield to call (YTC) for callable bonds.
- Understand the concept of current yield and yield spread.
- Calculate and interpret bond duration and convexity to assess interest rate risk.

Introduction

"Analysis of bonds and long-term financing" refers to the process of evaluating and assessing various aspects of bonds and other forms of long-term financial instruments that a company uses to raise capital for its operations and growth. This analysis is crucial for both investors and the issuing company to make informed decisions regarding investment, risk management, and financial planning.

Key components of the analysis of bonds and long-term financing:

Bond Characteristics: Understanding the specific features of the bonds being analyzed is essential. This includes details such as the bond's face value, maturity date, coupon rate (the interest rate paid to bondholders), and any special provisions or covenants.

Creditworthiness: Evaluating the creditworthiness of the issuer is a critical aspect of bond analysis. This involves assessing the issuer's financial health, credit rating, and ability to meet its debt obligations. Credit rating agencies like Moody's, Standard & Poor's, and Fitch provide ratings that can assist in this evaluation.

Market Conditions: Analyzing the prevailing market conditions, including interest rates and the overall economic environment, is essential. Changes in interest rates can impact the value of existing bonds and the cost of issuing new ones.

Risk Assessment: Assessing the risks associated with the bonds is crucial. This includes interest rate risk (how changes in interest rates affect bond prices), credit risk (the risk of the issuer defaulting on interest or principal payments), and liquidity risk (the ease with which the bonds can be bought or sold in the secondary market).

Yield Analysis: Calculating the yield on a bond is important for investors. Yield includes both the interest income (coupon) and any potential capital gains or losses if the bond is bought or sold at a different price than its face value. Different yield measures, such as current yield, yield to maturity, and yield to call, provide insights into potential returns.

Comparative Analysis: Investors and issuers often compare bonds with similar characteristics to assess their relative attractiveness. This may involve comparing bonds of the same issuer, bonds with similar maturities, or bonds in the same industry.

Use of Proceeds: Understanding how the funds raised through long-term financing will be used is important. Companies may issue bonds to fund capital projects, repay existing debt, or for other strategic purposes. Investors want to know that the funds will be used wisely and generate future cash flows.

Legal and Regulatory Considerations: Complying with legal and regulatory requirements is crucial for both issuers and investors. Bonds must adhere to securities laws, and issuers need to ensure they meet their obligations under bond agreements.

Tax Implications: Bond investments can have tax implications for both issuers and investors. Understanding the tax treatment of interest income and potential tax benefits is part of the analysis.

Exit Strategy: Investors also consider their exit strategy. They evaluate when and how they can sell the bonds if needed, especially if they are trading in the secondary market.

11.1 Valuation of Bonds

Bond valuation is the process of determining the fair market value of a bond, which is a debt instrument that pays periodic interest (coupon payments) to the bondholder and returns the bond's face value (principal) at maturity. Bond valuations are essential for investors, financial analysts, and issuers to understand the bond's worth, make investment decisions, and assess risk. There are several methods to evaluate bond values, including the following key approaches:

(i) Present Value (PV) Approach

- The most common method for valuing bonds is the present value approach. It calculates the present value of all future cash flows (interest payments and the face value) generated by the bond.

- The formula for calculating the present value of a bond's cash flows is:

Bond Value = $(C_1 / (1 + r)^1) + (C_2 / (1 + r)^2) + ... + (C_n / (1 + r)^n) + (FV / (1 + r)^n)$

Where:

- C_1, C_2, ..., C_n are the periodic coupon payments.

- FV is the face value of the bond.

- r is the discount rate, which is typically the prevailing market interest rate for bonds with similar risk profiles and maturities.

(ii) Yield to Maturity (YTM) Approach

- YTM is the rate of return an investor can expect to earn from a bond if it is held until maturity. It is often used as a benchmark for bond valuation.
- Bond value is calculated by equating the present value of the bond's cash flows to its market price, and solving for the discount rate (YTM) in the present value formula.
- Investors compare the YTM to the bond's coupon rate to determine whether the bond is trading at a premium (YTM < Coupon Rate), par (YTM = Coupon Rate), or discount (YTM > Coupon Rate).

(iii) **Bond Pricing Models:** There are specialized bond pricing models, such as the Black-Scholes model for options-embedded bonds and the binomial model for callable or putable bonds. These models account for features like embedded options, which can affect the bond's value.

(iv) **Zero-Coupon Bonds:** Zero-coupon bonds do not pay periodic interest. Instead, they are sold at a discount to face value and mature at face value. Bond valuation for zero-coupon bonds is straightforward because there are no coupon payments to consider. The bond value is simply calculated as:

$$\text{Bond Value} = FV / (1 + r)^n$$

Where:

- FV is the face value of the bond.
- r is the discount rate.
- n is the number of years until maturity.

(v) **Relative Valuation:** Bonds are also valued relative to other bonds with similar characteristics, such as credit quality, maturity, and coupon rate. The prices of comparable bonds in the market can provide insights into a bond's fair value.

(vi) **Credit Risk Assessment:** The bond's credit rating and credit spreads (the additional yield required by investors for taking on credit risk) can influence its valuation. Bonds with lower credit ratings typically trade at a higher yield (lower price) to compensate for the added risk.

11.2 Current Yield

Current yield is a financial metric used to assess the annual income generated by an investment relative to its current market price. It's a simple way to measure the return an investor can expect to receive from an investment in the form of periodic interest or dividend payments. Current yield is typically expressed as a percentage and is calculated using the following formula:

$$\text{Current Yield} = \frac{\text{Annual Income}}{\text{Current Market Price}} \times 100\%$$

Where:

"Annual Income" represents the annual interest, dividend, or coupon payments received from the investment.

"Current Market Price" is the current market value or price of the investment.

Example:

Suppose you are considering investing in a corporate bond. This bond has a face value of Rs.1,000, a coupon rate of 5%, and it is currently trading in the market at Rs.950.

Calculate the annual income (interest) from the bond:

The coupon rate is 5%, which means the bond pays 5% of its face value as interest annually.

Annual Interest = Rs.1,000 (Face Value) * 5% (Coupon Rate) = Rs.50

Determine the current market price of the bond, which is Rs.950.

Solution:

Calculate the current yield:

Current Yield = (Rs.50 Annual Income) / (Rs.950 Current Market Price) * 100% = 5.26%

So, the current yield of this bond is 5.26%. This means that if you invest in this bond at its current market price of Rs. 950, you can expect to receive an annual return of approximately 5.26% of your investment in the form of interest payments.

11.3 Bond Equivalent Yield

Bond Equivalent Yield (BEY), also known as the "bond equivalent rate" or "semi-annual yield," is a method for annualizing the yield of a short-term money market instrument, such as a Treasury bill or a certificate of deposit (CD), that pays interest on a semi-annual basis. This measure allows investors to compare the yield of these instruments with bonds and other investments that typically pay interest on an annual basis. The formula for calculating the Bond Equivalent Yield (BEY) is as follows:

$$BEY = \left(\frac{2 \times \text{Discount}}{\text{Face Value}} \right) \times \left(\frac{365}{\text{Days to Maturity}} \right)$$

Where:

"Discount" is the difference between the face value of the instrument and its purchase price.

"Face Value" is the nominal or par value of the instrument.

"Days to Maturity" is the number of days remaining until the instrument matures.

Key points about Bond Equivalent Yield (BEY):

Semi-Annual Payments: BEY is used for money market instruments that make semi-annual interest payments. These payments are typically equal to half of the annual coupon rate.

Annualization: BEY annualizes the yield, allowing for easier comparison with other investments that have annual interest payments. It essentially calculates the annual yield for a semi-annual interest-paying instrument.

365-Day Basis: The formula uses a 365-day basis for annualization. This is common in financial markets, although some variations may use a 360-day basis, especially for Treasury bills.

Discount or Yield: Depending on the information available, you can use either the discount (the difference between the purchase price and face value) or the yield (the interest rate) in the formula. The choice depends on what information is given or needed for calculation.

Example:

Suppose you purchase a 6-month Treasury bill with a face value of $10,000 for $9,900. The number of days to maturity is 180 days.

Using the BEY formula:

$$BEY = \left(\frac{2 \times (\$10,000 - \$9,900)}{\$10,000} \right) \times \left(\frac{365}{180} \right)$$

$$BEY = \left(\frac{2 \times \$100}{\$10,000} \right) \times 2.0278$$

$$BEY \approx 4.056\%$$

The Bond Equivalent Yield in this example is approximately 4.056%. This means that on an annualized basis, this Treasury bill is expected to yield around 4.056%, assuming all other factors remain constant.

11.4 Macaulay Duration

Macaulay Duration, named after Canadian economist Frederick Macaulay, is a fundamental concept in finance that measures the weighted average time it takes for an investor to receive the cash flows from an investment, such as a bond. It is a crucial tool for assessing the interest rate risk and price sensitivity of fixed-income securities, helping investors and portfolio managers make informed decisions. The Macaulay Duration of an investment is calculated using the following formula:

$$\text{Macaulay Duration} = \sum_{t=1}^{n} \left(\frac{t \cdot CF_t}{(1 + YTM)^t} \right)$$

Where:

- t represents each time period (e.g., year or semi-annual period).
- CF_t is the cash flow (usually, coupon payment or principal repayment) at time t.
- YTM is the yield to maturity, which represents the expected rate of return on the investment.

Key points to understand about Macaulay Duration:

Weighted Average: Macaulay Duration calculates the weighted average time until the bond's cash flows are received, with each cash flow discounted to its present value. The weights are determined by the size of each cash flow relative to the total present value of all cash flows.

Interest Rate Sensitivity: Macaulay Duration is a measure of interest rate sensitivity. It indicates how much the bond's price will change in response to changes in interest rates. Longer durations imply greater price sensitivity to interest rate changes.

Units of Time: The Macaulay Duration is expressed in terms of time, typically in years. It represents the approximate time it would take for an investor to recover the bond's initial investment through its periodic cash flows.

Zero-Coupon Bonds: For zero-coupon bonds, where there are no periodic coupon payments, the Macaulay Duration is equal to the bond's time to maturity. This is because all cash flows occur at the bond's maturity date.

Interest Rate Effect: Macaulay Duration is inversely related to the yield to maturity. As interest rates rise, the Macaulay Duration decreases, indicating that the bond's price is less sensitive to interest rate changes. Conversely, as interest rates fall, the Macaulay Duration increases, indicating greater price sensitivity.

Reinvestment Assumption: Macaulay Duration assumes that the cash flows received from the investment are reinvested at the same yield to maturity as the bond itself, which may not always be realistic.

11.5 Modified Duration

Modified Duration is a financial metric that measures the sensitivity of the price of a fixed-income investment, such as a bond, to changes in interest rates. It provides investors with an estimate of how much the bond's price will change in response to a one percentage point (1%) change in its yield to maturity (YTM). Modified Duration is a useful tool for managing interest rate risk in a fixed-income portfolio. The formula for calculating Modified Duration is as follows:

$$\text{Modified Duration} = \frac{\text{Macaulay Duration}}{1 + YTM}$$

Where:

"Macaulay Duration" is the weighted average time it takes for an investor to receive the bond's cash flows, as explained in the previous response.

"YTM" is the bond's yield to maturity, which represents the expected rate of return on the investment.

Key points to understand about Modified Duration

Sensitivity to Interest Rates: Modified Duration provides a measure of how sensitive a bond's price is to changes in interest rates. A higher Modified Duration indicates greater price sensitivity, implying that the bond's price will change more for a given change in interest rates.

Units of Measure: Modified Duration is expressed in years, just like Macaulay Duration. It represents the approximate time it would take for an investor to recover the bond's price through its periodic cash flows, adjusted for the impact of interest rate changes.

Inverse Relationship: There is an inverse relationship between Modified Duration and changes in interest rates. If interest rates rise, the bond's price will fall, and the Modified Duration will tell you approximately how much it will fall. Conversely, if interest rates fall, the bond's price will rise, and the Modified Duration will tell you approximately how much it will rise.

Zero-Coupon Bonds: For zero-coupon bonds, where there are no periodic coupon payments, the Modified Duration is equal to the bond's time to maturity.

Interest Rate Risk Management: Portfolio managers use Modified Duration to assess and manage interest rate risk in a bond portfolio. By adjusting the portfolio's Modified Duration, they can align it with their risk tolerance and investment objectives.

Convexity: While Modified Duration provides a linear approximation of price changes with respect to interest rate changes, it doesn't capture the curvature in the price-yield relationship. To address this, investors often use another measure called "convexity" alongside Modified Duration to refine their interest rate risk assessments.

11.6 Convexity

Convexity is a financial concept used to measure the curvature or the nonlinear relationship between a bond's price and changes in its yield to maturity (YTM). It is an important risk management tool for fixed-income investors and portfolio managers because it provides additional insights into how bond prices may change in response to interest rate movements beyond what is captured by modified duration alone.

Key points to understand about convexity:

Nonlinear Relationship: Unlike modified duration, which provides a linear estimate of bond price changes in response to changes in YTM, convexity accounts for the curvature in the bond's price-yield curve. In other words, it recognizes that the relationship between bond prices and interest rates is not perfectly linear.

Positive Convexity: Most bonds exhibit positive convexity. This means that as yields decrease, bond prices rise at an increasing rate, and as yields increase, bond prices fall at a decreasing rate. In

simpler terms, bond prices tend to be more responsive to declining interest rates than to rising interest rates.

Measuring Convexity: Convexity is calculated using the following formula:

$$\text{Convexity} = \frac{1}{(1+YTM)^2} \sum_{t=1}^{n} \left(\frac{t \cdot (t+1) \cdot CF_t}{(1+YTM)^t} \right)$$

Where:

* t represents each time period.
* CF_t is the cash flow (usually, coupon payment or principal repayment) at time t.
* YTM is the bond's yield to maturity.

Impact of Convexity: Convexity helps investors understand that the bond's price response to interest rate changes is not purely linear. When interest rates change, convexity provides insight into whether the bond's price will change more or less than what modified duration alone would suggest. It can be especially valuable when assessing the risk and return trade-offs in a bond portfolio.

Risk Management: Portfolio managers use convexity as part of their risk management strategy. By considering both modified duration and convexity, they can better assess how changes in interest rates will affect the overall portfolio's value. This can inform decisions related to asset allocation and interest rate hedging strategies.

Limitations: Convexity calculations can be more complex than modified duration calculations, and they may require computer software or financial calculators to perform accurately. Additionally, convexity provides better accuracy for bonds with substantial coupon payments and longer maturities, as they exhibit more pronounced convexity.

Summary

The analysis of bonds and long-term financing involves a thorough examination of the financial instruments, the issuer's creditworthiness, market conditions, risks, and various other factors to make informed investment decisions or manage a company's capital structure effectively. It is a critical process for both investors and the entities that issue bonds to ensure financial stability and growth.

Bond valuations are a critical part of fixed-income investing and financial analysis. The choice of valuation method depends on the bond's characteristics and the investor's objectives. Whether calculating bond values through present value, YTM, or specialized models, understanding bond valuation is essential for making informed investment decisions and managing risk in the bond market.

It's important to note that while current yield provides a simple way to estimate the return on an investment, it doesn't take into account potential changes in the market price of the investment or the time value of money. Therefore, it should be used in conjunction with other financial metrics when making investment decisions. Additionally, current yield is more relevant for fixed-income securities like bonds and dividend-paying stocks, where income is a significant component of returns.

Investors use BEY to make more accurate comparisons between money market instruments and bonds or other investments with different interest payment frequencies. It helps in assessing which investment offers the best yield relative to the investor's needs and risk tolerance.

Macaulay Duration is a valuable tool for investors and portfolio managers to assess the interest rate risk of fixed-income investments. It helps them understand how changes in interest rates can impact the bond's price and make more informed decisions regarding portfolio construction and risk management. A shorter Macaulay Duration implies lower interest rate risk, while a longer Macaulay Duration implies higher interest rate risk.

Modified Duration is a critical tool for fixed-income investors and portfolio managers to gauge the impact of interest rate changes on bond prices. It helps them make more informed investment decisions and manage their portfolios effectively by adjusting the portfolio's Modified Duration to align with their risk preferences and market conditions.

Convexity is a valuable tool for fixed-income investors and portfolio managers, helping them understand the nonlinear relationship between bond prices and interest rate changes. It provides a more comprehensive view of how bond prices may respond to fluctuations in yields and allows for more precise risk management in fixed-income portfolios.

Keywords

Bond Valuation, Yield to Maturity (YTM), Current Yield, Bond Pricing Models, Macaulay Duration

Modified Duration, Convexity, Coupon Rate, Face Value (Par Value), Yield Curve, Bond Spreads

Self Assessment

1. What is the face value of a bond also known as?

A. Coupon rate

B. Par value

C. Yield to maturity (YTM)

D. Current yield

2. Which of the following components is NOT typically used in bond valuation?

A. Coupon payments

B. Face value

C. Market price

D. Dividend yield

3. What does the yield to maturity (YTM) of a bond represent?

A. The annual income generated by the bond.

B. The current market price of the bond.

C. The expected rate of return for an investor who holds the bond until maturity.

D. The bond's credit rating.

4. Which bond valuation method calculates the present value of all future cash flows generated by a bond?

A. Coupon rate

B. Current yield

C. Macaulay Duration

D. Present value

5. Macaulay Duration measures the bond's:

A. Annual income

B. Credit risk

C. Price sensitivity to changes in interest rates

D. Liquidity

6. What does Modified Duration assess in bond valuation?

A. Bond's credit rating
B. Bond price sensitivity to changes in interest rates
C. Bond liquidity
D. Bond's face value

7. Convexity is used in bond valuation to measure:

A. The bond's credit risk
B. The curvature in the bond price-yield relationship
C. The bond's current market price
D. The bond's coupon rate

8. When market interest rates rise, how does bond price typically respond?

A. Bond price rises
B. Bond price remains unchanged
C. Bond price falls
D. Bond price becomes more volatile

9. Which bond characteristic typically has the greatest impact on bond price sensitivity to interest rate changes?

A. Maturity date
B. Face value
C. Coupon rate
D. Credit rating

10. When calculating the Current Yield of a bond, which of the following is NOT needed?

A. Annual Income
B. Current Market Price
C. Face Value
D. Yield to Maturity (YTM)

11. What is the primary purpose of bond convexity in bond valuation?

A. To calculate the bond's annual income
B. To assess the bond's credit risk
C. To provide insight into how bond prices change in response to changes in YTM
D. To determine the bond's face value

12. What term describes the relationship between a bond's yield and its time to maturity?

A. Yield curve

B. Bond duration

C. Macaulay Duration

D. Face value

13. A bond's Current Yield is calculated as:

A. Annual income divided by face value

B. Face value divided by annual income

C. Face value divided by current market price

D. Current market price divided by face value

14. Which of the following bonds is likely to have the highest price sensitivity to interest rate changes?

A. A bond with a short time to maturity

B. A bond with a high coupon rate

C. A zero-coupon bond

D. A bond with a long time to maturity and a low coupon rate

15. What is the key difference between a coupon payment and a bond's yield to maturity (YTM)?

A. Coupon payments are fixed, while YTM fluctuates with market conditions

B. Coupon payments represent the bond's market price, while YTM is the par value

C. Coupon payments are received at bond issuance, while YTM is received at maturity

D. Coupon payments are the annual interest payments, while YTM is the total return over the bond's life

Answers for Self Assessment

1.	**B**	2.	D	3.	C	4.	D	5.	C
6.	B	7.	B	8.	C	9.	A	10.	C
11.	C	12.	A	13.	A	14.	D	15.	D

Review Questions

1. What is bond valuation and why it's important in finance?

2. What are the key components of a bond's cash flows, and how do they contribute to bond valuation?

3. Describe the difference between the coupon rate and the yield to maturity (YTM) of a bond. How are they related to bond valuation?

4. How does the concept of present value apply to bond valuation, and why is it used?

5. What is the formula for calculating the current yield of a bond, and how can it be useful to investors?

6. Explain the concept of Macaulay Duration? How is it calculated, and what does it tell us about a bond's price sensitivity to interest rate changes?

7. What is Modified Duration, and why is it considered a better measure of bond price sensitivity to interest rate changes compared to Macaulay Duration?

8. How does convexity complement Modified Duration in assessing bond price sensitivity? Why is convexity important in bond valuation?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)

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Dr. Ajit Kumar, Lovely Professional University

Unit 12: Financial Risk Measurement and Analysis

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Objectives

After studying this unit, you will be able to:

- Understanding Fixed Income Instruments
- Describe the primary risks associated with fixed income investments.
- Understand the quantitative measures used to assess risk in fixed income markets
- Analyze how changes in interest rates impact bond prices and yields, and quantify interest rate risk using duration and convexity.
- Analyze the impact of reinvestment risk on fixed income investments and explore strategies to address this risk.

Introduction

Financial risk measurement is the process of quantifying and assessing the various types of risks that a financial institution, organization, or individual faces in the realm of finance and investments. These risks can arise from a variety of sources, including market fluctuations, credit exposure, operational mishaps, and economic changes. Understanding and measuring these risks is essential for making informed decisions about managing and mitigating them.

Types of Financial Risks:

Market Risk: This risk arises from fluctuations in financial markets, such as changes in interest rates, exchange rates, commodity prices, and stock market volatility. Market risk can be measured through techniques like Value at Risk (VaR) and stress testing.

Credit Risk: Also known as default risk, credit risk refers to the possibility that a borrower or counterparty will fail to meet their financial obligations. Credit risk measurement involves assessing the creditworthiness of borrowers and calculating potential losses in case of defaults.

Operational Risk: This risk is associated with internal processes, systems, and human error. Operational risk measurement aims to identify weaknesses in operational procedures and assess the potential impact of operational failures on financial outcomes.

Liquidity Risk: Liquidity risk refers to the inability to quickly convert assets into cash without significant loss. Measuring liquidity risk involves assessing the availability of liquid assets and the ability to meet short-term financial obligations.

Reputation Risk: Reputation risk arises from damage to an organization's reputation, which can lead to financial losses. Measuring reputation risk involves assessing public perception, customer trust, and the potential financial impact of a damaged reputation.

Quantitative and Qualitative Measures

Financial risk measurement combines quantitative methods (using mathematical models and statistical tools) and qualitative assessments (considering subjective factors like management competence, industry trends, and regulatory changes). Combining both approaches provides a more comprehensive understanding of risks.

12.1 Risk Measurement in Fixed Income Markets

Risk measurement in fixed income markets refers to the assessment and quantification of various types of risks associated with investments in fixed income securities. Fixed income securities are financial instruments that pay a fixed amount of interest income at regular intervals and return the principal amount at maturity. These securities include government bonds, corporate bonds, municipal bonds, and other debt instruments. Managing risk in fixed income markets is crucial for investors, as it helps them make informed investment decisions and protect their capital. Here are some key aspects of risk measurement in fixed income markets:

1. Interest Rate Risk

Interest rate risk is one of the primary risks in fixed income markets. It arises from changes in interest rates, which can affect the market value of fixed income securities. When interest rates rise, the market value of existing fixed-rate bonds typically falls, and vice versa. To measure interest rate risk, investors often use duration and convexity.

Duration: Duration is a measure of the sensitivity of a bond's price to changes in interest rates. It provides an estimate of how much the bond's price will change for a given change in interest rates. Longer-duration bonds are more sensitive to interest rate changes.

Convexity: Convexity is a measure that helps refine the estimate provided by duration. It accounts for the curvature in the relationship between bond prices and interest rates. Bonds with higher convexity are less sensitive to interest rate changes and exhibit less price volatility.

2.Credit Risk:

Credit risk, also known as default risk, is the risk that the issuer of a fixed income security will fail to make interest payments or repay the principal amount at maturity. To measure credit risk, investors rely on credit ratings provided by credit rating agencies such as Standard & Poor's and Moody's. These agencies assign ratings to bonds based on their assessment of the issuer's creditworthiness. Lower-rated bonds generally carry higher credit risk.

3. Liquidity Risk:

Liquidity risk in fixed income markets refers to the difficulty of buying or selling a security at a reasonable price without significantly affecting its market price. Less liquid bonds may have wider bid-ask spreads and can be more challenging to trade. Measuring liquidity risk involves considering factors like trading volume, bid-ask spreads, and market depth.

4.Reinvestment Risk:

Reinvestment risk is the risk that future cash flows (such as coupon payments) may need to be reinvested at lower interest rates than the original investment. This can lead to lower overall

returns than expected. Investors measure reinvestment risk when evaluating the potential impact on future cash flows.

5. Call and Prepayment Risk:

Some fixed income securities, such as callable bonds and mortgage-backed securities, have call options that allow issuers to redeem the bonds before maturity. This introduces call risk and prepayment risk, which can affect the expected cash flows and returns of these securities. Risk measurement in this context involves analyzing the likelihood and timing of call or prepayment events.

6. Yield Curve Risk:

Yield curve risk reflects the sensitivity of a fixed income portfolio to changes in the shape and slope of the yield curve (the relationship between interest rates and time to maturity). A steepening or flattening yield curve can impact the performance of fixed income investments.

7. Market Risk and Macroeconomic Factors:

Fixed income markets can be influenced by broader market risk factors and macroeconomic conditions, such as economic growth, inflation, and geopolitical events. Risk measurement often includes an analysis of these external factors and their potential impact on fixed income securities.

12.2 Market Risk Analysis

Market risk analysis is a process used by individuals, investors, financial institutions, and organizations to assess and quantify the potential financial losses or gains that may result from adverse movements in financial markets. Market risk, also known as systematic risk or non-diversifiable risk, is the risk that arises from various factors that affect entire markets or segments of the financial markets. Understanding and analyzing market risk is crucial for making informed investment decisions, managing portfolios, and ensuring the stability of financial institutions. Here are the key components and methods involved in market risk analysis:

Types of Market Risk

Equity Market Risk: This type of risk is associated with fluctuations in stock prices. Investors are exposed to equity market risk when they hold stocks or equity-based investment products like mutual funds and exchange-traded funds (ETFs).

Interest Rate Risk: Interest rate risk pertains to changes in interest rates, particularly in the bond market. It can affect the prices of fixed-income securities, such as bonds. When interest rates rise, bond prices typically fall, and vice versa.

Currency Risk (Foreign Exchange Risk): Currency risk arises when investments or business activities involve transactions in multiple currencies. Changes in exchange rates can impact the value of foreign investments and affect international trade.

Commodity Price Risk: This risk is associated with investments in commodities like oil, gold, and agricultural products. Commodity prices can be highly volatile due to factors such as supply and demand imbalances and geopolitical events.

Volatility Risk: Volatility risk refers to the potential for sharp and unpredictable price swings in financial markets. High market volatility can lead to rapid and unexpected gains or losses.

Quantitative Measures

Value at Risk (VaR): VaR is a widely used quantitative measure in market risk analysis. It estimates the maximum potential loss, within a specified confidence level and time horizon, that an investment or portfolio may incur due to adverse market movements. VaR can be calculated using

various statistical methods, such as historical simulation, parametric models, and Monte Carlo simulations.

Beta Coefficient: Beta measures the sensitivity of an asset's returns to market movements. An asset with a beta of 1.0 moves in line with the overall market, while a beta greater than 1.0 indicates greater volatility, and a beta less than 1.0 suggests lower volatility relative to the market.

Standard Deviation: Standard deviation measures the historical volatility of an investment's returns. Higher standard deviation values indicate greater price volatility.

Scenario Analysis

Market risk analysis often involves conducting scenario analysis, where different hypothetical scenarios are considered to assess how a portfolio or investment would perform under various adverse conditions. For example, one might analyze the impact of a significant interest rate hike or a sudden drop in stock prices.

Stress Testing

Stress testing goes a step further than scenario analysis by subjecting a portfolio or investment to extreme and unlikely market scenarios. It helps identify vulnerabilities and potential losses under severe market conditions.

Correlation Analysis:

Understanding the correlations between different asset classes and investments is essential for diversifying a portfolio effectively. Low or negative correlations between assets can help reduce overall market risk.

Risk Management Strategies:

Based on the results of market risk analysis, investors and financial institutions can implement risk management strategies, such as asset allocation, diversification, hedging with derivatives, and setting stop-loss orders, to mitigate and manage market risk effectively.

12.3 Credit Risk Measurement

Credit risk measurement, also known as credit risk analysis or credit risk assessment, is the process of evaluating and quantifying the risk that a borrower or counterparty will fail to meet their financial obligations, particularly the repayment of debt or the fulfillment of contractual obligations. Credit risk is a fundamental concern for financial institutions, lenders, investors, and organizations that extend credit or engage in lending activities. Accurate credit risk measurement is crucial for making informed lending decisions, setting appropriate interest rates, and managing credit portfolios.

Types of Credit Risk:

Default Risk: Default risk is the risk that a borrower will fail to make interest or principal payments on time or at all. It is the primary focus of credit risk measurement and analysis.

Credit Spread Risk: Credit spread risk arises from changes in the difference (spread) between the yield on a risky debt instrument and a risk-free benchmark, such as government bonds. It reflects changes in market perceptions of credit risk.

Migration Risk: Migration risk is the risk that a borrower's creditworthiness may change over time, leading to upgrades or downgrades in their credit rating. This can affect the value of a debt instrument.

Concentration Risk: Concentration risk arises from having a large portion of a credit portfolio exposed to a particular sector, industry, or counterparty. A downturn in that area can result in significant losses.

Quantitative Measures

Credit Ratings: Credit rating agencies, such as Standard & Poor's, Moody's, and Fitch, assign credit ratings to borrowers and debt instruments based on their assessment of creditworthiness. These ratings serve as a widely accepted quantitative measure of credit risk.

Probability of Default (PD): PD is a measure that estimates the likelihood that a borrower will default on their debt obligations within a specific time frame, often expressed as a percentage.

Loss Given Default (LGD): LGD represents the expected loss, as a percentage of the total exposure, in the event of a borrower's default. It considers factors like collateral and recovery rates.

Exposure at Default (EAD): EAD measures the amount of exposure (e.g., outstanding loan amount) at the time of a borrower's default. It is used to calculate potential credit losses.

Credit Risk Models: Financial institutions often use mathematical models, such as logistic regression, machine learning, and credit scoring models, to assess credit risk. These models consider a range of variables, including the borrower's credit history, financial ratios, industry trends, and economic conditions.

Qualitative Assessment

Credit Analysis: In-depth credit analysis involves evaluating the financial health and stability of borrowers, including their income, cash flow, balance sheet, and business operations. Qualitative factors like management competence and industry conditions are also considered.

Credit Risk Policy and Procedures: Establishing clear credit risk policies and procedures is essential for consistent and systematic credit risk measurement and management within an organization.

Stress Testing: Stress testing involves assessing how borrowers and a credit portfolio would perform under adverse economic scenarios, such as economic recessions or financial crises. It helps identify vulnerabilities and potential losses.

Risk Mitigation and Management: Once credit risk is measured and assessed, lenders and financial institutions can implement risk mitigation strategies. These strategies may include diversifying the credit portfolio, setting risk limits, requiring collateral, and purchasing credit insurance or credit default swaps.

Ongoing Monitoring: Credit risk measurement is an ongoing process, as credit risk can change over time. Regularly monitoring borrowers and credit portfolios is crucial to identify early warning signs of deteriorating creditworthiness.

Summary

Financial risk measurement is an ongoing process, as risks evolve over time, and new risks emerge. It plays a vital role in financial decision-making, helping individuals and organizations make informed choices to protect their financial well-being and achieve their financial objectives.

Investors and portfolio managers use various quantitative models, analytics, and risk management tools to measure and manage these risks in fixed income markets. Accurate risk measurement is essential for constructing well-balanced portfolios and optimizing risk-return trade-offs in fixed income investments.

Market risk analysis is an ongoing and dynamic process because financial markets are subject to constant changes and fluctuations. By regularly monitoring and analyzing market risk, investors can make informed decisions, optimize their investment strategies, and protect their capital from adverse market movements.

Credit risk measurement is essential for maintaining the stability and soundness of financial institutions and for making prudent lending decisions. Accurate credit risk assessment helps prevent excessive losses, supports responsible lending practices, and contributes to the overall health of the financial system.

Keywords

Fixed Income Securities, Bond Market, Interest Rate Risk, Credit Risk, Market Risk, Liquidity Risk, Yield Curve Risk, Duration, Convexity, Value at Risk (VaR), Market Volatility, Beta Coefficient

Self Assessment

1. What is the primary risk associated with fixed income investments?

A. Market risk

B. Liquidity risk

C. Credit risk

D. Reinvestment risk

2. Which measure assesses the sensitivity of a bond's price to changes in interest rates?

A. Yield to Maturity (YTM)

B. Duration

C. Convexity

D. Credit spread

3. Which risk arises from changes in the difference between the yield on a risky debt instrument and a risk-free benchmark?

A. Credit risk

B. Interest rate risk

C. Credit spread risk

D. Liquidity risk

4. Which of the following is a measure of the potential loss in the event of a borrower's default?

A. Duration

B. Convexity

C. Credit spread

D. Loss Given Default (LGD)

5. What does Value at Risk (VaR) measure in the context of fixed income portfolios?

A. Probability of default

B. Market volatility

C. Maximum potential loss at a specific confidence level

D. Credit rating

6. Which risk reflects the difficulty of buying or selling a security at a reasonable price without affecting its market price significantly?

A. Credit risk

B. Market risk

C. Liquidity risk

D. Reinvestment risk

7. In fixed income markets, what does credit migration risk refer to?

A. Changes in the yield curve
B. Fluctuations in commodity prices
C. Changes in a borrower's creditworthiness over time
D. The risk of a bond being called before maturity

8. What is the primary purpose of stress testing in fixed income portfolios?

A. Estimating expected returns
B. Identifying vulnerabilities under extreme scenarios
C. Calculating duration
D. Assessing liquidity risk

9. How does convexity differ from duration in measuring interest rate risk?

A. Convexity measures the bond's sensitivity to changes in interest rates, while duration measures price volatility.
B. Duration accounts for the bond's curvature in the price-yield relationship, while convexity measures the bond's linear price-yield relationship.
C. Convexity is only applicable to callable bonds, while duration applies to all fixed income securities.
D. Duration is used for credit risk assessment, while convexity is used for interest rate risk assessment.

10. Which of the following strategies is used to mitigate credit risk in fixed income portfolios?

A. Diversification
B. Hedging interest rate risk
C. Managing liquidity risk
D. Enhancing convexity

11. What is market risk analysis primarily concerned with?

A. Evaluating operational risks
B. Assessing credit risk
C. Analyzing risks associated with financial markets
D. Measuring liquidity risk

12. Which of the following types of risk is NOT typically associated with market risk analysis?

A. Credit risk
B. Interest rate risk
C. Currency risk
D. Equity market risk

13. What does Value at Risk (VaR) measure in the context of market risk analysis?

A. Maximum potential loss at a specific confidence level

B. Credit rating of a portfolio

C. Liquidity risk

D. Operational risk exposure

14. Which quantitative measure assesses the sensitivity of an asset's returns to market movements?

A. Duration

B. Convexity

C. Beta coefficient

D. Yield to Maturity (YTM)

15. What is the primary purpose of stress testing in market risk analysis?

A. Estimating expected returns

B. Identifying vulnerabilities under extreme market scenarios

C. Calculating portfolio duration

D. Assessing credit risk exposure

Answers for Self Assessment

1.	**A**	2.	B	3.	C	4.	D	5.	C
6.	C	7.	C	8.	B	9.	B	10.	A
11.	C	12.	A	13.	A	14.	C	15.	B

Review Questions

1. Explain the concept of interest rate risk in fixed income markets? How is it measured, and what are the key factors that influence it?

2. What are the primary sources of credit risk in fixed income investments, and how can credit risk be quantified and managed?

3. Discuss the importance of duration and convexity in measuring and managing interest rate risk in fixed income portfolios?

4. Explain the difference between credit ratings and credit spreads. How are these two indicators used in credit risk assessment?

5. How does yield curve risk affect fixed income investments, and what strategies can be employed to mitigate this risk?

6. Describe the role of liquidity risk in fixed income markets. How can investors measure and manage liquidity risk effectively?

7. What is reinvestment risk, and how does it impact the cash flows of fixed income investments?

8. How do you calculate Value at Risk (VaR) for a fixed income portfolio, and what are the limitations of using VaR for risk assessment?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

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Unit 13: Portfolio Statistics and Diversification

Objectives

After studying this unit, you will be able to:

- Understand the fundamental concepts of portfolio management
- Calculate and interpret the expected return of a portfolio, considering the weighted returns of its constituent assets.
- Explore the principles of diversification and its role in reducing portfolio risk by combining assets with low or negative correlations.
- Explain the importance of asset allocation in portfolio management and its impact on risk and return.
- Describe the process of portfolio rebalancing and its role in maintaining the desired asset allocation over time.
- Apply portfolio statistics and diversification principles to construct and manage a diversified investment portfolio.

Introduction

"Portfolio Statistics and Diversification" is a concept in finance and investment management that refers to the analysis and measurement of the risk and return characteristics of a portfolio of assets, such as stocks, bonds, and other investments. It involves evaluating how different assets within a portfolio interact with each other and the impact of diversification on risk reduction.

Here are key components and concepts related to portfolio statistics and diversification:

1. Portfolio Statistics

Expected Return: This statistic measures the anticipated gain or loss from an investment portfolio over a specific period. It is typically based on the historical returns of the individual assets in the portfolio and their respective weights.

Standard Deviation: Standard deviation quantifies the historical volatility or risk of a portfolio. A higher standard deviation indicates greater price variability and potential risk.

Correlation Coefficient: Correlation measures the degree to which two or more assets in a portfolio move in relation to each other. A positive correlation means the assets tend to move together, while a negative correlation implies they move in opposite directions.

Beta Coefficient: Beta measures the sensitivity of a portfolio's returns to movements in a benchmark index, such as the S&P 500 for stocks. A beta greater than 1 suggests the portfolio is more volatile than the benchmark, while a beta less than 1 indicates less volatility.

2. Diversification:

Diversification Principle: Diversification is the strategy of spreading investments across various asset classes or securities to reduce overall risk. By holding a diversified portfolio, an investor can potentially lower the impact of poor performance in a single asset.

Systematic and Unsystematic Risk: Systematic risk is market-wide or macroeconomic risk that cannot be eliminated through diversification. Unsystematic risk is specific to individual assets and can be mitigated through diversification.

Efficient Frontier: The efficient frontier represents a set of portfolios that offer the highest expected return for a given level of risk or the lowest risk for a given level of expected return. It helps investors find an optimal balance between risk and return.

Portfolio Risk Reduction: Diversification reduces the risk associated with individual assets in a portfolio by combining assets with low or negative correlations. As a result, the overall portfolio risk is often lower than the weighted average of the individual assets' risks.

3. Benefits of Diversification:

Risk Reduction: Diversification can help reduce the portfolio's overall risk, especially when assets are negatively correlated or have low correlations with each other.

Improved Risk-Return Tradeoff: Diversification allows investors to achieve a more favorable risk-return tradeoff, aiming for higher returns at a given level of risk or lower risk for a desired level of returns.

Smoothing Returns: A diversified portfolio can help smooth out the volatility in returns over time, providing more stable and predictable outcomes.

Lower Concentration Risk: Concentration risk, which arises from holding a large position in a single asset or asset class, is mitigated through diversification.

Enhanced Portfolio Stability: Diversification can lead to more stable and consistent portfolio performance, which can be particularly important for long-term investors.

13.1 Determining Portfolio Risk and Return

"Portfolio Risk and Return" are determined through a combination of individual asset characteristics, their weights within the portfolio, and the interactions between these assets. The process involves assessing the potential returns and the level of risk associated with holding a portfolio of various assets, such as stocks, bonds, or other investments. Here's how it's typically determined:

1. Asset Selection: The first step in determining portfolio risk and return is selecting the individual assets that will comprise the portfolio. These assets can include stocks, bonds, real estate, cash, and other investment instruments. The selection process is based on various factors, including investment objectives, risk tolerance, time horizon, and financial constraints.

2. Expected Returns for Individual Assets: To estimate the potential return for each individual asset, investors and portfolio managers typically consider historical performance, financial data, and economic indicators. Expected returns are influenced by factors such as dividend yields for stocks, coupon rates for bonds, rental income for real estate, and potential capital gains.

3.Risk Assessment for Individual Assets: Assessing the risk associated with individual assets involves evaluating factors such as historical volatility, credit risk (for bonds), and the asset's sensitivity to external factors like interest rates, economic conditions, and market sentiment. Measures like beta (for stocks) and credit ratings (for bonds) can provide insights into risk levels.

4.Portfolio Weighting: Once the assets are selected and their expected returns and risks are assessed, the portfolio manager or investor determines how much of each asset to include in the portfolio. This weighting is critical because it affects the overall risk and return profile of the portfolio. The goal is to create a balanced and diversified mix of assets.

5.Correlation and Diversification: Understanding the correlations between the assets in the portfolio is crucial. Positive correlations imply that assets tend to move in the same direction, while negative correlations suggest they move in opposite directions. Diversification involves combining assets with low or negative correlations to reduce overall portfolio risk.

6.Expected Portfolio Return: The expected return of the portfolio is calculated as the weighted average of the expected returns of the individual assets. The formula for expected portfolio return is:

Expected Portfolio Return = (Weight of Asset 1 * Expected Return of Asset 1) + (Weight of Asset 2 * Expected Return of Asset 2) + ... + (Weight of Asset n * Expected Return of Asset n)

7. Portfolio Risk: Portfolio risk is determined by the combination of assets' individual risks and their correlations within the portfolio. A well-diversified portfolio can have lower overall risk compared to the weighted average of individual asset risks. The formula for portfolio risk depends on the covariance and correlation between assets. Commonly used measures of portfolio risk include standard deviation and beta.

8.Risk-Return Tradeoff: Investors should consider their risk tolerance and investment objectives when determining the portfolio risk-return tradeoff. A higher expected return typically comes with higher risk, and vice versa. The goal is to find a balance that aligns with the investor's preferences and financial goals.

9. **Monitoring and Adjustment Portfolio risk and** return are not static but can change over time due to changes in asset prices, economic conditions, and market dynamics. Investors and portfolio managers regularly monitor and adjust portfolios to ensure they remain in line with their intended risk and return objectives.

13.2 Portfolios with More Than Two Securities

Portfolios with more than two securities, often referred to as multi-asset portfolios or diversified portfolios, consist of a collection of three or more individual securities or assets held by an investor or an entity. These portfolios are constructed to achieve various financial objectives, such as maximizing returns, minimizing risk, or achieving a specific asset allocation strategy.

1.**Diversification**: One of the primary reasons for creating portfolios with multiple securities is diversification. Diversification involves spreading investments across different asset classes, industries, or regions to reduce risk. By holding a variety of assets, investors can potentially lower the impact of poor performance in a single asset or sector on the overall portfolio.

2.**Asset Allocation**: Multi-asset portfolios allow investors to implement specific asset allocation strategies. Asset allocation involves deciding how to distribute investments among different types of assets, such as stocks, bonds, real estate, and cash. The allocation is based on an investor's financial goals, risk tolerance, and investment horizon.

3.**Risk Management**: Diversified portfolios aim to manage risk effectively. The risk associated with individual assets is often offset or mitigated by the inclusion of other assets with different risk profiles. This can result in a more stable and less volatile overall portfolio.

4. **Return Maximization**: Multi-asset portfolios provide investors with the opportunity to maximize returns while managing risk. By carefully selecting assets and their respective weights in the portfolio, investors can seek a balance between risk and return that aligns with their objectives.

5. **Income Generation**: Portfolios with multiple securities can be designed to generate regular income. For example, a diversified portfolio might include a mix of dividend-paying stocks and interest-bearing bonds to provide a steady stream of income.

6.**Market Exposure**: Investors can gain exposure to a broad range of markets, industries, and asset classes by holding multi-asset portfolios. This allows them to participate in different economic trends and investment opportunities.

7. **Risk-Return Tradeoff**: Multi-asset portfolios often involve a tradeoff between risk and return. While diversification can reduce risk, it may also limit the potential for exceptionally high returns that can be achieved by concentrating investments in a single asset class. The specific risk-return tradeoff depends on the asset allocation strategy.

8. **Portfolio Management**: Managing portfolios with multiple securities can be complex. It requires ongoing monitoring, rebalancing, and decision-making to ensure that the portfolio remains aligned with the investor's objectives and risk tolerance.

9. **Customization**: Multi-asset portfolios can be customized to suit individual investor preferences. For instance, investors can tailor their portfolios to incorporate specific environmental, social, or governance (ESG) criteria or ethical considerations.

10.**Professional Management**: Many investors opt for professionally managed multi-asset portfolios, such as mutual funds, exchange-traded funds (ETFs), and separately managed accounts (SMAs). These vehicles provide access to diversified portfolios managed by experienced professionals.

13.3 Locating Portfolios on the Efficient Frontier

Locating portfolios on the efficient frontier is a fundamental concept in portfolio theory and investment management. The efficient frontier is a graphical representation of the set of optimal portfolios that offer the highest expected return for a given level of risk or the lowest risk for a given level of expected return. In other words, it helps investors find the most efficient tradeoff between risk and return for their investment portfolios.

How are portfolios located on the efficient frontier?

1. Risk and Return Assessment: To locate portfolios on the efficient frontier, you first need to assess the expected risk and return of individual assets that will comprise your portfolio. These assets can include stocks, bonds, real estate, and other investments.

2. Asset Allocation: The key to building portfolios on the efficient frontier is asset allocation. You determine how much of each asset to include in the portfolio based on your investment goals, risk tolerance, and time horizon. Asset allocation involves creating a diversified mix of assets that optimizes the risk-return tradeoff.

3. Expected Portfolio Returns and Risks: Once you've allocated assets to your portfolio, you calculate the expected returns and risks for the entire portfolio. This involves taking into account the historical performance and expected future performance of each asset, as well as the portfolio's asset weights.

4. Portfolio Variance and Covariance: To assess risk, it's important to consider how the individual assets in your portfolio interact with each other. You calculate the variance and covariance of asset returns to determine how they move together. This information helps you estimate the portfolio's overall risk.

5. Efficient Frontier Construction: With the expected returns and risks of your portfolio, you can plot it on the efficient frontier graph. The x-axis typically represents risk (standard deviation of portfolio returns), and the y-axis represents return (portfolio's expected return).

6. Connecting Portfolios: To create the efficient frontier, you connect portfolios with varying asset allocations. These portfolios will have different risk-return profiles. As you increase the expected

return of a portfolio, its risk also tends to rise. The efficient frontier is the curve that connects the portfolios with the highest expected return for each level of risk.

7. Selecting the Optimal Portfolio: Your optimal portfolio on the efficient frontier depends on your risk tolerance and return objectives. Investors with a higher risk tolerance may select a portfolio with higher expected return and higher risk, while those with a lower risk tolerance may prefer a portfolio with lower risk and lower expected return.

8. Diversification and Risk Reduction: The efficient frontier illustrates the principle of diversification. Portfolios on the efficient frontier represent well-diversified combinations of assets, which helps reduce the overall risk of the portfolio compared to holding a single asset.

9. Rebalancing and Monitoring: Portfolios need to be regularly rebalanced and monitored to ensure they remain on the efficient frontier. Changes in asset performance or market conditions may cause a portfolio to drift from its optimal risk-return profile.

13.4 Charting the Efficient Frontier

"Charting the Efficient Frontier" is a graphical representation and analysis of the efficient frontier in the field of portfolio management and investment theory. The efficient frontier is a concept introduced by Harry Markowitz, a Nobel laureate in economics, and it represents the set of optimal portfolios that offer the highest expected return for a given level of risk or the lowest risk for a given level of expected return. Charting the efficient frontier involves plotting these optimal portfolios on a graph to visualize the risk-return tradeoff and help investors make informed investment decisions.

Working of the efficient frontier charting:

1.Risk and Return Assessment: To chart the efficient frontier, you start by assessing the expected risk and return of individual assets or asset classes that will be included in the portfolio. These assets can include stocks, bonds, real estate, and other investments

2. Asset Allocation: Asset allocation is a critical step in charting the efficient frontier. You determine how much of each asset to include in the portfolio based on your investment objectives, risk tolerance, and time horizon. Asset allocation involves creating a diversified mix of assets to optimize the risk-return tradeoff.

3. Expected Portfolio Returns and Risks: Once you've allocated assets to your portfolio, you calculate the expected returns and risks for the entire portfolio. This involves taking into account the historical performance and expected future performance of each asset, as well as the portfolio's asset weights.

4. Portfolio Variance and Covariance: To assess risk accurately, it's important to consider how the individual assets in your portfolio interact with each other. You calculate the variance and covariance of asset returns to determine how they move together. This information helps you estimate the portfolio's overall risk.

5. Efficient Frontier Construction: With the expected returns and risks of your portfolio, you can plot it on the efficient frontier graph. The x-axis typically represents risk (standard deviation of portfolio returns), and the y-axis represents return (portfolio's expected return).

6. Connecting Portfolios: To create the efficient frontier, you connect portfolios with varying asset allocations. These portfolios will have different risk-return profiles. As you increase the expected return of a portfolio, its risk also tends to rise. The efficient frontier is the curve that connects the portfolios with the highest expected return for each level of risk.

7. Optimal Portfolio Selection: The efficient frontier graph allows investors to choose an optimal portfolio that aligns with their risk tolerance and return objectives. The specific portfolio chosen depends on individual preferences and constraints.

8. Diversification and Risk Reduction: The efficient frontier illustrates the principle of diversification. Portfolios on the efficient frontier represent well-diversified combinations of assets, which helps reduce the overall risk of the portfolio compared to holding a single asset.

9. Rebalancing and Monitoring: Portfolios need to be regularly rebalanced and monitored to ensure they remain on the efficient frontier. Changes in asset performance or market conditions may cause a portfolio to drift from its optimal risk-return profile.

13.5 Role of Security Market Line (SML) and Capital Market Line (CML) in Security Portfolio Management

The Security Market Line (SML) and the Capital Market Line (CML) are essential concepts in security portfolio management and are used to evaluate the risk and return of investment portfolios. These lines play distinct but interconnected roles in helping investors make informed decisions about constructing and managing portfolios.

Security Market Line (SML)

The SML is a graphical representation of the relationship between the risk (beta) and expected return of individual securities or portfolios in a well-diversified market. It is a fundamental concept in the Capital Asset Pricing Model (CAPM), which helps investors determine whether an investment is offering a fair return relative to its risk. Here's the role of the SML in security portfolio management:

Risk Assessment: The SML provides a benchmark for assessing the risk-adjusted performance of individual securities or portfolios. It is based on the idea that the expected return of an asset should be directly proportional to its systematic risk, represented by its beta. Beta measures how an asset's returns move relative to the market as a whole.

Valuation Tool: Investors can use the SML to assess whether a particular security is overvalued or undervalued based on its expected return and beta. If a security's expected return is above the SML, it may be undervalued, suggesting a potential buying opportunity. Conversely, if it is below the SML, it may be overvalued.

Portfolio Construction: The SML is instrumental in constructing efficient portfolios. By combining assets along the SML, investors can create diversified portfolios that offer the highest expected return for a given level of risk (i.e., the optimal portfolio). Portfolios lying on the SML represent efficient combinations of risk and return, given the risk-free rate and the market risk premium.

Capital Allocation: The SML assists investors in allocating capital among different assets or portfolios. Investors can choose portfolios or individual assets that align with their risk tolerance and return expectations by considering their position relative to the SML.

Capital Market Line (CML):

The CML extends the concepts of the SML to include a risk-free asset and allows investors to consider a broader range of investment opportunities. It is a straight line that connects the risk-free rate of return with a well-diversified market portfolio. The CML has several important roles in security portfolio management:

Risk-Free Asset Inclusion: The CML incorporates a risk-free asset (typically represented by government bonds), allowing investors to diversify their portfolios between risky assets (e.g., stocks) and the risk-free asset.

Optimal Portfolio Construction: The CML helps investors determine the optimal portfolio that maximizes expected return for a given level of risk or minimizes risk for a given level of expected return. The point where the investor's indifference curve (risk-return preference) is tangent to the CML represents the optimal portfolio.

Investment Policy: The CML provides guidance on the allocation between risky assets (systematic risk) and the risk-free asset (no systematic risk). This allocation depends on the investor's risk tolerance and desired return, and it can be adjusted to align with changing investment objectives.

Capital Market Theory: The CML plays a central role in capital market theory by illustrating the relationship between risk and return in a fully diversified market. It emphasizes that investors can

achieve a higher expected return by taking on more systematic risk (beta) while balancing it with the risk-free asset.

Summary

Understanding portfolio statistics and the principles of diversification is fundamental for investors and portfolio managers as they seek to construct and manage portfolios that align with their risk tolerance and financial objectives. By applying these concepts effectively, investors can aim to achieve their desired investment outcomes while managing risk.

Determining portfolio risk and return involves a combination of quantitative analysis, financial modeling, and subjective judgment. It requires ongoing monitoring and adjustment to adapt to changing market conditions and investor preferences.

Portfolios with more than two securities are a common approach to managing investments, providing diversification, risk management, and opportunities for achieving various financial goals. The composition of such portfolios can vary widely, depending on the investor's objectives and the market conditions. Proper construction and ongoing management are essential to ensure that the portfolio aligns with the investor's needs and preferences.

Locating portfolios on the efficient frontier is a crucial step in constructing an investment portfolio that aligns with your financial goals and risk tolerance. It allows investors to make informed decisions about asset allocation, balance risk and return, and optimize their investment strategy to achieve the desired outcomes.

Charting the efficient frontier is a visual representation of the risk and return tradeoff in investing. It provides investors and portfolio managers with valuable insights into how to construct portfolios that achieve their financial objectives while managing risk effectively.

The SML and CML are integral in security portfolio management as they provide a framework for assessing the risk and return of assets and portfolios, constructing efficient portfolios, and making informed investment decisions. The SML focuses on individual asset risk and return, while the CML extends these concepts to include the risk-free asset and guides investors in constructing diversified portfolios that align with their risk-return preferences.

Keywords

Portfolio Analysis, Asset Allocation, Diversified Portfolio, Efficient Frontier. Expected Return, Portfolio Variance, Beta Coefficient, Risk-Return Tradeoff, Security Market Line (SML), Capital Market Line (CML), Risk-Free Rate, Portfolio Optimization

Self Assessment

1. What is the primary goal of diversification in portfolio management?

A. To maximize portfolio returns

B. To minimize portfolio risk

C. To increase portfolio volatility

D. To maximize individual asset returns

2. Which of the following is a measure of the total risk of a portfolio?

A. Alpha

B. Beta

C. Standard deviation

D. Correlation coefficient

3. What does the Sharpe ratio measure?

A. Portfolio returns

B. Portfolio risk-adjusted returns

C. Portfolio volatility

D. Portfolio beta

4. Which type of risk is also known as market risk and cannot be eliminated through diversification?

A. Systematic risk

B. Unsystematic risk

C. Idiosyncratic risk

D. Specific risk

5. Which portfolio construction technique aims to select assets with low or negative correlations to reduce risk?

A. Asset allocation

B. Portfolio optimization

C. Diversification

D. Rebalancing

6. The efficient frontier represents portfolios that:

A. Maximize expected return for a given level of risk

B. Minimize expected return for a given level of risk

C. Maximize risk for a given level of return

D. Minimize risk for a given level of return

7. What is the formula for calculating portfolio variance when two assets are held in equal proportions?

A. (Weight of Asset A)^2 * Variance of Asset A

B. (Weight of Asset A) * (Weight of Asset B) * Covariance between A and B

C. (Weight of Asset A) * (Weight of Asset B) * Standard Deviation of Asset A

D. (Weight of Asset A) * (Weight of Asset B) * Variance of Asset A

8. In the context of the Capital Market Line (CML), what is the significance of the risk-free rate?

A. It represents the expected return of the market portfolio.

B. It serves as the benchmark for risk-free assets.

C. It indicates the maximum level of portfolio risk.

D. It is the expected return of the riskiest asset in the portfolio.

9. Which ratio measures a portfolio's excess return per unit of systematic risk?

A. Treynor ratio

B. Sharpe ratio

C. Alpha ratio

D. Beta ratio

10. When constructing a diversified investment portfolio, what does asset allocation refer to?

A. Allocating assets to different sectors of the economy

B. Allocating assets to various geographic regions

C. Determining the proportion of different asset classes in the portfolio

D. Allocating assets to specific individual securities

11. In portfolio management, what is the primary advantage of constructing portfolios with more than two securities?

A. Simplicity in portfolio management

B. Higher potential returns

C. Lower portfolio risk through diversification

D. Greater control over individual asset performance

12. Diversification in a multi-asset portfolio is achieved by:

A. Concentrating investments in a single asset class

B. Holding only two securities with a strong positive correlation

C. Spreading investments across various assets or asset classes

D. Increasing the number of securities without considering their correlation

13. Which of the following is a key benefit of holding a diversified portfolio with more than two securities?

A. Higher individual asset returns

B. Reduced exposure to systematic risk

C. Increased concentration risk

D. Lower transaction costs

14. What is the term used to describe risk that is specific to individual assets and can be reduced through diversification?

A. Systematic risk

B. Market risk

C. Unsystematic risk

D. Beta risk

15. Which of the following statements about the efficient frontier in multi-asset portfolios is true?

A. It represents portfolios with the highest return and lowest risk.

B. It is a straight line connecting all possible portfolios.

C. It includes portfolios consisting of only two securities.

D. It does not consider the impact of diversification.

Answers for self Assessment

1.	**B**	2.	C	3.	B	4.	A	5.	C

| 6. | A | 7. | B | 8. | B | 9. | A | 10. | C |
| 11. | C | 12. | C | 13. | B | 14. | C | 15. | A |

Review Questions

1. Explain the concept of diversification in portfolio management and why it is important?
2. What is the significance of the risk-return tradeoff in portfolio construction?
3. How do you calculate the expected return of a portfolio consisting of multiple assets with different weights and returns?
4. How can diversifying across asset classes reduce portfolio risk?
5. Explain the significance beta when assessing a portfolio's performance relative to a benchmark index.
6. Explain the concept of asset allocation in portfolio management and how it impacts risk and return.
7. What are the key considerations when determining the appropriate asset allocation for an investor with a long-term investment horizon?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

Web Link

- https://corporatefinanceinstitute.com/resources/financial-modeling/financial-forecasting-guide/
- https://www.netsuite.com/portal/resource/articles/financial-management/importance-financial-forecasting.shtml
- https://www.wallstreetmojo.com/financial-forecasting/
- https://www.investopedia.com/ask/answers/difference-between-financial-forecasting-and-financial-modeling/

Unit 14: Pricing of Derivative Instruments

Objectives

After studying this unit, you will be able to:

- Understand futures and options
- Apply the Concepts of future and options into trading

Introduction

Derivative instruments, often referred to simply as "derivatives," are financial contracts or securities whose value is derived from an underlying asset, reference rate, index, or other financial instrument. These instruments are used by individuals, companies, and financial institutions for various purposes, including risk management, speculation, and investment. Derivatives derive their value from changes in the price or value of the underlying asset or reference point, and they are widely traded in financial markets.

Characteristics of derivative instruments

Underlying Assets: Derivatives can be based on a wide range of underlying assets, including stocks, bonds, commodities (such as oil or gold), currencies, interest rates, and market indices (like the S&P 500).

Value Derivation: The value of a derivative is not determined independently but depends on the movements or changes in the value of the underlying asset. For example, a stock option's value is derived from the price of the underlying stock.

Leverage: Derivatives often allow investors to control a large amount of an underlying asset with a relatively small amount of capital. This leverage can amplify both gains and losses.

Risk Management: One of the primary purposes of derivatives is to manage risk. For instance, a company may use futures contracts to hedge against unfavorable price movements in commodities, thus protecting itself from potential losses.

Speculation: Traders and investors also use derivatives to speculate on price movements without owning the underlying asset. For example, a trader may buy a call option if they believe a stock's price will rise.

14.1 Types of Derivative Instruments

Futures Contracts: These obligate the holder to buy (or sell) an underlying asset at a predetermined price and date in the future. Futures are commonly used for commodities, currencies, and financial indices.

Options Contracts: These provide the holder with the right (but not the obligation) to buy (call option) or sell (put option) an underlying asset at a specified price before or on a specific expiration date.

Swaps: Swaps are agreements between parties to exchange one set of cash flows or financial instruments for another. Interest rate swaps and currency swaps are common examples used for managing interest rate and currency risk.

Forwards: Similar to futures contracts, forwards are agreements to buy or sell an asset at a future date at a predetermined price. However, they are typically customized contracts, whereas futures are standardized and traded on exchanges.

Options on Futures: These combine features of options and futures, allowing traders to speculate or hedge using futures contracts.

Credit Derivatives: These are used to manage credit risk and include instruments like credit default swaps (CDS), which provide insurance against the default of a borrower.

14.2 Future Contracts

A futures contract is a standardized financial agreement between two parties to buy or sell a specified quantity of an underlying asset at a predetermined price on a specified future date. Futures contracts are traded on organized exchanges, and they play a crucial role in financial markets, serving various purposes for both hedging and speculative activities.

Characteristics of future contracts

1. *Standardization*: Futures contracts are highly standardized, specifying the following:

- **Underlying Asset**: The asset (or reference point) that will be delivered or received upon the contract's expiration. This can include commodities (e.g., oil, wheat), financial instruments (e.g., stock indices, interest rates), or even cryptocurrencies.
- **Contract Size**: The quantity of the underlying asset that the contract represents. For example, one crude oil futures contract might represent 1,000 barrels of oil.
- **Contract Expiration Date**: The date on which the contract matures and obligates the parties to settle.
- **Contract Price**: The price at which the underlying asset will be bought or sold when the contract expires.

2. **Margin Requirements**: To trade futures, both parties (the buyer and the seller) are required to deposit an initial margin with the exchange. This margin acts as collateral to cover potential losses and is adjusted daily based on the contract's price movement. This daily settlement process is known as marking to market.

3. **Daily Settlement**: Futures contracts are marked to market daily, meaning that the gains or losses from the contract are settled each day. If one party incurs a loss, it is deducted from their margin account and credited to the other party's margin account.

4. **Leverage**: Futures contracts provide a high degree of leverage. Traders can control a large notional value of the underlying asset with a relatively small margin deposit. This leverage amplifies both potential gains and losses.

5. **Clearinghouse**: Futures contracts are typically traded on organized exchanges with a central clearinghouse. The clearinghouse acts as an intermediary, ensuring that the contract's terms are met and managing counterparty risk. When a futures contract is traded, the clearinghouse becomes the counterparty to both the buyer and the seller.

6. **Delivery vs. Cash Settlement**: While futures contracts can involve physical delivery of the underlying asset, most contracts are settled in cash. Cash settlement means that, upon contract expiration, the parties exchange the difference between the contract price and the market price in cash without physically delivering the underlying asset.

Purpose or uses of Future contracts

✓ **Hedging**: Participants in various industries use futures contracts to hedge against price fluctuations in the underlying assets. For example, farmers can use grain futures to lock in prices for their crops, and airlines can use oil futures to hedge against rising fuel costs.

✓ **Speculation**: Traders and investors can use futures contracts to speculate on the price direction of underlying assets without owning them. They can profit from both rising (by buying) and falling (by selling) markets.

✓ **Arbitrage**: Arbitrageurs can exploit price differences between the futures market and the spot market for the same underlying asset.

14.3 Charting Futures Pay Offs

When traders and investors analyze the potential payoffs of futures contracts or any other financial instrument, they often use graphical tools and charts to visualize and understand how different scenarios could impact their profits or losses. These charts help in making informed decisions and managing risk. Here's a general approach to charting futures payoffs:

1. **X and Y Axes**: On a chart, the X-axis typically represents the range of possible prices of the underlying asset at the expiration of the futures contract, while the Y-axis represents the profit or loss.

2. **Long Futures Position**: If you are holding a long (buy) futures position, your profit or loss will depend on whether the market price of the underlying asset at expiration is higher or lower than the futures contract price. The payoff diagram for a long futures position is usually a linear line sloping upward from left to right. You profit when prices rise and incur losses when prices fall below the contract price.

3. **Short Futures Position**: In contrast, if you are holding a short (sell) futures position, your profit or loss will be the opposite of the long position. You profit when prices fall below the contract price and incur losses when prices rise above the contract price. The payoff diagram for a short futures position is typically a line sloping downward from left to right.

4. **Options Strategies**: If you are dealing with options on futures, such as call options or put options, the payoff diagrams can be more complex. Options offer the holder the right (but not the obligation) to buy (call option) or sell (put option) the underlying futures contract at a specified price. The payoff diagrams for options can include various curves and lines, depending on factors like the strike price and whether the option is a call or put.

5. **Combination Strategies**: Traders often use combinations of futures and options to create more sophisticated strategies. Payoff diagrams for these strategies can involve multiple lines and curves, showing how the combination of positions will perform under different market conditions.

6. **Break-Even Points**: Payoff diagrams can also help traders identify break-even points, which are the prices at which they neither make a profit nor incur a loss.

Following are the sample diagrams to depict the points mentioned above:
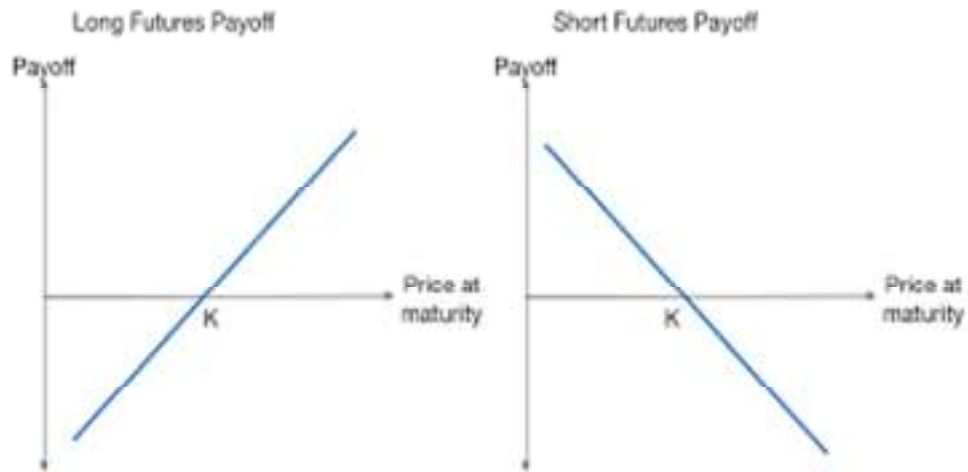
14.4 Options

Options refer to financial derivatives that give the holder the right (but not the obligation) to buy or sell an underlying asset at a predetermined price (known as the strike price) on or before a specified expiration date. Options are important instruments in the capital markets, and they are used for various purposes, including speculation, hedging, and income generation.

Types of Options

- **Call Options**: A call option gives the holder the right to buy the underlying asset at the strike price. Call options are often used when an investor expects the price of the underlying asset to rise. If the market price is higher than the strike price at expiration, the call option holder can profit by buying the asset at the lower strike price.

- **Put Options**: A put option gives the holder the right to sell the underlying asset at the strike price. Put options are typically used when an investor expects the price of the underlying asset to fall. If the market price is lower than the strike price at expiration, the put option holder can profit by selling the asset at the higher strike price.

Features of Options

- Expiration Date: Every option contract has a specific expiration date. Options can be short-term (e.g., expiring in a matter of days or weeks) or long-term (e.g., expiring in several months or years).

- Strike Price: The strike price is the price at which the underlying asset can be bought (for call options) or sold (for put options) if the option is exercised. It is a critical component of option contracts and is chosen when the option is created.

- Premium: To acquire an option, the buyer pays a premium to the seller. The premium represents the cost of the option and is determined by factors such as the current market price of the underlying asset, the strike price, the time to expiration, and market volatility.

Option Holder and Writer:

These are two parties in an options contract:

- The **Option Holder** (or buyer) is the one who pays the premium and has the right to exercise the option.
- The **Option Writer** (or seller) is the one who receives the premium and is obligated to fulfill the terms of the option if the holder chooses to exercise it.

Option Strategies

- Traders and investors use various option strategies to achieve specific goals. Some common strategies include covered calls, protective puts, straddles, and strangles, among others.

Risk and Reward

- Options can offer both leverage and limited risk. The maximum loss for an option buyer is limited to the premium paid, while the profit potential can be substantial.
- Option writers, on the other hand, face potentially unlimited losses if the market moves strongly against their position, although their profit potential is limited to the premium received.

Market Liquidity

- Options are traded on organized options exchanges, and liquidity can vary depending on the underlying asset and the specific option contract.
- Highly liquid options are easier to buy and sell at favorable prices.

Hedging and Speculation

- Investors and institutions often use options for risk management (hedging) to protect their portfolios from adverse price movements.
- Traders use options for speculative purposes, taking positions based on their expectations of future market movements.

Regulation

- Options markets are regulated to ensure fairness and transparency.
- Regulatory bodies oversee options trading to maintain market integrity.

14.5 Charting of Options Payoffs

Charting options payoffs involves creating graphical representations or diagrams that illustrate the potential profit or loss that can result from holding or trading options positions under various market conditions. These charts are valuable tools for options traders and investors to visualize and analyze the performance of their options strategies and make informed decisions. There are several types of option payoff diagrams, each corresponding to a specific options strategy. Examples of some common option payoff diagrams are as follows:
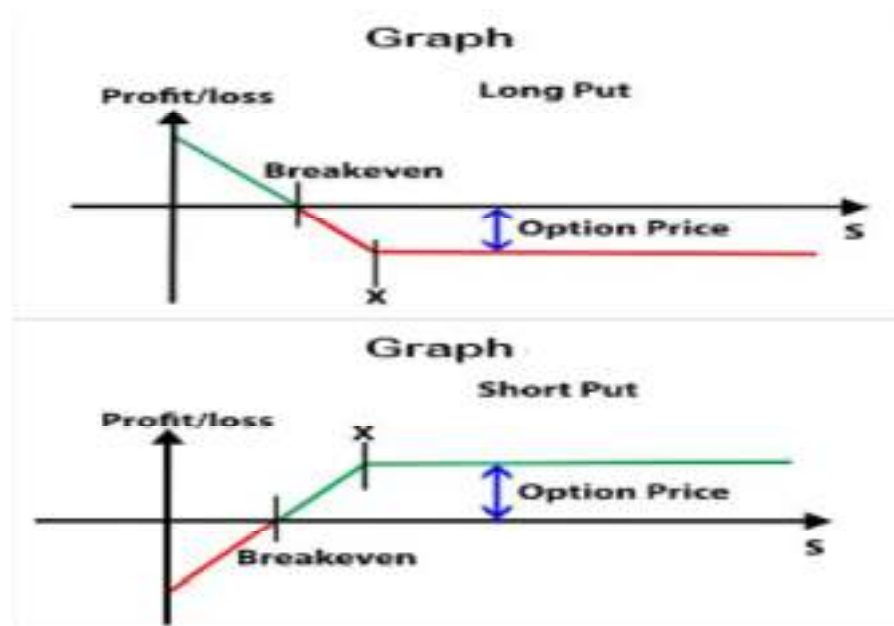
Call Option Payoff Chart

- A call option payoff chart illustrates the potential profit or loss of holding a long call option position. The X-axis typically represents the price of the underlying asset at expiration, while the Y-axis represents the profit or loss.
- The payoff diagram for a long call option is characterized by a limited loss (the premium paid for the option) and unlimited profit potential if the underlying asset's price rises significantly.
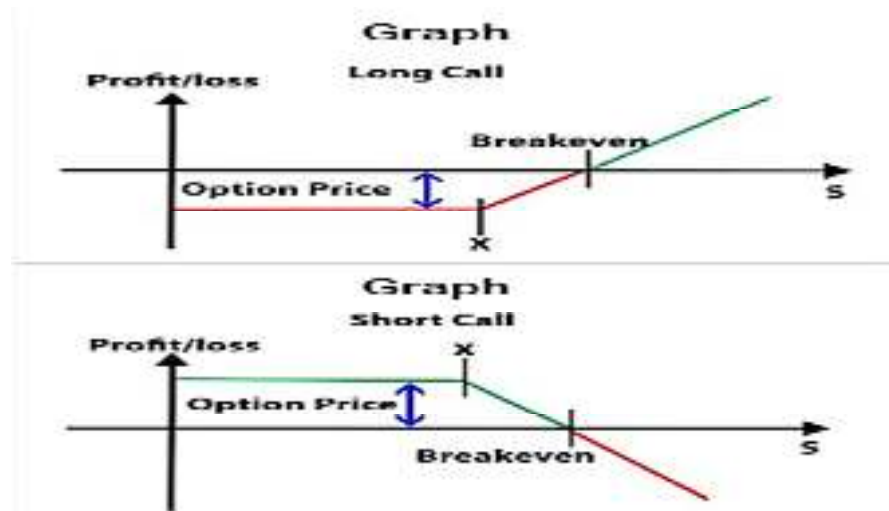
Put Option Payoff Chart

- A put option payoff chart shows the potential profit or loss of holding a long put option position. Similar to the call option chart, the X-axis represents the price of the underlying asset at expiration, and the Y-axis represents the profit or loss.
- The payoff diagram for a long put option is characterized by a limited loss (the premium paid for the option) and potential profit if the underlying asset's price falls below the strike price.

Covered Call Payoff Chart

- A covered call strategy involves holding a long position in the underlying asset (e.g., owning stock) and selling a call option against it. The payoff diagram for a covered call position combines the profit or loss from owning the underlying asset with the profit or loss from the call option.
- The covered call strategy provides limited profit potential (capped at the call strike price) and limited protection against a decline in the underlying asset's price.


Protective Put Payoff Chart

- A protective put strategy involves holding a long position in the underlying asset and purchasing a put option to protect against potential price declines. The payoff diagram for a protective put combines the profit or loss from owning the asset with the profit or loss from the put option.
- The protective put strategy limits potential losses (the cost of the put premium) while allowing for potential gains if the asset's price increases.


5. Straddle Payoff Chart

Financial Analytics

- A straddle strategy involves buying both a call option and a put option with the same strike price and expiration date. The payoff diagram for a straddle shows potential profits and losses from both options.
- The straddle strategy profits from significant price movements in either direction, but it requires a substantial price change to cover the combined premium costs of both options.
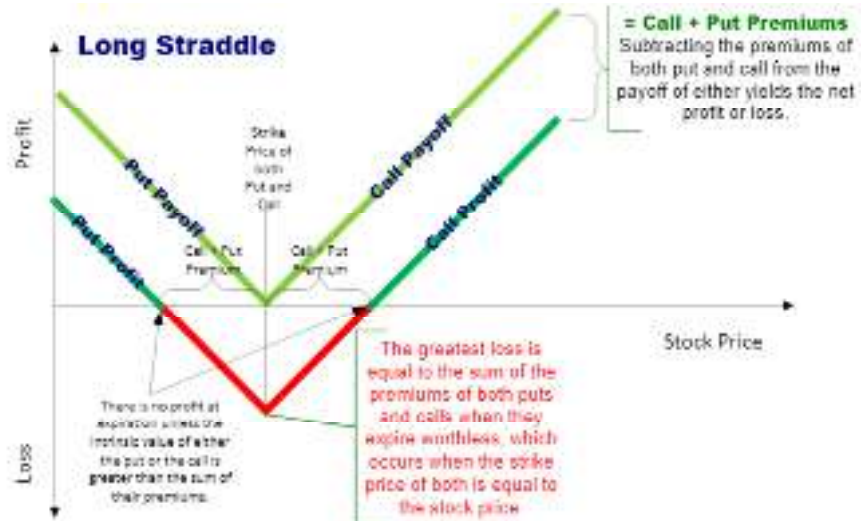
Strangle Payoff Chart

- A strangle strategy is similar to a straddle but involves buying a call option and a put option with different strike prices. The payoff diagram for a strangle displays potential profits and losses from both options.
- The strangle strategy also profits from significant price movements but at a lower initial cost compared to a straddle. However, it requires larger price movements to be profitable.
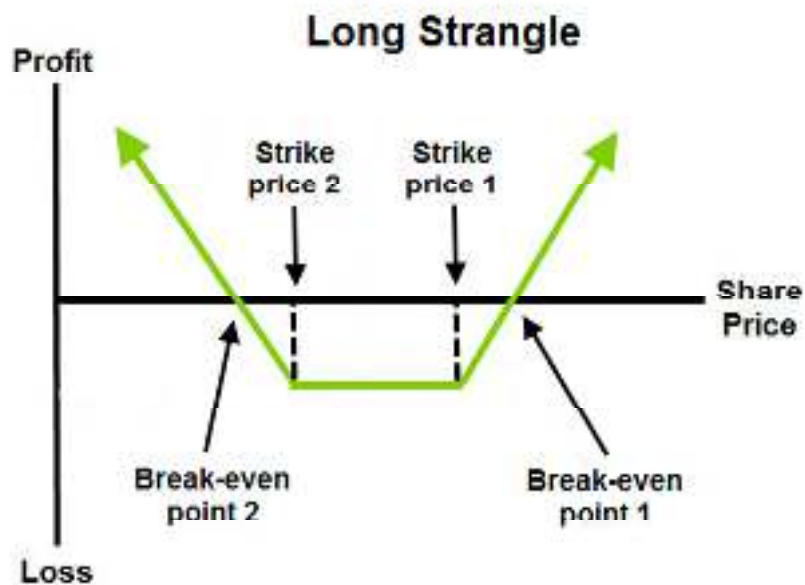
14.6 Futures and Options Pricing

Futures and options pricing is the process of determining the fair market value or price of futures contracts and options contracts. Accurate pricing is crucial in financial markets because it helps traders and investors make informed decisions about buying, selling, or holding these derivative instruments. Pricing models are used to estimate the value of futures and options based on various factors and inputs. Here's an overview of futures and options pricing:

Futures Pricing

Cost-of-Carry Model: The cost-of-carry model is a fundamental approach to pricing futures contracts. It suggests that the futures price should equal the current spot price of the underlying asset plus the cost of carrying the asset until the futures contract's expiration. The cost of carry includes expenses like financing costs, storage costs, and any income generated from holding the asset.

Futures Price = Spot Price + Cost of Carry

Arbitrage-Free Pricing: In efficient markets, arbitrage opportunities should not exist. Traders will quickly exploit price differences between the futures and spot markets. Arbitrage pricing models ensure that such opportunities are eliminated. For example, if the futures price deviates too much from the theoretical cost-of-carry price, arbitrageurs will buy or sell the asset to bring the two prices back in line.

Interest Rates: Interest rates play a critical role in futures pricing, especially for financial futures like interest rate futures. The relationship between interest rates and futures prices is governed by the cost of financing the underlying asset.

Options Pricing

Black-Scholes Model: The Black-Scholes model is a widely used options pricing model for European-style options (options that can only be exercised at expiration). It considers several factors:

- The current market price of the underlying asset.
- The option's strike price.
- Time to expiration.
- Volatility of the underlying asset's price.
- Risk-free interest rate.

The Black-Scholes model provides an estimate of the fair market value of a European call or put option. There are also variations of this model for American-style options (options that can be exercised at any time before or at expiration).

2. Binomial Model: The binomial options pricing model is a discrete-time model that is often used to price both European and American options. It simulates the possible future paths of the underlying asset's price over discrete time intervals and calculates option values at each step. It's a flexible model that can accommodate various assumptions about price movements and volatility.

3. Implied Volatility: Implied volatility is a crucial input in options pricing models. It represents the market's expectations for future price volatility. Traders can derive implied volatility from the current market prices of options. Higher implied volatility generally leads to higher option premiums, as it indicates greater uncertainty in future price movements.

4. Put-Call Parity: Put-call parity is an essential concept for options pricing. It establishes a relationship between the prices of call options and put options with the same strike price and expiration date. Any deviation from put-call parity can create arbitrage opportunities that traders can exploit to profit.

5. Dividends and Other Factors: For options on stocks, dividends and other corporate actions can affect pricing. Options pricing models may need to account for dividends paid by the underlying stock, especially for American-style options.

Summary

Derivatives can be valuable tools for various market participants, but they also carry risks due to their leverage and complexity. It's essential for individuals and organizations to have a solid understanding of derivatives and their associated risks before using them in their financial strategies or investments. Additionally, derivatives markets are subject to regulatory oversight to ensure transparency and stability.

Futures markets are regulated to ensure fairness and stability, and they provide liquidity and price discovery for a wide range of financial and commodity markets. However, because of their leverage and potential for substantial losses, trading futures requires a good understanding of the markets and risk management techniques.

Charts and diagrams are essential tools for traders and investors to assess the risk and potential reward associated with their futures positions or strategies. They enable individuals to visually understand the relationship between market price movements and their financial outcomes.

Options play a significant role in the capital market by providing investors and traders with flexible tools to manage risk and profit from market movements. However, due to their complexity and leverage, options trading carries risks and requires a good understanding of the markets and strategies involved.

Traders and investors can create customized payoff diagrams for various complex options strategies by combining multiple options contracts with different strike prices and expirations. These charts are essential for understanding the risk and potential reward associated with options positions and for making informed trading decisions. They allow traders to visualize how their positions will perform under different market scenarios and to plan their strategies accordingly.

Options pricing can be complex, especially for exotic options or those with multiple factors influencing their value. Traders and investors often use pricing models to estimate option values, and they may also consider market factors such as supply and demand, news events, and macroeconomic conditions when making trading decisions. Accurate pricing is essential for managing risk and making informed choices in the futures and options markets.

Keywords

Futures Contracts, Options Contracts, Derivatives Trading, Stock Options, Strike Price, Expiration Date, Call Options, Put Options, Long Position, Short Position, Hedging Strategies, Speculation

Self Assessment

1. What is the key difference between futures and options contracts?

A. Futures are standardized, while options are customizable.
B. Futures are securities, while options are not.
C. Options obligate the holder, while futures do not.
D. Options have a longer time to expiration than futures.

2. What is the strike price of an options contract?

A. The price at which the underlying asset will be bought or sold.
B. The current market price of the underlying asset.
C. The price at which the option was originally purchased.
D. The price at which the option can be exercised.

3. According to the cost-of-carry model, what factors contribute to the futures price?

A. Spot price and dividends.

B. Spot price and interest rates.

C. Strike price and time to expiration.

D. Implied volatility and risk-free rate.

4. In options pricing, what does "implied volatility" refer to?

A. The actual historical volatility of the underlying asset.

B. The volatility that is expected or implied by current option prices.

C. The volatility of futures prices.

D. The volatility of the risk-free rate.

5. A long call option gives the holder the right to:

A. Sell the underlying asset at the strike price.

B. Buy the underlying asset at the strike price.

C. Buy the underlying asset at the current market price.

D. Sell the underlying asset at the current market price.

6. Which options strategy involves holding a long position in the underlying asset and selling a call option against it?

A. Covered call.

B. Protective put.

C. Straddle.

D. Strangle.

7. What does the term "contango" typically indicate in futures markets?

A. A market condition where futures prices are higher than spot prices.

B. A market condition where futures prices are lower than spot prices.

C. A market condition with low volatility.

D. A market condition with high liquidity.

8. In options trading, what is the primary risk for the holder of an uncovered (naked) call option?

A. Limited profit potential.

B. Margin calls.

C. Unlimited potential losses.

D. Lack of liquidity.

9. Which regulatory body oversees the futures and options markets in the United States?

A. SEC (U.S. Securities and Exchange Commission).

B. CFTC (Commodity Futures Trading Commission).

C. FINRA (Financial Industry Regulatory Authority).

D. FDIC (Federal Deposit Insurance Corporation).

10. What role does a clearinghouse play in futures and options trading?

A. It executes trades on behalf of investors.
B. It provides liquidity to the markets.
C. It acts as a counterparty to both buyers and sellers, ensuring the integrity of trades.
D. It regulates the options markets.

11. A call option holder profits when the market price of the underlying asset:

A. Rises above the strike price.
B. Falls below the strike price.
C. Equals the strike price.
D. Exceeds the premium paid.

12. In a long put option position, the potential loss is:

A. Limited to the premium paid.
B. Unlimited if the market price increases.
C. Unlimited if the market price decreases.
D. Equal to the strike price.

13. What type of options strategy combines a long call and a long put option with the same strike price and expiration date?

A. Straddle.
B. Strangle.
C. Covered call.
D. Bull spread.

14. What is the primary goal of a protective put strategy?

A. To maximize profit potential.
B. To limit potential losses.
C. To generate income through premiums.
D. To create a neutral position.

15. Which strategy involves holding a long position in the underlying asset and selling a call option against it?

A. Covered call.
B. Protective put.
C. Straddle.
D. Strangle.

Answers for Self Assessment

1.	**A**	2.	D	3.	B	4.	B	5.	B
6.	A	7.	A	8.	C	9.	B	10.	C

11. A   12. A   13. A   14. B   15. A

Review Questions

1. What is the fundamental difference between futures and options contracts?
2. Explain the concept of a "strike price" in options contracts.
3. What is the significance of the expiration date in futures and options?
4. Differentiate between call options and put options?
5. Describe the cost-of-carry model and its role in pricing futures contracts.
6. What factors influence the pricing of options according to the Black-Scholes model?
7. What is the difference between a long and a short position in futures and options trading?
8. Describe a common hedging strategy using futures or options.
9. What is a covered call strategy, and when might an investor use it?
10. Explain how a straddle strategy works and when it might be employed?

Further Reading

- T.S. Grewal's Analysis of Financial Statements: (Paperback, CA. (Dr.) G.S. Grewal, T.S. Grewal, H.S. Grewal, R.K. Khosla)
- FINANCIAL STATEMENTS ANALYSIS: Financial statements, Comparative analysis, Common size analysis, Trend analysis, Inter-firm analysis, FAQs (Illustrated) Kindle Edition, by Chandra Sekhar (Author)

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