SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES,
CHITTOOR,
(AUTONOMOUS)
Approved by AICTE, New Delhi, Affiliated to JNTUA, Ananthapuramu

Lecture Notes

Subject Notes : Security Analysis and Portfolio Management

Year/Branch : II / MBA

Regulations : R22

Prepared By : Dr. K. Suresh, Assistant Professor

II MBA – Semester - III					
Course Code	**SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT**	**L**	**T**	**P**	**C**
22MBA235A		**3**	**1**	**0**	**4**

Course Educational Objectives (CEO):

CEO1: To provide knowledge on Investment Environment and Capital Markets.
CEO2: To develop skills on fundamental analysis and technical analysis of securities.
CEO3: To provide knowledge for the measurement of return and risk of various securities through various tools.
CEO4: To provide knowledge for the valuation of various securities through various methods.
CEO5: To develop skills for the portfolio management through by various models.

UNIT - I	**Investment and Trading Environment**	Lecture Hrs: 8

Investment Meaning and Environment - Capital Markets - Trading in Stock Exchanges: BSE, NSE, MCX - New Issue Market.

UNIT - II	**Security Analysis**	Lecture Hrs: 12

Fundamental Analysis: Economy, Industry and Company Analysis - Technical Analysis - Fundamental Analysis Vs Technical Analysis – Dow Theory - Trend Analysis – Patterns - Moving Averages - Relative Strength Index (RSI).

UNIT - III	**Measurement of Return and Risk**	Lecture Hrs:12

Revenue Return and Capital Appreciation - Probability Distribution – Holding Period - Statistical Methods - Calculation of Expected Return Risk Factors - Risk Classification: Systematic Risk and Unsystematic Risk - Standard Deviation – Variance – Correlation Coefficient – Beta - Calculating Expected Return and Risk.

UNIT - IV	**Valuation of Securities**	Lecture Hrs:12

Approaches of Valuation – Bond Valuation – Preference Share Valuation – Common Stock Valuation.

UNIT - V	**Portfolio Management**	Lecture Hrs:12

Process of Portfolio Management - Diversification – Modern Portfolio – Portfolio Models: Markowitz Model, Sharpe Single Index Model, Capital Asset Pricing Model.

Course Outcomes:

On successful completion of the course the student will be able to,		**POs related to COs**
CO1	**Demonstrate** knowledge on knowledge on investment environment and capital markets	PO8
CO2	**Analyse** the various securities through fundamental analysis and technical analysis	PO2, PO8
CO3	**Measure** the return and risk of various securities through various tools	PO2, PO4, PO8
CO4	**Apply** the approaches of Valuation of securities and use various methods for valuation.	PO2, PO4, PO8

CO5	**Identify** the best portfolio management through by various models	PO2, PO4, PO8

Text Books:

1. Portfolio Management, 2/e, S Kevin, Prentice Hall, New Delhi, 2007.
2. Investment Analysis & Portfolio Management, 3/e, Prasanna Chandra, Tata McGraw Hill, New Delhi, 2008.

Reference Books:

1. Investment Analysis And Portfolio Management, 2021 Edition, Prasanna Chandra, McGraw Hill, 2021.
2. Security Analysis and Portfolio Management, 1/e, Sudhindra Bhat, Excel Books, New Delhi, 2008.
3. Security Analysis & Portfolio Management, 10/e, Awadhani, Himalaya Publishers, Mumbai, 2011.
4. Security Analysis and Portfolio Management, 4/e, Donald E fisher, Ronald J Jordan, Pearson Prentice Hall, New Delhi, 2008.

Online Learning Resources:

https://nptel.ac.in/courses/110105035
https://onlinecourses.nptel.ac.in/noc21_mg99/preview
https://nptel.ac.in/courses/110107154

COURSE OUTCOMES VS POs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

Course	**PO / CO**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO1**	**PSO2**
22MBA235A : SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	**C2305A.1**	-	-	-	-	-	-	-	3	3	-
	C2305A.2	-	2	-	-	-	-	-	3	2.5	-
	C2305A.3	-	2	-	2	-	-	-	3	2.5	2
	C2305A.4	-	2	-	2	-	-	-	3	2.5	2
	C2305A.5	-	2	-	2	-	-	-	3	2.5	2
	C2305A	-	2	-	2	-	-	-	3	2.6	2

Note on Bloom's Taxonomy Levels Used in This Document

Level	Descriptor
L1	Remember
L2	Understand
L3	Apply
L4	Analyze
L5	Evaluate

UNIT I — INVESTMENT AND TRADING ENVIRONMENT

"An investment in knowledge pays the best interest." — Benjamin Franklin

Unit Overview

This unit lays the foundation for the entire course. It introduces the meaning of investment and how it differs from speculation and gambling, surveys the structure of the Indian financial system, and explains how capital is raised and traded through the primary market and the major stock and commodity exchanges (BSE, NSE, and MCX). A sound grasp of this unit is essential before any security can be analysed, valued, or assembled into a portfolio in the units that follow.

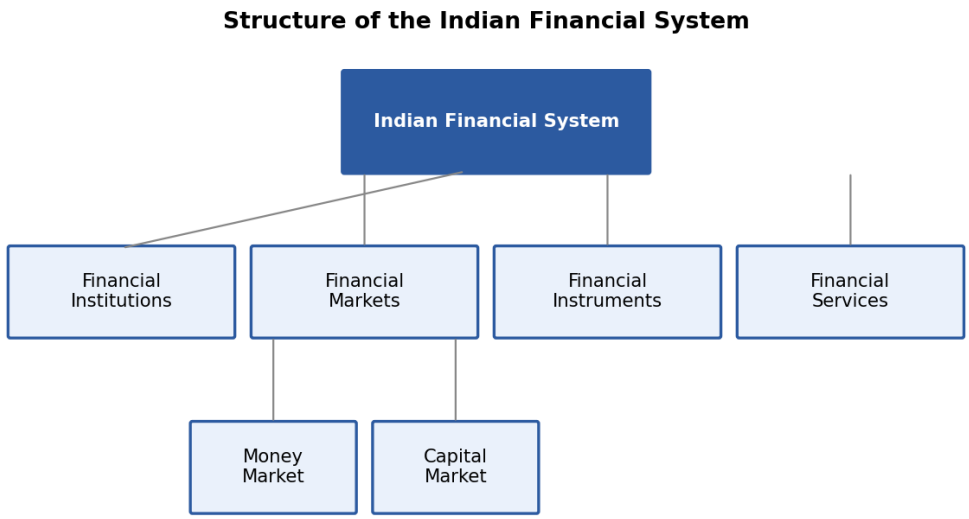

Fig. 1.1 — Structure of the Indian Financial System

Objectives of the Unit

1. Explain the meaning, objectives, and process of investment (L2).
2. Distinguish investment from speculation and gambling (L2).
3. Describe the constituents and functions of the Indian financial system and capital markets (L2).
4. Explain the trading mechanism followed at BSE, NSE, and MCX (L2).
5. Discuss the methods, intermediaries, and importance of the New Issue (Primary) Market (L2).

Key Concepts

Investment | Speculation | Gambling | Capital Market | Money Market | BSE | NSE | MCX | Primary Market | IPO / FPO | Book Building | Underwriting | Rights Issue | Bonus Issue | SEBI

Learning Outcomes

On successful completion of this unit, the student will be able to:

Demonstrate knowledge of the investment environment and capital markets.

Importance of Studying This Unit

Every analytical tool used later in this course — from ratio analysis to portfolio optimisation — assumes the reader already understands where securities come from and how they are traded. Studying this unit equips the learner to correctly interpret market news, participate confidently as an investor, and appreciate the regulatory and institutional framework that protects capital markets in India.

1.2 Introduction

Every rupee that is not spent today carries within it a choice: to hold it idle, to consume it later, or to put it to work so that it grows. This unit builds the foundation of the entire course — it introduces the vocabulary, institutions, and mechanics of the environment in which every subsequent unit (security analysis, risk measurement, valuation, and portfolio management) operates. Without a clear understanding of what an "investment" is, how markets are organised, and how new securities are issued, no analytical technique can be meaningfully applied.

1.3 Meaning and Definition of Investment

Investment is the current commitment of money or other resources in the expectation of reaping future benefits that will compensate the investor for (a) the time the funds are committed, (b) the expected rate of inflation, and (c) the uncertainty of future payments.

Key terminologies:

- **Investor:** A person or institution that commits capital with the expectation of a financial return.
- **Return:** The reward for investing, comprising income (dividend/interest) and capital appreciation.
- **Risk:** The variability or uncertainty associated with the expected return.
- **Liquidity:** The ease with which an asset can be converted into cash without significant loss of value.
- **Safety:** The certainty of return of the principal amount without loss of money or time.
- **Time Horizon:** The period over which an investor plans to hold the investment.

1.3.1 Investment vs. Speculation vs. Gambling

Basis	**Investment**	**Speculation**	**Gambling**
Time Horizon	Long-term	Short-term	Immediate
Basis of Decision	Fundamental analysis, planning	Market trends, tips, technical signals	Chance
Risk	Moderate, calculated	High	Very high, uncontrolled
Return	Steady, from earnings/appreciation	Quick profit from price movements	Windfall or total loss
Funds	Own surplus funds	Own and borrowed funds	Own or borrowed funds
Economic Contribution	Creates capital formation	Provides market liquidity	None; a zero-sum transfer

Why this distinction matters: Regulators, portfolio managers, and analysts must communicate using a shared vocabulary. A pension fund manager who "speculates" with retirees' savings violates fiduciary duty; understanding the boundary protects both the investor and the institution.

1.3.2 Objectives of Investment

1. **Safety of Principal** — protecting the capital sum invested.
2. **Adequate Liquidity** — the ability to convert to cash when required.
3. **Income Stability** — a regular and dependable flow of income.
4. **Capital Growth** — appreciation in the value of the investment over time.
5. **Tax Efficiency** — minimizing the tax burden through eligible instruments (e.g., ELSS, PPF).
6. **Hedge Against Inflation** — ensuring the real (inflation-adjusted) rate of return remains positive.

1.3.3 Investment Process (Overview)

The investment process, as elaborated further in Units III–V, may be summarised in five sequential steps:

1. **Framing of Investment Policy** — decide objectives, amount of investment, and identify potential investment avenues.
2. **Investment Analysis** — apply fundamental and technical analysis (Unit II).
3. **Valuation** — estimate intrinsic value of securities (Unit IV).
4. **Portfolio Construction** — select combination of assets (Unit V).
5. **Portfolio Evaluation and Revision** — periodic review of performance against objectives.

1.4 The Investment Environment

The **investment environment** refers to the kinds of marketable securities that exist and where and how they are bought and sold. It has undergone dramatic change in India since the liberalisation reforms of 1991, characterised by:

- **Dematerialisation** of securities (paperless holding through NSDL/CDSL).
- **Screen-Based Trading** replacing the open-outcry system.
- **Rolling Settlement** (T+1 in the Indian markets) replacing account-period settlement.

- **Entry of Foreign Portfolio Investors (FPIs)** and mutual funds as dominant institutional players.
- **Regulatory oversight** by the Securities and Exchange Board of India (SEBI), established in 1988 and given statutory powers in 1992.
- **Product Innovation** — Exchange Traded Funds (ETFs), derivatives (futures & options), Real Estate Investment Trusts (REITs), Infrastructure Investment Trusts (InvITs), Sovereign Gold Bonds, and Systematic Investment Plans (SIPs).

1.4.1 Constituents of the Indian Financial System

1. **Financial Institutions** — RBI, SEBI, IRDAI, PFRDA (regulators); banks, NBFCs, insurance companies, mutual funds, pension funds (intermediaries).
2. **Financial Markets** — Money market (short-term) and Capital market (long-term).
3. **Financial Instruments** — Equity shares, debentures, bonds, government securities, derivatives, mutual fund units.
4. **Financial Services** — Merchant banking, underwriting, credit rating, portfolio management, depository services.

Figure 1.1 (described): A pyramid diagram with the RBI and SEBI at the apex as regulators, flowing down into Money Market and Capital Market segments, which in turn connect to intermediaries (banks, brokers, depositories) and finally to the retail and institutional investors at the base.

1.5 Capital Markets

The **capital market** is the market for long-term funds — both debt and equity — that channels household and institutional savings into productive investment.

1.5.1 Functions of the Capital Market

1. Mobilisation of savings and channelling them into productive investment.
2. Facilitating price discovery for securities.
3. Providing liquidity by enabling securities to be bought and sold.

4. Reducing the cost and time of transacting.
5. Providing a continuous market for existing securities (secondary market).

1.5.2 Structure of the Capital Market

A. Primary Market (New Issue Market): Deals in new securities — securities that were not previously available and are offered to investors for the first time (see Section 1.8).

B. Secondary Market (Stock Exchanges): Deals in securities previously issued — provides liquidity and continuous price discovery for existing securities (see Sections 1.6–1.7).

1.5.3 Money Market vs Capital Market

Basis	**Money Market**	**Capital Market**
Maturity	Up to 1 year	More than 1 year
Instruments	T-Bills, CPs, CDs, Call Money	Shares, Debentures, Bonds
Purpose	Working capital needs	Fixed capital / long-term needs
Risk & Return	Low risk, low return	Higher risk, higher potential return
Regulator	RBI	SEBI

1.5.4 Importance of Capital Markets to the Economy

Capital markets are the circulatory system of a modern economy: they transform idle household savings into productive capital for corporations and governments, enable risk-sharing between savers and entrepreneurs, and provide the price signals that guide the efficient allocation of scarce capital across competing industries. A well-developed capital market is strongly correlated with long-run economic growth (a relationship documented extensively in World Bank and RBI research on financial deepening).

1.6 Trading in Stock Exchanges

A **stock exchange** is an organised, regulated market where listed securities are bought and sold under a well-defined set of rules. Section 2(3) of the Securities Contracts (Regulation) Act, 1956 defines a stock exchange as “a body of individuals, whether incorporated or not,

constituted for the purpose of assisting, regulating, or controlling the business of buying, selling, or dealing in securities."

1.6.1 Functions of a Stock Exchange

1. **Liquidity and Marketability** — converting investment into cash at any time.
2. **Price Discovery** — continuous matching of buy and sell orders determines fair prices.
3. **Safety of Transactions** — trading among members registered under regulatory supervision.
4. **Contribution to Economic Growth** — channelling savings into the most productive listed enterprises.
5. **Spreading of Equity Cult** — encouraging wider public participation in ownership of companies.
6. **Reflecting the Economy (Barometer Role)** — indices such as SENSEX and NIFTY act as leading indicators of economic sentiment.

1.6.2 Bombay Stock Exchange (BSE)

Established in 1875, the BSE is Asia's oldest stock exchange and one of the earliest in the world. Key features:

- Benchmark index: **SENSEX** (S&P BSE SENSEX), a free-float market-capitalisation-weighted index of 30 large, established, and financially sound companies.
- Trading platform: **BOLT** (BSE On-Line Trading), a fully automated screen-based system.
- Settlement cycle: **T+1** rolling settlement (aligned with NSE since 2023).
- Regulatory status: recognised stock exchange under SCRA, 1956, regulated by SEBI.

1.6.3 National Stock Exchange (NSE)

Incorporated in 1992 and commencing operations in 1994, NSE was India's first exchange to offer a fully automated, screen-based electronic trading system, replacing the earlier open-outcry system across Indian exchanges.

- Benchmark index: **NIFTY 50**, comprising the 50 largest and most liquid Indian companies.
- Trading segments: Equity (Capital Market segment), Futures & Options (F&O segment), Currency Derivatives, Debt segment, and SME platform (NSE Emerge).
- NSE pioneered the **Electronic Clearing and Settlement** mechanism through the National Securities Clearing Corporation Limited (NSCCL) and demutualisation of exchange ownership from broker-members.

1.6.4 BSE vs NSE — Comparative Summary

Basis	**BSE**	**NSE**
Established	1875	1992 (operations from 1994)
Benchmark Index	SENSEX (30 stocks)	NIFTY 50 (50 stocks)
Number of Listed Companies	Higher (broader SME base)	Comparatively fewer, but higher trading volumes
Trading System	BOLT	NEAT (National Exchange for Automated Trading)
Liquidity	High	Generally higher, dominates derivatives trading

1.6.5 Multi Commodity Exchange (MCX)

MCX, established in 2003 and headquartered in Mumbai, is India's leading commodity derivatives exchange. Unlike BSE/NSE (which trade financial securities), MCX facilitates trading in:

- **Bullion:** Gold, Silver.
- **Base Metals:** Copper, Zinc, Lead, Aluminium, Nickel.
- **Energy:** Crude Oil, Natural Gas.
- **Agricultural Commodities:** Cotton, Mentha Oil, Cardamom (subject to regulatory permissions from time to time).

Importance of MCX: It enables price discovery and price-risk management (hedging) for producers, processors, traders, and consumers of commodities, and offers portfolio diversification opportunities for investors, since commodity prices often exhibit low correlation with equity markets (a concept elaborated in Unit V under diversification). MCX operates under the regulatory framework administered by SEBI (commodity derivatives were brought under SEBI's regulatory umbrella in 2015 following the merger of the erstwhile Forward Markets Commission with SEBI).

1.6.6 Trading Mechanism (Illustrative Workflow)

Figure 1.2 (described): A flow diagram showing: Investor places order with broker → Broker routes order to exchange trading system (NEAT/BOLT) → Order matched with counter-order → Trade confirmed → Clearing Corporation nets obligations → Settlement (funds and securities transferred, T+1) → Depository (NSDL/CDSL) updates demat account.

Steps in a typical trade:

1. Investor opens a trading account (with a SEBI-registered broker) and a demat account (with a depository participant).
2. Investor places a buy/sell order specifying price and quantity.
3. Order is transmitted electronically to the exchange and matched by price-time priority.
4. Trade confirmation is generated instantly.
5. Clearing corporation (e.g., NSCCL, Indian Clearing Corporation) guarantees settlement, acting as a central counterparty.

6. On T+1, funds move from buyer's bank and securities move from seller's demat account, and vice-versa.

1.6.7 Advantages and Disadvantages of Stock Exchange Trading

Advantages: - Provides liquidity and easy exit for investors. - Transparent, regulator-supervised price discovery. - Wide range of instruments catering to different risk appetites. - Investor protection mechanisms (Investor Protection Fund, arbitration, SCORES grievance portal).

Disadvantages: - Exposure to market volatility and systemic risk. - Possibility of speculative excess and price manipulation (though curbed by surveillance). - Requires financial literacy; uninformed retail investors may incur losses. - Transaction costs (brokerage, STT, stamp duty, GST) reduce net returns.

1.7 Application: How Exchanges Serve the Real Economy

When a mid-sized manufacturing company needs funds to build a new factory, it can either borrow from a bank (debt) or raise equity by listing on the NSE/BSE. Once listed, its shares trade continuously in the secondary market — this liquidity is precisely what makes investors willing to subscribe to new issues in the primary market in the first place, since they know they can exit later. This linkage between secondary-market liquidity and primary-market fundraising is one of the most important — and frequently examined — ideas in this unit.

1.8 New Issue Market (Primary Market)

The **New Issue Market (NIM)**, also called the **Primary Market**, deals with the raising of fresh capital by companies, either for setting up new projects or for expansion, diversification, or modernisation of existing units. Unlike the secondary market, there is no physical or fixed location — the primary market is a *function*, not a place.

1.8.1 Methods of Floating New Issues

1. **Public Issue**
   - **Initial Public Offer (IPO):** first-time sale of shares by a private company to the public.
   - **Further Public Offer (FPO):** an already listed company issues additional shares to the public.
2. **Rights Issue:** shares offered to existing shareholders in proportion to their current holding, typically at a discount to market price.
3. **Bonus Issue:** free additional shares given to existing shareholders out of the company's reserves, in a fixed ratio (e.g., 1:1), without cash consideration.
4. **Private Placement:** securities sold to a select group of institutional or high-net-worth investors rather than to the general public.
5. **Preferential Allotment:** issue of shares/convertible securities to a select set of persons at a price determined as per SEBI (ICDR) Regulations.
6. **Qualified Institutional Placement (QIP):** a mechanism allowing listed companies to raise capital swiftly from Qualified Institutional Buyers without the elaborate compliance of a public issue.
7. **Offer for Sale (OFS):** promoters or large shareholders sell their existing holding to the public, without fresh capital coming into the company.

1.8.2 Pricing of New Issues

- **Fixed Price Method:** the issuer, in consultation with merchant bankers, decides the issue price in advance and it is disclosed in the prospectus.
- **Book Building Method:** the issue price is discovered through a bidding process within a specified price band (floor price to cap price); investors bid at various price points and the final "cut-off price" is determined by demand.

1.8.3 Key Intermediaries in the New Issue Market

Intermediary	**Role**
Merchant Banker / Lead Manager	Manages the entire issue process, due diligence, and prospectus drafting
Underwriters	Guarantee subscription to the issue, absorbing unsubscribed portion
Registrar to the Issue	Manages application processing and allotment
Bankers to the Issue	Collect application money
Credit Rating Agency	Rates debt instruments (CRISIL, ICRA, CARE)
SEBI	Regulates disclosure norms and investor protection under ICDR Regulations

1.8.4 Importance of the New Issue Market

1. Serves as the **primary vehicle of capital formation** — without it, the secondary market would have nothing new to trade.
2. Provides an avenue for **entrepreneurs to access public capital**, reducing dependence on debt and promoter funds.
3. Widens **share ownership** and democratises wealth creation.
4. Signals **investor confidence** in the economy — a robust IPO pipeline is often read as a barometer of bullish sentiment.

1.8.5 Advantages and Limitations

Advantages: access to large capital pools; enhanced company visibility and credibility; liquidity event for early investors (VCs/PE); market-based valuation discovery.

Limitations: high cost of issue (merchant banking fees, underwriting commission, marketing); extensive regulatory compliance and disclosure burden; dilution of promoter control; market-timing risk (an issue can fail in adverse market conditions).

1.9 Real-World Example

Example — LIC IPO (2022): The Life Insurance Corporation of India's IPO, one of the largest in Indian history, illustrates several primary-market concepts: it used the book-building method with a price band, reserved separate quotas for policyholders, employees, and retail investors, and was managed by a syndicate of merchant bankers. Its post-listing price performance also illustrates a common phenomenon studied in finance — **IPO underpricing** — where issue prices are frequently set below the "true" market-clearing price to ensure full subscription, often resulting in listing-day gains (or, as in this instance, initial declines when market sentiment shifts between pricing and listing dates).

1.10 Mini Case Study — Choosing Between IPO Application and Secondary Market Purchase

Case: Ravi, a first-time investor with ₹1,00,000 in surplus savings, is considering whether to apply for shares in an upcoming IPO of a technology company or to instead buy shares of an already-listed, comparable technology company from the secondary market. The IPO is priced via book-building with a band of ₹450–₹480; the comparable listed company trades at ₹520 with steady dividend history and analyst coverage going back five years.

Discussion points for students: 1. What information is available to Ravi in each case (prospectus vs. five years of audited financial history, analyst reports, and price charts)? 2. How does liquidity differ before and immediately after listing? 3. What role does underpricing play in his expected first-day return if he chooses the IPO? 4. Which choice better aligns with the safety, liquidity, and growth objectives introduced in Section 1.3.2?

(Instructors may extend this case with real, current IPO prospectus data for classroom discussion.)

1.11 Unit I — Questions

(a) Short Answer Questions (2 Marks Level)

1. Define “investment.” (L1)
2. State any two objectives of investment. (L1)
3. What is meant by the “capital market”? (L1)
4. Differentiate between money market and capital market in one line each. (L2)
5. What is BOLT? (L1)
6. Name the benchmark index of NSE. (L1)
7. What is a rights issue? (L1)
8. Define “primary market.” (L1)
9. What does MCX trade in? (L1)
10. What is book building? (L2)
11. Distinguish between an IPO and an FPO. (L2)
12. What is meant by “underwriting”? (L1)
13. Name any two regulators of the Indian financial system. (L1)
14. What is a bonus issue? (L1)
15. What is meant by “rolling settlement”? (L2)

(b) Essay Type Questions (10 Marks Level)

1. Explain the meaning and objectives of investment. Distinguish investment from speculation and gambling. (L2)
2. Discuss the structure of the Indian capital market with a suitable diagram. (L2)
3. Explain the trading mechanism followed at NSE from order placement to settlement. (L4)
4. Compare and contrast BSE and NSE on the basis of history, indices, and trading systems. (L4)

5. Discuss the role and importance of the Multi Commodity Exchange (MCX) in India's investment environment. (L2)
6. Explain the various methods of floating new issues in the primary market. (L2)
7. "The primary market and secondary market are interdependent." Critically examine this statement. (L5)
8. Evaluate the role of SEBI in investor protection and regulation of new issues. (L5)
9. Discuss the advantages and disadvantages of investing through stock exchanges. (L4)
10. Analyze the importance of the New Issue Market for capital formation in a developing economy. (L4)

Problems

Problem 1.1: A company issues an IPO through book building with a price band of ₹200 (floor) to ₹220 (cap). The demand at each price point is: ₹200 → 50,00,000 shares; ₹210 → 35,00,000 shares; ₹220 → 20,00,000 shares. If the company wishes to issue 30,00,000 shares, determine the cut-off price using the concept of cumulative demand, and explain your reasoning. (L3)

Solution approach: Cumulative demand at ₹220 = 20,00,000; at ₹210 and above = 20,00,000 + 35,00,000 = 55,00,000, which is greater than or equal to the issue size of 30,00,000. Hence the cut-off price is **₹210**, since it is the highest price at which the cumulative demand meets or exceeds the number of shares on offer.

Problem 1.2: An investor is allotted 100 shares in a rights issue at a rights price of ₹90 when the cum-rights market price is ₹120, in a 1:5 ratio (1 new share for every 5 held). Calculate the theoretical ex-rights price if the investor originally held 500 shares. (L3)

Solution approach: Value of holding before rights = 500 × ₹120 = ₹60,000. New shares issued = 500/5 = 100 shares at ₹90 = ₹9,000. Total value after rights = ₹69,000. Total shares after rights = 600. Theoretical ex-rights price = ₹69,000 / 600 = **₹115 per share**.

Unit I Highlights

- Investment differs from speculation and gambling mainly in time horizon, basis of decision, and risk taken.
- The Indian financial system rests on four pillars: institutions, markets, instruments, and services.
- The capital market is split into the primary market (new issues) and the secondary market (trading of existing securities).
- BSE and NSE are India's principal stock exchanges; MCX is the leading commodity exchange.
- The New Issue Market allows companies to raise fresh capital through IPOs, FPOs, rights, and bonus issues.

Textbook Reference — Unit I

Kevin, S. (2007). Portfolio Management, 2nd Edition. New Delhi: Prentice Hall.

Chandra, Prasanna (2008). Investment Analysis & Portfolio Management, 3rd Edition. New Delhi: Tata McGraw Hill.

Chandra, Prasanna (2021). Investment Analysis and Portfolio Management, 2021 Edition. McGraw Hill.

Bhat, Sudhindra (2008). Security Analysis and Portfolio Management, 1st Edition. New Delhi: Excel Books.

UNIT II — SECURITY ANALYSIS

"Price is what you pay. Value is what you get."

— Warren Buffett

Unit Overview

Having understood where securities are created and traded, this unit turns to how their worth is judged. It presents the two broad approaches to security analysis — fundamental analysis (through the Economy-Industry-Company or EIC framework) and technical analysis (through Dow Theory, chart patterns, moving averages, and the Relative Strength Index). Together these tools form the analytical toolkit an investor uses to decide what to buy, hold, or sell.

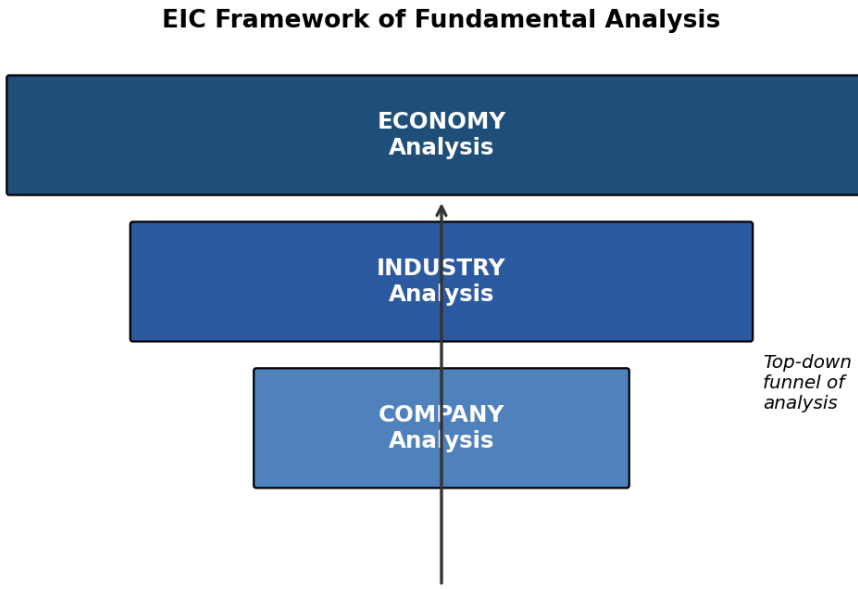

Fig. 2.1 — The EIC Framework of Fundamental Analysis

2.1 Learning Objectives

1. Explain the meaning and approaches to security analysis (L2).
2. Analyze the economy, industry, and company using the EIC framework (L4).
3. Explain the principles and tools of technical analysis (L2).
4. Distinguish between fundamental analysis and technical analysis (L4).
5. Apply Dow Theory to interpret market trends (L3).
6. Apply moving averages and the Relative Strength Index (RSI) to identify trading signals (L3).

Key Concepts

Security Analysis | Fundamental Analysis | EIC Framework | Economy Analysis | Industry Analysis | Company Analysis | Technical Analysis | Dow Theory | Support & Resistance | Moving Averages | Relative Strength Index (RSI)

Learning Outcomes

On successful completion of this unit, the student will be able to:

Analyse various securities through fundamental analysis and technical analysis

Importance of Studying This Unit

Security analysis is the bridge between raw market information and a reasoned investment decision. Mastery of this unit allows a student to read financial statements and price charts with equal fluency, forming the analytical backbone needed before risk and return can be measured (Unit III) or a security can be valued (Unit IV).

2.2 Meaning of Security Analysis

Security analysis is the process of evaluating securities to determine their true worth (intrinsic value) and to identify mispriced securities — those trading above or below their fair value — so that rational buy, hold, or sell decisions can be made. It is broadly divided into two schools of thought:

1. **Fundamental Analysis** — studies the underlying economic and financial factors that determine a security's intrinsic value.
2. **Technical Analysis** — studies historical price and volume data to forecast future price movements, on the premise that market prices move in trends driven by supply and demand.

2.3 Fundamental Analysis: The EIC (Economy–Industry–Company) Framework

Fundamental analysis proceeds top-down, from the broad economy, to the industry, and finally to the specific company — the logic being that a company's fortunes are nested inside its industry's fortunes, which are in turn nested inside the macro-economy's fortunes.

2.3.1 Economy Analysis

Purpose: to assess whether the broad macroeconomic climate favours corporate earnings growth and, hence, equity returns.

Key Macroeconomic Indicators:

Indicator	**Significance**
Gross Domestic Product (GDP) growth rate	Overall economic health; higher growth generally supports corporate revenue growth
Inflation (CPI/WPI)	High inflation erodes real returns and often triggers monetary tightening
Interest Rates (Repo Rate)	Inversely related to equity valuations; higher rates raise the discount rate applied to future cash flows
Fiscal Deficit	Persistently high deficits can crowd out private investment and pressure the currency
Balance of Payments / Current Account Deficit	Signals external sector vulnerability
Exchange Rate	Affects export/import-oriented companies differently
Index of Industrial Production (IIP)	Tracks manufacturing sector momentum
Business and Consumer Confidence Indices	Leading indicators of future spending and investment
Monsoon / Agricultural Output (India-specific)	Significant influence on rural demand and inflation

Techniques of Economic Analysis: - Economic Rainbow / Business Cycle Analysis: identifying whether the economy is in expansion, peak, contraction, or trough phase, since different sectors outperform in different phases. - **Anticipatory Surveys:** surveys of consumer and business intentions (e.g., RBI's Consumer Confidence Survey). - **Econometric**

Model Building: statistical models relating economic variables to forecast GDP, inflation, etc. - **Opportunistic Model Building (Sectoral Analysis):** studying key sectors that disproportionately drive GDP.

2.3.2 Industry Analysis

Purpose: even in a favourable economy, industries perform unevenly — industry analysis identifies which industries are best positioned.

Industry Life Cycle:

1. **Pioneering Stage** — rapid growth, high risk, many entrants, uncertain survivors.
2. **Rapid Growth (Expansion) Stage** — surviving firms grow quickly; demand outstrips supply.
3. **Maturity (Stabilisation) Stage** — growth slows to the pace of the overall economy; competition intensifies.
4. **Decline Stage** — obsolescence, substitution by newer technologies/industries, shrinking demand.

Figure 2.1 (described): An S-shaped (logistic) curve plotting Industry Sales/Profit on the Y-axis against Time on the X-axis, showing four labelled zones corresponding to the four life-cycle stages above.

Porter's Five Forces (a widely used industry-analysis tool):

1. Threat of new entrants.
2. Bargaining power of suppliers.
3. Bargaining power of buyers.
4. Threat of substitute products.
5. Rivalry among existing competitors.

Other Industry Analysis Factors: Government policy and regulation, labour conditions, degree of competition, supply of key inputs, technological change, and export potential.

2.3.3 Company Analysis

Purpose: to select the best company within the chosen industry by studying its financial statements, management quality, competitive position, and growth prospects.

Key Areas of Company Analysis:

1. **Financial Statement Analysis**
   - **Profitability Ratios:** Gross Profit Margin, Net Profit Margin, Return on Equity (ROE), Return on Capital Employed (ROCE).
   - **Liquidity Ratios:** Current Ratio, Quick Ratio.
   - **Leverage Ratios:** Debt-Equity Ratio, Interest Coverage Ratio.
   - **Efficiency Ratios:** Inventory Turnover, Asset Turnover.
   - **Valuation Ratios:** Price-Earnings (P/E) Ratio, Price-to-Book (P/B) Ratio, Dividend Yield (elaborated further in Unit IV).
2. **Quality of Management** — track record, corporate governance, capital allocation history.
3. **Competitive Position** — market share, brand strength, cost leadership or differentiation (linking back to Porter's framework).
4. **Growth Prospects** — capacity expansion plans, R&D pipeline, order book.
5. **SWOT Analysis** — Strengths, Weaknesses, Opportunities, Threats.

Importance: Company analysis is where fundamental analysis culminates in an actionable intrinsic value estimate (developed fully with valuation models in Unit IV).

2.3.4 Advantages and Limitations of Fundamental Analysis

Advantages: grounded in real economic and financial data; suitable for long-term investors; helps identify genuinely undervalued securities; considers qualitative factors like management quality.

Limitations: time-consuming and data-intensive; relies on forecasts that may prove wrong; does not help with precise entry/exit timing; financial statements can be manipulated (creative accounting).

2.4 Technical Analysis

Technical analysis is the study of past market data — primarily price and volume — to forecast future price trends. It rests on three basic premises:

1. **Market price discounts everything** — all known information is already reflected in the price.
2. **Prices move in trends** — prices tend to continue in the direction of an established trend until a reversal signal appears.
3. **History tends to repeat itself** — recurring price patterns reflect enduring patterns of investor psychology (fear and greed).

2.4.1 Fundamental Analysis vs Technical Analysis

Basis	**Fundamental Analysis**	**Technical Analysis**
Focus	Intrinsic value, economic/financial data	Price and volume patterns
Time Horizon	Long-term	Short-term to medium-term
Data Used	Financial statements, macro data	Charts, price history
Objective	"What" to buy	"When" to buy/sell
Underlying Assumption	Markets can misprice securities temporarily but converge to intrinsic value	Prices move in identifiable trends driven by supply-demand and psychology
User Profile	Long-term investors, portfolio managers	Traders, short-term speculators

Complementary use: in practice, many analysts use fundamental analysis to select *what* to buy and technical analysis to time *when* to buy or sell — the two approaches are frequently combined rather than viewed as mutually exclusive.

2.4.2 Dow Theory

Developed by Charles H. Dow (founder of the *Wall Street Journal* and co-creator of the Dow Jones Industrial Average), Dow Theory is the foundation of modern technical analysis.

Basic Tenets of Dow Theory:

1. **The Averages Discount Everything** — all relevant information is reflected in index levels.
2. **The Market Has Three Trends:**
   - **Primary Trend:** the major, long-term direction (bull or bear market), lasting a year or more.
   - **Secondary (Intermediate) Trend:** corrections against the primary trend, lasting weeks to months.
   - **Minor (Short-term) Trend:** day-to-day fluctuations of little analytical significance.
3. **Primary Trends Have Three Phases:**
   - *Bull Market:* Accumulation Phase → Public Participation Phase → Excess (Distribution) Phase.
   - *Bear Market:* Distribution Phase → Public Participation (Panic) Phase → Despair Phase.
4. **Volume Must Confirm the Trend** — volume should expand in the direction of the primary trend.
5. **A Trend Remains in Effect Until a Clear Reversal Signal Occurs.**

Figure 2.2 (described): A zig-zag line chart with an overall rising slope (primary bull trend) made up of smaller rising and falling segments (secondary and minor trends), with successive higher peaks and higher troughs illustrating an uptrend.

Importance: Dow Theory remains conceptually foundational even though modern traders use more sophisticated tools — nearly all later technical concepts (support/resistance, trend lines, confirmation) trace back to it.

2.4.3 Trend Analysis

A **trend** is the general direction in which a security's price is moving.

- **Uptrend:** series of higher highs and higher tops and higher lows.
- **Downtrend:** series of lower highs and lower lows.
- **Sideways (Horizontal) Trend:** prices oscillate within a range without a clear directional bias.

Support and Resistance: - **Support** is a price level where buying interest is strong enough to halt a decline. - **Resistance** is a price level where selling interest is strong enough to halt an advance.

Trend Lines: straight lines drawn connecting successive higher lows (in an uptrend) or lower highs (in a downtrend); a decisive break of a trend line is often read as an early reversal signal.

2.4.4 Chart Patterns

Chart patterns are recurring price formations believed to signal continuation or reversal of a trend.

Reversal Patterns: - **Head and Shoulders:** three peaks, the middle one (head) higher than the two flanking peaks (shoulders); signals a bearish reversal after an uptrend. The inverse ("Inverse Head and Shoulders") signals a bullish reversal after a downtrend. - **Double Top /**

Double Bottom: two peaks (or troughs) at approximately the same level, signalling exhaustion of the prevailing trend.

Continuation Patterns: - **Triangles** (symmetrical, ascending, descending) — periods of consolidation before the prior trend resumes. - **Flags and Pennants** — brief pauses in a strong trend.

Figure 2.3 (described): A Head-and-Shoulders formation drawn as three successive peaks (left shoulder, head, right shoulder) above a horizontal "neckline," with a downward breakout below the neckline marked as the sell signal.

2.4.5 Moving Averages

A **moving average (MA)** smooths price data by calculating the average price over a specified number of periods, updated as each new period's data becomes available, thereby filtering out short-term "noise" to reveal the underlying trend.

Simple Moving Average (SMA):

$$SMA_n = \frac{P_1 + P_2 + \cdots + P_n}{n}$$

where $P_1 \ldots P_n$ are the closing prices of the last n periods.

Exponential Moving Average (EMA): assigns greater weight to more recent prices, making it more responsive to new information than the SMA.

Trading Signals from Moving Averages: - **Golden Cross:** a shorter-term MA (e.g., 50-day) crosses above a longer-term MA (e.g., 200-day) — considered a bullish signal. - **Death Cross:** a shorter-term MA crosses below a longer-term MA — considered a bearish signal. - Price crossing above its own moving average is often read as a buy signal, and vice versa.

2.4.6 Relative Strength Index (RSI)

Developed by J. Welles Wilder Jr., the **RSI** is a momentum oscillator that measures the speed and magnitude of recent price changes to evaluate overbought or oversold conditions, scaled between 0 and 100.

$$RSI = 100 - \frac{100}{1 + RS}$$

where **RS (Relative Strength) = Average Gain over *n* periods ÷ Average Loss over *n* periods** (typically *n* = 14 days).

Interpretation: - **RSI > 70:** security considered **overbought** — a correction/reversal downward may be due. - **RSI < 30:** security considered **oversold** — a rebound/reversal upward may be due. - **RSI Divergence:** when price makes a new high/low but RSI fails to confirm it, this divergence is read as an early warning of weakening momentum.

2.4.7 Advantages and Limitations of Technical Analysis

Advantages: useful for timing entry/exit; applicable across all traded securities and time frames; incorporates market psychology; does not require detailed financial statement analysis.

Limitations: subjective interpretation of patterns; self-fulfilling prophecy criticism; ignores fundamental value, risking large losses if a security is fundamentally weak; less reliable in illiquid or thinly-traded securities; challenged by the Efficient Market Hypothesis, which holds that historical price data cannot be used to earn abnormal (risk-adjusted) returns.

2.5 Real-World Example

Example: During 2020, several pharmaceutical and IT companies were classified in the "rapid growth" stage of their industry life cycle owing to pandemic-driven demand (diagnostics, vaccines, and remote-work software), while sectors such as aviation, hospitality, and physical retail were pushed toward the "decline/distress" end of their cycle temporarily. Analysts applying the EIC framework overweighted pharma/IT and underweighted travel-

related sectors in their model portfolios — an applied illustration of how economy-wide shocks propagate unevenly across industries.

2.6 Case Study — Combining Fundamental and Technical Signals

Case: An analyst has fundamentally screened a mid-cap FMCG company and finds it fundamentally attractive: ROE of 22%, low debt-equity of 0.2, and consistent double-digit revenue growth over five years, trading at a reasonable P/E relative to its five-year average. However, the stock's 14-day RSI currently reads 78, and it has recently formed a double-top pattern near a well-established resistance level.

Discussion points for students: 1. Should the analyst recommend an immediate purchase, given the strong fundamentals? 2. What does the RSI reading of 78 suggest about near-term price risk? 3. How might the analyst combine both frameworks to time entry — e.g., waiting for RSI to fall back below 60 or for a pullback to a moving-average support level? 4. What does this case illustrate about the complementary (rather than competing) use of fundamental and technical analysis discussed in Section 2.4.1?

2.7 Unit II — Questions

(a) Short Answer Questions (2 Marks Level)

1. Define "security analysis." (L1)
2. What are the two broad approaches to security analysis? (L1)
3. List the three components of the EIC framework. (L1)
4. What is meant by "industry life cycle"? (L1)
5. Name any two profitability ratios used in company analysis. (L1)
6. State the three basic assumptions of technical analysis. (L2)
7. What is the "primary trend" according to Dow Theory? (L1)
8. Define "support" and "resistance." (L2)
9. What is a "Golden Cross"? (L1)
10. Define RSI and state its scale. (L1)

11. What RSI value indicates an "overbought" condition? (L1)
12. What is meant by a "Head and Shoulders" pattern? (L1)
13. Differentiate between SMA and EMA in one line. (L2)
14. What is Porter's Five Forces framework used for? (L1)
15. Define "trend" in the context of technical analysis. (L1)

(b) Essay Type Questions (10 Marks Level)

1. Explain the EIC (Economy-Industry-Company) framework of fundamental analysis in detail. (L2)
2. Discuss the key macroeconomic indicators an analyst studies in economy analysis. (L2)
3. Explain the stages of the industry life cycle with a diagram and their implications for investment decisions. (L2)
4. Discuss the major components of company analysis. (L2)
5. Explain Dow Theory and its basic tenets with a suitable diagram. (L2)
6. Distinguish between fundamental analysis and technical analysis, and discuss whether they should be used together. (L4)
7. Explain moving averages and how the "Golden Cross" and "Death Cross" are used as trading signals. (L2)
8. Explain the Relative Strength Index (RSI) with its formula, and interpret overbought and oversold conditions. (L3)
9. Discuss any three chart patterns used in technical analysis with suitable diagrams. (L2)
10. Evaluate the strengths and limitations of technical analysis as an investment decision-making tool. (L5)

Problems

Problem 2.1: Calculate the 5-day Simple Moving Average from the following closing prices of a stock: Day 1: ₹100, Day 2: ₹104, Day 3: ₹108, Day 4: ₹106, Day 5: ₹112. (L3)

Solution: $SMA_5 = (100 + 104 + 108 + 106 + 112) / 5 = 530 / 5 =$ **₹106**.

Problem 2.2: Over the last 14 days, a stock had an average gain of ₹3.2 per day on up-days and an average loss of ₹1.6 per day on down-days. Calculate the RSI. (L3)

Solution: RS = Average Gain / Average Loss = 3.2 / 1.6 = 2.0. RSI = 100 − [100 / (1 + RS)] = 100 − [100 / 3] = 100 − 33.33 = **66.67**. *Interpretation:* An RSI of 66.67 is approaching, but has not yet crossed, the overbought threshold of 70; the analyst would watch for further momentum before concluding the stock is overbought.

2.9 Additional Worked Problems — Unit II

Problem 2.3 (10-day SMA): Given closing prices for 10 days: 50, 52, 51, 53, 55, 54, 56, 58, 57, 59, calculate the 10-day SMA. (L3)

Solution: Sum = 50+52+51+53+55+54+56+58+57+59 = 545. SMA_{10} = 545/10 = **54.5**.

Problem 2.4 (RSI from raw price data): A stock's price moved as follows over 6 days: 100, 103, 101, 105, 108, 104. Calculate the average gain, average loss, and RSI over this 5-interval window. (L3)

Solution: Day-to-day changes: +3, −2, +4, +3, −4. Gains: 3, 4, 3 → average gain = 10/5 = 2.0 (averaged over all 5 intervals, treating loss-days as zero gain). Losses: 2, 4 → average loss = 6/5 = 1.2. RS = 2.0/1.2 = 1.67. RSI = 100 − [100/(1+1.67)] = 100 − 37.45 = **62.55**. *Interpretation:* An RSI near 62.5 indicates moderately bullish momentum, but the stock is not yet in overbought territory (RSI < 70).

2.10 Glossary of Key Terms — Unit II

- **Bull Market:** a sustained period of rising security prices, typically accompanied by investor optimism.
- **Bear Market:** a sustained period of falling security prices, typically accompanied by investor pessimism.
- **Breakout:** a price movement outside a defined support/resistance level or chart pattern boundary, often on high volume.
- **Divergence:** a situation where price and a technical indicator (e.g., RSI) move in opposite directions, often signalling weakening trend momentum.
- **Efficient Market Hypothesis (EMH):** the theory that security prices fully reflect all available information, implying that consistently outperforming the market through analysis is difficult.
- **Momentum:** the rate of acceleration of a security's price movement.
- **Oscillator:** a technical indicator (such as RSI) that fluctuates within a bounded range, used to identify overbought/oversold conditions.
- **Overbought:** a condition where a security is considered to have risen too far, too fast, and may be due for a pullback.
- **Oversold:** a condition where a security is considered to have fallen too far, too fast, and may be due for a rebound.
- **P/E Ratio:** Price-Earnings Ratio, the ratio of a company's share price to its earnings per share.
- **SWOT Analysis:** an evaluation framework covering a company's internal Strengths and Weaknesses and external Opportunities and Threats.
- **Volume:** the total number of shares/contracts traded during a given period, used to confirm the strength of a price trend.

Unit II Highlights

- Fundamental analysis moves top-down: Economy → Industry → Company (the EIC framework).
- Technical analysis assumes price discounts everything, prices move in trends, and history repeats itself.
- Dow Theory identifies primary, secondary, and minor trends in the market.
- Moving averages and RSI are widely used tools to identify momentum and reversal signals.
- Fundamental and technical analysis are complementary, not mutually exclusive, in practice.

Textbook Reference — Unit II

Kevin, S. (2007). Portfolio Management, 2nd Edition. New Delhi: Prentice Hall.

Chandra, Prasanna (2008). Investment Analysis & Portfolio Management, 3rd Edition. New Delhi: Tata McGraw Hill.

Chandra, Prasanna (2021). Investment Analysis and Portfolio Management, 2021 Edition. McGraw Hill.

Bhat, Sudhindra (2008). Security Analysis and Portfolio Management, 1st Edition. New Delhi: Excel Books.

UNIT III — MEASUREMENT OF RETURN AND RISK

"Risk comes from not knowing what you're doing." — Warren Buffett

Unit Overview

This unit equips the learner with the statistical vocabulary of investing. It defines return and its components, shows how probability distributions are used to compute expected return, and classifies risk into systematic and unsystematic categories. Statistical tools — standard deviation, variance, correlation, and beta — are introduced as the quantitative language in which risk and return are ultimately expressed and compared.

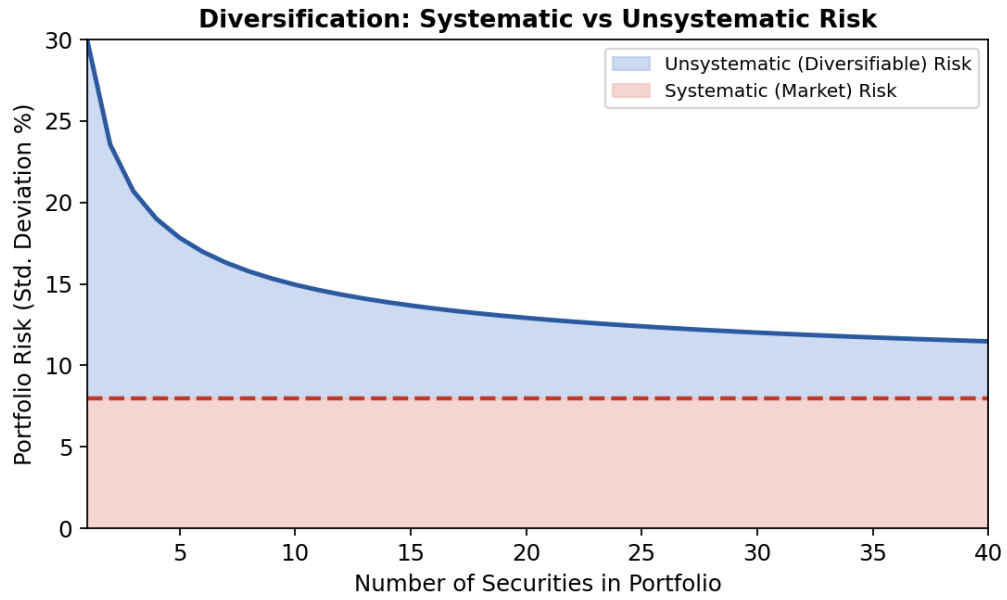

Fig. 3.1 — Systematic vs Unsystematic Risk and Diversification

3.1 Learning Objectives

1. Explain the components of return: revenue return and capital appreciation (L2).
2. Apply probability distributions to estimate expected return (L3).
3. Calculate holding period return and annualised return (L3).
4. Classify risk into systematic and unsystematic categories (L2).
5. Compute standard deviation, variance, correlation coefficient, and beta (L3).
6. Apply these statistical tools to calculate expected portfolio return and risk (L3).

Key Concepts

Return | Capital Appreciation | Holding Period Return | Probability Distribution | Expected Return | Systematic Risk | Unsystematic Risk | Standard Deviation | Variance | Correlation Coefficient | Beta

Learning Outcomes

On successful completion of this unit, the student will be able to:

Measure the return and risk of various securities through various tools.

Importance of Studying This Unit

No investment decision can be made responsibly without first quantifying what is being risked for what expected reward. This unit gives the learner the statistical foundation — standard deviation, correlation, and beta — that underlies every valuation model in Unit IV and every portfolio model in Unit V.

3.2 Components of Return

The **total return** on a security has two components:

1. **Revenue (Current Income) Return:** periodic cash flow received by the investor, such as dividends (on equity) or interest (on bonds/debentures), expressed as a percentage of the investment.
2. **Capital Appreciation (Capital Gain) Return:** the change in the market price of the security over the holding period.

$$\text{Total Return} = \frac{(\text{Ending Price} - \text{Beginning Price}) + \text{Income Received}}{\text{Beginning Price}} \times 100$$

Key terminologies:

- **Return:** the reward earned from an investment, both realised (actual) and expected (ex-ante).
- **Holding Period:** the length of time an investment is held, from purchase to sale.

- **Holding Period Return (HPR):** the total return earned over the entire period an asset is held.
- **Expected Return:** the probability-weighted average of all possible returns.
- **Risk:** the variability of actual returns from the expected return.

3.3 Holding Period Return (HPR)

$$HPR = \frac{(P_1 - P_0) + D_1}{P_0}$$

where P_0 = beginning price, P_1 = ending price, D_1 = income (dividend/interest) received during the period.

Holding Period Yield (HPY) expresses HPR as a percentage. For comparison across different holding periods, HPR is often annualised:

$$\text{Annualised Return} = (1 + HPR)^{1/n} - 1$$

where *n* is the number of years in the holding period.

3.4 Probability Distribution and Expected Return

Because future returns are uncertain, analysts assign **probabilities** to a range of possible outcomes (economic scenarios) and compute a probability-weighted **expected return**:

$$E(R) = \sum_{i=1}^{n} P_i R_i$$

where P_i is the probability of outcome *i* and R_i is the return under outcome *i*.

Illustration:

Economic Scenario	Probability (P)	Return (%) (R)	P × R
Boom	0.30	25	7.5
Normal	0.50	15	7.5

Recession	0.20	-5	-1.0
Total	**1.00**		**E(R) = 14%**

3.5 Risk: Meaning and Classification

Risk refers to the possibility that the actual outcome (return) of an investment will differ from the expected outcome — it captures both the probability and magnitude of adverse deviation, and, in the modern portfolio-theory sense (Unit V), the *symmetric* variability of returns around their expected value.

3.5.1 Types of Risk

A. Systematic Risk (Market Risk / Non-diversifiable Risk): risk arising from macroeconomic and market-wide factors affecting *all* securities, which cannot be eliminated through diversification.

- **Market Risk** — general volatility of the market due to investor sentiment.
- **Interest Rate Risk** — risk arising from fluctuations in interest rates, particularly affecting bond prices inversely.
- **Purchasing Power (Inflation) Risk** — erosion of real returns due to inflation.
- **Exchange Rate Risk** — impact of currency fluctuations, especially for exporters/importers and foreign investors.

B. Unsystematic Risk (Diversifiable / Company-Specific Risk): risk unique to a particular company or industry, which *can* be reduced or eliminated through diversification (elaborated in Unit V).

- **Business Risk** — uncertainty of operating income due to the nature of the company's business.
- **Financial Risk** — risk arising from the use of debt (financial leverage) in the capital structure.
- **Management Risk** — risk arising from the quality/decisions of management.

- **Liquidity Risk** — risk that a security cannot be sold quickly without a significant price concession.

$$\text{Total Risk} = \text{Systematic Risk} + \text{Unsystematic Risk}$$

Figure 3.1 (described): A graph with "Number of Securities in Portfolio" on the X-axis and "Portfolio Risk (Standard Deviation)" on the Y-axis, showing total risk declining steeply at first and flattening out at a level representing systematic (non-diversifiable) risk, which never reaches zero however many securities are added — this curve is one of the most frequently reproduced diagrams in the entire course and is revisited in Unit V.

3.5.2 Importance of Risk Classification

Understanding the systematic/unsystematic split is central to modern finance: it explains *why* diversification works (Unit V), *why* only systematic risk is priced/rewarded in equilibrium asset-pricing models such as CAPM (Unit V), and *why* company-specific risk, however large, earns no additional expected return once a portfolio is well-diversified.

3.6 Statistical Measures of Risk

3.6.1 Variance and Standard Deviation

Variance (σ^2) measures the average squared deviation of returns from their expected value:

$$\sigma^2 = \sum_{i=1}^{n} P_i \, [R_i - E(R)]^2$$

Standard Deviation (σ) is the square root of variance, expressed in the same unit as the return (percentage), and is the most widely used single measure of total risk:

$$\sigma = \sqrt{\sigma^2}$$

Interpretation: a higher standard deviation indicates greater dispersion of possible returns around the expected return, i.e., greater risk.

3.6.2 Covariance and Correlation Coefficient

Covariance measures the degree to which two securities' returns move together:

$$Cov(A,B) = \sum_{i=1}^{n} P_i \left[R_{A,i} - E(R_A)\right]\left[R_{B,i} - E(R_B)\right]$$

Correlation Coefficient (ρ) standardises covariance to a range of −1 to +1, making it easier to interpret:

$$\rho_{A,B} = \frac{Cov(A,B)}{\sigma_A \times \sigma_B}$$

Interpretation: - **ρ = +1:** perfect positive correlation (securities move exactly together). - **ρ = −1:** perfect negative correlation (securities move exactly opposite). - **ρ = 0:** no linear relationship.

Importance: the correlation coefficient is the single most important input into diversification and portfolio-risk-reduction analysis (Unit V) — the lower (or more negative) the correlation between two securities, the greater the risk-reduction benefit of combining them in a portfolio.

3.6.3 Beta (β)

Beta measures the sensitivity of a security's returns to movements in the overall market — i.e., it measures a security's *systematic risk* relative to the market:

$$\beta = \frac{Cov(R_i, R_m)}{\sigma_m^2}$$

where $Cov(R_i, R_m)$ is the covariance between the security's return and the market return, and σ_m^2 is the variance of the market return.

Interpretation of Beta:

Beta Value	Interpretation
$\beta = 1$	Security moves in line with the market
$\beta > 1$	Security is more volatile than the market (aggressive stock)
$\beta < 1$ (but > 0)	Security is less volatile than the market (defensive stock)
$\beta = 0$	Security's returns are uncorrelated with market movements
$\beta < 0$	Security moves opposite to the market (rare; e.g., some gold-mining stocks in certain periods)

Beta is central to the Capital Asset Pricing Model, covered in Unit V.

3.7 Advantages and Limitations of Statistical Risk Measures

Advantages: provide an objective, quantifiable, and comparable measure of risk; enable portfolio optimisation (Unit V); widely accepted and used across the finance industry; form the basis of regulatory risk disclosures.

Limitations: standard deviation treats upside and downside variability symmetrically, though investors typically fear downside loss more than they value upside gain; historical data-based estimates (variance, covariance, beta) may not hold in the future ("past performance is no guarantee"); assumes returns are normally distributed, whereas real-world returns often exhibit "fat tails" (extreme events more frequent than the normal distribution predicts).

3.8 Real-World Example

Example: During the market turbulence of March 2020 (COVID-19 crash), most equities exhibited a sharp, simultaneous decline — correlations across nearly all sectors rose close to +1, temporarily eliminating much of the diversification benefit investors expect in normal times. This illustrates an important caveat to Section 3.6.2: correlations are not stable

constants — they tend to rise sharply during systemic crises (a phenomenon sometimes called "correlation breakdown" or "contagion"), precisely when diversification is needed most.

3.9 Case Study — Risk Profiling Two Stocks

Case: An analyst is comparing two stocks, Stock A (an FMCG company) and Stock B (a mid-cap IT export company), over the same five-year period. Stock A's returns have a standard deviation of 12% and a beta of 0.6; Stock B's returns have a standard deviation of 28% and a beta of 1.7. Both have delivered similar average annual returns of about 16%.

Discussion points for students: 1. Which stock carries greater total risk, and which carries greater systematic risk? 2. For a conservative retiree seeking stable income, which stock's risk profile is more suitable, and why? 3. What might explain Stock B's higher beta given that it is an export-oriented business (consider currency and global-demand sensitivity)? 4. If Stock A and Stock B have a correlation coefficient of only +0.2, what does this suggest about combining them in a portfolio (a question extended fully in Unit V)?

3.10 Unit III — Questions

(a) Short Answer Questions (2 Marks Level)

1. Define "return" on investment. (L1)
2. What are the two components of total return? (L1)
3. Define "holding period return." (L1)
4. What is meant by "expected return"? (L1)
5. Define "risk" in the context of investment. (L1)
6. Distinguish systematic risk from unsystematic risk in one line each. (L2)
7. Name any two types of systematic risk. (L1)
8. Name any two types of unsystematic risk. (L1)
9. Define "standard deviation." (L1)
10. What does a correlation coefficient of −1 signify? (L2)
11. Define "beta" and state its formula. (L1)

12. What does a beta of 1.5 indicate? (L2)
13. Define “variance.” (L1)
14. What is “covariance”? (L1)
15. State the formula for annualising a holding period return. (L1)

(b) Essay Type Questions (10 Marks Level)

1. Explain the components of return with suitable examples. (L2)
2. Discuss the concept of probability distribution and its use in estimating expected return. (L2)
3. Explain the classification of risk into systematic and unsystematic risk with examples of each. (L2)
4. Discuss why unsystematic risk can be diversified away while systematic risk cannot, with a suitable diagram. (L4)
5. Explain the calculation of standard deviation and its significance as a measure of risk. (L2)
6. Explain the correlation coefficient and its importance in portfolio construction. (L2)
7. Discuss the concept and calculation of beta, and explain its interpretation with examples. (L2)
8. Critically evaluate the limitations of using standard deviation as a measure of investment risk. (L5)
9. Analyze how the holding period return is calculated and annualised, with a numerical illustration. (L4)
10. “Correlation is the key to diversification.” Discuss this statement in the context of risk management. (L5)

Problems

Problem 3.1 (Holding Period Return): An investor buys a share for ₹250, receives a dividend of ₹10 during the year, and sells it after one year for ₹280. Calculate the holding period return. (L3)

Solution: HPR = [(280 − 250) + 10] / 250 = 40 / 250 = **16%**.

Problem 3.2 (Expected Return): The probability distribution of returns for a stock is: Boom (P = 0.25, R = 30%), Normal (P = 0.50, R = 12%), Recession (P = 0.25, R = −10%). Calculate the expected return. (L3)

Solution: E(R) = (0.25 × 30) + (0.50 × 12) + (0.25 × −10) = 7.5 + 6 − 2.5 = **11%**.

Problem 3.3 (Standard Deviation): Using the data in Problem 3.2, calculate the standard deviation of returns. (L3)

Solution: Deviations from E(R) = 11%: Boom = 30 − 11 = 19; Normal = 12 − 11 = 1; Recession = −10 − 11 = −21. Squared deviations: 361, 1, 441. Variance = (0.25 × 361) + (0.50 × 1) + (0.25 × 441) = 90.25 + 0.5 + 110.25 = 201. Standard deviation = √201 ≈ **14.18%**.

Problem 3.4 (Beta): The covariance between a stock's returns and the market's returns is 180, and the variance of market returns is 150. Calculate the stock's beta and interpret it. (L3)

Solution: $\beta = Cov(R_i,R_m) / \sigma_m^2 = 180 / 150 =$ **1.2**. *Interpretation:* The stock is 20% more volatile than the market — for every 1% move in the market, the stock is expected to move approximately 1.2% in the same direction, indicating an aggressive stock.

Problem 3.5 (Correlation Coefficient): Two stocks, X and Y, have standard deviations of 18% and 22% respectively, and their covariance is 158.4. Calculate the correlation coefficient between them. (L3)

Solution: ρ = Cov(X,Y) / (σ_X × σ_Y) = 158.4 / (18 × 22) = 158.4 / 396 = **0.40**. *Interpretation:* A moderate positive correlation — combining X and Y offers some diversification benefit, though not as much as securities with low or negative correlation.

3.12 Additional Worked Problems — Unit III

Problem 3.6 (Annualised Return): An investor's holding period return over a 3-year holding period is 40%. Calculate the annualised (compounded) return. (L3)

Solution: Annualised Return = (1 + 0.40)^(1/3) − 1 = (1.40)^0.3333 − 1. (1.40)^0.3333 ≈ 1.1187. Annualised Return ≈ 0.1187, i.e., ≈ **11.87% per annum**.

Problem 3.7 (Portfolio of two securities — weighted average risk without diversification benefit for comparison): Two securities, P and Q, have standard deviations of 20% and 10% respectively, and a correlation of +1 (perfectly positively correlated). If a portfolio is formed with 60% in P and 40% in Q, calculate the portfolio standard deviation. (L3)

Solution: Since ρ = +1, portfolio risk equals the simple weighted average: σ_p = w_P σ_P + w_Q σ_Q = (0.6 × 20) + (0.4 × 10) = 12 + 4 = **16%**. *Interpretation:* This special case (ρ = +1) confirms that diversification provides **no risk reduction** when securities are perfectly positively correlated — risk reduction requires correlation less than +1, as elaborated further in Unit V.

Problem 3.8 (Variance from a larger data set): A stock's returns in five different economic states are: 12%, 18%, 8%, −5%, 22%, each equally likely (probability 0.20 each). Calculate the expected return and variance. (L3)

Solution: E(R) = (12+18+8−5+22)/5 = 55/5 = 11%. Deviations: 1, 7, −3, −16, 11. Squared: 1, 49, 9, 256, 121. Sum = 436. Variance = 436/5 = 87.2. Standard deviation = √87.2 ≈ **9.34%**.

3.13 Glossary of Key Terms — Unit III

- **Business Risk:** the risk inherent in a company's operations, arising from the nature of its industry and cost structure.
- **Coefficient of Variation:** a normalised measure of risk per unit of return (σ / mean return), useful for comparing securities with different expected returns.
- **Currency Risk (Exchange Rate Risk):** the risk of loss arising from fluctuations in exchange rates.
- **Diversifiable Risk:** another term for unsystematic risk; risk that can be reduced by holding a variety of securities.
- **Financial Risk:** risk arising from a company's use of debt financing (financial leverage).
- **Inflation (Purchasing Power) Risk:** the risk that inflation erodes the real value of investment returns.
- **Interest Rate Risk:** the risk of loss arising from changes in market interest rates, particularly affecting fixed-income securities.
- **Nominal Return:** the return on an investment before adjusting for inflation.
- **Real Return:** the inflation-adjusted return on an investment.
- **Risk Premium:** the additional return investors demand for bearing additional risk over the risk-free rate.
- **Systematic Risk:** market-wide risk that cannot be eliminated through diversification.
- **Volatility:** the degree of variation in a security's price/return over time, commonly measured by standard deviation.

Unit III Highlights

- Total return has two components: revenue (current income) return and capital appreciation.
- Expected return is the probability-weighted average of possible outcomes.
- Risk is split into systematic (market-wide, non-diversifiable) and unsystematic (firm-specific, diversifiable) risk.
- Standard deviation and variance measure total risk; beta measures only systematic risk.
- Correlation between securities is the key driver of the risk-reduction benefit of diversification.

Textbook Reference — Unit III

Kevin, S. (2007). Portfolio Management, 2nd Edition. New Delhi: Prentice Hall.

Chandra, Prasanna (2008). Investment Analysis & Portfolio Management, 3rd Edition. New Delhi: Tata McGraw Hill.

Chandra, Prasanna (2021). Investment Analysis and Portfolio Management, 2021 Edition. McGraw Hill.

Bhat, Sudhindra (2008). Security Analysis and Portfolio Management, 1st Edition. New Delhi: Excel Books.

UNIT IV — VALUATION OF SECURITIES

"It's far better to buy a wonderful company at a fair price than a fair company at a wonderful price." — Warren Buffett

Unit Overview

This unit applies the time value of money to determine what a security is actually worth. It covers the valuation of bonds (using present value of coupons and redemption value), preference shares (redeemable and irredeemable), and equity shares (through the Dividend Discount Model and its zero-growth, constant-growth, and multi-stage variants, as well as relative valuation using the P/E multiple).

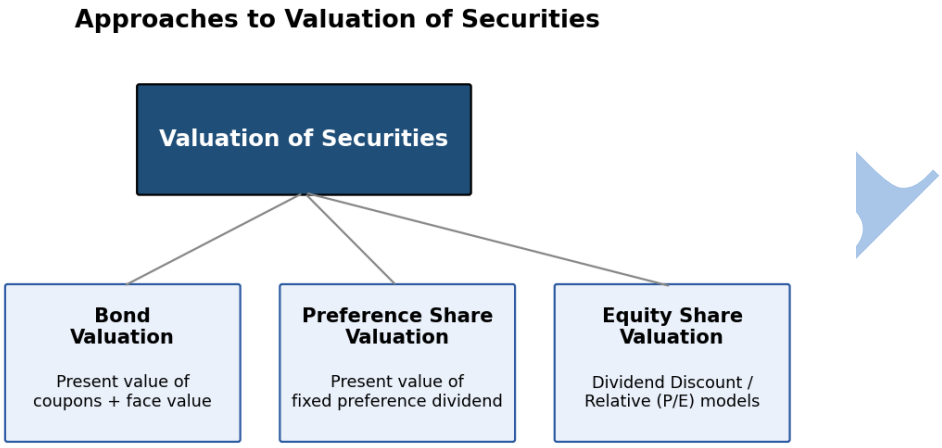

Fig. 4.1 — Approaches to Valuation of Securities

4.1 Learning Objectives

1. Explain the general approaches to the valuation of securities (L2).
2. Apply the bond valuation model to compute the intrinsic value of bonds (L3).
3. Apply the preference share valuation model (L3).
4. Apply dividend discount and other models to value common stock (L3).
5. Evaluate the appropriateness of different valuation models in different contexts (L5).

Key Concepts

Intrinsic Value | Bond Valuation | Yield to Maturity (YTM) | Preference Share Valuation | Dividend Discount Model | Gordon Growth Model | Multi-Stage Growth Model | P/E Multiple | Terminal Value

Learning Outcomes

On successful completion of this unit, the student will be able to:

Apply the approaches of valuation of securities and use various methods for valuation.

Importance of Studying This Unit

Valuation is the point at which analysis becomes a decision: it converts the qualitative and statistical insights of Units II and III into a single comparable number — intrinsic value — against which the market price can be judged. This unit is indispensable for anyone who must decide whether a security is underpriced, overpriced, or fairly priced.

4.2 Meaning and Approaches to Valuation

Valuation is the process of determining the fair (intrinsic) value of a security, which is then compared to its prevailing market price to make a buy/hold/sell decision. If intrinsic value > market price, the security is considered **undervalued** (a buy candidate); if intrinsic value < market price, it is considered **overvalued** (a sell/avoid candidate).

4.2.1 General Approaches to Valuation

1. **Balance Sheet (Asset-Based) Valuation:** values a company based on its net assets — book value, liquidation value, or replacement value.
2. **Dividend/Income-Based (Discounted Cash Flow) Valuation:** values a security as the present value of the future cash flows (interest, dividends, or free cash flows) it is expected to generate — the dominant approach in modern finance and the basis of Sections 4.3–4.5.

3. **Relative (Market-Based) Valuation:** values a security by comparing valuation multiples (P/E, P/B, EV/EBITDA) with comparable companies or the security's own historical average.

The Time Value of Money — Foundational Concept: All discounted valuation models rest on the principle that a rupee received today is worth more than a rupee received in the future, because today's rupee can be invested to earn a return. The **discount rate** (required rate of return) used converts future cash flows into their present-value equivalent:

$$PV = \frac{CF_t}{(1+k)^t}$$

where CF_t is the cash flow in period *t* and *k* is the required rate of return (discount rate).

4.3 Bond Valuation

A **bond** is a fixed-income debt instrument under which the issuer promises to pay periodic interest (coupon) and to repay the principal (face value) at maturity.

Key Terminologies: - **Face Value (Par Value):** the amount repaid at maturity, typically ₹100 or ₹1,000. - **Coupon Rate:** the fixed annual interest rate stated on the bond, applied to face value. - **Maturity Period:** the number of years until the principal is repaid. - **Yield to Maturity (YTM):** the internal rate of return earned if the bond is held to maturity, i.e., the discount rate that equates the present value of all future cash flows to the current market price.

4.3.1 Bond Valuation Model

$$V_B = \sum_{t=1}^{n} \frac{C}{(1+k_d)^t} + \frac{F}{(1+k_d)^n}$$

where V_B = value of the bond, C = annual coupon payment, F = face value, k_d = required rate of return (market yield), n = number of years to maturity.

This can equivalently be written using the Present Value Interest Factor of Annuity (PVIFA) and Present Value Interest Factor (PVIF):

$$V_B = C \times PVIFA(k_d, n) + F \times PVIF(k_d, n)$$

4.3.2 Bond Price–Yield Relationship

- If **coupon rate = required yield (k_d)** → bond sells **at par**.
- If **coupon rate > required yield** → bond sells **at a premium** (above face value).
- If **coupon rate < required yield** → bond sells **at a discount** (below face value).
- **Inverse Relationship:** bond prices and market interest rates (yields) move in *opposite* directions — this is the single most tested concept in fixed-income valuation.

4.3.3 Bond Valuation — Special Cases

- **Zero-Coupon Bond:** pays no periodic coupon; sold at a deep discount to face value, with the entire return coming from capital appreciation:

$$V_B = \frac{F}{(1 + k_d)^n}$$

- **Perpetual Bond (Irredeemable Bond/Consol):** has no maturity date and pays coupon forever:

$$V_B = \frac{C}{k_d}$$

4.3.4 Bond Duration (Brief Introduction)

Duration measures the weighted-average time to receive a bond's cash flows and, importantly, approximates the bond's price sensitivity to changes in interest rates — the higher the duration, the greater the price volatility for a given change in yield. Longer-maturity and lower-coupon bonds generally have higher duration.

4.3.5 Advantages and Limitations of Bond Valuation Models

Advantages: provides an objective, formula-driven fair value; directly links to observable market yields; useful for both issuers (pricing new bonds) and investors (identifying mispriced bonds).

Limitations: assumes a constant discount rate across the entire life of the bond; does not fully capture reinvestment risk or credit/default risk; complex for bonds with embedded options (callable/puttable bonds) which require adjusted models.

4.4 Preference Share Valuation

A **preference share** carries a fixed dividend rate and has priority over equity shareholders in dividend payment and capital repayment, but typically does not carry voting rights.

4.4.1 Valuation of Irredeemable Preference Shares

Like a perpetual bond, an irredeemable preference share pays a fixed dividend forever:

$$V_P = \frac{D_P}{k_p}$$

where D_P = annual preference dividend, k_p = required rate of return on preference shares.

4.4.2 Valuation of Redeemable Preference Shares

$$V_P = \sum_{t=1}^{n} \frac{D_P}{(1+k_p)^t} + \frac{RV}{(1+k_p)^n}$$

where RV = redemption value at maturity, n = number of years to redemption. This is structurally identical to the bond valuation formula (Section 4.3.1), with the coupon replaced by the fixed preference dividend.

4.4.3 Importance and Application

Preference shares are a hybrid instrument (debt-like fixed payment, equity-like subordination and no maturity in the irredeemable case), and their valuation is important for both corporate

finance (cost of capital calculations) and investors seeking relatively stable income with a modest equity-like risk premium over bonds.

4.5 Common Stock (Equity Share) Valuation

Equity valuation is inherently more challenging than bond/preference share valuation because dividends are *not* fixed or guaranteed — they depend on company profitability and management's dividend policy.

4.5.1 Dividend Discount Model (DDM) — General Form

$$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k_e)^t}$$

where D_t = expected dividend in year *t*, k_e = required rate of return on equity.

4.5.2 Zero-Growth (No-Growth) Model

Applicable when dividends are expected to remain constant indefinitely:

$$V_0 = \frac{D}{k_e}$$

4.5.3 Constant Growth Model (Gordon Growth Model)

Applicable when dividends are expected to grow at a constant rate (g) forever:

$$V_0 = \frac{D_1}{k_e - g} = \frac{D_0(1+g)}{k_e - g}$$

where D_1 = expected dividend next year, D_0 = current year's dividend, g = constant growth rate of dividends, and it is required that k_e > g for the model to yield a meaningful (finite, positive) value.

Estimating the Growth Rate (g): commonly estimated using the retention ratio:

$$g = b \times ROE$$

where *b* = earnings retention ratio (1 − payout ratio) and ROE = return on equity.

4.5.4 Multi-Stage (Two-Stage / Three-Stage) Growth Model

Used when a company is expected to grow at a high (often unsustainable) rate for a few years before settling into a stable, long-run growth rate — common for young, high-growth companies.

$$V_0 = \sum_{t=1}^{n} \frac{D_t}{(1+k_e)^t} + \frac{V_n}{(1+k_e)^n}, \quad \text{where } V_n = \frac{D_{n+1}}{k_e - g_{stable}}$$

The first term discounts the explicit high-growth-phase dividends; the second term ("terminal value") captures the value of all dividends beyond the explicit forecast period, once growth has stabilised.

4.5.5 Other Approaches to Equity Valuation

1. **Price-Earnings (P/E) Multiple Approach:** V_0 = Expected EPS × Justified/Industry P/E ratio — a relative valuation approach.
2. **Price-to-Book (P/B) Approach:** compares market price to book value per share, often used for financial/asset-heavy companies.
3. **Free Cash Flow to Equity (FCFE) / Discounted Cash Flow (DCF) Approach:** discounts free cash flows available to equity holders rather than dividends alone — useful for companies that pay little or no dividend.

4.5.6 Advantages and Limitations of Equity Valuation Models

Advantages: the Gordon Growth Model is simple, intuitive, and widely taught/used as a first-pass valuation; multi-stage models accommodate realistic growth trajectories; relative valuation (P/E) is fast and market-grounded.

Limitations: DDM is highly sensitive to the assumed growth rate and discount rate — small changes in g or k_e produce large swings in value (a well-known and frequently examined weakness); not applicable to non-dividend-paying companies without modification (e.g., using FCFE instead); relative valuation (P/E) can perpetuate market-wide mispricing if the entire peer group is over/undervalued.

4.6 Real-World Example

Example: Consider a mature, dividend-paying company like a large private-sector bank or an FMCG major that has paid a steadily growing dividend for over a decade. Analysts commonly apply the constant-growth Gordon model to such stable-dividend payers. In contrast, for a young digital-first company that reinvests all profits into growth and pays no dividend at all, analysts instead switch to a Free Cash Flow to Equity (DCF) approach or a relative (P/E, EV/Sales) approach — illustrating why Section 4.5's toolbox contains multiple models rather than a single universal formula.

4.7 Case Study — Choosing the Right Valuation Model

Case: An equity research trainee is asked to value three companies: (i) a government bond-like utility company paying a stable, unchanging dividend of ₹8 per share indefinitely; (ii) a consumer goods company paying ₹10 per share this year, expected to grow dividends at a constant 8% per year forever; and (iii) a fast-growing e-commerce company currently paying no dividend, expected to start paying dividends only after five years, initially growing at 25% per year for five years before settling into a stable 6% growth thereafter.

Discussion points for students: 1. Which valuation model (zero-growth, constant-growth, or multi-stage) is appropriate for each company, and why? 2. What discount rate considerations might differ across the three companies (hint: relative risk/beta, referring back to Unit III)? 3. Why would applying the constant-growth Gordon model directly to the e-commerce company (which pays no current dividend) produce a meaningless result? 4. What role might relative valuation (P/E, EV/Sales) play as a cross-check for the e-commerce company?

4.8 Unit IV — Questions

(a) Short Answer Questions (2 Marks Level)

1. Define "intrinsic value." (L1)
2. State the three general approaches to valuation of securities. (L1)
3. Define "Yield to Maturity." (L1)

4. What is the relationship between bond price and market interest rate? (L2)
5. When does a bond sell at a "premium"? (L1)
6. Define "irredeemable preference share." (L1)
7. State the formula for valuing an irredeemable preference share. (L1)
8. What is the Gordon Growth Model used for? (L1)
9. State the condition necessary for the Gordon Growth Model to be valid. (L1)
10. What is a "zero-coupon bond"? (L1)
11. Define "duration" of a bond. (L1)
12. What is the P/E multiple approach to equity valuation? (L1)
13. Define "retention ratio." (L1)
14. What is meant by "terminal value" in a multi-stage growth model? (L2)
15. Distinguish between redeemable and irredeemable preference shares. (L2)

(b) Essay Type Questions (10 Marks Level)

1. Explain the general approaches to the valuation of securities. (L2)
2. Explain the bond valuation model and the relationship between bond price and market interest rates. (L2)
3. Discuss the valuation of redeemable and irredeemable preference shares with formulas. (L2)
4. Explain the Dividend Discount Model and its variants (zero-growth, constant-growth, multi-stage). (L2)
5. Discuss the Gordon Growth Model, its assumptions, and its limitations. (L4)
6. Explain the multi-stage growth model and when it is appropriate to use. (L2)
7. Compare and contrast dividend-based valuation with relative (P/E) valuation of equity shares. (L4)
8. Evaluate the strengths and weaknesses of the Dividend Discount Model as a valuation tool. (L5)

9. Explain how the concept of time value of money underlies all valuation models discussed in this unit. (L2)
10. Discuss with examples how the choice of valuation model depends on a company's dividend and growth characteristics. (L4)

Problems

Problem 4.1 (Bond Valuation): A bond with a face value of ₹1,000 carries a coupon rate of 9% payable annually and matures in 5 years. If the required rate of return (market yield) is 10%, calculate the value of the bond. (L3)

Solution: Annual coupon C = 9% × 1,000 = ₹90. V_B = 90 × PVIFA(10%,5) + 1,000 × PVIF(10%,5) PVIFA(10%,5) ≈ 3.7908; PVIF(10%,5) ≈ 0.6209. V_B = (90 × 3.7908) + (1,000 × 0.6209) = 341.17 + 620.90 = **₹962.07 (approximately)**. *Interpretation:* Since the coupon rate (9%) is less than the required yield (10%), the bond correctly values at a discount to its face value of ₹1,000, consistent with the rule in Section 4.3.2.

Problem 4.2 (Irredeemable Preference Share): A preference share has a face value of ₹100 and carries a fixed dividend rate of 8%. If the required rate of return on such preference shares is 10%, calculate its value. (L3)

Solution: D_P = 8% × 100 = ₹8. V_P = D_P / k_p = 8 / 0.10 = **₹80**.

Problem 4.3 (Gordon Growth Model): A company's current year dividend (D_0) is ₹5 per share, expected to grow at a constant rate of 6% per year. If investors require a 14% rate of return, calculate the value of the share. (L3)

Solution: $D_1 = D_0(1+g) = 5 \times 1.06 = ₹5.30$. $V_0 = D_1 / (k_e - g) = 5.30 / (0.14 - 0.06) = 5.30 / 0.08$ = **₹66.25**.

Problem 4.4 (Zero-Growth Model): A preferred-stock-like equity share is expected to pay a constant dividend of ₹12 per share indefinitely. If the required return is 15%, find its value. (L3)

Solution: $V_0 = D / k_e = 12 / 0.15 =$ **₹80**.

4.10 Additional Worked Problems — Unit IV

Problem 4.5 (Bond Valuation — Semi-Annual Coupons): A bond with a face value of ₹1,000 pays a coupon of 8% per annum, paid semi-annually, and matures in 3 years. If the required annual yield is 10% (5% per half-year), calculate the value of the bond. (L3)

Solution: Semi-annual coupon = (8%×1000)/2 = ₹40. Number of periods = 3×2 = 6. Half-yearly rate = 5%. PVIFA(5%,6) ≈ 5.0757; PVIF(5%,6) ≈ 0.7462. V_B = (40 × 5.0757) + (1,000 × 0.7462) = 203.03 + 746.20 = **₹949.23 (approximately)**.

Problem 4.6 (Redeemable Preference Share): A preference share with a face value of ₹100 and a dividend rate of 9% is to be redeemed at par after 4 years. If the required rate of return is 11%, calculate its value. (L3)

Solution: D_P = 9% × 100 = ₹9 per year. RV = ₹100. n = 4, k_p = 11%. PVIFA(11%,4) ≈ 3.1024; PVIF(11%,4) ≈ 0.6587. V_P = (9 × 3.1024) + (100 × 0.6587) = 27.92 + 65.87 = **₹93.79 (approximately)**.

Problem 4.7 (Two-Stage Growth Model — Simplified): A company is expected to pay dividends of ₹4, ₹5, and ₹6 in years 1, 2, and 3 respectively (high-growth phase). From year 4 onward, dividends are expected to grow at a stable 5% per year forever. If the required return is 13%, estimate the value of the share (using year-3 terminal value discounted back). (L4)

Solution (approach): Terminal value at end of year 3: $V_3 = D_4 / (k_e - g)$ = [6 × 1.05] / (0.13 − 0.05) = 6.30/0.08 = ₹78.75. PV of explicit dividends: $4/(1.13)^1 + 5/(1.13)^2 + 6/(1.13)^3$ = 3.54 + 3.92 + 4.16 = ₹11.62. PV of terminal value: $78.75/(1.13)^3 = 78.75/1.4429$ ≈ ₹54.58. V_0 = 11.62 + 54.58 = **₹66.20 (approximately)**. *Interpretation:* This illustrates the general multi-stage structure of Section 4.5.4, where the bulk of value (here, roughly 82%) typically comes from the terminal value representing the stable-growth phase beyond the explicit forecast horizon.

4.11 Glossary of Key Terms — Unit IV

- **Cost of Capital:** the required rate of return that a company must earn on its investments to satisfy its providers of capital (debt and equity).
- **Coupon:** the periodic interest payment made by a bond issuer to bondholders.
- **Discount Rate:** the rate used to convert future cash flows to their present value, reflecting the time value of money and risk.
- **Dividend Payout Ratio:** the proportion of earnings distributed to shareholders as dividends.
- **EV/EBITDA:** Enterprise Value to Earnings Before Interest, Taxes, Depreciation, and Amortisation — a relative valuation multiple.
- **Face Value (Par Value):** the nominal value of a bond or share as stated on the certificate, repaid at maturity for bonds.
- **Intrinsic Value:** the "true" or fair value of a security, as estimated by a valuation model, independent of its current market price.
- **Redeemable Security:** a security (bond or preference share) that is repaid/redeemed at a specified maturity date.
- **Terminal Value:** the estimated value of all cash flows beyond an explicit forecast period, typically calculated using a stable-growth perpetuity formula.
- **Time Value of Money:** the principle that a given sum of money is worth more today than the same sum in the future, due to its earning potential.
- **Yield to Maturity (YTM):** the total return anticipated on a bond if it is held until it matures.

Unit IV Highlights

- Valuation rests on discounting expected future cash flows at an appropriate required rate of return.
- Bond value equals the present value of coupon payments plus the present value of the redemption/face value.
- Irredeemable preference shares are valued as a perpetuity: V = D / k.
- The Gordon Growth Model values equity as V = D1 / (ke − g), valid only when ke > g.
- Relative valuation (P/E multiple) is a market-based alternative to intrinsic, cash-flow-based valuation.

Textbook Reference — Unit IV

Kevin, S. (2007). Portfolio Management, 2nd Edition. New Delhi: Prentice Hall.

Chandra, Prasanna (2008). Investment Analysis & Portfolio Management, 3rd Edition. New Delhi: Tata McGraw Hill.

Chandra, Prasanna (2021). Investment Analysis and Portfolio Management, 2021 Edition. McGraw Hill.

Bhat, Sudhindra (2008). Security Analysis and Portfolio Management, 1st Edition. New Delhi: Excel Books.

UNIT V — PORTFOLIO MANAGEMENT

"Do not put all your eggs in one basket." —

Traditional proverb, foundational to portfolio theory

Unit Overview

The final unit shifts focus from individual securities to the combination of securities into a portfolio. It explains the portfolio management process, the benefits of diversification, and three landmark models — the Markowitz Model and the Efficient Frontier, the Sharpe Single Index Model, and the Capital Asset Pricing Model (CAPM) — that investors and fund managers use to construct and price optimal portfolios.

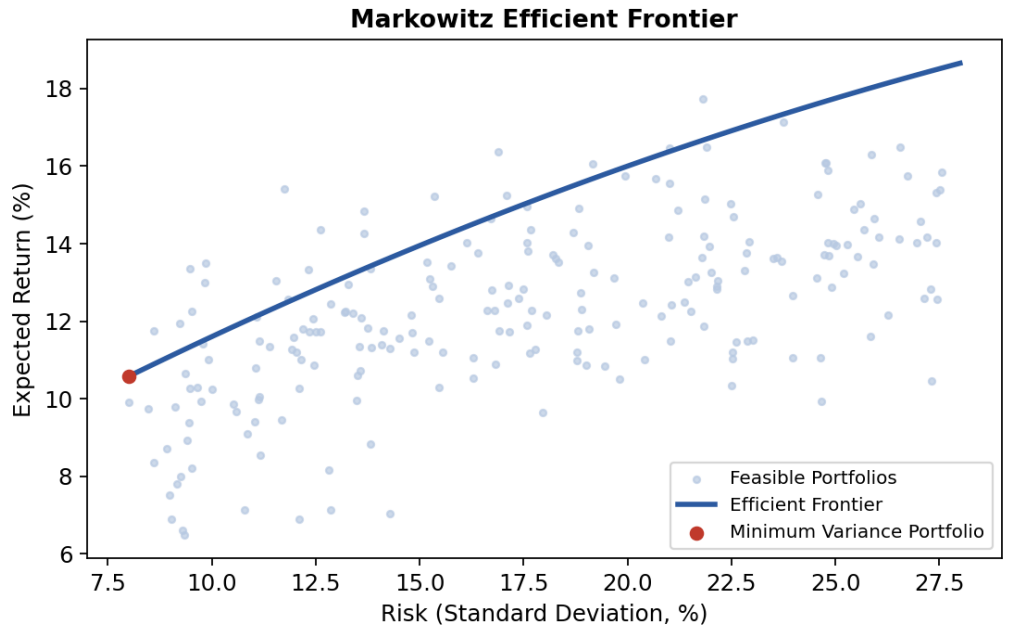

Fig. 5.1 — Markowitz Efficient Frontier

5.1 Learning Objectives

1. Explain the process of portfolio management (L2).
2. Explain the concept and benefits of diversification (L2).
3. Discuss the principles of Modern Portfolio Theory (L2).
4. Apply the Markowitz Model to construct an efficient portfolio (L3).
5. Apply the Sharpe Single Index Model to simplify portfolio selection (L3).
6. Apply the Capital Asset Pricing Model (CAPM) to estimate required return (L3).
7. Evaluate and compare portfolio models for practical investment decisions (L5).

Key Concepts

Portfolio | Portfolio Management Process | Diversification | Modern Portfolio Theory | Markowitz Model | Efficient Frontier | Sharpe Single Index Model | Capital Asset Pricing Model (CAPM) | Security Market Line (SML)

Learning Outcomes

On successful completion of this unit, the student will be able to:

Identify the best portfolio management approach through various models.

Importance of Studying This Unit

Ultimately, investors do not hold single securities in isolation they hold portfolios. This unit integrates everything learned earlier (return, risk, correlation, and valuation) into a coherent framework for building, evaluating, and pricing a portfolio, making it the capstone unit of the course.

5.2 Meaning of Portfolio and Portfolio Management

A **portfolio** is a combination or group of financial assets such as shares, bonds, mutual fund units, and cash equivalents, held by an investor to achieve a specific investment objective.

Portfolio Management is the art and science of selecting, combining, monitoring, and revising a group of investments that meet the investor's long-term financial objectives and risk tolerance.

5.3 Process of Portfolio Management

Portfolio management is a continuous, cyclical process comprising the following stages:

1. **Security Analysis** — evaluating individual securities using fundamental and technical analysis (Unit II) to identify candidates for inclusion.
2. **Portfolio Analysis** — calculating the expected return and risk of various possible combinations of securities, using the statistical tools of Unit III (expected return, standard deviation, covariance, correlation).

3. **Portfolio Selection** — identifying the **optimal portfolio** from the set of possible portfolios, i.e., the portfolio that best matches the investor's risk-return preference (using models such as Markowitz, Sharpe, or CAPM, discussed below).
4. **Portfolio Revision** — periodically reviewing and adjusting portfolio composition in response to changes in security fundamentals, investor objectives, or market conditions.
5. **Portfolio Evaluation** — assessing portfolio performance against a benchmark, using risk-adjusted performance measures (e.g., Sharpe Ratio, Treynor Ratio, Jensen's Alpha).

Figure 5.1 (described): A circular flow diagram with five connected stages — Security Analysis → Portfolio Analysis → Portfolio Selection → Portfolio Revision → Portfolio Evaluation — with an arrow looping back from Evaluation to Security Analysis, illustrating that portfolio management is an ongoing cycle rather than a one-time exercise.

5.3.1 Objectives of Portfolio Management

1. Maximisation of return for a given level of risk (or minimisation of risk for a given level of return).
2. Ensuring safety and stability of principal.
3. Ensuring adequate liquidity and marketability.
4. Achieving diversification to reduce unsystematic risk.
5. Maximising tax efficiency.

5.4 Diversification

Diversification is the strategy of spreading investment across a variety of securities/asset classes so that the poor performance of some is offset by the better performance of others, thereby reducing the overall (unsystematic) risk of the portfolio without a proportionate sacrifice in expected return.

5.4.1 Why Diversification Works

As established in Unit III (Section 3.6.2), the risk-reduction benefit of combining securities depends critically on the **correlation coefficient** between their returns:

- Combining securities with **correlation less than +1** reduces portfolio risk below the simple weighted average of individual risks.
- The **lower (or more negative) the correlation**, the greater the risk-reduction benefit.
- Diversification eliminates **unsystematic risk** but cannot eliminate **systematic (market) risk** — recall Figure 3.1, where portfolio risk flattens out at the level of systematic risk as more securities are added.

5.4.2 Types of Diversification

1. **Random (Naive) Diversification** — simply adding securities without analysing correlations, relying on the statistical law of large numbers.
2. **Markowitz (Efficient) Diversification** — selecting securities based on their correlation with each other to achieve the maximum risk reduction for a given expected return (see Section 5.5).

5.5 Modern Portfolio Theory (MPT) and the Markowitz Model

Developed by **Harry Markowitz** (1952, Nobel Prize in Economics 1990), Modern Portfolio Theory revolutionised investment management by mathematically formalising the trade-off between risk and return at the *portfolio* level rather than the individual-security level.

5.5.1 Assumptions of the Markowitz Model

1. Investors are **rational** and **risk-averse** — for a given return, they prefer lower risk; for a given risk, they prefer higher return.
2. Investors base decisions solely on **expected return and variance (standard deviation)** of returns.
3. All investors have the **same single-period investment horizon**.
4. Markets are **frictionless** (no taxes or transaction costs, for simplicity of the model).

5.5.2 Portfolio Return and Risk (Two-Asset Case)

Portfolio Expected Return:

$$E(R_p) = w_A E(R_A) + w_B E(R_B)$$

where w_A, w_B are the proportions (weights) invested in securities A and B (w_A + w_B = 1).

Portfolio Risk (Standard Deviation):

$$\sigma_p = \sqrt{w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2 w_A w_B \rho_{AB} \sigma_A \sigma_B}$$

where ρ_AB is the correlation coefficient between A and B (as defined in Unit III, Section 3.6.2).

Key insight: unlike portfolio *return*, which is always a simple weighted average, portfolio *risk* is **not** a simple weighted average of individual risks (except in the special case ρ = +1) — this is the mathematical essence of diversification.

5.5.3 The Efficient Frontier

By computing E(R_p) and σ_p for every possible combination of weights across a set of securities, an analyst can plot all possible portfolios on a risk-return graph. The **Efficient Frontier** is the set of portfolios that offer the **maximum expected return for each level of risk** (equivalently, the minimum risk for each level of expected return).

Figure 5.2 (described): A graph with Portfolio Risk (σ_p) on the X-axis and Portfolio Expected Return E(R_p) on the Y-axis. A cloud of dots represents all feasible portfolios; the upper-left boundary of this cloud, a curved (bullet-shaped) line, is the Efficient Frontier. Portfolios below/inside this frontier are "dominated" (inefficient) because a portfolio on the frontier offers either higher return for the same risk, or lower risk for the same return.

5.5.4 Selecting the Optimal Portfolio

The specific portfolio an investor chooses *on* the efficient frontier depends on their individual **risk tolerance**, represented by indifference curves (utility curves reflecting the investor's risk-return trade-off preference). The optimal portfolio is the point where the investor's highest attainable indifference curve is tangent to the efficient frontier.

5.5.5 Advantages and Limitations of the Markowitz Model

Advantages: provides a rigorous, mathematically sound basis for diversification; explicitly quantifies the risk-reduction benefit of combining assets; forms the theoretical foundation for nearly all subsequent portfolio theory including CAPM.

Limitations: computationally intensive for large numbers of securities (requires estimating covariance between every pair of securities — n(n−1)/2 covariance terms for n securities); highly sensitive to input estimation errors (expected returns are notoriously difficult to forecast accurately); assumes returns are normally distributed and investors are rational, which does not always hold in practice (behavioural finance critiques).

5.6 Sharpe Single Index Model

Developed by **William Sharpe** (1963) as a computationally simpler alternative to the full Markowitz model, the **Single Index Model** dramatically reduces the data requirements by relating each security's return not to every other security individually, but to a single common factor — the return on the **market index**.

5.6.1 The Single Index Model Equation

$$R_i = \alpha_i + \beta_i R_m + e_i$$

where: - R_i = return on security *i*, - α_i = the component of security i's return independent of market movements (the intercept), - β_i = the security's sensitivity to market movements (as defined in Unit III, Section 3.6.3), - R_m = return on the market index, - e_i = random

(residual) error term specific to the security, assumed uncorrelated with R_m and with e_j of other securities.

5.6.2 Risk Decomposition Under the Single Index Model

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{ei}^2$$

where β_i²σ_m² represents **systematic risk** (explained by the market) and σ_ei² represents **unsystematic (residual) risk** — a direct, formal restatement of the risk classification introduced in Unit III, Section 3.5.1.

5.6.3 Why the Single Index Model Simplifies Portfolio Selection

Instead of estimating a full covariance matrix (n(n−1)/2 terms), the analyst needs only: - n estimates of α_i, - n estimates of β_i, - n estimates of σ_ei², - 1 estimate of the market return and variance.

This reduces the data requirement from an order of n² to an order of n — a dramatic simplification that made large-scale portfolio optimisation computationally feasible in the pre-modern-computing era, and remains widely used in the investment industry today.

5.6.4 Advantages and Limitations

Advantages: vastly reduces computational and data-estimation burden compared to the full Markowitz model; provides an intuitive decomposition of risk into systematic and unsystematic components; forms a natural bridge to the CAPM (Section 5.7).

Limitations: assumes security returns are correlated *only* through their common relationship with the market index (i.e., residual errors e_i are assumed uncorrelated across securities), which understates risk when securities share industry-specific or other common factors beyond the market; a single-factor model may be too simplistic compared to multi-factor models used in contemporary practice (e.g., Fama-French three/five-factor models).

5.7 Capital Asset Pricing Model (CAPM)

Developed by **William Sharpe, John Lintner, and Jan Mossin** in the 1960s (building on Markowitz's portfolio theory), the **CAPM** provides an equilibrium model for determining the **required (expected) rate of return** on a security, given its systematic risk (beta).

5.7.1 The CAPM Equation (Security Market Line)

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

where: - E(R_i) = expected/required return on security *i*, - R_f = risk-free rate of return (e.g., yield on government treasury bills), - β_i = beta of the security (Unit III, Section 3.6.3), - E(R_m) = expected return on the market portfolio, - [E(R_m) − R_f] = **market risk premium** — the additional return investors demand for bearing market risk over the risk-free rate.

5.7.2 The Security Market Line (SML)

The CAPM equation, when plotted with β on the X-axis and E(R) on the Y-axis, produces a straight line called the **Security Market Line (SML)**, with intercept R_f and slope [E(R_m) − R_f].

Figure 5.3 (described): A straight upward-sloping line (the SML) starting at R_f on the Y-axis when β = 0, passing through the point (β = 1, E(R_m)), representing the market portfolio. Securities plotting *above* the SML are considered **undervalued** (offering more return than their risk justifies); securities plotting *below* the SML are considered **overvalued**.

5.7.3 Assumptions of CAPM

1. Investors are rational, risk-averse, and hold diversified portfolios (only systematic/beta risk is priced; unsystematic risk earns no reward since it can be diversified away — a direct application of Section 5.4.1).
2. A risk-free asset exists, and investors can borrow/lend unlimited amounts at the risk-free rate.

3. All investors have homogeneous expectations about future returns, variances, and covariances.
4. Markets are frictionless — no taxes, transaction costs, or restrictions on short selling.
5. All investors have the same single-period investment horizon.

5.7.4 Applications of CAPM

1. Estimating the **cost of equity** for corporate capital budgeting and valuation (linking back to k_e used in the Gordon Growth Model, Unit IV, Section 4.5.3).
2. Evaluating whether a security is fairly priced (comparing actual/expected return to the CAPM-required return, i.e., positioning relative to the SML).
3. Performance evaluation of portfolio managers, via risk-adjusted measures built on CAPM foundations (e.g., **Jensen's Alpha** = actual portfolio return − CAPM-required return).

5.7.5 Advantages and Limitations of CAPM

Advantages: simple, single-factor model requiring only three inputs (R_f, β, market risk premium); provides a clear, intuitive theoretical link between risk and required return; widely used across corporate finance and investment practice as an industry-standard benchmark.

Limitations: relies on restrictive and often unrealistic assumptions (frictionless markets, homogeneous expectations, unlimited risk-free borrowing/lending); beta estimated from historical data may not be a reliable predictor of future systematic risk; empirical tests (e.g., Fama & French, 1992) have found that beta alone does not fully explain cross-sectional differences in stock returns, motivating multi-factor extensions.

5.8 Comparative Summary of Portfolio Models

Model	Key Idea	Primary Data Requirement	Main Limitation
Markowitz Model	Full covariance-based portfolio optimisation to construct the efficient frontier	Full covariance matrix (n^2 order)	Computationally heavy; sensitive to input estimation error
Sharpe Single Index Model	Relates each security's return to a single market index to simplify computation	n betas + n residual variances (n order)	Ignores non-market common factors across securities
CAPM	Equilibrium model linking required return to systematic risk (beta)	R_f, β, expected market return	Restrictive assumptions; beta alone may not fully explain returns

5.9 Real-World Example

Example: Indian mutual fund houses routinely disclose the beta, standard deviation, and Sharpe Ratio of their equity schemes in factsheets, allowing investors to compare risk-adjusted performance across funds — a direct, everyday application of the concepts developed across Units III and V. A large-cap index fund tracking the NIFTY 50 will, by construction, have a beta close to 1.0 and minimal unsystematic risk (since it already holds a broadly diversified basket), while a concentrated small-cap thematic fund will typically exhibit both a higher beta and meaningfully higher unsystematic (fund-manager-specific) risk.

5.10 Case Study — Constructing a Two-Asset Portfolio

Case: An investor is considering combining two mutual funds: Fund X (large-cap equity, expected return 12%, standard deviation 15%) and Fund Y (debt-oriented hybrid, expected return 7%, standard deviation 5%), with a correlation coefficient of +0.2 between them. The

investor is deciding between three allocations: (a) 100% Fund X, (b) 70% Fund X / 30% Fund Y, and (c) 50% Fund X / 50% Fund Y.

Discussion points for students (to be solved as an extension of Problem 5.1 below): 1. Calculate the expected return and standard deviation for each of the three allocations. 2. Which allocation would a highly risk-averse investor prefer, and why? 3. Does the low correlation (+0.2) meaningfully reduce risk relative to a simple weighted average? Explain using the logic of Section 5.4.1. 4. How might this analysis change if the correlation between Fund X and Fund Y turned negative during a market downturn (equity falls while debt/hybrid rises)?

5.11 Unit V — Questions

(a) Short Answer Questions (2 Marks Level)

1. Define “portfolio.” (L1)
2. List the five stages of the portfolio management process. (L1)
3. Define “diversification.” (L1)
4. Who developed Modern Portfolio Theory, and in which year? (L1)
5. State the formula for portfolio expected return (two-asset case). (L1)
6. Define the “Efficient Frontier.” (L1)
7. What is the key simplification offered by the Sharpe Single Index Model over the Markowitz Model? (L2)
8. State the CAPM equation. (L1)
9. Define “Security Market Line.” (L1)
10. What does it mean if a security plots above the SML? (L2)
11. Define “market risk premium.” (L1)
12. What is “Jensen’s Alpha”? (L1)
13. State any two assumptions of CAPM. (L1)
14. Distinguish between random diversification and Markowitz diversification. (L2)
15. What is meant by the “optimal portfolio”? (L1)

(b) Essay Type Questions (10 Marks Level)

1. Explain the process of portfolio management with a suitable diagram. (L2)
2. Discuss the concept of diversification and explain why it reduces portfolio risk. (L2)
3. Explain the Markowitz Model, its assumptions, and the concept of the Efficient Frontier. (L2)
4. Discuss the Sharpe Single Index Model and explain how it simplifies portfolio selection compared to the Markowitz Model. (L4)
5. Explain the Capital Asset Pricing Model (CAPM) and derive/state the Security Market Line. (L2)
6. Compare the Markowitz Model, Sharpe Single Index Model, and CAPM in terms of assumptions and data requirements. (L4)
7. Critically evaluate the assumptions and limitations of CAPM. (L5)
8. Explain how correlation between securities affects portfolio risk, with a numerical illustration. (L4)
9. Discuss the role of the risk-free asset and market risk premium in determining a security's required return. (L2)
10. Evaluate which portfolio model — Markowitz, Sharpe, or CAPM — is most practical for an Indian retail investor today, giving reasons. (L5)

Problems

Problem 5.1 (Two-Asset Portfolio Risk and Return): Fund X has an expected return of 12% and a standard deviation of 15%; Fund Y has an expected return of 7% and a standard deviation of 5%. The correlation coefficient between them is +0.2. Calculate the expected return and standard deviation of a portfolio with 70% invested in Fund X and 30% in Fund Y. (L3)

Solution: $E(R_p) = (0.7 \times 12\%) + (0.3 \times 7\%) = 8.4\% + 2.1\% = \mathbf{9.5\%}$.

$\sigma_p = \sqrt{[w_X^2\sigma_X^2 + w_Y^2\sigma_Y^2 + 2w_Xw_Y\rho_{XY}\sigma_X\sigma_Y]} = \sqrt{[(0.7^2 \times 15^2) + (0.3^2 \times 5^2) + (2 \times 0.7 \times 0.3 \times 0.2 \times 15 \times 5)]} = \sqrt{[(0.49 \times 225) + (0.09 \times 25) + (0.084 \times 75)]} = \sqrt{[110.25 + 2.25 + 6.3]} = \sqrt{118.8} \approx$ **10.90%**.

Interpretation: Note that 10.90% is less than the weighted average of the individual standard deviations [(0.7×15)+(0.3×5) = 12%], demonstrating the risk-reduction effect of diversification even with a modest positive correlation of +0.2, consistent with Section 5.4.1.

Problem 5.2 (CAPM): The risk-free rate is 6%, the expected return on the market portfolio is 14%, and a stock has a beta of 1.3. Calculate the required rate of return on the stock using CAPM. (L3)

Solution: $E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 6\% + 1.3 \times (14\% - 6\%) = 6\% + 1.3 \times 8\% = 6\% + 10.4\% =$ **16.4%**.

Problem 5.3 (CAPM — Mispricing Assessment): Using the data in Problem 5.2, if the stock's actual expected return (based on analyst forecasts) is 19%, is the stock undervalued or overvalued according to CAPM? (L4)

Solution: CAPM-required return = 16.4% (from Problem 5.2). Actual expected return = 19% > 16.4%. *Interpretation:* Since the stock's expected return exceeds its CAPM-required return, it plots **above the SML** and is considered **undervalued** — offering more return than its systematic risk (beta) alone would justify, making it an attractive buy candidate, all else equal.

Problem 5.4 (Single Index Model — Risk Decomposition): A stock has a beta of 1.4. The variance of the market's return is 100, and the residual (unsystematic) variance of the stock is 60. Calculate the stock's total risk (variance) and the proportion of risk that is systematic. (L3)

Solution: Systematic risk = $\beta^2 \times \sigma_m^2 = 1.4^2 \times 100 = 1.96 \times 100 = 196$. Total risk ($\sigma_i^2$) = Systematic risk + Unsystematic risk = 196 + 60 = **256**. Proportion systematic = 196 / 256 = **76.6%** (approximately). *Interpretation:* Roughly three-quarters of this stock's total risk is

attributable to market-wide (systematic) movements, and only about a quarter is company-specific (diversifiable) risk.

5.13 Additional Worked Problems — Unit V

Problem 5.5 (Three-Asset Portfolio Expected Return): A portfolio consists of three securities: 40% in Security A (expected return 10%), 35% in Security B (expected return 15%), and 25% in Security C (expected return 8%). Calculate the portfolio's expected return. (L3)

Solution: $E(R_p) = (0.40\times10) + (0.35\times15) + (0.25\times8) = 4.0 + 5.25 + 2.0 =$ **11.25%**.

Problem 5.6 (Impact of Negative Correlation): Two securities, M and N, each have a standard deviation of 20%, and are equally weighted (50%-50%) in a portfolio. Calculate the portfolio standard deviation if (a) $\rho = +1$, (b) $\rho = 0$, and (c) $\rho = -1$, and comment on the results. (L4)

Solution: General formula: $\sigma_p = \sqrt{[0.5^2(20^2) + 0.5^2(20^2) + 2(0.5)(0.5)(\rho)(20)(20)]} = \sqrt{[100 + 100 + 200\rho]} = \sqrt{[200 + 200\rho]}$.

(a) $\rho = +1$: $\sigma_p = \sqrt{[200+200]} = \sqrt{400} =$ **20%** (no risk reduction — equals simple weighted average).

(b) $\rho = 0$: $\sigma_p = \sqrt{[200+0]} = \sqrt{200} \approx$ **14.14%** (moderate risk reduction).

(c) $\rho = -1$: $\sigma_p = \sqrt{[200-200]} = \sqrt{0} =$ **0%** (risk is completely eliminated).

Interpretation: This problem powerfully demonstrates the central insight of Section 5.4.1 — as correlation falls from +1 toward −1, portfolio risk falls dramatically, even though both securities individually carry the same 20% standard deviation and are combined in the same 50-50 proportion. At perfect negative correlation, a riskless portfolio can theoretically be constructed from two risky securities.

Problem 5.7 (CAPM — Finding Beta from Required Return): An investor requires a return of 18% on a stock. The risk-free rate is 7% and the expected market return is 15%. Calculate the implied beta of the stock. (L4)

Solution: $18 = 7 + \beta(15-7) \rightarrow 11 = 8\beta \rightarrow \beta = 11/8 =$ **1.375**.

5.14 Glossary of Key Terms — Unit V

- **Alpha (Jensen's Alpha):** the excess return of a portfolio over its CAPM-predicted return, used as a measure of a manager's stock-selection skill.
- **Efficient Frontier:** the set of portfolios offering the maximum expected return for each level of risk.
- **Indifference Curve:** a curve representing combinations of risk and return that provide an investor with equal satisfaction (utility).
- **Optimal Portfolio:** the portfolio on the efficient frontier that best matches an investor's individual risk tolerance.
- **Portfolio Revision:** the periodic process of altering the composition of a portfolio in response to changing conditions.
- **Residual Risk:** unsystematic risk specific to a security, not explained by market movements (also called unique risk).
- **Risk-Free Rate:** the theoretical rate of return on an investment with zero risk, typically proxied by government treasury bill yields.
- **Security Market Line (SML):** the graphical representation of the CAPM, plotting required return against beta.
- **Sharpe Ratio:** a risk-adjusted performance measure calculated as (portfolio return − risk-free rate) / portfolio standard deviation.
- **Treynor Ratio:** a risk-adjusted performance measure calculated as (portfolio return − risk-free rate) / portfolio beta.

Unit V Highlights

- The portfolio management process has five stages: security analysis, portfolio analysis, portfolio selection, revision, and evaluation.
- Diversification reduces unsystematic risk; it cannot eliminate systematic (market) risk.
- The Markowitz Model identifies the Efficient Frontier — portfolios offering maximum return for a given risk.
- The Sharpe Single Index Model simplifies the Markowitz Model by relating each security's return only to a market index.
- CAPM prices a security's required return as $R_f + \beta(R_m - R_f)$, represented graphically by the Security Market Line.

Textbook Reference — Unit V

Kevin, S. (2007). Portfolio Management, 2nd Edition. New Delhi: Prentice Hall.

Chandra, Prasanna (2008). Investment Analysis & Portfolio Management, 3rd Edition. New Delhi: Tata McGraw Hill.

Chandra, Prasanna (2021). Investment Analysis and Portfolio Management, 2021 Edition. McGraw Hill.

Bhat, Sudhindra (2008). Security Analysis and Portfolio Management, 1st Edition. New Delhi: Excel Books.

CONSOLIDATED REFERENCES

Text Books

1. Kevin, S. (2007). *Portfolio Management*, 2nd Edition. New Delhi: Prentice Hall.
2. Chandra, Prasanna (2008). *Investment Analysis & Portfolio Management*, 3rd Edition. New Delhi: Tata McGraw Hill.

Reference Books

1. Chandra, Prasanna (2021). *Investment Analysis and Portfolio Management*, 2021 Edition. McGraw Hill.
2. Bhat, Sudhindra (2008). *Security Analysis and Portfolio Management*, 1st Edition. New Delhi: Excel Books.
3. Awadhani (2011). *Security Analysis & Portfolio Management*, 10th Edition. Mumbai: Himalaya Publishers.
4. Fisher, Donald E. & Jordan, Ronald J. (2008). *Security Analysis and Portfolio Management*, 4th Edition. New Delhi: Pearson Prentice Hall.

Web / Online Resources

1. NPTEL — Security Analysis and Portfolio Management: https://nptel.ac.in/courses/110105035
2. NPTEL/SWAYAM — Security Analysis and Portfolio Management: https://onlinecourses.nptel.ac.in/noc21_mg99/preview
3. NPTEL — Financial Markets and Institutions: https://nptel.ac.in/courses/110107154
4. Securities and Exchange Board of India (SEBI): www.sebi.gov.in
5. National Stock Exchange of India (NSE): www.nseindia.com
6. BSE Limited: www.bseindia.com
7. Multi Commodity Exchange of India (MCX): www.mcxindia.com
8. Reserve Bank of India (RBI): www.rbi.org.in

Industry Case Insights and Emerging Trends (Enrichment)

1. **Rise of Passive Investing in India:** Rapid growth of index funds and ETFs tracking the NIFTY 50 and SENSEX, driven by cost-consciousness and mounting evidence that few active fund managers consistently beat their benchmarks after fees — directly relevant to the CAPM and Efficient Market discussions in Units II and V.
2. **T+1 Settlement Cycle:** India's transition to a T+1 rolling settlement cycle across all listed securities (completed in 2023) — one of the fastest settlement cycles among major global markets — reducing counterparty risk discussed in Unit I.
3. **Algorithmic and Quantitative Trading:** Increasing share of exchange volume driven by algorithmic strategies that systematise technical-analysis rules (Unit II) such as moving-average crossovers and RSI thresholds.
4. **ESG and Factor Investing:** Growing investor interest in Environmental, Social, and Governance (ESG) scoring, and multi-factor models extending beyond single-factor CAPM (Unit V) — e.g., value, size, momentum, and quality factors.
5. **Financialisation of Commodities:** Growth of commodity derivatives (MCX) and Sovereign Gold Bonds as portfolio diversification tools, connecting Unit I's market structure discussion with Unit V's diversification principles.
6. **SEBI's Investor Protection Reforms:** Introduction of the ASBA mechanism, UPI-based IPO applications, and the SCORES online grievance-redressal portal, strengthening the primary-market ecosystem discussed in Unit I.

APPENDIX A — CONSOLIDATED FORMULA SHEET

This appendix collects every formula introduced across Units I–V in one place for quick revision before examinations.

A.1 Unit III — Return and Risk Formulas

Concept	Formula
Holding Period Return	$HPR = [(P_1 - P_0) + D_1] / P_0$
Annualised Return	$(1 + HPR)^{(1/n)} - 1$
Expected Return	$E(R) = \Sigma P_i R_i$
Variance	$\sigma^2 = \Sigma P_i [R_i - E(R)]^2$
Standard Deviation	$\sigma = \sqrt{\sigma^2}$
Covariance	$Cov(A,B) = \Sigma P_i [R_{A,i} - E(R_A)][R_{B,i} - E(R_B)]$
Correlation Coefficient	$\rho_{AB} = Cov(A,B) / (\sigma_A \times \sigma_B)$
Beta	$\beta = Cov(R_i, R_m) / \sigma_m^2$

A.2 Unit IV — Valuation Formulas

Concept	Formula
Present Value	$PV = CF_t / (1+k)^t$
Bond Value	$V_B = C \times PVIFA(k_d,n) + F \times PVIF(k_d,n)$
Zero-Coupon Bond	$V_B = F / (1+k_d)^n$
Perpetual Bond	$V_B = C / k_d$
Irredeemable Preference Share	$V_P = D_P / k_p$
Redeemable Preference Share	$V_P = D_P \times PVIFA(k_p,n) + RV \times PVIF(k_p,n)$
Zero-Growth Equity (DDM)	$V_0 = D / k_e$
Constant-Growth Equity (Gordon)	$V_0 = D_1 / (k_e - g)$
Growth Rate Estimate	$g = b \times ROE$
Multi-Stage DDM Terminal Value	$V_n = D_{n+1} / (k_e - g_{stable})$

A.3 Unit V — Portfolio Formulas

Concept	**Formula**
Portfolio Expected Return (2-asset)	$E(R_p) = w_A E(R_A) + w_B E(R_B)$
Portfolio Standard Deviation (2-asset)	$\sigma_p = \sqrt{[w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_Aw_B\rho_{AB}\sigma_A\sigma_B]}$
Single Index Model	$R_i = \alpha_i + \beta_i R_m + e_i$
Risk Decomposition	$\sigma_i^2 = \beta_i^2\sigma_m^2 + \sigma_{ei}^2$
CAPM	$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$
Sharpe Ratio	$(R_p - R_f) / \sigma_p$
Treynor Ratio	$(R_p - R_f) / \beta_p$
Jensen's Alpha	$R_p - [R_f + \beta_p(R_m - R_f)]$