

CMA KNOWLEDGE REVISION SERIES

THE INSTITUTE OF COST ACCOUNTANTS OF INDIA

CMA FINAL · PAPER 14

Strategic Financial Management

Master Revision Handbook

December 2026 Edition

Complete Coverage of All 17 Modules

Section A Investment Decisions · **Section B** Security Analysis

Section C Financial Risk Management · **Section D** International Finance

Section E Digital Finance

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MASTER REVISION HANDBOOK



MASTER INDEX

*Complete Coverage of All 17 Modules — December 2026 Edition***SECTION A — INVESTMENT DECISIONS****WEIGHTAGE: 25%**

Module	Topic	Level	Page
01	Investment Decisions, Project Planning & Control 1.1 Measuring Cash Flows & DCF Technique · 1.2 NPV & IRR Conflict Resolution · 1.3 Inflation Adjusted Cash Flow · 1.4 Capital Rationing · 1.5 Social Cost Benefit Analysis	HIGH	3
02	Evaluation of Risky Proposals for Investment Decisions 2.1 Risk Analysis in Capital Budgeting · 2.2 Sensitivity Analysis · 2.3 Scenario Analysis · 2.4 Monte Carlo Simulation	HIGH	27
03	Leasing Decisions 3.1 Lease Financing – Lease vs. Buy · 3.2 Break-Even Lease Rental · 3.3 Cross Border Leasing, Sale & Leaseback	HIGH	45
04	Securitization 4.1 Definition, Concept & Benefits · 4.2 Participants in Securitization · 4.3 Mechanism & Problems · 4.4 Securitization Instruments	MEDIUM	61

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07	Mutual Funds 7.1 Meaning, Advantages & Disadvantages, Structure & Types · 7.2 Regulations · 7.3 Computation of NAV · 7.4 Evaluation of Performance · 7.5 ETF, REIT, InvIT	HIGH	125
08	Portfolio Theory and Practice 8.1 Portfolio Return & Risk, Systematic & Unsystematic Risk, Diversification · 8.2 Optimal Portfolio, Efficient Frontier, CML · 8.3 Principles of Asset Allocation	HIGH	149
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SECTION C — FINANCIAL RISK MANAGEMENT

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13	Financial Derivatives – Instruments for Risk Management 13.1 Introduction to Financial Derivatives · 13.2 Forward & Futures · 13.3 Options · 13.4 Swaps · 13.5 Interest Rate Derivatives – FRA, Futures, Options, Caps, Floors, Collars	HIGH	255

MASTER REVISION HANDBOOK



MASTER INDEX

*Continued — Sections D & E***SECTION D — INTERNATIONAL FINANCIAL MANAGEMENT** **WEIGHTAGE: 15%**

Module	Topic	Level	Page
14	The International Financial Environment 14.1 International Financial Institutions & Markets · 14.2 Sources of Foreign Currency – Eurobonds, FCCBs, ADRs, GDRs	HIGH	289
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16	Foreign Exchange Risk Management 16.1 Transaction Exposure · 16.2 Translation Exposure · 16.3 Operating Exposure	HIGH	337

SECTION E — DIGITAL FINANCE**WEIGHTAGE: 5%**

Module	Topic	Level	Page
17	Digital Finance 17.1 Meaning, Traditional Finance vs. Digital Finance · 17.2 Digital Finance Ecosystem – Infrastructure, Money, Assets, Services · 17.3 Regulation & Governance	MEDIUM	357

APPENDICES & QUICK REFERENCE**REVISION TOOLS**

App.	Description	Type	Page
A	Comprehensive Formula Handbook All formulas from Modules 1–17 organized by topic	FORMULA	375
B	Top 100 Examination Points Most critical examination concepts across all modules	EXAM	383
C	Top 50 Numerical Questions Frequently asked numerical types with solutions	PRACTICE	389
D	One-Night Revision Notes Consolidated last-day revision for all modules	REVISION	395
E	Final Checklist & Exam Strategy Pre-exam checklist, time management, presentation tips	STRATEGY	399

Handbook at a Glance



17 Modules
Complete Syllabus Coverage



150+ Formulas
In Dedicated Formula Boxes



100+ Numericals
With Step-by-Step Solutions



Exam Alerts
Marks-wise Importance Markers



One-Night Revision
Per Module + Consolidated



Dec 2026 Focus
Probable Examination Areas

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HOW TO USE THIS HANDBOOK

Study Roadmap

Recommended Study Sequence

1. Read Theory



2. Study Formula Box



3. Solve Numericals

4. Review Exam Alerts



5. One-Night Revision



6. Final Checklist

Module Weightage Overview

Section	Modules	Weightage	Priority
A – Investment Decisions	1 – 4	25%	HIGH
B – Security Analysis & Portfolio Management	5 – 11	35%	VERY HIGH
C – Financial Risk Management	12 – 13	20%	HIGH
D – International Financial Management	14 – 16	15%	MEDIUM
E – Digital Finance	17	5%	LOW

Key Features of This Handbook



Formula Boxes

Every formula in a dedicated box with variables, meaning, when to use, exam tips, and common errors

12
34

Numerical Illustrations

Question, concept tested, formula applied, working notes, calculation, answer, exam presentation format, and shortcut methods



Exam Alerts

Marks-wise importance markers — 5 marks, 10 marks, 15 marks areas, frequently asked topics, and Dec 2026 likely areas



One-Night Revision

Concise last-day revision notes for each module and a consolidated section



Dec 2026 Focus

Probable examination areas identified for each module based on trend analysis



Infographics

Process flow diagrams, concept trees, decision trees, formula charts, and comparison infographics

Examination Strategy



DEC 2026 – EXAMINATION STRATEGY

- **Time Allocation:** Section B (35%) and Section A (25%) together account for 60% — prioritize these
- **Numerical Focus:** NPV/IRR, Portfolio Risk, CAPM, Option Pricing, Forex — practice extensively
- **Theory Focus:** Risk Management, Derivatives, Digital Finance, Mutual Funds — memorize key points
- **Presentation:** Show all workings, use formula boxes, and conclude with clear recommendations
- **Revision:** Use One-Night Revision Notes for final week preparation
- **Mock Tests:** Attempt at least 3 full-length mock tests before the exam



Ready to Begin?

Your journey to CMA Final success starts here.

Turn the page to begin **Module 1 — Investment Decisions**

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**CMA FINAL PAPER 14 · STRATEGIC FINANCIAL
MANAGEMENT**

01

Investment Decisions, Project Planning & Control

Master Revision Handbook · December 2026 Edition

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Module 1 – Investment Decisions, Project Planning & Control

Module Objective

Primary Objective

To obtain in-depth knowledge on application of various techniques of project evaluation under a deterministic environment as well as techniques of incorporating the element of uncertainty in project appraisal. To develop detailed understanding of how to make strategic choices in long-term investment decisions such as own or lease and making optimal allocation of limited funds.

Mapped CMLO: 2a, 2b, 3c

Learning Outcomes

Students will be able to...	Application Skill
Perform project appraisals, allocation of limited funds among competing projects and making strategic choices in long-term investment decisions.	Prepare project appraisal reports and guide management in selecting the appropriate one.
Identify the risks associated with various functional areas of the organisation and evaluate the alternative risk management techniques.	Prepare risk reports to facilitate strategic decision making relating to the functional areas of the organisation.
Build profitable portfolios and evaluate their performance continuously to identify if any revision is warranted.	Prepare periodic portfolio performance reports to facilitate portfolio revision decisions.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
1.1	Measuring Cash Flows, DCF Technique for Project Evaluation	HIGH 10%	Numerical + Theory
1.2	NPV & IRR – Conflict & Resolution, MIRR, Unequal Lives, Abandonment Value, MACRS	HIGH 10%	Numerical + Theory
1.3	Inflation Adjusted Cash Flow Forecasting	MEDIUM 5%	Numerical
1.4	Capital Rationing – Divisible & Non-divisible Projects	MEDIUM 5%	Numerical + Theory
1.5	Social Cost Benefit Analysis	LOW 2%	Theory

Expected Examination Areas – Dec 2026



DEC 2026 LIKELY AREAS

- NPV vs. IRR conflict resolution (time, life, scale disparity) – **10–15 marks**
- MIRR and Modified NPV numerical – **5–10 marks**
- Capital rationing with divisible and indivisible projects – **5–10 marks**
- Inflation adjusted NPV – **5 marks**
- Abandonment value and real options – **5 marks**
- Social Cost Benefit Analysis theory – **5 marks**

Frequently Tested Concepts

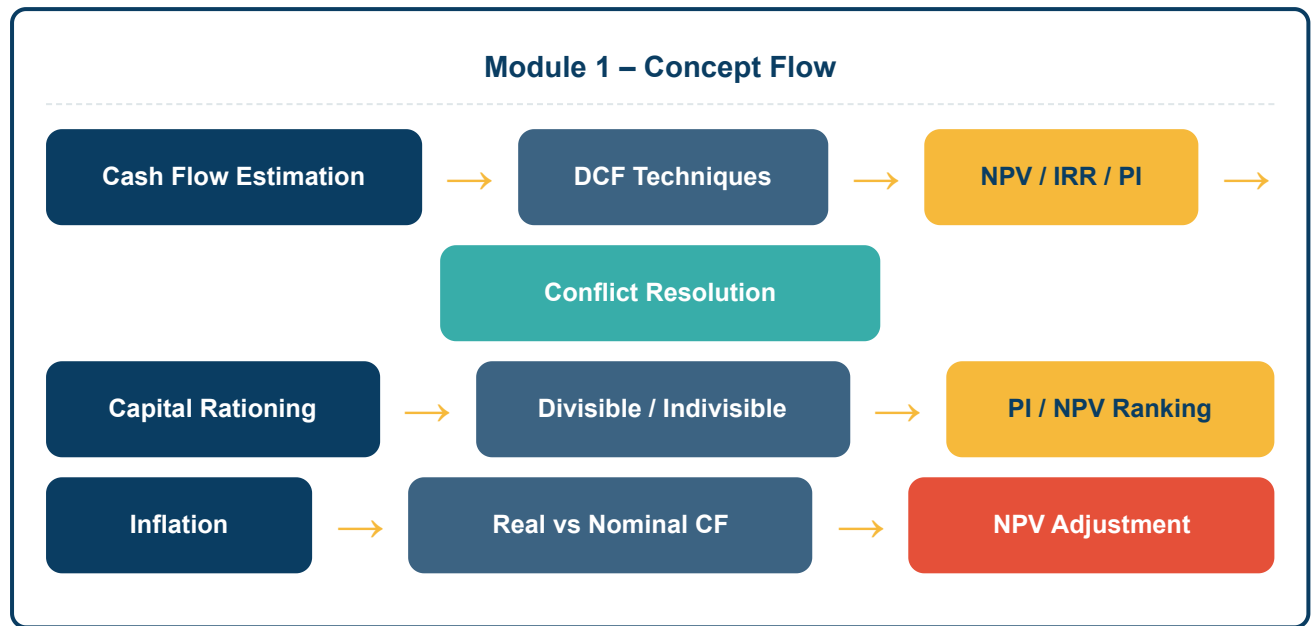


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★ FREQUENTLY ASKED – MODULE 1

- **NPV vs IRR conflict** – asked in almost every attempt
- **Capital rationing** – divisible and indivisible projects
- **MIRR calculation** – 5 marks practical
- **Inflation adjusted NPV** – 5 marks practical
- **Abandonment value** – theory + small numerical

1.1 Measuring Cash Flows & DCF Technique

Chapter Overview

This chapter establishes the foundation of capital budgeting by focusing on the estimation of relevant cash flows and the application of discounted cash flow (DCF) techniques for project evaluation. The chapter covers both non-discounted methods (ARR, Payback) and discounted methods (NPV, PI, IRR, MIRR, ANPV, MNPV).

Learning Objectives

- Understand the concept and importance of relevant cash flow analysis
- Estimate initial, subsequent, and terminal cash flows
- Apply DCF techniques for project evaluation
- Understand the conflict between NPV and IRR and resolution techniques
- Apply capital rationing for divisible and indivisible projects

1.1.1 Estimation of Project Cash Flow

Why Cash Flow Approach is Superior

- Cash flows are theoretically better measure of net economic benefits
- Cost of investment is represented by cash outflows; benefits by cash inflows
- Avoids non-cash items like depreciation and accounting policy differences

Classification of Cash Flows

Three Types of Project Cash Flows

Initial Cash Flow



Subsequent Cash Flow



Terminal Cash Flow

(i) Initial Cash Outflow

Σ Initial Cash Outflow

$$\begin{aligned} &\text{Cost of new asset (incl. installation, transport, incidental)} \\ &\quad +/\text{-- Change in working capital} \\ &\quad - \text{Salvage value of old asset (if replacement)} \\ &\quad - \text{Tax savings on loss} / + \text{Tax on profit on sale of old asset} \end{aligned}$$

Ignore: Sunk costs **Consider:** Opportunity cost of idle land

(ii) Subsequent Cash Flow – CFAT

Σ Net Cash Inflow after Taxes (CFAT)

$$\text{CFAT} = \text{EBIT} (1 - t) + \text{Depreciation}$$

EBIT: Earnings before interest & tax **t:** Tax rate **Note:** Interest excluded (Interest Exclusion Principle)

△ Exam Tip: If PAT is given after interest, add back Interest Net of Taxes + Depreciation.

Illustration – CFAT Calculation

Given: Net Sales ₹10,00,000; COGS ₹5,00,000; Operating Exp ₹2,00,000; Depreciation ₹1,00,000; Interest ₹50,000; Tax @ 30%.

Compute: CFAT

EBIT	₹2,00,000
Less: Tax @ 30%	₹60,000
PAT (excluding interest)	₹1,40,000
Add: Depreciation	₹1,00,000
CFAT	₹2,40,000

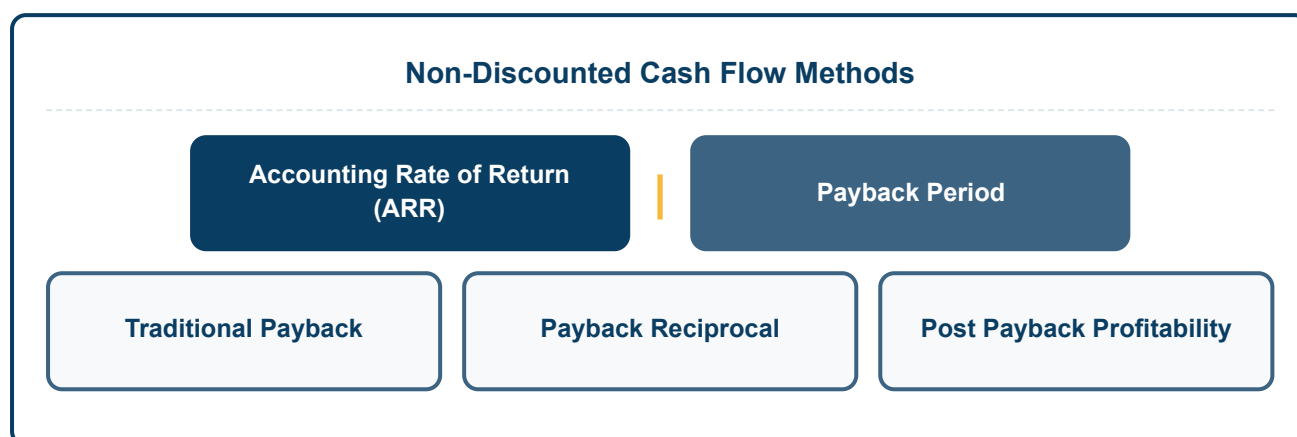
CFAT = ₹2,40,000

Shortcut: $CFAT = EBIT(1-t) + Dep = 2,00,000(0.70) + 1,00,000 = 2,40,000$

Relevant Cost Analysis

Relevant (Consider)	Irrelevant (Ignore)
Incremental cash flows	Sunk costs
Opportunity costs	Committed costs
Imputed costs	Historical costs
Out-of-pocket costs	Book values
Avoidable costs	Allocated fixed overheads
Differential costs	Non-cash items (except depreciation tax shield)

1.1.3 Non-Discounted Cash Flow Methods



1. Accounting Rate of Return (ARR)

Σ Accounting Rate of Return

$$\text{ARR} = (\text{Average Annual Net Income} \div \text{Average Investment}) \times 100$$

Average Investment: (Initial Investment + Salvage Value) ÷ 2 Or, Initial Investment ÷ 2 (if no salvage)

✓ Accept if ARR > Target Rate

⚠ Ignores time value of money – not recommended as sole criterion.

2. Payback Period (PBP)

Σ Traditional Payback Period

$$\text{PBP} = \text{Year before full recovery} + (\text{Unrecovered cost at start of year} \div \text{Cash flow during the year})$$

Uses **nominal (undiscounted) CFAT**

✓ Accept if PBP < Target PBP; choose lowest PBP

Illustration – Payback Period

Initial Investment ₹3,00,000; CFAT: Y1 ₹60,000; Y2 ₹50,000; Y3 ₹70,000; Y4 ₹75,000; Y5 ₹90,000; Y6 ₹60,000

Year	CFAT	Cumulative CFAT
1	60,000	60,000
2	50,000	1,10,000
3	70,000	1,80,000
4	75,000	2,55,000
5	90,000	3,45,000
6	60,000	4,05,000

$$\text{PBP} = 4 + (3,00,000 - 2,55,000) / (3,45,000 - 2,55,000) = 4 + 0.5 = 4.5 \text{ years}$$

Extensions of Payback Period



Payback Reciprocal

= Average Annual CFAT ÷ Initial Investment
Approximates IRR if life $\geq 2 \times$ PBP



Post Payback Profitability

= (Annual CFAT $\times$ Life) – Initial Investment
Considers cash flows after PBP

5 5 MARKS AREA – Payback Period

Simple calculation of PBP, DPBP, Payback Reciprocal, and Post Payback Profitability. Often asked as part of a larger capital budgeting problem.

1.1.4 Discounted Cash Flow Techniques

DCF Techniques Overview

Discounted Payback Period

Net Present Value (NPV)

Profitability Index (PI)

Adjusted NPV (ANPV)

Internal Rate of Return (IRR)

Modified IRR (MIRR)

Modified NPV (MNPV)

1. Discounted Payback Period (DPBP)

Σ Discounted Payback Period

$$\text{DPBP} = \text{Year before full recovery} + \frac{\text{Unrecovered cost at start of year}}{\text{PV of cash flow during the year}}$$

Use **PV of CFAT** instead of nominal CFAT

✓ Use when liquidity/risk is primary concern

△ Decision: Accept if $\text{DPBP} < \text{target}$; choose lowest DPBP among mutually exclusive projects.

Illustration – DPBP

Initial investment ₹60,000; Cost of capital 10%; CFAT: Y1 ₹10,000; Y2 ₹15,000; Y3 ₹20,000; Y4 ₹25,000; Y5 ₹20,000.

Year	CFAT	PVIF @10%	PV of CFAT	Cumulative PV
1	10,000	0.909	9,090	9,090
2	15,000	0.826	12,390	21,480
3	20,000	0.751	15,020	36,500
4	25,000	0.683	17,075	53,575
5	20,000	0.621	12,420	65,995

$$\text{DPBP} = 4 + (60,000 - 53,575) / (65,995 - 53,575) = 4 + 0.52 = 4.52 \text{ years}$$

2. Net Present Value (NPV)

Σ Net Present Value

$$\text{NPV} = \text{PV of Cash Inflows} - \text{PV of Cash Outflows}$$

$$\text{NPV} = \sum_{t=1}^n [\text{CF}_t / (1+K)^t] - I_0$$

CF_t: Cash inflow at time t **K**: Cost of capital **I₀**: Initial investment

✓ **Most preferred technique – absolute measure of wealth creation**

△ *Decision: Accept if NPV > 0; among mutually exclusive, choose highest NPV.*

NPV Decision Rules

- **NPV > 0**: Accept – adds to shareholder wealth
- **NPV = 0**: Indifferent – project breaks even
- **NPV < 0**: Reject – destroys shareholder value

3. Profitability Index (PI) / Benefit-Cost Ratio

Σ Profitability Index

$$PI = PV \text{ of Cash Inflows} \div PV \text{ of Cash Outflows}$$

$$PI = PV \text{ of Cash Inflows} \div \text{Initial Outlay (for conventional cash flows)}$$

Also called **Benefit-Cost Ratio**

✓ **Use when projects have different initial outlays (capital rationing)**

△ *Decision: Accept if $PI > 1$; among mutually exclusive, choose highest PI .*

Illustration – PI

Initial outlay ₹70,000; CFAT: Y1 ₹25,000; Y2 ₹30,000; Y3 ₹18,000; Y4 ₹16,000; Cost of capital 10%.

$$PV \text{ of CFAT} = 25,000(0.909) + 30,000(0.826) + 18,000(0.751) + 16,000(0.683) = 71,951$$

$$PI = 71,951 \div 70,000 = 1.028 \rightarrow \text{Accept}$$

4. Adjusted Net Present Value (ANPV)

Σ Adjusted NPV

$$ANPV = \text{Base Case NPV} + PV \text{ of Tax Shields} - PV \text{ of Floatation Cost}$$

Base Case NPV: NPV if project is all-equity financed **Tax Shield:** $(\text{Debt} \times \text{Interest} \times \text{Tax}) \times PVIFA$

✓ **Use when project is financed with a different debt-equity mix than the firm**

Illustration – ANPV

Investment ₹50 lakh; Expected cash flow ₹10 lakh p.a. for 8 years; Equity required return 15%; Debt ₹24 lakh @ 14%; Tax 40%; Floatation cost 5%

Base Case NPV = $10,00,000 \times \text{PVIFA}(15\%, 8) - 50,00,000 = 10,00,000 \times 4.4873 - 50,00,000 = (-)₹5,12,700$

PV of Tax Shield = ₹4,03,270

Floatation Cost = ₹1,37,000

ANPV = $-5,12,700 + 4,03,270 - 1,37,000 = (-)₹2,46,430 \rightarrow \text{Reject}$

5. Internal Rate of Return (IRR)

Σ Internal Rate of Return

$$\text{IRR} = \text{Lower Rate} + [(\text{Higher Rate} - \text{Lower Rate}) \times (\text{NPV at Lower Rate} \div (\text{NPV at Lower Rate} - \text{NPV at Higher Rate}))]$$

IRR: Discount rate at which NPV = 0 At IRR, PI = 1

✓ **Accept if IRR > Cost of Capital**

⚠ *IRR assumes reinvestment at IRR itself – may be unrealistic.*

Illustration – IRR

Project Cost ₹1,10,000; CFAT: Y1 ₹60,000; Y2 ₹20,000; Y3 ₹10,000; Y4 ₹50,000.

Year	CFAT	PV @ 10%	PV @ 12%
1	60,000	54,540	53,580
2	20,000	16,520	15,940
3	10,000	7,510	7,120
4	50,000	34,150	31,800
PV of Inflows		1,12,720	1,08,440
Less: Initial Investment		1,10,000	1,10,000
NPV		2,720	(1,560)

$$\text{IRR} = 10\% + [(12\% - 10\%) \times 2,720 / (2,720 + 1,560)] = 11.28\%$$

Shortcut: Guidance rate (Fake PBP) = $I/C = 1,10,000/35,000 = 3.14 \rightarrow$ Look up PVIFA table for 4 years
 $\rightarrow \sim 10\%$

10 10 MARKS AREA – NPV vs IRR

Comparison of NPV and IRR, conflict resolution, and superiority of NPV is a recurring 10-mark question. Always discuss: (a) Reinvestment assumption, (b) Absolute vs relative measure, (c) Scale and timing differences.

1.2 NPV & IRR – Conflict & Resolution

Chapter Overview

While NPV and IRR generally give consistent results for independent projects, conflicts arise for mutually exclusive projects due to differences in timing, life, or scale. This chapter covers the reasons for conflict and the resolution techniques including MIRR, MNPV, EAB/EAC, and differential cash flow approach.

Reasons for Conflict

Three Causes of NPV–IRR Conflict



Time Disparity

Different cash flow patterns



Life Disparity

Different project lifespans



Scale Disparity

Different initial investments

1.2.1 Time Disparity in Cash Flows

Concept

Cash flow patterns differ significantly – one project has higher early cash flows, the other has higher later cash flows. Total cash flow may be similar.

Illustration – Time Disparity

Project I: Investment ₹2,20,000; CFAT: Y1 ₹62,000; Y2 ₹80,000; Y3 ₹1,00,000; Y4 ₹1,40,000

Project II: Investment ₹2,20,000; CFAT: Y1 ₹1,42,000; Y2 ₹80,000; Y3 ₹82,000; Y4 ₹40,000

Cost of capital 10%

Particulars	Project I	Project II
NPV	₹73,158	₹64,135
Ranking (NPV)	1	2
IRR (approx.)	22.61%	25.99%
Ranking (IRR)	2	1

Conflict exists. Resolution: Use MIRR/MNPV with reinvestment rate 14%.

MIRR(I) = 19.58%; MIRR(II) = 19.44% → Project I preferred.

MNPV(I) = ₹87,235; MNPV(II) = ₹85,871 → Project I preferred.

1.2.2 Life Disparity – EAB/EAC Approach

Concept

Projects have different lifespans. NPV may favour the longer project while IRR may favour the shorter one.

Equivalent Annual Benefit (EAB) / Equivalent Annual Cost (EAC)

$$\text{EAB} = \text{NPV} \times \text{Capital Recovery Factor}$$

$$\text{or EAB} = \text{NPV} \div \text{PVIFA}$$

$$\text{Capital Recovery Factor} = 1 \div \text{PVIFA}$$

 **Use when projects have unequal lives and can be replicated**

 **Choose project with highest EAB (or lowest EAC).**

Illustration – Life Disparity

Project A: Life 1 year; NPV ₹1,69,750
Project B: Life 3 years; NPV ₹3,36,400
Cost of capital 12%

$PVIFA(A) = 0.893$; $PVIFA(B) = 2.402$
 $EAB(A) = 1,69,750 \times 1.12 = ₹1,90,120$
 $EAB(B) = 3,36,400 \times 0.416 = ₹1,39,882$

Project A is better (higher EAB).

1.2.3 Scale or Size Disparity – Differential Cash Flow Approach

Concept

Projects differ in initial investment size. IRR (relative measure) may favour smaller project while NPV (absolute) favours larger project.

Illustration – Scale Disparity

Project X: Investment ₹10,000; Annual CFAT ₹4,000 for 5 years
Project Y: Investment ₹40,000; Annual CFAT ₹14,000 for 5 years
Cost of capital 10%

$NPV(X) = 4,000 \times 3.79 - 10,000 = ₹5,160$
 $NPV(Y) = 14,000 \times 3.79 - 40,000 = ₹13,060$
 $IRR(X) = 29\%$; $IRR(Y) = 22\%$

Differential cash flow: Investment ₹30,000; Annual CFAT ₹10,000
IRR of incremental = 19.86% > 10% → Choose Y (larger project).

1.2.4 Modified Internal Rate of Return (MIRR)

Σ Modified Internal Rate of Return

$$\text{MIRR} = \sqrt[n]{(\text{Aggregate Future Value of Cash Inflows} \div \text{Initial Investment})} - 1$$

Future values compounded at **cost of capital** Eliminates multiple IRR problem

✓ **Use for non-conventional cash flows or when reinvestment rate assumption of IRR is unrealistic**

Illustration – MIRR

Initial Outlay ₹1,00,000; Cost of capital 12%; Life 5 years

CFAT: ₹20,000, ₹30,000, ₹40,000, ₹50,000, ₹30,000

$$\begin{aligned} \text{Aggregate FV} &= 20,000(1.5735) + 30,000(1.4049) + 40,000(1.2544) + 50,000(1.12) + 30,000 \\ &= 31,470 + 42,147 + 50,176 + 56,000 + 30,000 = ₹2,09,793 \end{aligned}$$

$$\text{MIRR} = (2,09,793 / 1,00,000)^{1/5} - 1 = 15.97\%$$

1.2.5 Modified NPV (MNPV) / Terminal Value Method

Σ Modified NPV

$$\text{MNPV} = \text{PV of Terminal Value} - \text{Initial Outlay}$$

Terminal Value: Aggregate FV of cash inflows compounded at reinvestment rate

Discount TV at cost of capital

✓ **Resolves NPV–IRR conflict; assumes realistic reinvestment rate**

Illustration – MNPV

Initial Outlay ₹1,20,000; Life 4 years; CFAT: ₹30,000, ₹40,000, ₹30,000, ₹36,000
Reinvestment rates: 8%, 9%, 10%, 9%; Cost of capital 10%

Terminal Value = $30,000(1.263) + 40,000(1.1881) + 30,000(1.10) + 36,000 = 37,800 + 47,524 + 33,000 + 36,000 = ₹1,54,324$
PV of TV = $1,54,324 \times 0.683 = ₹1,05,403$

MNPV = 1,05,403 – 1,20,000 = (–)₹14,597 → Reject

1.2.6 Comparing Projects with Unequal Lives – LCM Approach

LCM of Lives Approach

Extend the time horizon so that both projects' lives divide exactly into the horizon. Replicate the shorter project as many times as needed.

Example: Project A (1 year) and Project B (3 years). LCM = 3. Project A replicated 3 times, Project B once.

PV of replicated NPVs = $NPV \times [1 + PVIFA(r, n) + PVIFA(r, 2n) + \dots]$

1.2.7 Abandonment Value

Concept

Abandonment value is the value of a project if it were immediately liquidated. Also called **liquidation value**.

Rule: Abandon project if salvage value > NPV of expected cash flows.

Considered under **Real Option Analysis** in capital budgeting.

Illustration – Abandonment Option

Initial outlay ₹5,00,000; Life 6 years; Annual CFAT: 50% probability ₹80,000 or 50% probability ₹1,40,000; Required return 12%; Salvage value after 1 year ₹4,00,000.

NPV without abandonment = $0.5(-1,71,120) + 0.5(75,540) = (-)₹47,790$

NPV with abandonment (low cash flow) = $-5,00,000 + 80,000(0.893) + 4,00,000(0.893) = (-)₹71,360$

NPV with abandonment (high cash flow) = 75,540 (continue)

NPV with abandonment = $0.5(-17,780) + 0.5(75,540) = ₹28,880 \rightarrow \text{Accept}$

15 15 MARKS AREA – Conflict Resolution

Comprehensive questions on NPV vs IRR conflict with all three types of disparity and resolution techniques are frequently asked for 15 marks. Practice MIRR, MNPV, EAB, and differential cash flow approaches thoroughly.

1.3 Inflation Adjusted Cash Flow Forecasting

Chapter Overview

Inflation affects the purchasing power of money and distorts capital budgeting decisions if not properly incorporated. This chapter covers the relationship between nominal and real cash flows, nominal and real discount rates, and the correct methodology for inflation-adjusted NPV.

Key Concepts

Inflation

Inflation refers to the increase in general price level of goods and services. Due to such increase, purchasing power of money decreases.

Measures: CPI, PPI, WPI, Commodity Price Index

Relationship Between NDR and RDR

Fisher Equation – Nominal vs Real Discount Rate

$$1 + \text{NDR} = (1 + \text{RDR})(1 + \text{IR})$$

$$\text{NDR} = (1 + \text{RDR})(1 + \text{IR}) - 1$$

NDR: Nominal Discount Rate **RDR:** Real Discount Rate **IR:** Inflation Rate

 Use when converting between nominal and real rates

Adjustment Process

Two Methods to Compute PV with Inflation



Illustration – Inflation Adjusted NPV

Initial Outlay ₹24 lakh; Life 4 years; Annual PBDT ₹10 lakh; Tax 40%; Inflation 5%; Real Discount Rate 10%.

Without Inflation:

Annual CFAT = 10,00,000 – 6,00,000 (Dep) = 4,00,000 PBT; Tax = 1,60,000; PAT = 2,40,000;
CFAT = 8,40,000

PV of CFAT = 8,40,000 × 3.170 = ₹26,62,800; NPV = 26,62,800 – 24,00,000 = ₹2,62,800

With 5% Inflation:

NDR = (1.10)(1.05) – 1 = 15.5%

PV of nominal CFAT = 8,40,000 × PVIFA(15.5%, 4) = 8,40,000 × 2.826 = ₹23,74,000

NPV = 23,74,000 – 24,00,000 = (–)₹26,000

Without inflation: NPV = +₹2,62,800 → Accept

With inflation: NPV = (–)₹26,000 → Reject

Exam Presentation: Always show both calculations – without and with inflation – to demonstrate the impact.

5 5 MARKS AREA – Inflation Adjusted NPV

Typically asked as a small numerical: given nominal cash flows, inflation rate, and real discount rate, compute NPV and comment on viability.

1.4 Capital Rationing

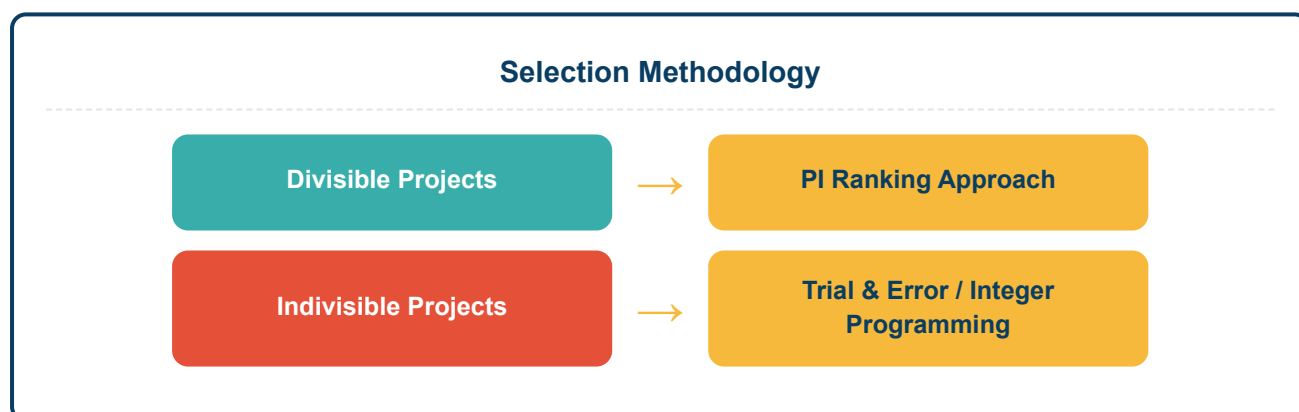
Chapter Overview

Capital rationing occurs when a firm has more acceptable projects than it can finance. The objective is to select the combination of projects that maximises NPV within the budget constraint.

Types of Capital Rationing

Type	Description
Soft / Internal	Budget ceiling imposed internally by management
Hard / External	Market constraint on funds available due to external factors

Divisible vs Indivisible Projects



Divisible Projects – PI Approach

Methodology

- 1 Calculate PI for each project
- 2 Rank projects in descending order of PI
- 3 Select projects until budget is exhausted
- 4 Part acceptance possible for divisible projects

Illustration – Capital Rationing (Divisible)

Budget ₹1.5 crore. Projects: A (₹70L, NPV ₹30L, PI 1.43); B (₹25L, NPV ₹16L, PI 1.64); C (₹50L, NPV ₹20L, PI 1.4); D (₹20L, NPV ₹10L, PI 1.5); E (₹55L, NPV ₹45L, PI 1.8); F (₹75L, NPV –₹25L, PI 0.67)

Ranking by PI: $E(1.8) > B(1.64) > D(1.5) > A(1.43) > C(1.4) > F(0.67)$

Select: E(55L), B(25L), D(20L), A(part – 50L out of 70L)

Total NPV = 45L + 16L + 10L + (5/7 × 30L) = ₹92.43L

Indivisible Projects – Trial & Error

Methodology

- 1 List all feasible combinations within budget
- 2 Calculate total NPV for each combination
- 3 Select combination with highest NPV

Illustration – Capital Rationing (Indivisible)

Budget ₹1.5 crore; Same projects as above

Feasible combinations:

EBDC: ₹1.5Cr, NPV ₹91L

EBA: ₹1.5Cr, NPV ₹91L

BAC: ₹1.45Cr, NPV ₹66L

Either EBDC or EBA – both give NPV ₹91L. Select either.

5 5 MARKS AREA – Capital Rationing

Usually asked with 2–3 projects, requiring PI ranking and selection. For indivisible projects, trial and error combinations.

1.5 Social Cost Benefit Analysis (SCBA)

Chapter Overview

SCBA evaluates investment proposals from the larger social point of view, considering social costs and benefits that differ from private costs and benefits due to market imperfections, externalities, taxes, and distributional concerns.

Need for SCBA

Why SCBA?

- 1 Monetary CBA ignores external effects (pollution, infrastructure)
- 2 Taxes and subsidies are transfer payments – irrelevant from social view
- 3 Market prices do not represent social values
- 4 Redistribution effects matter – benefits to poorer sections more important
- 5 Merit goods (education, health) vs demerit goods (liquor, cigarettes)

Relevance for Private Enterprises

- Government enterprises must consider rehabilitation, social costs
- Private corporations have moral responsibility for socially desirable projects
- Socially beneficial projects survive in long run
- SCBA ensures long-term interest of private sector

SCBA vs Financial Analysis

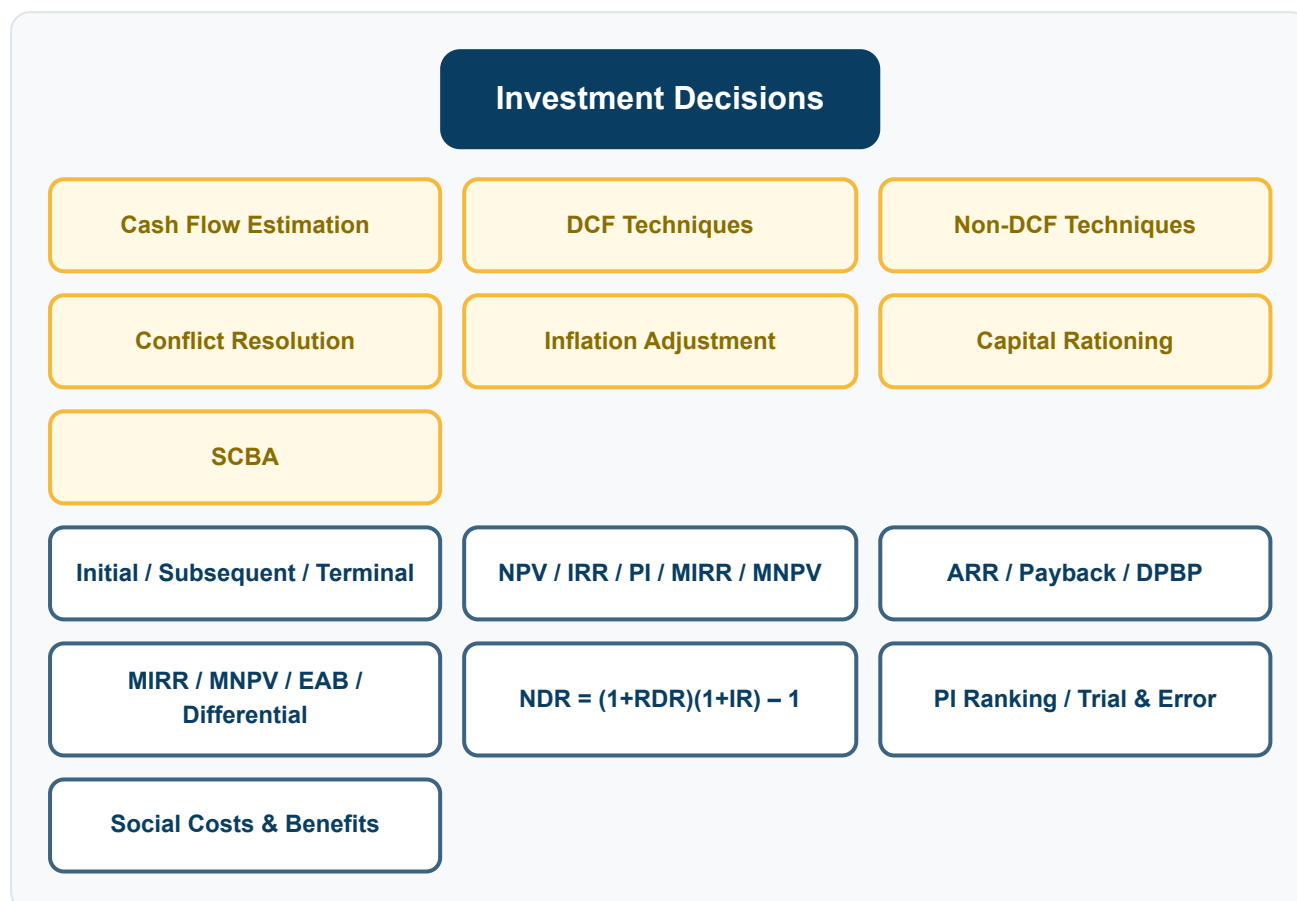
Aspect	Financial Analysis	SCBA
Perspective	Private / Firm	Society / Economy
Prices Used	Market Prices	Shadow / Accounting Prices
Taxes	Cost / Benefit	Transfer Payment (Ignored)
Externalities	Ignored	Considered
Objective	Profit Maximization	Social Welfare Maximization

5 5 MARKS AREA – SCBA

Theory question on need for SCBA, relevance for private enterprises, and difference from financial analysis.
Usually 5 marks.

Module 1 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 1



Key Points for Revision

1. CFAT = $EBIT(1-t) + \text{Depreciation}$
2. Interest excluded from CFAT (Interest Exclusion Principle)
3. Sunk costs are irrelevant; opportunity costs are relevant
4. NPV > 0: Accept; NPV < 0: Reject
5. IRR: Discount rate where NPV = 0
6. PI = PV of Inflows ÷ PV of Outflows; PI > 1: Accept
7. DPBP uses discounted cash flows
8. MIRR eliminates multiple IRR problem; assumes reinvestment at cost of capital
9. NPV vs IRR conflict: Time, Life, Scale disparity
10. Time disparity: MIRR/MNPV resolution
11. Life disparity: EAB/EAC or LCM approach
12. Scale disparity: Differential cash flow approach
13. EAB = NPV × Capital Recovery Factor
14. Abandonment value = liquidation value; abandon if salvage > NPV of cash flows
15. $NDR = (1+RDR)(1+IR) - 1$
16. Real CF = Nominal CF ÷ $(1+IR)^t$
17. Capital rationing: Soft (internal) vs Hard (external)
18. Divisible projects: PI ranking; Indivisible: Trial & error
19. SCBA considers externalities and redistribution; taxes ignored
20. ANPV = Base NPV + PV of tax shields – Floatation cost
21. Payback Reciprocal = Average CFAT ÷ Initial Investment
22. Post Payback Profitability = (Annual CFAT × Life) – Initial Investment
23. ARR = Average Annual Net Income ÷ Average Investment
24. PI is best for capital rationing; NPV for absolute wealth creation
25. MIRR and MNPV assume reinvestment at cost of capital
26. IRR assumes reinvestment at IRR itself – may be unrealistic
27. Multiple IRRs occur with non-conventional cash flows
28. Abandonment option is a put option on remaining cash flows
29. EAB converts NPV into equivalent annual annuity
30. Inflation reduces real value of cash flows

Comprehensive Formula Handbook – Module 1

CFAT	$EBIT(1-t) + \text{Depreciation}$
NPV	$\sum CF_t / (1+K)^t - I_0$
PI	$PV \text{ of Inflows} \div PV \text{ of Outflows}$
IRR	Rate where $NPV = 0$
MIRR	$\sqrt[n]{(\text{Aggregate FV} \div \text{Initial Investment})} - 1$
EAB	$NPV \div PVIFA$
NDR	$(1+RDR)(1+IR) - 1$
Real CF	$\text{Nominal CF} \div (1+IR)^t$
ANPV	$\text{Base NPV} + PV(\text{Tax Shields}) - PV(\text{Floatation Cost})$
DPBP	$\text{Year before recovery} + \text{Unrecovered} \div PV \text{ of CF during year}$
Payback Reciprocal	$\text{Average Annual CFAT} \div \text{Initial Investment}$
Post Payback Profitability	$(\text{Annual CFAT} \times \text{Life}) - \text{Initial Investment}$
ARR	$(\text{Average Annual Net Income} \div \text{Average Investment}) \times 100$
MNPV	$PV \text{ of Terminal Value} - \text{Initial Outlay}$

One-Night Revision Notes – Module 1

Last Night Before Exam – Module 1

- **NPV vs IRR conflict:** Three reasons – Time, Life, Scale. Resolution: MIRR/MNPV, EAB, Differential CF.
- **MIRR:** Compounding at cost of capital, discounting at IRR. Eliminates multiple IRR.
- **Abandonment:** Compare salvage value with PV of future cash flows. If salvage > PV, abandon.
- **Inflation:** $NDR = (1+RDR)(1+IR) - 1$. Discount nominal CF at NDR OR real CF at RDR.
- **Capital Rationing:** Divisible → PI ranking. Indivisible → Trial & error.
- **SCBA:** Externalities, redistribution, merit goods, transfer payments ignored.
- **PI:** Best for capital rationing. NPV: Best for absolute wealth creation.
- **DPBP:** Uses discounted cash flows. Accept if DPBP < target.
- **ANPV:** Base NPV + PV of tax shields – Floatation cost.
- **EAB:** $NPV \div PVIFA$. Choose highest EAB.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- NPV vs IRR conflict resolution – 10–15 marks
- MIRR numerical – 5 marks
- Capital rationing – 5–10 marks
- Inflation adjusted NPV – 5 marks
- Abandonment value – 5 marks
- SCBA theory – 5 marks
- ANPV numerical – 5 marks
- EAB for unequal lives – 5 marks

Final Checklist – Module 1

✓ Before Moving to Module 2

- Can I calculate CFAT, NPV, PI, IRR, MIRR, DPBP independently?
- Can I explain NPV vs IRR conflict and resolve it?
- Can I compute EAB for unequal lives?
- Can I adjust cash flows for inflation and compute NPV?
- Can I solve capital rationing for divisible and indivisible projects?
- Can I explain SCBA and its relevance?
- Can I compute ANPV and MNPV?
- Can I calculate Payback Reciprocal and Post Payback Profitability?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 10 numericals from this module?

END OF MODULE 1

Module 2 – Evaluation of Risky Proposals for Investment Decisions

will be generated upon request.

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02

Evaluation of Risky Proposals for Investment Decisions

Master Revision Handbook · December 2026 Edition

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Module 2 – Evaluation of Risky Proposals for Investment Decisions

Module Objective

Primary Objective

To obtain in-depth knowledge on application of various techniques of project evaluation under a deterministic environment as well as techniques of incorporating the element of uncertainty in project appraisal. To develop detailed understanding of how to make strategic choices in long-term investment decisions such as own or lease and making optimal allocation of limited funds.

Mapped CMLO: 2a, 2b, 3c

Learning Outcomes

Students will be able to...	Application Skill
Understand certainty equivalent approach, risk adjusted discount rate, expected NPV and standard deviation, decision tree analysis in capital budgeting.	Perform risk-adjusted project appraisals and prepare risk reports for management.
Learn sensitivity analysis, scenario analysis and Monte Carlo Simulation techniques to deal with uncertainty in capital budgeting.	Apply simulation and scenario tools to evaluate project risk and facilitate strategic decision making.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
2.1	Risk Analysis in Capital Budgeting – CE Approach, RADR, Expected NPV, SD of NPV, Decision Tree, Real Options	HIGH 10%	Numerical + Theory
2.2	Sensitivity Analysis	MEDIUM 5%	Numerical
2.3	Scenario Analysis	MEDIUM 3%	Numerical + Theory
2.4	Monte Carlo Simulation	MEDIUM 3%	Numerical + Theory

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- Certainty Equivalent vs RADR numerical – **5–10 marks**
- Expected NPV and Standard Deviation – **10 marks**
- Decision Tree Analysis – **10–15 marks**
- Sensitivity Analysis – **5 marks**
- Scenario Analysis vs Sensitivity Analysis – **5 marks**
- Monte Carlo Simulation – **5 marks**
- Real Options in Capital Budgeting – **5 marks**

Frequently Tested Concepts

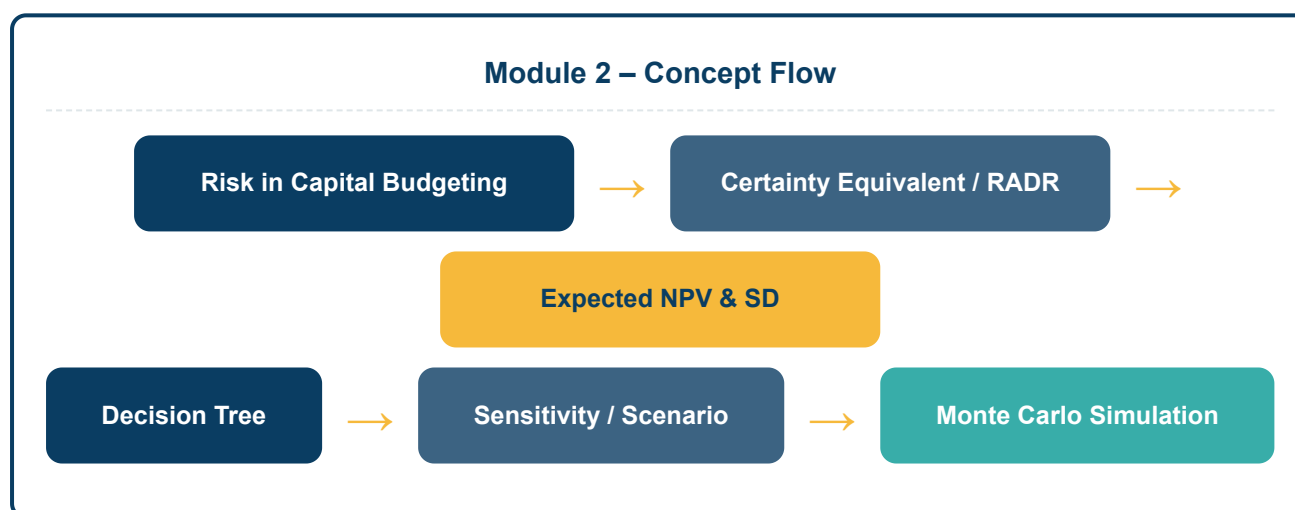


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★ FREQUENTLY ASKED – MODULE 2

- **Certainty Equivalent vs RADR** – conceptual + numerical
- **Expected NPV & Standard Deviation** – correlation assumptions
- **Decision Tree Analysis** – joint probability and expected NPV
- **Sensitivity Analysis** – tolerance limits
- **Simulation** – random number allocation and NPV

2.1 Risk Analysis in Capital Budgeting

Chapter Overview

This chapter deals with the techniques for incorporating risk and uncertainty into capital budgeting decisions. It covers certainty equivalent approach, risk-adjusted discount rate, expected NPV and standard deviation, decision tree analysis, and real options.

Learning Objectives

- Distinguish between certainty, risk, and uncertainty
- Apply certainty equivalent approach and RADR
- Compute expected NPV and standard deviation under different correlation assumptions
- Apply normal probability distribution to assess project risk
- Construct decision trees and compute expected NPV
- Understand real options in capital budgeting

2.1.1 Decision Making Under Certainty, Risk & Uncertainty

Three Decision Environments



Complete Certainty

All outcomes and probabilities fully known



Risk

Probabilities of outcomes can be determined



Complete Uncertainty

Even probabilities are unknown



Key Distinction

Risk is measurable – probabilities can be assigned based on past experience. **Uncertainty** is not measurable – total lack of knowledge about what may happen.

2.1.2 Certainty Equivalent (CE) Approach

Concept

Under this approach, risky cash flows are converted to their certainty equivalent by multiplying with a certainty equivalent coefficient (α). The certain cash flows are then discounted at the risk-free rate.

Certainty Equivalent Coefficient

$$\text{CE Coefficient } (\alpha_t) = \text{Riskless Cash Flow} \div \text{Risky Cash Flow}$$

α_t : Certainty equivalent coefficient for period t Value between 0 and 1 Inverse relationship with risk

NPV under CE Approach

$$\text{NPV} = -\text{CF}_0 + \sum_{t=1}^n [\alpha_t \times \text{CF}_t \div (1 + i)^t]$$

CF_0 : Initial cash outlay CF_t : Risky cash inflow in year t α_t : CE coefficient for year t i : Risk-free rate

 Accept if $\text{NPV} > 0$

 Major difference from RADR: CE adjusts cash flows for risk; RADR adjusts discount rate.

5 MARKS AREA – CE vs RADR

Comparison of CE and RADR methods – conceptual question. Both adjust for risk but in different ways.

2.1.3 Risk Adjusted Discount Rate (RADR)

Concept

Different projects should be discounted at different rates based on their risk. Higher risk → higher discount rate. The RADR = Risk-free rate + Premium for normal risk + Premium for abnormal risk.

Risk Adjusted Discount Rate

$$\text{RADR (i)} = r + u + a$$

r: Risk-free rate **u:** Premium for normal risk of the firm

a: Premium for abnormal/subnormal risk of the project

 **Use when projects have different risk characteristics**

 *The first two components (r + u) together constitute the WACC.*

Typical Risk Categories & Discount Rates

Category of Investment	Discount Rate
Replacement investments	Cost of capital + 2%
New projects	Cost of capital + 4%
Research and development	Cost of capital + 5%

Illustration – RADR

Cost of capital = 13%; Risk adjustment = +2%; Initial outflow = ₹14 lakh; CFAT: Y1–5 = ₹2.54 lakh; Y6–10 = ₹3.14 lakh.

$$\text{RADR} = 13\% + 2\% = 15\%$$

$$\begin{aligned}\text{NPV} &= -14 + 2.54 \times \text{PVIFA}(15\%, 5) + 3.14 \times \text{PVIFA}(15\%, 5) \times \text{PVIF}(15\%, 5) \\ &= -14 + 2.54 \times 3.352 + 3.14 \times 3.352 \times 0.497 \\ &= -14 + 8.514 + 5.231 = (-)\text{₹}0.255 \text{ lakh}\end{aligned}$$

NPV = (–)₹0.255 lakh → Reject

2.1.4 Expected NPV and Standard Deviation (Hillier Model)

Hillier Model

H.S. Hillier argued that uncertainty is shown by the standard deviation of expected cash flows. The model evaluates long-term investment proposals based on Expected NPV and Standard Deviation of NPV.

Step 1: Calculate Expected Cash Flows and SD of Cash Flows

Expected Cash Flow and Standard Deviation

$$\text{Expected Cash Flow } (\bar{A}_t) = \sum P_i \times CF_i$$

$$\text{SD of Cash Flows } (\sigma_t) = \sqrt{[\sum P_i (CF_i - \bar{A}_t)^2]}$$

P_i : Probability of state i CF_i : Cash flow under state i $\bar{A}_t$: Expected cash flow

Illustration – Expected Cash Flow and SD

Project M: P = 0.10, CF = 12,000; P = 0.20, CF = 14,000; P = 0.40, CF = 16,000; P = 0.20, CF = 18,000; P = 0.10, CF = 20,000

P	CF (X)	P × X	X – $\bar{A}$	(X – $\bar{A}$) ²	P(X – $\bar{A}$) ²
0.10	12,000	1,200	–4,000	16,000,000	1,600,000
0.20	14,000	2,800	–2,000	4,000,000	800,000
0.40	16,000	6,400	0	0	0
0.20	18,000	3,600	2,000	4,000,000	800,000
0.10	20,000	2,000	4,000	16,000,000	1,600,000
Total		16,000			4,800,000

Expected Cash Flow = ₹16,000

Variance = 4,800,000; Standard Deviation = $\sqrt{4,800,000}$ = ₹2,190

Step 2: Calculate Expected NPV and SD of NPV

Σ Expected NPV

$$\text{Expected NPV} = \sum_{t=1}^n [\bar{A}_t \div (1+i)^t] - I_0$$

$\bar{A}_t$: Expected cash flow in year t i : Risk-free discount rate I_0 : Initial investment

Step 3: SD of NPV under Different Correlation Assumptions

(a) Perfectly Correlated

$\sigma(\text{NPV}) = \sum [\sigma_t \div (1+i)^t]$
Cash flows move together

(b) Uncorrelated

$\sigma(\text{NPV}) = \sqrt{\sum \sigma_t^2 \div (1+i)^{2t}}$
No relationship between CFs

(c) Moderately Correlated

Use conditional & joint probabilities
Realistic scenario

Step 4: Coefficient of Variation

Σ Coefficient of Variation

$$CV = \sigma(\text{NPV}) \div \text{Expected NPV}$$

Higher CV → Higher risk per unit of return Used to compare projects with different expected NPVs

Illustration – CV Comparison

Project X: Expected NPV = ₹12,000; SD of NPV = ₹4,800

Project Y: Expected NPV = ₹14,000; SD of NPV = ₹5,800

$$CV(X) = 4,800 \div 12,000 = 0.40$$

$$CV(Y) = 5,800 \div 14,000 = 0.414$$

Project Y is riskier (higher CV). Project X may be preferred.

10 10 MARKS AREA – Expected NPV & SD

Comprehensive numerical covering expected cash flows, SD, expected NPV, and SD of NPV under different correlation assumptions. Frequently asked.

2.1.5 Use of Normal Probability Distribution

Concept

Once expected NPV and SD of NPV are known, the probability of occurrence of any value of NPV can be calculated assuming NPV follows a normal distribution. This helps in assessing the risk of a project.

Z-Score for Normal Distribution

$$Z = (\text{NPV} - \text{Expected NPV}) \div \text{SD of NPV}$$

Z: Standard normal variate Use standard normal distribution table to find probability

 **Use to find probability of NPV being above/below a specified value**

 **Remember:** $P(Z > 0) = 0.5$; $P(Z > 1.96) = 0.025$; $P(Z > 1.645) = 0.05$

Illustration – Normal Distribution

Expected NPV = ₹800; SD of NPV = ₹400

Find: (i) $P(\text{NPV} \leq 0)$; (ii) $P(\text{NPV} > 0)$; (iii) $P(500 \leq \text{NPV} \leq 900)$; (iv) $P(300 \leq \text{NPV} \leq 600)$

(i) $Z = (0 - 800)/400 = -2.0$

$P(Z \leq -2) = 1 - P(Z \leq 2) = 1 - (0.5 + 0.4772) = 0.0228$ or 2.28%

(ii) $P(\text{NPV} > 0) = 1 - 0.0228 = 0.9772$ or 97.72%

(iii) $Z_1 = (500 - 800)/400 = -0.75$; $Z_2 = (900 - 800)/400 = 0.25$

$P(-0.75 \leq Z \leq 0.25) = P(Z \leq 0.25) - P(Z \leq -0.75)$
 $= 0.5987 - 0.2266 = 0.3721$ or 37.21%

(iv) $Z_1 = (300 - 800)/400 = -1.25$; $Z_2 = (600 - 800)/400 = -0.50$

$P(-1.25 \leq Z \leq -0.50) = P(Z \leq -0.50) - P(Z \leq -1.25)$
 $= 0.3085 - 0.1056 = 0.2029$ or 20.29%

(i) 2.28% (ii) 97.72% (iii) 37.21% (iv) 20.29%

2.1.6 Decision Tree Analysis

Concept

Decision Tree Analysis is a useful tool for analysing investment proposals incorporating project flexibility. It analyses investment opportunities involving a sequence of decisions over time, with various decision points defined in relation to subsequent chance events.

Decision Tree – Structure

Investment Decision (Year 0)

Year 1: Cash Inflow ₹25,000 ($P = 0.4$)

Year 2: ₹12,000 ($P=0.2$) | ₹16,000 ($P=0.3$) |
₹22,000 ($P=0.5$)

Year 1: Cash Inflow ₹30,000 ($P = 0.6$)

Year 2: ₹20,000 ($P=0.4$) | ₹25,000 ($P=0.5$) |
₹30,000 ($P=0.1$)

Illustration – Decision Tree

Initial outlay ₹40,000; Discount rate 12%; Cash flows as per decision tree above.

Path	Y1 CF	Y2 CF	PV @ 12%	Total PV	NPV	Joint Prob.	Expected NPV
1	25,000	12,000	22,323 + 9,566	31,889	–8,111	0.08	–648.88
2	25,000	16,000	22,323 + 12,755	35,078	–4,922	0.12	–590.64
3	25,000	22,000	22,323 + 17,538	39,861	–139	0.20	–27.80
4	30,000	20,000	26,787 + 15,944	42,731	2,731	0.24	655.44
5	30,000	25,000	26,787 + 19,930	46,717	6,717	0.30	2,015.10
6	30,000	30,000	26,787 + 23,916	50,703	10,703	0.06	642.18
Expected NPV							2,045.40

Expected NPV = ₹2,045.40 → Accept (positive)

Worst outcome: NPV = (–)₹8,111 with 8% probability

Best outcome: NPV = ₹10,703 with 6% probability

10 10 MARKS AREA – Decision Tree

Construct decision tree, calculate joint probabilities, compute NPV for each path, and find expected NPV. Frequently asked as a comprehensive numerical.

2.1.7 Options in Capital Budgeting – Real Options

Concept

Traditional NPV assumes investment must be made either now or never. Real options theory recognises that management can revise strategies in response to market and technological developments. Real options provide the right but not the obligation to take action in the future.

Types of Real Options



Option to Expand

Make additional investment in future



Option to Abandon

Cease project to realise salvage value



Option to Wait

Defer decision to future



Option to Switch

Shut down and resume as conditions change



Option to Contract

Shut down project in unfavourable conditions

Analogy with Financial Options

- **Option to expand** $\approx$ Call option on real assets
- **Option to abandon** $\approx$ Put option on remaining cash flows
- **Option to wait** $\approx$ Timing option (like American option)
- **Option to switch** $\approx$ Portfolio of options

5 5 MARKS AREA – Real Options

Theory question on types of real options and their analogy with financial options. Also, small numerical on abandonment value.

2.2 Sensitivity Analysis

Chapter Overview

Sensitivity analysis examines the impact of changes in one variable at a time on the project's NPV, holding all other variables constant. It identifies which variables are most critical to the project's viability.

Concept

Sensitivity analysis measures to what extent the changes in underlying variables (cash outlay, cash inflow, discount rate, life) can be tolerated before the project becomes unacceptable (NPV = 0).

Sensitivity Calculation

$$\text{Tolerance Limit} = (\text{Change that makes NPV} = 0) \div \text{Original Estimate} \times 100$$

Variable with lowest tolerance limit is most sensitive Also called "what-if" analysis

Illustration – Sensitivity Analysis

Investment ₹1,00,000; Life 3 years; Annual Cash Inflows ₹2,00,000; Annual Cash Outflows ₹1,50,000; Discount rate 10%.

$$\text{Expected NPV} = -1,00,000 + 50,000 \times \text{PVIFA}(10\%, 3) = -1,00,000 + 50,000 \times 2.486 = ₹24,300$$

Investment Sensitivity:

$$-X + 50,000 \times 2.486 = 0 \rightarrow X = 1,24,300$$

$$\text{Tolerance} = (1,24,300 - 1,00,000)/1,00,000 = 24.30\%$$

Life Sensitivity:

$$-1,00,000 + 50,000 \times \text{PVIFA}(10\%, X) = 0 \rightarrow \text{PVIFA} = 2.0 \rightarrow X = 2.35 \text{ years}$$

$$\text{Tolerance} = (2.35 - 3)/3 = 21.67\%$$

NCF Sensitivity:

$$-1,00,000 + X \times 2.486 = 0 \rightarrow X = 40,225$$

$$\text{Tolerance} = (50,000 - 40,225)/50,000 = 19.55\%$$

Discount Rate Sensitivity:

$$-1,00,000 + 50,000 \times \text{PVIFA}(X\%, 3) = 0 \rightarrow \text{PVIFA} = 2.0 \rightarrow X \approx 23.4\%$$

$$\text{Tolerance} = (23.4 - 10)/10 = 13.4\%$$

Element	Sensitivity
Initial Investment	24.30%
Net Cash Inflow	19.55%
Life	21.67%
Discount Rate	23.40%

Most sensitive: Net Cash Inflow (lowest tolerance)

5 5 MARKS AREA – Sensitivity Analysis

Calculate tolerance limits for each variable and identify the most sensitive variable. Frequently asked as a short numerical.

2.3 Scenario Analysis

Chapter Overview

Scenario analysis is a "what-if" analysis in which a model's output is calculated for a number of scenarios. It examines the effect of changing all input variables simultaneously, unlike sensitivity analysis which changes only one variable at a time.

Three Scenarios



Best Case

Lowest discount rate, highest growth, lowest tax



Base Case

Most likely values for each input



Worst Case

Highest discount rate, lowest growth, highest tax

Illustration – Scenario Analysis

Base Case: WACC 8%; Cash Inflow ₹2,000 Cr at end of 3rd year; Cash Outflow ₹300 Cr/year for 3 years

Best Case: WACC 6.5%; Cash Inflow ₹2,100 Cr at end of 2nd year; Outflow ₹400 Cr (Y1) and ₹500 Cr (Y2)

Worst Case: WACC 9%; Cash Inflow ₹1,200 Cr at end of 4th year; Outflow ₹200 Cr/year for 4 years

Base Case NPV = ₹814.5 Cr (given)

Best Case:

$$\text{NPV} = -400/(1.065)^1 + (2100-500)/(1.065)^2 = -375.6 + 1,410.7 = ₹1,035 \text{ Cr}$$

Worst Case:

$$\begin{aligned} \text{NPV} &= -200 \times \text{PVIFA}(9\%, 4) + 1,200/(1.09)^4 \\ &= -200 \times 3.240 + 1,200/1.412 = -648 + 850 = ₹202 \text{ Cr} \end{aligned}$$

NPV range: ₹202 Cr to ₹1,035 Cr

Most likely: ₹814.5 Cr

Scenario Analysis vs Sensitivity Analysis

Aspect	Sensitivity Analysis	Scenario Analysis
Variables changed	One at a time	All simultaneously
Purpose	Identify critical variables	Assess combined impact
Output	Tolerance limits	Range of NPV (best to worst)
Realism	Less realistic	More realistic

5 5 MARKS AREA – Scenario Analysis

Compute NPV under best, base, and worst-case scenarios. Also, theoretical comparison with sensitivity analysis.

2.4 Monte Carlo Simulation

Chapter Overview

Monte Carlo simulation is a technique used to evaluate capital investments under conditions of risk. It uses random numbers and probability distributions to simulate thousands of possible outcomes and their NPVs.

Steps in Simulation

- 1 Determine "probabilistic" variables
- 2 Define probability distributions for these variables
- 3 Check for correlation across variables
- 4 Run the simulation
- 5 Decide on the best possible course of action

Simulation Process

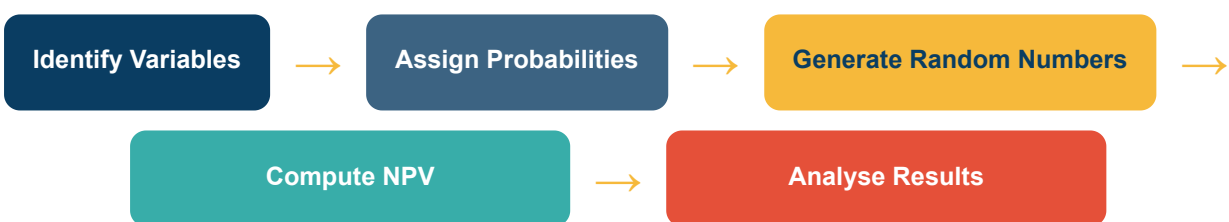


Illustration – Monte Carlo Simulation

A project has cash flows and probabilities as given below. Simulate 5 runs using random numbers.

Random Number Allocation:

Year 1: CF 10 (P=0.3) → RN 0–2; CF 15 (P=0.4) → RN 3–6; CF 20 (P=0.3) → RN 7–9

Year 2: CF 10 (P=0.1) → RN 0; CF 20 (P=0.2) → RN 1–2; CF 30 (P=0.4) → RN 3–6; CF 40 (P=0.3) → RN 7–9

Year 3: CF 10 (P=0.3) → RN 0–2; CF 20 (P=0.5) → RN 3–7; CF 30 (P=0.2) → RN 8–9

Simulation Results:

Set 1: Y1=15 (RN 4), Y2=20 (RN 1), Y3=20 (RN 7) → NPV = -0.68

Set 2: Y1=20 (RN 7), Y2=30 (RN 3), Y3=30 (RN 9) → NPV = 17.80

Set 3: Y1=15 (RN 3), Y2=40 (RN 8), Y3=20 (RN 4) → NPV = 14.43

Set 4: Y1=15 (RN 5), Y2=10 (RN 0), Y3=10 (RN 1) → NPV = -14.82

Set 5: Y1=10 (RN 1), Y2=20 (RN 1), Y3=20 (RN 3) → NPV = -5.03

Average NPV = ₹2,340.40

Probability of negative NPV = 3/5 = 60%

Advantages of Simulation

Handles complex problems

Considers all possible outcomes

Can model correlation

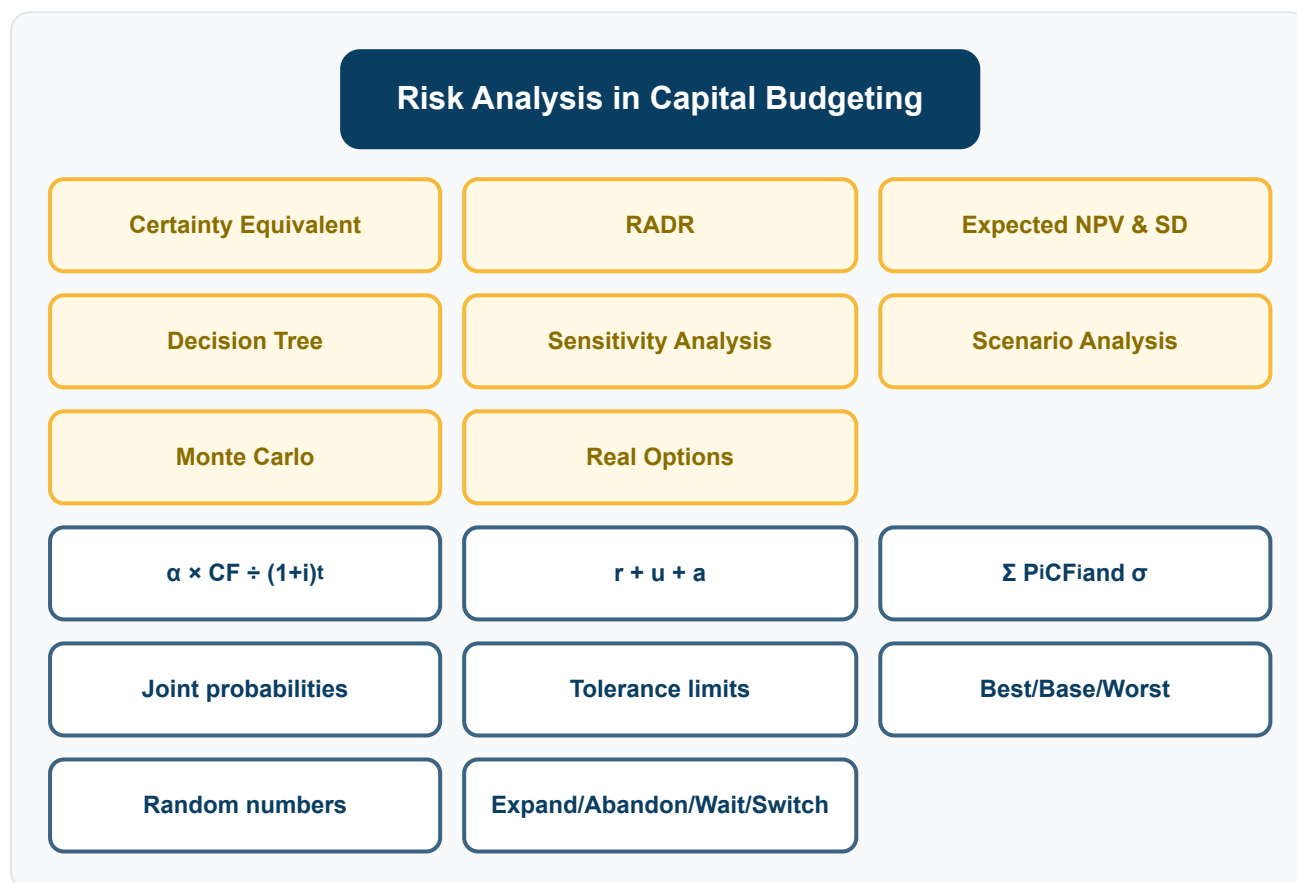
Flexible and powerful

5 5 MARKS AREA – Monte Carlo Simulation

Simulate cash flows using random numbers, compute NPV for each run, and find expected NPV and probability of loss.

Module 2 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 2



Key Points for Revision

1. Risk is measurable; uncertainty is not
2. CE approach adjusts cash flows; RADR adjusts discount rate
3. CE coefficient α = Riskless CF $\div$ Risky CF
4. RADR = $r + u + a$
5. Expected CF = $\sum P_i \times CF_i$
6. SD of CF = $\sqrt{[\sum P_i (CF_i - \bar{A})^2]}$
7. Perfectly correlated: $\sigma(\text{NPV}) = \sum \sigma_t / (1+i)^t$
8. Uncorrelated: $\sigma(\text{NPV}) = \sqrt{[\sum \sigma_t^2 / (1+i)^{2t}]}$
9. CV = $\sigma(\text{NPV}) \div \text{Expected NPV}$
10. $Z = (\text{NPV} - \text{Expected NPV}) \div \text{SD of NPV}$
11. Decision tree uses joint probabilities
12. Joint probability = $P(A) \times P(B/A) \times P(C/B,A)$
13. Real options: Expand, Abandon, Wait, Switch, Contract
14. Abandonment option $\approx$ Put option
15. Expansion option $\approx$ Call option
16. Sensitivity analysis changes one variable at a time
17. Scenario analysis changes all variables simultaneously
18. Monte Carlo uses random numbers and probability distributions
19. Simulation can handle complex, correlated variables
20. Most sensitive variable = lowest tolerance limit
21. Expected NPV positive $\rightarrow$ Accept; negative $\rightarrow$ Reject

Comprehensive Formula Handbook – Module 2

CE Coefficient

$$\alpha_t = \text{Riskless CF} \div \text{Risky CF}$$

NPV under CE

$$-CF_0 + \sum [\alpha_t \times CF_t \div (1+i)^t]$$

RADR

$$r + u + a$$

Expected CF

$$\bar{A}_t = \sum P_i \times CF_i$$

SD of CF

$$\sigma_t = \sqrt{[\sum P_i (CF_i - \bar{A}_t)^2]}$$

Expected NPV	$\Sigma \bar{A}_t \div (1+i)^t - I_0$
SD(NPV) Perfectly Correlated	$\Sigma \sigma_t \div (1+i)^t$
SD(NPV) Uncorrelated	$\sqrt{[\Sigma \sigma_t^2 \div (1+i)^{2t}]}$
Coefficient of Variation	$CV = \sigma(\text{NPV}) \div \text{Expected NPV}$
Z-Score	$Z = (\text{NPV} - \text{Expected NPV}) \div \text{SD of NPV}$
Joint Probability	$P(A) \times P(B/A) \times P(C/B,A)$
Sensitivity Tolerance	$(\text{Change making NPV} = 0) \div \text{Original Estimate} \times 100$

One-Night Revision Notes – Module 2

Last Night Before Exam – Module 2

- **CE vs RADR:** CE adjusts cash flows ($\alpha \times CF$), RADR adjusts discount rate ($r + u + a$).
- **Expected NPV:** $\sum \bar{A}_t / (1+i)^t - I_0$. Accept if > 0 .
- **SD of NPV:** Perfectly correlated $\rightarrow \sum \sigma_t / (1+i)^t$; Uncorrelated $\rightarrow \sqrt{[\sum \sigma_t^2 / (1+i)^{2t}]}$
- **CV:** $\sigma(\text{NPV}) \div \text{Expected NPV}$. Higher CV = higher risk.
- **Normal distribution:** $Z = (\text{NPV} - \text{Expected NPV}) / \text{SD}$. Use Z-table.
- **Decision tree:** Joint probability = product of conditional probabilities. Expected NPV = $\sum (\text{Joint Prob} \times \text{NPV})$.
- **Real options:** Expand (call), Abandon (put), Wait, Switch, Contract.
- **Sensitivity:** Change one variable at a time. Lowest tolerance = most sensitive.
- **Scenario:** Change all variables simultaneously. Best/Base/Worst.
- **Simulation:** Random numbers $\rightarrow CF \rightarrow NPV$. Repeat many times. Find average NPV and probability of loss.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Certainty Equivalent vs RADR – 5–10 marks
- Expected NPV & Standard Deviation – 10 marks
- Decision Tree Analysis – 10–15 marks
- Normal Distribution application – 5 marks
- Sensitivity Analysis – 5 marks
- Scenario Analysis – 5 marks
- Monte Carlo Simulation – 5 marks
- Real Options theory – 5 marks

Final Checklist – Module 2

✓ Before Moving to Module 3

- Can I apply CE approach and RADR?
- Can I compute Expected NPV and SD of NPV?
- Can I calculate SD of NPV under different correlation assumptions?
- Can I use normal distribution to find probabilities?
- Can I construct a decision tree and compute expected NPV?
- Can I identify and explain types of real options?
- Can I perform sensitivity analysis and identify critical variables?
- Can I perform scenario analysis for best/base/worst cases?
- Can I run a Monte Carlo simulation with random numbers?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 10 numericals from this module?

END OF MODULE 2

Module 3 – Leasing Decisions

will be generated upon request.

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**CMA FINAL PAPER 14 · STRATEGIC FINANCIAL
MANAGEMENT**

03

Leasing Decisions

Master Revision Handbook · December 2026 Edition

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Module 3 – Leasing Decisions

Module Objective

Primary Objective

To develop detailed understanding of how to make strategic choices in long-term investment decisions such as own or lease and making optimal allocation of limited funds. To understand the meaning of lease financing, evaluate lease vs. buy options, determine break-even lease rental and implicit rate, and understand cross-border lease and sale and leaseback arrangements.

Mapped CMLO: 3c

Learning Outcomes

Students will be able to...	Application Skill
Understand the meaning of lease financing and evaluate lease vs. buy options.	Prepare comparative analysis of lease and buy options and recommend the appropriate choice.
Determine the break-even lease rental and implicit rate.	Calculate break-even lease rental from both lessee and lessor perspectives.
Understand the meaning of cross border lease and sale and leaseback arrangements.	Analyse cross-border leasing and sale-leaseback structures for tax and financing benefits.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
3.1	Lease Financing – Evaluation of Lease vs. Buy Options	HIGH 3%	Numerical + Theory
3.2	Break-Even Lease Rental Determination and Implicit Rate	HIGH 2%	Numerical
3.3	Cross Border Leasing, Sale and Lease Back	MEDIUM 1%	Theory

Expected Examination Areas – Dec 2026



DEC 2026 LIKELY AREAS

- Lease vs. Buy decision – **10–15 marks**
- Break-even lease rental – **5–10 marks**
- Evaluation from lessee and lessor perspective – **10 marks**
- Cross-border leasing theory – **5 marks**
- Sale and leaseback – **5 marks**
- Leveraged lease – **5 marks**

Frequently Tested Concepts

Module 3 – Concept Flow

Lease Financing



Lease vs. Buy



Break-Even Lease Rental

Cross Border Lease



Sale & Leaseback



Leveraged Lease

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★ FREQUENTLY ASKED – MODULE 3

- **Lease vs. Buy decision** – comprehensive numerical
- **Break-even lease rental** – lessee and lessor perspective
- **Cross-border leasing** – theory and advantages
- **Sale and leaseback** – concept and benefits
- **Leveraged lease** – structure and BELR

3.1 Lease Financing – Evaluation of Lease vs. Buy Options

Chapter Overview

This chapter introduces the concept of lease financing, its types, advantages, limitations, and the methodology for evaluating lease vs. buy options. It also covers break-even lease rental determination from both lessee and lessor perspectives.

Learning Objectives

- Understand the meaning and types of lease financing
- Identify the parties associated with lease
- Evaluate lease vs. buy options
- Determine break-even lease rental and implicit rate
- Understand cross-border lease and sale-leaseback arrangements

3.1.1 Concept of Lease

Definition

A lease is an agreement between two parties, commonly known as lessor and lessee, whereby the lessor conveys to the lessee the right to use an asset for an agreed period of time in return for a payment or series of payments.

3.1.2 Parties Associated with Lease

Parties to a Lease Agreement



Lessor

Owner of the asset who conveys right to use



Lessee

User who makes payments to use the asset



Sub-Lessee

When lessee again leases out asset to another

3.1.3 Types of Leases

Classification of Leases



Finance Lease

Transfers substantially all risks and rewards of ownership
Long-term; lease period covers substantial life; disguised purchase



Operating Lease

Does not transfer risks and rewards of ownership
Short-term; merely a rental arrangement

Aspect	Finance Lease	Operating Lease
Risk & Rewards	Transferred to lessee	Retained by lessor
Lease Period	Long-term; covers substantial life	Short-term; less than useful life
Cost Recovery	Lease rentals cover substantial cost	Lease rentals cover only portion of cost
Termination	Generally non-cancellable	Cancellable by lessee
Maintenance	Lessee's responsibility	Lessor's responsibility
Nature	Disguised purchase	Merely a rental

3.1.4 Advantages of Leasing

Advantages to the Lessor



Full Security

Owner of asset; can repossess if lessee defaults



Tax Benefits

Depreciation tax shield;
high tax bracket advantage



High Profits

Quicker capital recovery;
higher return than lending



Trading on Equity

Use borrowed funds; high financial leverage

Advantages to the Lessee



Source of Financing

Use asset without purchasing

No Dilution of Ownership

No equity dilution; no loss of control

Less Risk

Obsolescence risk with lessor

Tax Benefits

Lease rentals treated as expenditure

**Sale and Leaseback**

Overcome financial crisis

3.1.5 Limitations of Leasing

**Restrictions on Use**

Lessor may impose restrictions on asset modifications

**High Pay-out**

Higher obligation if equipment not useful; premature termination costly

**No Ownership**

Lessee deprived of residual value

3.1.6 Evaluation of Lease vs. Buy Option

Methodology

In order to make a comparative analysis, all relevant cash flows are identified and tax savings are taken into consideration. The present value of cash outflows under both options is compared and the option with lower PV of outflows is selected.

Cash Flows Under Lease vs. Buy

Buy (Through Loan)	Lease
PV of instalments against loan taken to buy asset	Present value of after-tax lease rentals
Less: Interest tax shield	—
Less: Depreciation tax shield	—
Less: PV of residual value of asset	—
Present value of any maintenance cost	Present value of any maintenance cost

Discount Rate for Lease vs. Buy

$$\text{Discount Rate} = \text{Interest Rate} \times (1 - \text{Tax Rate})$$

This is the after-tax cost of debt Used to discount cash flows under both options

 Always use after-tax discount rate for both lease and buy options.

Illustration – Lease vs. Buy

Excel Transport needs a truck:

(i) Buy for ₹3,00,000 by borrowing @ 12% interest, repayable in 4 equal annual instalments.

(ii) Acquire on lease with annual lease rental of ₹90,000 for 4 years.

Straight line depreciation; Tax rate 30%; Life 4 years.

Which option should the firm opt for?

Applicable discount rate = $12(1 - 0.30) = 8.4\%$ p.a.

Lease Option:

PV of after-tax lease rentals = $90,000 \times (1 - 0.30) \times PVIFA(8.4\%, 4)$

= $63,000 \times 3.28 = ₹2,06,640$

Buy Option:

Annual instalment = $3,00,000 \div PVIFA(12\%, 4) = 3,00,000 \div 3.037 = ₹98,782$

Calculation of Interest Tax Shield:

Opening Outstanding	Interest @ 12%	Instalment	Principal	Closing Outstanding	Tax Savings	PVIF @ 8.4%	PV
3,00,000	36,000	98,782	62,782	2,37,218	10,800	0.9225	9,963
2,37,218	28,466	98,782	70,316	1,66,902	8,540	0.8510	7,268
1,66,902	20,028	98,782	78,754	88,148	6,008	0.7851	4,717
88,148	10,634	98,782	88,148	0	3,190	0.7242	2,310
Total PV of Interest Tax Shield							24,258

Calculation of Depreciation Tax Shield:

Annual Depreciation = $3,00,000 \div 4 = 75,000$

Annual Tax Savings = $75,000 \times 30\% = 22,500$

PV = $22,500 \times PVIFA(8.4\%, 4) = 22,500 \times 3.2828 = ₹73,863$

PV of Cash Flow under Buy Option:

= PV of instalments – PV of Interest Tax Shield – PV of Depreciation Tax Shield

= $98,782 \times 3.2828 - 24,258 - 73,863$

= $3,24,282 - 24,258 - 73,863 = ₹2,26,161$

Lease: PV of outflows = ₹2,06,640

Buy: PV of outflows = ₹2,26,161

Since lease has lower PV of outflows, Leasing is preferable.

Exam Presentation: Show all workings clearly – discount rate, lease PV, interest tax shield table, depreciation tax shield, and buy PV. Conclude with recommendation.

3.2 Break-Even Lease Rental Determination and Implicit Rate

Chapter Overview

Break-even lease rental (BELR) is the rental at which the lessee remains indifferent between leasing and buying. From the lessor's perspective, it is the minimum rental that yields a zero NPV. This chapter covers BELR determination from both perspectives, leveraged lease, and alternative lease rental structures.

3.2.1 BELR from Lessee's Perspective

Concept

BELR is the maximum lease rental the lessee is willing to pay. If actual lease rental $\leq$ BELR, the lessee accepts the lease; otherwise, rejects it.

BELR from Lessee's Perspective

PV of after-tax lease rental (L) = PV of cash outflow under buy option

$$L \times (1 - t) \times PVIFA(K_d(1-t), n) = \text{PV of Instalments} - \text{PV of Interest Tax Shield} - \text{PV of Depreciation Tax Shield}$$

L: Break-even lease rental **t:** Tax rate **K_d:** Cost of debt **n:** Life of asset

Illustration – BELR from Lessee's Perspective

Excel Transport needs a truck:

(i) Buy for ₹3,00,000 by borrowing @ 12% interest, repayable in 4 equal annual instalments.

(ii) Acquire on lease for 4 years.

Straight line depreciation; Tax rate 30%; Life 4 years.

What is the maximum amount the lessee will be willing to pay for accepting the lease?

Applicable discount rate = $12(1 - 0.30) = 8.4\%$ p.a.

PV of cash flow under buy option:

= PV of instalments – PV of Interest Tax Shield – PV of Depreciation Tax Shield

= $98,782 \times 3.2828 - 24,258 - 73,863 = ₹2,26,160$

Let the break-even lease rental be X.

PV of after-tax lease rental = $X \times (1 - 0.30) \times 3.2828 = 2.29796X$

Condition: $2.29796X = 2,26,160$

$X = ₹98,417$

Maximum amount lessee will be willing to pay = ₹98,417 per annum

3.2.2 BELR from Lessor's Perspective

Concept

From the lessor's perspective, BELR is the minimum lease rental that the lessor can accept. It is the lease rental for which the NPV is zero.

BELR from Lessor's Perspective

**PV of after-tax lease rental (L) = Cost of asset – PV of Depreciation Tax Shield
– PV of Salvage Value**

Lessor's discount rate = After-tax cost of debt Lessor gets depreciation tax shield

Illustration – BELR from Lessor's Perspective

ABC Finance Ltd. has been approached to acquire a machine with Cash Down price ₹6 crores. Customer requests a 4-year lease with rentals payable at the end of each year in diminishing manner in ratio 4:3:2:1. Depreciation on straight line basis; ABC Finance's marginal tax rate 30%; Target return 10% p.a. Asset has no salvage value.

Applicable discount rate = $10(1 - 0.30) = 7\%$ p.a.

Cost of asset = ₹6 crores

Depreciation = $6 \text{ crores} \div 4 = ₹1.5 \text{ crores p.a.}$

PV of depreciation tax shield = $1.5 \times 0.30 \times \text{PVIFA}(7\%, 4) = 1.5 \times 0.30 \times 3.387 = ₹1.52415 \text{ crores}$

Let the annual lease rental for fourth year be X.

Lease rentals: Year 1 = 4X, Year 2 = 3X, Year 3 = 2X, Year 4 = X

PV of after-tax lease rentals = $[4X(0.70) \times 0.935 + 3X(0.70) \times 0.873 + 2X(0.70) \times 0.816 + X(0.70) \times 0.763]$

$= X[2.618 + 1.833 + 1.142 + 0.534] = 6.1278X$

Condition: $6.1278X = 6,00,00,000 - 1,52,41,500$

$6.1278X = 4,47,58,500$

$X = ₹73,04,171$

Lease rentals to be quoted:

Year 1: $4 \times ₹73,04,171 = ₹2,92,16,684$

Year 2: $3 \times ₹73,04,171 = ₹2,19,12,513$

Year 3: $2 \times ₹73,04,171 = ₹1,46,08,342$

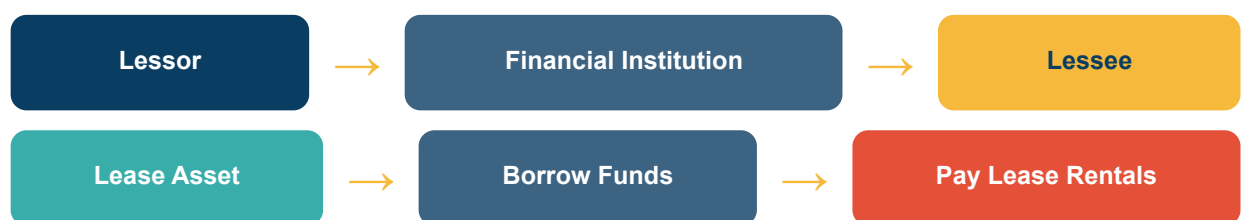
Year 4: $1 \times ₹73,04,171 = ₹73,04,171$

3.2.3 Leveraged Lease and BELR

Concept

In a leveraged lease, the lessor acquires an asset partially financed by financial institutions and leases it to the lessee. The lessee transfers lease rentals directly to an escrow account. The financial institution charges loan instalments from the proceeds, and the balance goes to the lessor.

Leveraged Lease Structure



Lessor borrows funds to acquire asset; Lessee pays rentals to escrow account; Financial institution deducts loan instalments; Balance transferred to lessor.

BELR in Leveraged Lease

$$(\text{Lease Rental} - \text{Loan Instalment}) \times \text{PVIFA}(K_e, n) = \text{Equity Component}$$

K_e : Lessor's required return on equity n : Lease term

Illustration – BELR in Leveraged Lease

P Ltd. has taken a plant on lease valued at ₹40 crore.

Lease arrangement: Leveraged lease; K Ltd. is equity participant and H Ltd. is loan participant.

They invest in ratio 1:4. Loan from H Ltd. carries 15% interest, payable in 6 equated annual instalments.

Lease term 6 years; Lease rental payable annually in arrear.

(a) Compute equated annual instalment from H Ltd.'s viewpoint.

(b) If lease rate is unknown and H Ltd.'s pre-tax yield is 20%, what is the minimum lease rent?

Cost of asset = ₹40 crores

Debt-equity ratio = 1:4

Loan raised = $40 \times 4/5 = ₹32$ crores

Rate of interest = 15% p.a.

(a) Equated Annual Instalment:

Let instalment = X

$X \times PVIFA(15\%, 6) = 32$

$X \times 3.7845 = 32$

$X = 32 \div 3.7845 = ₹8.4555$ crores = ₹8,45,55,423

(b) Minimum Lease Rent:

Equity component = $40 \times 1/5 = ₹8$ crores

Net cash flow = Lease rental – Loan instalment = $(Y - 8,45,55,423)$

Condition: $(Y - 8,45,55,423) \times PVIFA(20\%, 6) = 8,00,00,000$

$(Y - 8,45,55,423) \times 3.3255 = 8,00,00,000$

$Y - 8,45,55,423 = 2,40,56,533$

$Y = ₹10,86,11,956$

(a) Equated annual instalment = ₹8,45,55,423

(b) Minimum lease rent = ₹10,86,11,956

3.2.4 Alternative Lease Rental Structures

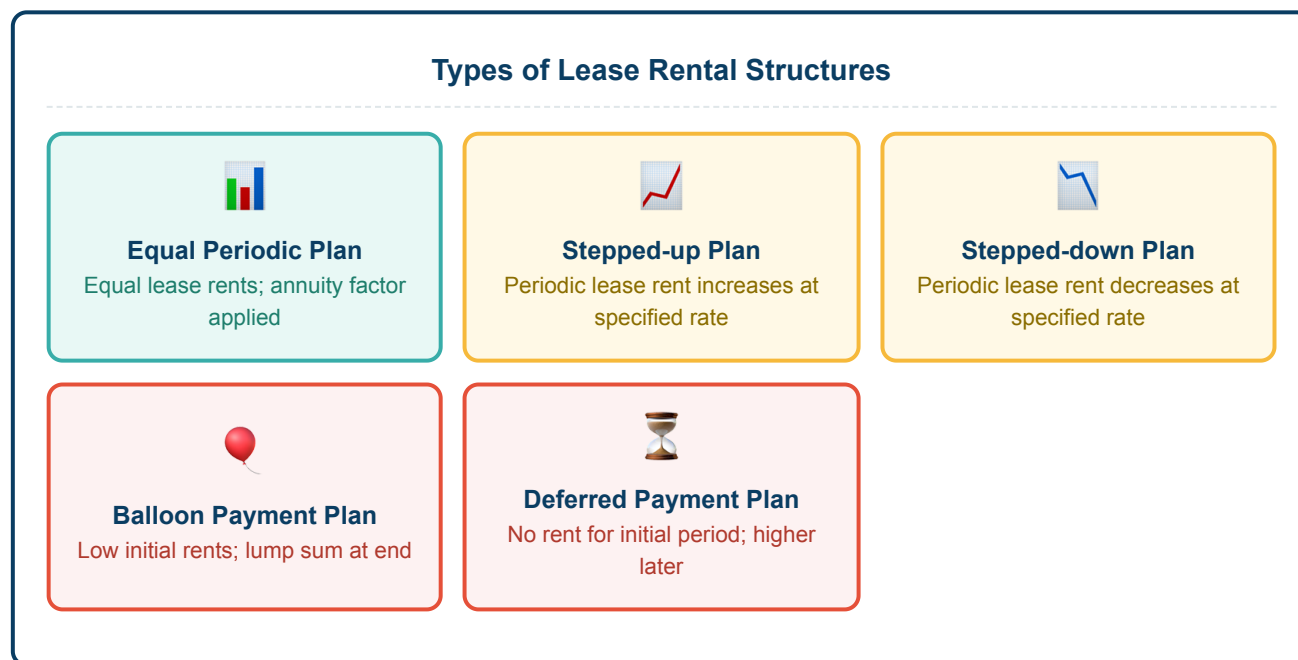


Illustration – Lease Rental Structures

Investment cost ₹99 lakhs; Lease term 3 years; Residual value NIL; Pre-tax required return 22%.
Determine annual lease rental under: (a) Equated (b) Stepped-up (12% increase) (c) Ballooned (₹15 lakhs for Y1 and Y2) (d) Deferred (1 year deferment)

(a) Equated Lease Rent:

Let X be equated lease rent.

$$X \times \text{PVAF}(3 \text{ yrs}, 22\%) = 99,00,000$$

$$X \times 2.0422 = 99,00,000$$

$$X = ₹48,47,713$$

(b) Stepped-up (12% annual increase):

Let first year rent = X. Rents: X, 1.12X, 1.2544X

$$\text{PV} = X \times 0.8196 + 1.12X \times 0.6719 + 1.2544X \times 0.5507 = 99,00,000$$

$$0.8196X + 0.7525X + 0.6908X = 99,00,000$$

$$2.2629X = 99,00,000$$

$$X = ₹43,74,873$$

(c) Ballooned Plan:

Annual rental ₹15 lakhs for Year 1 and Year 2.

Let balloon payment = X at end of Year 3.

$$\text{PV} = 15,00,000 \times 0.8196 + 15,00,000 \times 0.6719 + X \times 0.5507 = 99,00,000$$

$$12,29,400 + 10,07,850 + 0.5507X = 99,00,000$$

$$0.5507X = 99,00,000 - 22,37,250 = 76,62,750$$

$$X = ₹1,39,14,019$$

(d) Deferred Payment Plan:

Deferment period = 1 year; Let X be annual lease rent for Year 2 and Year 3.

$$\text{PV} = X \times 0.6719 + X \times 0.5507 = 99,00,000$$

$$1.2226X = 99,00,000$$

$$X = ₹80,97,497$$

(a) Equated = ₹48,47,713

(b) Stepped-up = ₹43,74,873 (Year 1)

(c) Ballooned = ₹15,00,000 (Y1, Y2) + ₹1,39,14,019 (Y3)

(d) Deferred = ₹80,97,497 (Y2, Y3)

3.3 Cross Border Leasing, Sale and Lease Back

Chapter Overview

This chapter covers cross-border leasing (where lessor and lessee are in different countries) and sale-and-leaseback arrangements (where the lessee sells an asset to the lessor and then leases it back).

3.3.1 Cross Border Leasing

Concept

Cross-border leasing is a leasing arrangement where lessor and lessee are situated in different countries. It is an alternative to equipment loans to foreign buyers. Operating leases may be feasible for exports of large equipment with long economic life relative to the lease term.

Objectives of Cross Border Leasing



Lower Cost of Financing

Utilise tax depreciation allowances of lessor



Security

Non-recourse debt; mortgage on equipment



Accounting Treatment

Favourable leveraged lease treatment



Repossession

Easier to repossess as owner, not secured lender

Advantages of Cross Border Leasing

Double Dip Lease

Cross-border leasing is widely used to arbitrage differences in tax laws of different countries. Each country applies differing rules for determining whether the lessor is the "owner" for tax purposes. With sufficiently long leases (often 99 years), an asset can end up with two effective owners, one in each country — referred to as a **double-dip lease**.

Financing Infrastructure

Cross-border leasing has been used as a means of financing infrastructure development in emerging nations — rail and air transport equipment, telephone and telecommunications equipment, power generation and distribution systems, and other projects with predictable revenue streams.

3.3.2 Sale and Lease Back Agreement

Concept

Under this arrangement, the lessee first purchases the equipment of his choice and then sells it to the lessor firm. The lessor in turn leases out the asset to the same lessee. The main advantage is that the lessee can be assured about the quality of the asset and can convert the sale into a lease arrangement after having possession.

Sale and Leaseback Process

Lessee Purchases Asset



Sells to Lessor



Lessor Leases Back

Lessee gets lump sum cash from sale; continues to use asset; lessor gets depreciation tax shield.

Benefits of Sale and Leaseback

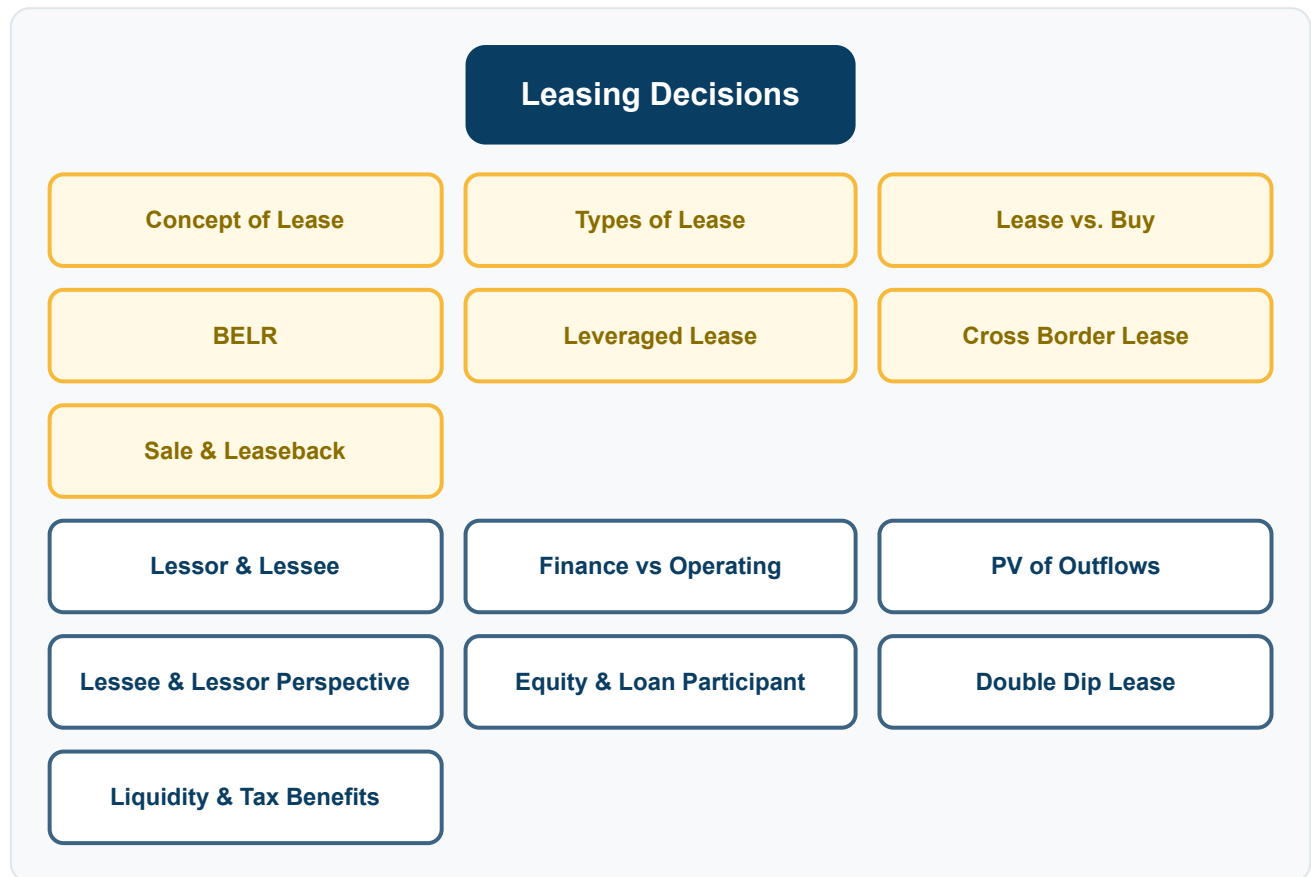
- Lessee can convert sale into lease after having possession
- Can be exercised even for existing asset used for some time
- Gets lump sum cash released from asset for alternative use
- Lessor gets tax benefit for depreciation
- Popular when lessee is in liquidity problems — improves liquidity position
- Lessee continues to use the asset without parting with it

5 5 MARKS AREA – Cross Border Leasing

Theory question on objectives of cross-border leasing, double-dip lease, advantages, and sale-leaseback arrangements. Frequently asked as a 5-mark theory question.

Module 3 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 3



Key Points for Revision

1. Lease = agreement between lessor and lessee for right to use asset
2. Finance lease transfers risks and rewards of ownership
3. Operating lease does not transfer risks and rewards
4. Finance lease = disguised purchase; Operating lease = rental
5. Lessee advantages: financing, no dilution, tax benefits, less risk
6. Lessor advantages: security, tax benefits, high profits, trading on equity
7. Discount rate for lease vs. buy = $K_d(1 - t)$
8. Lease vs. Buy: Compare PV of outflows; choose lower PV
9. Buy option outflows = PV of instalments – PV of interest tax shield – PV of depreciation tax shield
10. Lease option outflows = PV of after-tax lease rentals
11. BELR from lessee = Maximum rent willing to pay; PV of lease = PV of buy
12. BELR from lessor = Minimum rent acceptable; NPV = 0
13. Lessor gets depreciation tax shield; lessee gets rent tax shield
14. Leveraged lease: Lessor uses debt + equity; lessee pays to escrow
15. Cross-border lease: Lessor and lessee in different countries
16. Double-dip lease: Tax arbitrage between two countries
17. Sale and leaseback: Sell asset to lessor and lease it back
18. Sale and leaseback improves liquidity; lessor gets depreciation benefit
19. Lease rental structures: Equal, Stepped-up, Stepped-down, Ballooned, Deferred
20. Implicit rate in lease = IRR of lease cash flows
21. Always consider tax effects in lease evaluation
22. Salvage value is relevant for buy option; not for lease (generally)
23. Maintenance cost may differ between lease and buy
24. Cross-border lease: Tax savings passed as lower finance cost
25. BELR determination: Compare PV of lease rentals with cost of asset

Comprehensive Formula Handbook – Module 3

Discount Rate

$$K_d \times (1 - t)$$

Lease PV (Lessee)

$$L \times (1 - t) \times PVIFA(K_d(1-t), n)$$

Buy PV

$$PV \text{ of Instalments} - PV(\text{Interest Tax Shield}) - PV(\text{Depreciation Tax Shield})$$

BELR (Lessee)

$$PV \text{ of Buy Outflows} = PV \text{ of After-tax Lease Rentals}$$

BELR (Lessor)

$\text{Cost} - \text{PV}(\text{Dep. Tax Shield}) - \text{PV}(\text{Salvage}) = \text{PV of After-tax Lease Rentals}$

Leveraged Lease BELR

$(\text{Lease Rent} - \text{Loan Instalment}) \times \text{PVIFA}(K_e, n) = \text{Equity}$

Interest Tax Shield

$\text{Interest} \times \text{Tax Rate}$

Depreciation Tax Shield

$\text{Depreciation} \times \text{Tax Rate}$

Annual Loan Instalment

$\text{Loan Amount} \div \text{PVIFA}(K_d, n)$

Implicit Rate

IRR of lease cash flows

One-Night Revision Notes – Module 3

Last Night Before Exam – Module 3

- **Lease vs. Buy:** Discount rate = $K_d(1 - t)$. Compare PV of outflows. Choose lower PV.
- **Buy outflows:** PV of instalments – PV of interest tax shield – PV of depreciation tax shield.
- **Lease outflows:** PV of after-tax lease rentals = $L \times (1 - t) \times PVIFA$.
- **BELR (Lessee):** Maximum rent willing to pay. PV of lease = PV of buy.
- **BELR (Lessor):** Minimum rent acceptable. NPV = 0.
- **Leveraged lease:** Lessor uses debt + equity. Lessee pays to escrow. Financial institution gets instalments; balance to lessor.
- **Cross-border lease:** Lessor and lessee in different countries. Double-dip lease = tax arbitrage.
- **Sale and leaseback:** Sell asset to lessor and lease it back. Improves liquidity. Lessor gets depreciation benefit.
- **Lease rental structures:** Equal, Stepped-up, Stepped-down, Ballooned, Deferred.
- **Lessor gets depreciation tax shield; lessee gets rent tax shield.**

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Lease vs. Buy decision – 10–15 marks
- Break-even lease rental – 5–10 marks
- Evaluation from lessee and lessor perspective – 10 marks
- Leveraged lease – 5 marks
- Cross-border leasing theory – 5 marks
- Sale and leaseback – 5 marks
- Lease rental structures – 5 marks

Final Checklist – Module 3

Before Moving to Module 4

- Can I explain the concept and types of lease?
- Can I evaluate lease vs. buy options numerically?
- Can I compute interest tax shield and depreciation tax shield?
- Can I determine BELR from lessee's perspective?
- Can I determine BELR from lessor's perspective?
- Can I solve leveraged lease problems?
- Can I calculate lease rentals under different structures?
- Can I explain cross-border leasing and double-dip lease?
- Can I explain sale and leaseback and its benefits?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 5 numericals from this module?

END OF MODULE 3

Module 4 – Securitization

will be generated upon request.

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MANAGEMENT

04

Securitization

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Module 4 – Securitization

Module Objective

Primary Objective

To develop detailed understanding of how to make strategic choices in long-term investment decisions such as own or lease and making optimal allocation of limited funds. To understand the meaning and benefits of securitization, appreciate the mechanism of securitization and the limitations associated with it, and know about various securitized instruments.

Mapped CMLO: 3c

Learning Outcomes

Students will be able to...	Application Skill
Understand the meaning and benefits of securitization and know about the participants involved in securitization.	Identify and explain the roles of various parties in a securitization transaction.
Appreciate the mechanism of securitization and the limitations associated with it.	Describe the securitization process and evaluate its problems.
Know about various securitized instruments.	Classify and compare different types of securitized instruments.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
4.1	Definition, Concept and Benefits of Securitization	MEDIUM 2%	Theory
4.2	Participants in Securitization	MEDIUM 1%	Theory
4.3	Mechanism and Problems of Securitization	HIGH 1.5%	Theory
4.4	Securitization Instruments	HIGH 1.5%	Theory

Expected Examination Areas – Dec 2026



DEC 2026 LIKELY AREAS

- Meaning, definition and benefits of securitization – **5 marks**
- Participants in securitization – **5 marks**
- Mechanism of securitization (steps) – **5–10 marks**
- Problems of securitization – **5 marks**
- Types of securitized instruments – **5–10 marks**
- Difference between ABS and MBS – **5 marks**
- Pass Through vs Pay Through Certificates – **5 marks**

Frequently Tested Concepts

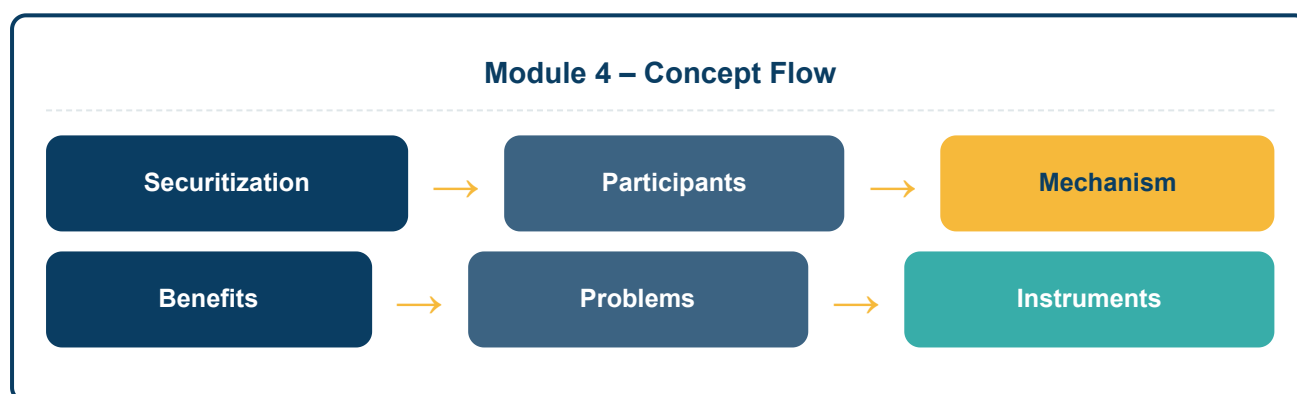


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★ FREQUENTLY ASKED – MODULE 4

- **Benefits of securitization** – from bank and investor perspective
- **Participants in securitization** – roles and responsibilities
- **Mechanism of securitization** – 12 steps
- **Problems of securitization** – limitations
- **Types of securitized instruments** – ABS, MBS, CDOs, PTCs

4.1 Definition, Concept and Benefits of Securitization

Chapter Overview

This chapter introduces the concept of securitization, its definition, historical growth, and the benefits it offers to banks, investors, and the financial system as a whole.

Learning Objectives

- Understand the meaning and concept of securitization
- Trace the historical growth of securitization
- Identify the benefits of securitization from different perspectives
- Appreciate the role of securitization in modern financial markets

4.1.1 Definition and Concept of Securitization

Definition

Securitization is the process in which certain types of assets are pooled so that they can be repackaged into interest-bearing securities. The interest and principal payments from the assets are passed through to the purchasers of the securities.

Sundaresan (1997): "A framework in which some illiquid assets of a corporation or a financial institution are transformed into a package of securities backed by these assets, through careful packaging, credit enhancements, liquidity enhancements, and structuring."

Securitization – Basic Concept



The process converts illiquid assets into liquid, tradable securities backed by the cash flows from the original assets.

Key Features

- **Pooling:** High-volume loans (mortgages, car loans, credit card loans) are packaged together
- **SPV:** Assets sold to a Special Purpose Vehicle specifically set up for the purpose
- **Securities Issuance:** SPV issues notes/bonds backed by cash flows from original assets
- **Pass-through:** Interest and principal payments from assets passed to security holders
- **Off-balance sheet:** Assets removed from originator's balance sheet

4.1.2 Growth of Securitization

Historical Evolution of Securitization

Year	Development
1860s	Farm railroad mortgage bonds – primitive form
1880s	Mortgage-backed bonds; securitization of mortgages before 1929 crash
1970	First modern residential mortgage-backed security (GNMA – Ginnie Mae)
1971	Freddie Mac issued first conventional loan securitization
1977	Bank of America issued first private label residential mortgage pass-through bond
1986	Tax Reform Act – REMIC provisions enabled greater flexibility
Mid-1980s	First securitizations of automobile loans and bank credit card receivables
1980s	UK banks began structuring residential mortgage securitizations
Late 1980s-1990s	Securitization market exploded; commercial mortgages began to be securitized
1990s	First securitizations of sub-prime residential mortgages
2000s	Huge growth in sub-prime mortgage securitization

4.1.3 Benefits of Securitization

Benefits for Banks / Originators



Funding Assets

Support rapid asset growth; diversify funding mix; reduce cost of funding



Balance Sheet Capital Management

Regulatory capital relief; economic capital relief; diversified funding sources



Risk Management

Credit risk transfer; remove non-performing assets; free up regulatory capital

Benefits for Investors



Diversification

Access to sectors not available in regular bond markets (residential mortgages, project finance)



Risk-Reward Profiles

Access to different and sometimes superior risk-reward profiles



New Markets

Access to sectors otherwise not open to them



Additional Benefits

- **Lower funding cost:** SPV notes often rated higher than originating bank's bonds
- **Maturity matching:** Economic maturity of issued notes matches that of assets
- **Liquidity:** Converts illiquid assets into liquid securities
- **Capital relief:** Regulatory and economic capital relief for banks
- **Profit:** Originator may receive surplus profit from SPV

5 5 MARKS AREA – Benefits of Securitization

From bank's viewpoint and investor's viewpoint – frequently asked theory question. Also, historical growth may be asked briefly.

4.2 Participants in Securitization

Chapter Overview

A typical securitization transaction involves several parties, each with specific roles and responsibilities. This chapter explains the role of each participant in the securitization process.

Parties in a Securitization Transaction

**Originator**

Creates securitized asset;
generates/owns the cash flow
stream

**Arranger**

Designs and sets up securitization
structure; creates tranches

**SPV**

Special Purpose Vehicle;
purchases assets; issues
securities

**Investors**

Purchase securities issued by
SPV

**Servicer**

Administers and collects
underlying receivables

**Rating Agencies**

Rate securities; assess capacity to
pay interest and principal

**Enhancement Providers**

Provide credit enhancement to
improve liquidity and safety

**Regulators**

Issue regulations; guide and
regulate securitization process

Detailed Roles and Responsibilities

Participant	Role and Responsibilities
Originator	• Actually creates a securitized asset • Generates (originates) or owns the defined cash flow • Examples: Retail bank securitizing mortgages, automobile loans, credit card receivables
Arranger	• Appointed by originator to design and set up securitization structure • Determines risk profile of receivables to create different tranches • Sets up SPV, designs credit enhancement and liquidity support • Usually a financial institution
SPV	• Entity established by originator to purchase assets • Realizes off-balance-sheet treatment for legal and accounting purposes • Generally a trust or company; bankruptcy remote from originator • Issues securities to investors to fund purchase of receivables
Investors	• Financial institutions, insurance companies, pension funds, hedge funds, companies, HNIs • Purchase securities issued by SPV according to risk/return preferences
Servicer	• Appointed by SPV to administer and collect underlying receivables • Acts as SPV's agent for a servicing fee • Usually the originator
Rating Agencies	• Rate the securities to indicate strength/weakness of SPV's capacity to pay • Act as ultimate appraiser of underlying pool of collateral
Enhancement Providers	• Provide credit enhancement to asset-backed securities • Improve liquidity, marketability, appeal, and safety of underlying cash flows • Internal enhancement: underwriters/dealers buy subordinated tranche • External enhancement: banks/insurers provide unconditional guarantees
Regulators	• Issue regulations guiding and regulating securitization process • Accountancy practices, capital adequacy requirements, structuring of SPV • Licensing requirements, supervision, laws for trading of securities, data protection

5 5 MARKS AREA – Participants in Securitization

Name and explain the role of various parties in securitization. Frequently asked as a short note or part of a larger question.

4.3 Mechanism and Problems of Securitization

Chapter Overview

This chapter explains the step-by-step mechanism of securitization and the various problems and limitations associated with the process.

4.3.1 Mechanism of Securitization

Basic Mechanism

In its simplest form, securitization involves two steps:

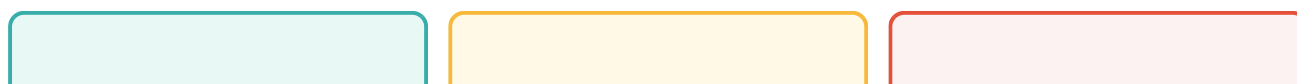
1. Originator identifies assets, pools them into a reference portfolio, and sells to an SPV
2. SPV finances acquisition by issuing tradable, interest-bearing securities to investors

Investors receive payments from a trustee account funded by cash flows generated by the reference portfolio.

Securitization Process – 12 Steps

- 1 Originator selects receivables to be assigned
- 2 Special Purpose Entity (SPV) is formed
- 3 SPV acquires the receivables
- 4 SPV issues securities (publicly offered or privately placed)
- 5 Securities structured – Class A, B, C (senior, mezzanine, junior); ratings driven by credit support
- 6 Servicer appointed – normally the originator
- 7 Debtors/obligors notified depending on legal requirements (usually avoided)
- 8 Servicer collects receivables in escrow mechanism; pays to SPV
- 9 SPV passes collections to investors or reinvests to pay at stated intervals
- 10 In case of default, servicer takes action against debtors as SPV's agent
- 11 When small amount of receivables left, originator cleans up by buying back
- 12 At end, originator's profit (if retained) is paid off

Tranche Structure





Senior Tranche

First call on income; lowest risk;
lowest return



Mezzanine Tranche

Intermediate risk and return



Junior / First Loss Tranche

Last claim; highest risk; highest
return; smallest size



Concentration of Losses

The conventional securitization structure assumes a three-tier security design—junior, mezzanine, and senior tranches. This structure concentrates expected portfolio losses in the junior, or first loss position, which is usually the smallest tranche but bears most of the credit exposure and is rewarded with the highest return.

4.3.2 Problems of Securitization

Limitations

In spite of its widely recognised benefits, securitization has a few limitations as well.



Costly Source

Higher premium demanded by investors; additional cost of rating and legal fees



Minimum Economic Size

High initial payment for SPV setup; below minimum size not cost-effective



Asset-Liability Mismatch

Problem transferred to investors; repayment profile replicates payback pattern



High Disclosure

Disclosures to regulators, services, trustees, rating agencies, investors



Quality Constraints

Only high-quality receivables can be securitized



No Restructuring

Professional trustees have no discretion to allow time or skip payments



Upfront Profits

Accounting leads to upfront booking of profits; estimated based on future profitability

Detailed Explanation of Problems

- **Costly source:** Primarily in emerging markets due to higher premium and additional costs
- **Minimum economic size:** SPV setup requires high initial payment; securitization is not cost-effective below a certain size
- **Asset-liability mismatch:** Pass-through transactions replicate payback pattern of assets
- **High disclosure:** In addition to regulator disclosures, disclosures to servicers, trustees, rating agencies, and investors
- **Quality constraints:** Banks can securitize only better-quality receivables
- **No restructuring:** Debt restructuring not possible; SPVs are bankruptcy remote entities
- **Upfront profits:** Profits represent not only encashed profits but also estimated profits based on future profitability

5 5 MARKS AREA – Problems of Securitization

List and explain the limitations of securitization. Frequently asked as a 5-mark theory question.

4.4 Securitization Instruments

Chapter Overview

This chapter covers the various types of securities issued by the SPV in securitization transactions, including ABS, MBS, CDOs, Pass Through Certificates, Pay Through Certificates, and other instruments.

4.4.1 ABS, MBS and CDOs

Major Types of Securitized Instruments



Asset-Backed Securities (ABS)

Backed by income-generating assets: credit card receivables, home equity loans, student loans, auto loans



Mortgage-Backed Securities (MBS)

Formed by pooling together mortgages exclusively; variations of ABS



Collateralized Debt Obligations (CDOs)

Consolidate group of fixed income assets into a pool divided into various tranches

Types of CDOs

Type	Description
CBOs	Collateralized Bond Obligations – backed primarily by corporate bonds
CLOs	Collateralized Loan Obligations – backed primarily by leveraged bank loans
CRE CDOs	Commercial Real Estate CDOs – backed primarily by commercial real estate loans and bonds

4.4.2 Pass Through Certificates

Pass Through Certificates

- Payments to investors depend upon cash flow from assets backing such certificates
- As and when cash (principal and interest) received from original borrower by SPV, passed on to certificate holders at regular intervals
- Entire principal returned with retirement of assets packed in pool
- **Single maturity structure**
- Tenure of certificates matched with life of securitized assets

4.4.3 Pay Through Certificates

Pay Through Certificates

- **Multiple maturity structure** depending upon maturity pattern of underlying assets
- SPV can issue two or three different types of securities with different maturity patterns: short term, medium term, and long term
- Greater flexibility with varying maturity pattern needed by investors
- SPV issues debt securities (bonds) repayable on fixed dates, backed by mortgages transferred by originator
- SPV temporarily reinvests cash flows to bridge gap between payment dates

5 5 MARKS AREA – Pass Through vs Pay Through

Difference between Pass Through Certificates and Pay Through Certificates – single vs multiple maturity structure. Frequently asked.

4.4.4 Other Instruments



Preferred Stock Certificates

Issued by subsidiary against trade debts and consumer receivables of parent; short-term; backed by guarantees from highly rated merchant banks



Asset Backed Commercial Papers

SPV purchases portfolio of mortgages from different sources; combined into single group; transferred to Trust; short-term



Interest Only Certificates

Payments made to investors only from interest incomes earned from securitized assets



Principal Only Certificates

Payments made to investors only from repayment of principal by original borrower; enable speculative dealings



Summary of Instruments

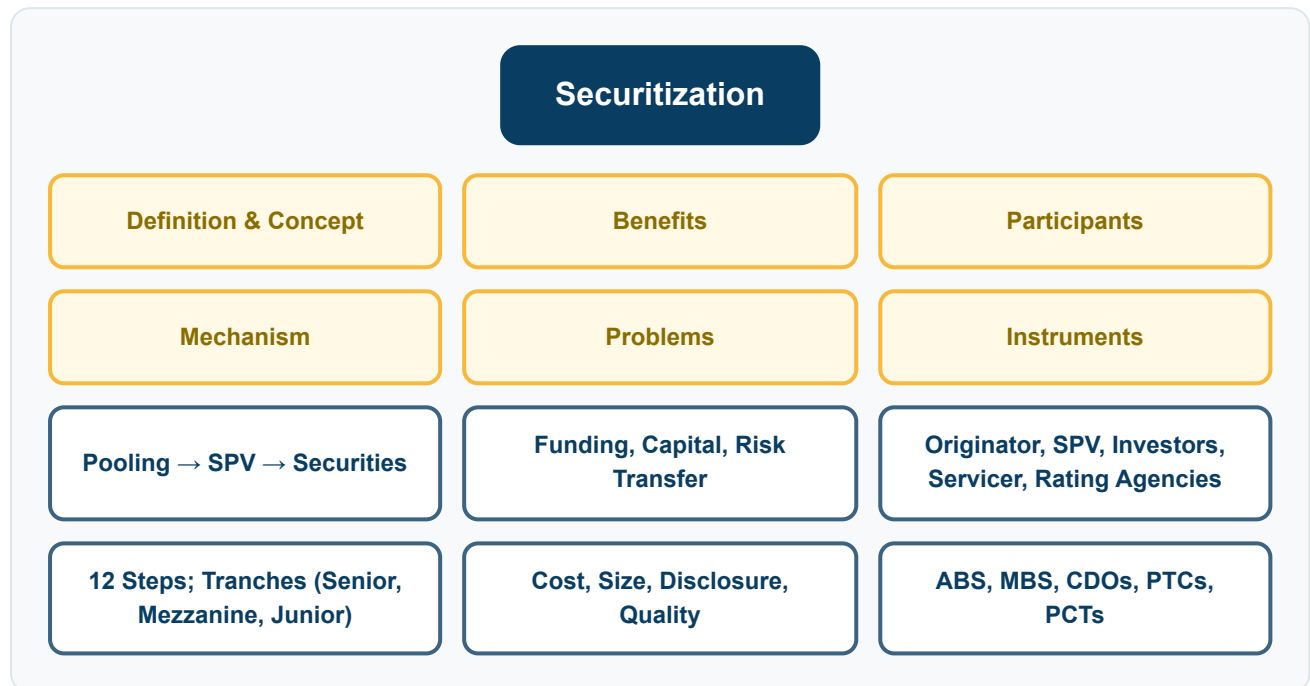
Instrument	Key Features
ABS	Backed by income-generating assets (credit cards, auto loans, student loans)
MBS	Backed by mortgages exclusively (residential or commercial)
CDOs	Pool of fixed income assets divided into tranches (CBOs, CLOs, CRE CDOs)
Pass Through Certificates	Single maturity; payments passed as received; tenure matches asset life
Pay Through Certificates	Multiple maturity; SPV issues debt securities with different maturities
Preferred Stock Certificates	Issued by subsidiary against trade debts/receivables of parent; short-term
Asset Backed Commercial Papers	SPV purchases mortgages; combined into group; transferred to Trust; short-term
Interest Only Certificates	Payments only from interest incomes earned from securitized assets
Principal Only Certificates	Payments only from repayment of principal by original borrower

10 10 MARKS AREA – Securitization Instruments

Comprehensive question on various types of securitized instruments, their features, and differences.
Frequently asked for 10 marks.

Module 4 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 4



Key Points for Revision

1. Securitization = process of pooling assets and repackaging into interest-bearing securities
2. SPV = Special Purpose Vehicle; purchases assets; issues securities
3. Off-balance sheet treatment for originator
4. Bank benefits: funding, capital management, risk transfer
5. Investor benefits: diversification, risk-reward profiles, new markets
6. Participants: Originator, Arranger, SPV, Investors, Servicer, Rating Agencies, Enhancement Providers, Regulators
7. Originator creates securitized asset; generates/owns cash flow
8. Arranger designs and sets up securitization structure
9. SPV is bankruptcy remote from originator
10. Servicer collects receivables; usually originator
11. Rating agencies rate securities; appraise underlying pool
12. Enhancement providers improve liquidity and safety
13. Mechanism: 12 steps from asset selection to profit distribution
14. Tranches: Senior, Mezzanine, Junior (First Loss)
15. Junior tranche bears most credit exposure; highest return
16. Problems: costly, minimum size, asset-liability mismatch, disclosure, quality, no restructuring, upfront profits
17. ABS: backed by income-generating assets
18. MBS: backed by mortgages exclusively
19. CDOs: pooled fixed income assets divided into tranches
20. CBOs, CLOs, CRE CDOs are types of CDOs
21. Pass Through Certificates: single maturity structure
22. Pay Through Certificates: multiple maturity structure
23. Preferred Stock Certificates: issued by subsidiary against parent's receivables
24. Interest Only Certificates: payments from interest only
25. Principal Only Certificates: payments from principal only
26. Securitization converts illiquid assets into liquid securities
27. Growth: 1860s → 1970 (GNMA) → 1986 (REMIC) → 1990s (sub-prime)
28. Double-dip lease concept in cross-border securitization

Comprehensive Formula Handbook – Module 4

Securitization

Pooling → SPV → Securities

SPV	Special Purpose Vehicle
ABS	Asset-Backed Securities
MBS	Mortgage-Backed Securities
CDO	Collateralized Debt Obligation
CBO	Collateralized Bond Obligation
CLO	Collateralized Loan Obligation
CRE CDO	Commercial Real Estate CDO
PTC	Pass Through Certificate
PTC (Pay)	Pay Through Certificate

One-Night Revision Notes – Module 4

Last Night Before Exam – Module 4

- **Securitization:** Process of pooling assets and repackaging into interest-bearing securities.
- **SPV:** Special Purpose Vehicle – purchases assets, issues securities, bankruptcy remote.
- **Benefits for banks:** Funding, balance sheet capital management, risk transfer.
- **Benefits for investors:** Diversification, risk-reward profiles, new markets.
- **Participants:** Originator, Arranger, SPV, Investors, Servicer, Rating Agencies, Enhancement Providers, Regulators.
- **Mechanism:** 12 steps – asset selection → SPV formation → security issuance → collections → payments.
- **Tranches:** Senior (lowest risk), Mezzanine, Junior/First Loss (highest risk).
- **Problems:** Costly, minimum size, asset-liability mismatch, disclosure, quality, no restructuring, upfront profits.
- **Instruments:** ABS, MBS, CDOs (CBOs, CLOs, CRE CDOs), PTCs, Pay Through Certificates, Preferred Stock Certificates, ABCPs, Interest Only, Principal Only.
- **Pass Through:** Single maturity; Pay Through: Multiple maturity.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Meaning and benefits of securitization – 5 marks
- Participants in securitization – 5 marks
- Mechanism of securitization – 5–10 marks
- Problems of securitization – 5 marks
- Types of securitized instruments – 5–10 marks
- Difference between ABS and MBS – 5 marks
- Pass Through vs Pay Through Certificates – 5 marks

Final Checklist – Module 4

Before Moving to Next Module

- Can I define securitization and explain its concept?
- Can I list and explain the benefits of securitization for banks and investors?
- Can I name and explain the role of all participants in securitization?
- Can I describe the 12-step mechanism of securitization?
- Can I explain the tranche structure (Senior, Mezzanine, Junior)?
- Can I list and explain the problems of securitization?
- Can I differentiate between ABS, MBS, and CDOs?
- Can I explain Pass Through vs Pay Through Certificates?
- Can I describe Interest Only and Principal Only Certificates?
- Have I memorised all key terms and definitions?
- Have I practised writing at least 5 theory answers from this module?

END OF MODULE 4

Module 5 – Introduction to Security Analysis

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05

Introduction to Security Analysis

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Module 5 – Introduction to Security Analysis

Module Objective

Primary Objective

To equip oneself with the knowledge of application of various techniques in security evaluation, building a portfolio, measuring its performance and making revisions to optimise the returns. To understand the meaning of technical analysis and fundamental analysis and the difference between the two approaches in security analysis. To appreciate various tools used under these two approaches.

Mapped CMLO: 3a

Learning Outcomes

Students will be able to...	Application Skill
Understand the meaning of technical analysis and fundamental analysis and the difference between the two approaches in security analysis.	Differentiate between fundamental and technical analysis; apply appropriate approach based on investment horizon.
Appreciate various tools used under these two approaches.	Apply economic, industry and company analysis tools; use chart patterns and technical indicators.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
5.1	Fundamental Analysis – Economic, Industry and Company Analysis	HIGH 5%	Theory + Concept
5.2	Technical Analysis – Dow Theory, Charts, Patterns, Indicators	HIGH 5%	Theory + Concept

Expected Examination Areas – Dec 2026



DEC 2026 LIKELY AREAS

- Fundamental vs Technical Analysis – **5–10 marks**
- Top-down vs Bottom-up approach – **5 marks**
- Economic Analysis factors and techniques – **5–10 marks**
- Industry Life Cycle stages – **5–10 marks**
- Porter's Five Forces Model – **5–10 marks**
- Company Analysis – SWOT, ratios, valuation – **5–10 marks**
- Dow Theory – **5–10 marks**
- Chart Patterns (Head & Shoulders, Double Top/Bottom) – **5–10 marks**
- Technical Indicators (RSI, Stochastic, Moving Averages) – **5 marks**

Frequently Tested Concepts

Module 5 – Concept Flow

Security Analysis



Fundamental Analysis



Economic → Industry →
Company

Technical Analysis



Dow Theory



Charts & Patterns

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★ FREQUENTLY ASKED – MODULE 5

- **Fundamental vs Technical Analysis** – comparison
- **Top-down approach** – Economic, Industry, Company
- **Industry Life Cycle** – 5 stages
- **Porter's Five Forces** – competitive analysis
- **Dow Theory** – three principles
- **Chart Patterns** – Head & Shoulders, Double Top/Bottom
- **Technical Indicators** – RSI, Stochastic, Moving Averages

5.1 Fundamental Analysis

Chapter Overview

This chapter introduces the concept of security analysis and the two basic approaches – fundamental analysis and technical analysis. It focuses on fundamental analysis, covering the top-down approach – economic analysis, industry analysis, and company analysis – along with tools and techniques for valuation.

Learning Objectives

- Understand the meaning and scope of security analysis
- Differentiate between fundamental and technical analysis
- Apply top-down and bottom-up approaches
- Analyse economic, industry, and company factors
- Use tools for valuation of shares

5.1.1 Security Analysis – Basics

What is Security Analysis?

Security analysis is the first part of the investment decision process involving the valuation and analysis of individual securities. It is primarily concerned with the analysis of a security to determine its value, so that appropriate decisions may be made based on such valuation as compared with the value placed on the security in the market.

Two Approaches to Security Analysis



Fundamental Analysis

Determines intrinsic value based on company's profits, dividends, and economic factors



Technical Analysis

Judges strength/weakness by examining investor and price behaviour of security

5.1.2 Top-Down vs Bottom-Up Approach

Fundamental Analysis – Two Approaches

Top-Down Approach	Bottom-Up Approach
Analyses economy first, then industry, finally individual companies	Focuses directly on a company's value (products, competitive position, financial status)
Starts with macro factors: GDP, inflation, interest rates, political stability	Starts with company-specific factors: earnings, growth, competitive edge
Then moves to industry characteristics and demand	Emphasis on finding companies with good growth prospects
Finally analyses company profitability, efficiency, future growth	Growth investing and value investing categories
Better approach for comprehensive analysis	Useful for stock pickers and focused investors

Top-Down Approach – Flow

Economic Analysis



Industry Analysis



Company Analysis

Economic Analysis considers GDP, inflation, interest rates, political stability → Industry Analysis considers industry characteristics, demand, government policy → Company Analysis considers profitability, efficiency, future growth.

💡 Growth Stocks vs Value Stocks

Growth Stocks	Value Stocks
Above average future growth in earnings	Cheap assets and strong balance sheets
Above average valuations (high P/E ratios)	Low P/E ratios, low price-to-book
Investors willing to pay high multiples	Often undervalued by market

5.1.3 Economic Analysis

Importance

Economic analysis occupies the first place in the top-down approach. The analysis of the macroeconomic environment is essential to understand the behaviour of stock prices. When the economy is having sustainable growth, industry groups and companies will benefit and grow faster.

Macroeconomic Factors – Commonly Analysed



Business Cycles

Recurring pattern of recession and recovery



Gross Domestic Product

Total goods and services produced; higher growth favourable



Savings & Investment

Domestic savings channeled through stock market



Inflation

Reduces value of fixed-income securities; constant mild inflation positive



Interest Rates

Increase reduces borrowings; adverse impact on stock prices



Government Budget

Deficit leads to inflation; surplus leads to deflation; balanced favourable



Tax Structure

Incentives for savings and investments



Balance of Payment

Current, capital, official reserve accounts



Foreign Exchange Reserves

Depends on BoP position



Monsoon & Agriculture

Good monsoon → better harvesting → improved economy



Infrastructure

Transport, energy, banking, communication



Demographic Factors

Population by age, occupation, literacy, location



Political Stability

Essential for good economic performance

Techniques Used in Economic Analysis



Economic Model Building

GNP model building; sectoral analysis using National Accounting Framework



Gross National Product Analysis

Measures growth rate in economic activities; forecasting tool

- 1 Hypothesize total economic demand by measuring total income (GNP) based on political stability, rate of inflation, changes in economic levels
- 2 Forecast GNP by estimating levels of various components: consumption expenditure, gross private domestic investment, government purchases, net exports
- 3 After forecasting individual components, add them up to obtain forecasted GNP
- 4 Compare total GNP with independent agency forecast; test for consistency

5 5 MARKS AREA – Economic Analysis

List and explain the macroeconomic factors analysed under economic analysis. Also, techniques used (Economic Model Building, GNP Analysis).

5.1.4 Industry Analysis

Importance

Each industry is different from the other. The performance of industries varies with the economy — when the economy expands, industry performance is better; when the economy contracts, the reverse happens. An investor needs to analyse competitive forces to determine the intensity of competition in an industry.

Factors in Industry Analysis



Characteristics of Industry

Seasonal demand, scale of production, width of market



Demand and Market

Demand not controlled by government; good profitability prospects



Government Policy

Clearances, installed capacity, price, distribution, reservation



Labour & Industrial Problems

Productivity of labour; labour problems → avoid investment



Management

Tax planning, technology, modernization, liquidity of shares



Future Prospects

Overall picture of industry; problems and prospects

Techniques Used in Industry Analysis



Regression Analysis

Diagnose factors determining demand: GNP, disposable income, price elasticity



Input-Output Analysis

Flow of goods and services through economy; detect changing patterns

Industry Life Cycle – Five Stages

Industry Life Cycle Stages

Stage	Characteristics
1. Pioneering Development	Start-up stage; modest sales growth; very small or negative profits; small market; major development costs
2. Rapid Accelerating Growth	Markets develop; demand substantial; limited number of firms; little competition; high profit margins; excess demand
3. Mature Growth	Most demand satisfied; future sales growth above normal but no longer accelerates; competitors attracted; profit margins decline
4. Stabilization Stage	Growth begins to moderate; longest part of life cycle; products standardized; marketplace full of competitors; costs stable
5. Decline	Sales growth declines; shifts in demand or substitutes; profit margins squeezed; some firms experience losses



Profit Margin Pattern

The profit margin series typically peaks very early in the total cycle and then levels off and declines as competition is attracted by the early success of the industry.

Porter's Five Forces Model – Competitive Strategy



💡 Barriers to Entry

- Economies of scale
- Brand loyalty – makes it difficult for new entrants
- Government regulation
- Customer switching costs
- Absolute cost advantage
- Ease in distribution
- Strong capital base
- Patent protection

5 5 MARKS AREA – Industry Analysis

Industry Life Cycle stages, Porter's Five Forces Model, and factors considered in industry analysis. Frequently asked as a short note.

5.1.5 Company Analysis

Concept

Company analysis is a method of assessing the competitive position of a firm, its earnings and profitability, the efficiency with which it operates, its financial position, and its future with respect to earnings of its shareholders.

Qualitative and Quantitative Factors

Company Analysis – Factors

Qualitative Factors	Quantitative Factors
Business model	Earnings of the Company
Management	Growth Rate
Strategy	Competitive edge
Leadership Style	Financial Leverage
Corporate Governance	Operating Leverage
Corporate Culture	Production Efficiency
	Utilization of resources, particularly Cash Flow movement

SWOT Analysis

SWOT Analysis Framework

Internal Factors	Positive	Negative
Strengths (S)	Technological Skill, Leading brands, Distribution Channels, Customer Loyalty, Production Quality, Scale, Management	
Weaknesses (W)		Absence of important skills, Weak brands, Poor access to distribution, Low customer retention, Unreliable product/service, Sub-scale, Management
External Factors	Positive (Opportunities)	Negative (Threats)
Opportunities (O)	Change in customer tastes, Technological advances, Changes in Government Policies, Lower Personal Taxes, Change in Population age, New distribution Channels	
Threats (T)		Change in customer base, Closing of geographic markets, Technological advances, Changes in Government policies, Tax increases, Change in Population age, New distribution Channels

Factors Considered in Company Analysis



Net Worth and Book Value

Net worth available to equity shareholders; Book Value per Share



Sources and Utilization of Funds

Fund Flow and Cash Flow Analysis; check short-term funds financing long-term investments



Time Series / Common Size / Ratio Analysis

Inter and Intra Firm Comparison



Size and Ranking

Assess risk; technical know-how; R&D; price leadership



Location & Labour- Management Relations

Economic viability;
proximity to market;
efficiency of operations



Pattern of Existing Stock Holding

Stake of various parties in
the Company



Marketability of Shares

Listing, dispersal of
shareholding, market
depth, speculative
interest

Techniques Used in Company Analysis



Correlation & Regression Analysis

Simple (two variables) or Multiple (more than two variables); interrelationship between economy, industry, company



Time Series and Trend Analysis

Trend line or characteristic line using method of least squares



Decision Tree Analysis

Probability to find expected value; various probabilities assigned to states of nature

Fundamental Analysis Tools – Key Ratios

Σ Earnings Per Share (EPS)

$$\text{EPS} = \text{Total Earnings Available to Equity Shareholders} \div \text{Total No. of Equity Shares Outstanding}$$

Σ Price to Earnings Ratio (P/E Ratio)

$$\text{P/E} = \text{Stock Price} \div \text{EPS}$$

Shows relationship between stock price and company earnings

Σ PEG Ratio

$$\text{PEG Ratio} = (\text{Price / Earnings Ratio}) \div \text{Annual EPS Growth}$$

Lower PEG = more undervalued stock Favoured over P/E because it accounts for growth

Σ Price to Sales Ratio (P/S or PSR)

$$\text{P/S} = \text{Share Price} \div \text{Revenue Per Share}$$

Σ Price to Book Ratio (P/B)

$$\text{P/B} = \text{Share Price} \div \text{Book Value Per Share}$$

Σ Dividend Yield (Return)

$$\text{Dividend Yield} = \text{Annual Dividend Per Share} \div \text{Market Price Per Share}$$

Σ Dividend Payout Ratio

$$\text{Dividend Payout Ratio} = \text{Dividends} \div \text{Net Income for the same period}$$

Σ Book Value Per Share

$$\text{BVPS} = (\text{Total Shareholder's Equity} - \text{Preferred Equity}) \div \text{Total Outstanding Shares}$$

DuPont Model – ROE Decomposition

$$\text{ROE} = \text{Net Margin} \times \text{Asset Turnover} \times \text{Equity Multiplier}$$

$$\text{ROE} = (\text{Net Income} \div \text{Revenue}) \times (\text{Revenue} \div \text{Total Assets}) \times (\text{Total Assets} \div \text{Equity})$$

Sustainable Growth

$$\begin{aligned}\text{Sustainable Growth} &= \text{Retention Ratio} \times \text{ROE} \\ &= (1 - \text{Payout Ratio}) \times \text{ROE}\end{aligned}$$

5.1.6 Valuation of Shares

Three Methods of Valuation

1. **Book Value Method** – Balance sheet value / Net asset value
2. **Market Value Method** – Yield value method (dividend or EPS based)
3. **Fair Value Method** – Average of Book Value and Market Value

Book Value Method

Book Value Per Share

$$\text{Book Value} = (\text{Current Value of All Assets} - \text{Preference Shareholder's Claim}) \div \text{Number of Equity Shares}$$

Assumes liquidation without liquidation expenses Also called Balance Sheet Value or Net Asset Value

Market Value / Yield Value Method

Market Price Based on Constant Dividend

$$MP = D \div K_e$$

D: Dividend per share **K_e:** Normal rate of return on equity shares (capitalization rate)

Market Price Based on Dividend Growing at Constant Rate

$$MP = D_1 \div (K_e - g)$$

D₁: Next year's expected dividend **g:** Growth rate

Σ Market Price Based on EPS

$$MP = EPS \div K_e$$

Also called PE method (P/E is reciprocal of K_e)

✓ Order of preference: (i) Growth based method, (ii) EPS based method, (iii) Constant dividend based method

Fair Value Method

Σ Fair Value

$$\text{Fair Value} = (\text{Book Value} + \text{Market Value}) \div 2$$

5.2 Technical Analysis

Chapter Overview

This chapter introduces technical analysis – the study of price movements and investor behaviour to forecast future price trends. It covers Dow Theory, chart types, chart patterns, and technical indicators.

Learning Objectives

- Understand the meaning and basis of technical analysis
- Apply Dow Theory principles
- Identify different types of charts and chart patterns
- Use technical indicators (RSI, Stochastic, Moving Averages)
- Differentiate between technical and fundamental analysis

5.2.1 Basis of Technical Analysis – Dow Theory

Three Basic Principles of Dow Theory

1. **Price discounts everything** – Current price fully reflects all available information
2. **Price movements are not totally random** – Prices trend
3. **"What" is more important than "Why"** – Focus on price, not reasons

Three Types of Price Movements (Dow Theory)

Type	Analogy	Description
Major / Primary Trends	Tides in the ocean	Broad upward or downward movements lasting a year or more
Intermediate Trends	Waves	Corrections lasting from three weeks to three months
Short-run Movements	Ripples	Daily fluctuations

Bullish Price Pattern (Dow Theory)



Each recovery reaches a new peak above prior peak, accompanied by heavy trading volume. Each profit-taking reversal has a trough above prior trough with relatively light volume.

5.2.2 Tools & Techniques – Charts

Types of Charts in Technical Analysis

Chart Type	Description
Line Chart	Single graph drawn by plotting closing price of stock on a given day and connecting points over a period. Price on Y-axis, time on X-axis. Helpful for easy identification of patterns.
Bar Chart	Dot entered to represent highest price; another dot for lowest price; line connects them; horizontal number marks closing price. Simplest and most commonly used tool.
Point and Figure Chart	One-dimensional without time or volume; shows price changes in relation to previous prices; drawn on ruled paper. Helps predict extent and direction of price movements.
Candlestick Chart	Oldest price prediction chart (1700s Japan). Needs four elements: open, high, low, closing price. Body shows open-close; shadows show high-low. Bullish: close > open; Bearish: close < open.

💡 Chart Patterns – Two Main Types

Type	Description
Reversal Patterns	Signal an end to the trend that was in place prior to chart pattern forming. If price was trending higher and reversal pattern completes, uptrend is likely over.
Continuation Patterns	Signal continuation of a trend. If price is moving lower, continuation pattern forms and price breaks out in trending direction, downtrend likely continues.

Uses of Charts

- Help to spot current trends for buying and selling
- Indicate probable future action of market by projection
- Show historical movements
- Indicate key areas of support and resistance

"Charts are like fire or electricity. They are brilliant tools if intelligently controlled and handled, but dangerous to a novice." – James Dines

5.2.3 Chart Patterns



'V' Formation

Long sharp decline and fast reversal. Occurs in popular stocks where interest changes quickly from hope to fear and vice versa.



Tops and Bottoms

Formed at beginning or end of new trends. Reversal from tops and bottoms indicate sell and buy signals. Investor should buy after upward trend starts and exit before top.



Head and Shoulders

Three rallies: left shoulder, head, right shoulder. Neckline drawn connecting lows of tops. Price cutting neckline from above signals bear market.



Inverted Head and Shoulders

Reverse pattern. Price falls and rises making inverted right shoulder. Head and left shoulders created. Neckline connecting tips. Price piercing neckline from below indicates end of bear market and beginning of bull market.



Rounding Bottom

Bullish signal; U-shaped. Bottom low new low; decline and rise take equal period; breakout higher than beginning of decline. Volumes high at beginning, low at end, increase during advance.



Flags

Parallelogram pattern; emerges before a fall or rise; market corrections of over-bought/over-sold situation. Bullish flag: two trend lines sloping downwards; breakout on upper side. Bearish flag: both trend lines sloping upwards; breakout downward.



Pennant

Symmetrical triangle. Bullish pennant: lower tops form upper trend line; lower trend line connects rising bottoms. Bearish pennant: upward trend line falling; lower trend line rising.

5 5 MARKS AREA – Chart Patterns

Explain any two/three chart patterns with their significance (Head & Shoulders, Double Top/Bottom, Flags, Pennants, Rounding Bottom). Frequently asked as a short note.

5.2.4 Technical Indicators



Relative Strength Index (RSI)

Developed by Wells Wilder. Oscillator used to identify inherent technical strength/weakness. Formula: $RSI = 100 - [100 \div (1 + \text{Average Gain} / \text{Average Loss})]$. Calculated for 5, 7, 9, 14 days. Longer period → less wrong signals.



Stochastic Oscillator

Developed by George C. Lane in late 1950s. Momentum indicator showing location of closing price relative to high-low range. Two lines: %K (faster) and %D (slower). Values between 0 and 100. Overbought > 70; Oversold < 30. Best buy signal below 15; best sell signal above 85.



Moving Averages

Used to identify trends. Buy signal when stock price line rises above a falling moving average line. Sell signal when price falls below a rising moving average line.



Elliott Wave Theory

Developed by Ralph Nelson Elliott in late 1920s. Stock prices move in repetitive cycles (waves). Five waves indicate main trend; three corrective waves. A 5-3 wave cycle completes. Impulsive waves (1, 3, 5) move with trend; corrective waves (2, 4, B) move against.



Stochastic Oscillator – Key Points

- **Overbought region:** Above 70% mark
- **Oversold region:** Below 30 mark
- **Best buy signal:** Below 15 mark
- **Best sell signal:** Above 85 mark
- **%D line:** Used to identify overbought and oversold zones
- **Intersection:** %K line intersecting %D from above in overbought zone → Sell signal; %K moving above %D in oversold zone → Buy signal



Elliott Wave Theory – Wave Classification

Category	Description
Grand Super Cycle	Largest wave category
Super Cycle	Sub-division of Grand Super Cycle
Cycle	Sub-division of Super Cycle
Primary	Sub-division of Cycle
Intermediate	Sub-division of Primary
Minor	Smallest wave category

5 5 MARKS AREA – Technical Indicators

Explain RSI, Stochastic Oscillator, Moving Averages, and Elliott Wave Theory. Frequently asked as a short note or part of a larger question.

5.2.5 Technical Analysis vs Fundamental Analysis

Comparison – Technical vs Fundamental Analysis

Aspect	Technical Analysis	Fundamental Analysis
Objective	Predicts short-term price movements	Establishes long-term values
Focus	Internal market data – price and volume	Economy, industry and company factors
Users	Speculators wanting quick money	Investors investing on long-term basis
Nature	Simple and quick method	Complex, time-consuming, tedious
Basis	Price and volume data, charts, patterns	Financial statements, economic data
View on Market	Market is 90% psychological and 10% logical	Market is 90% logical and 10% psychological
Time Horizon	Short-term (days to weeks)	Long-term (months to years)
Approach	Direct – focus on price only	Indirect – focus on reasons behind price

Complementary Nature

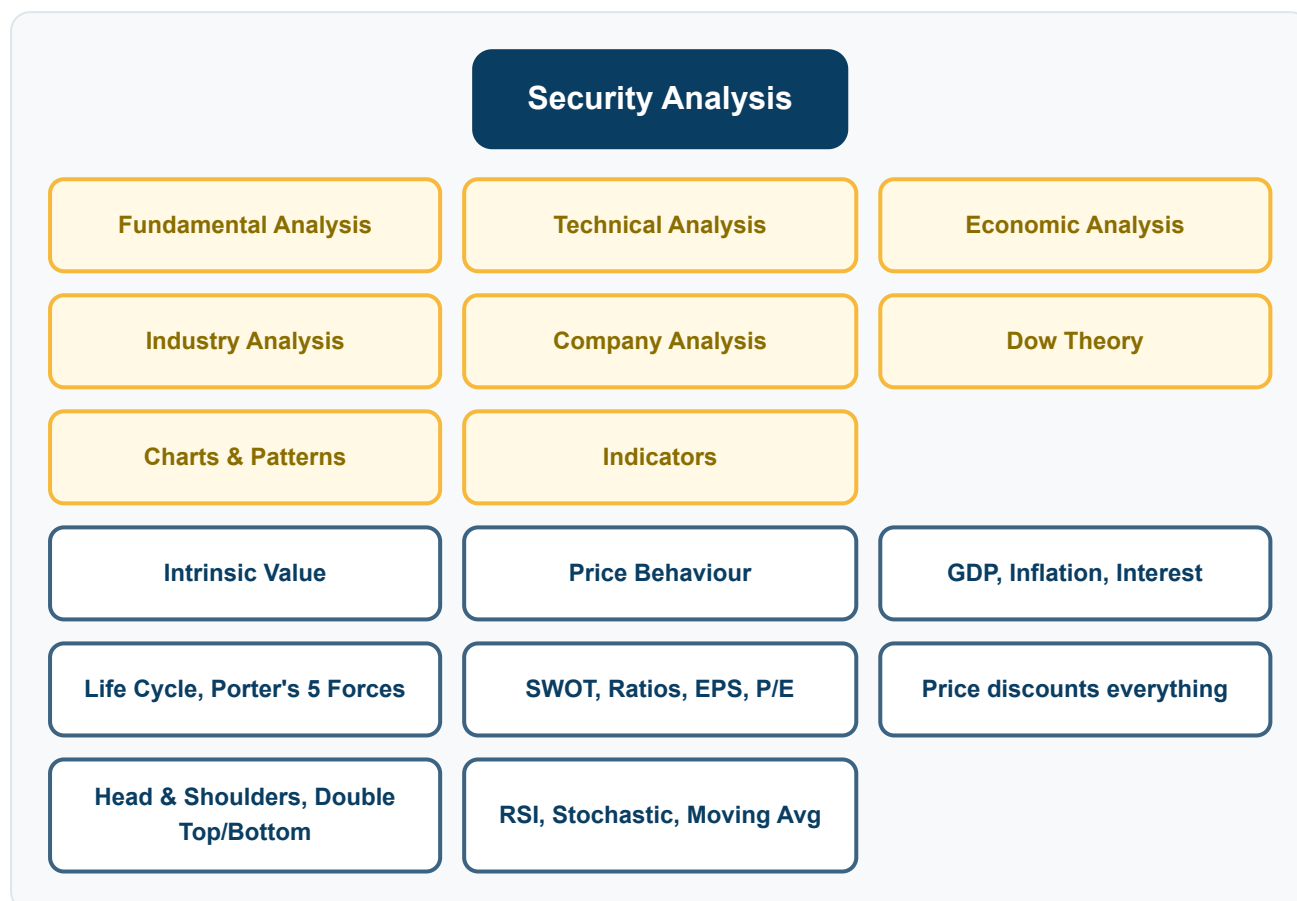
Technical and fundamental analysis provide exactly opposite approaches to valuation, but in practice, a judicious combination of both these approaches is used to arrive at better results. These two approaches are not used as substitutes but as complementary to each other.

10 10 MARKS AREA – Technical vs Fundamental Analysis

Detailed comparison between technical and fundamental analysis. Frequently asked as a 10-mark theory question. Include all differences with examples.

Module 5 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 5



Key Points for Revision

1. Security analysis – valuation and analysis of individual securities
2. Two approaches: Fundamental and Technical
3. Fundamental analysis determines intrinsic value
4. Top-down approach: Economy → Industry → Company
5. Bottom-up approach: Company → Industry → Economy
6. Economic analysis factors: GDP, inflation, interest, BoP, monsoon, etc.
7. Techniques: Economic Model Building, GNP Analysis
8. Industry Life Cycle stages: Pioneering, Rapid Growth, Mature Growth, Stabilization, Decline
9. Porter's Five Forces: Entrants, Rivalry, Substitutes, Buyers, Suppliers
10. Barriers to entry: Economies of scale, brand loyalty, regulation, switching costs
11. Company analysis: SWOT, financial ratios, EPS, P/E, PEG, P/B, Dividend Yield
12. DuPont: $ROE = \text{Net Margin} \times \text{Asset Turnover} \times \text{Equity Multiplier}$
13. Sustainable growth = Retention ratio $\times$ ROE
14. Valuation methods: Book value, Market value, Fair value
15. Book value = $(\text{Assets} - \text{Preference claim}) \div \text{Equity shares}$
16. Market price (constant dividend) = $D \div K_e$
17. Market price (growing dividend) = $D_1 \div (K_e - g)$
18. Market price (EPS based) = $EPS \div K_e$
19. Technical analysis – study of price movements and investor behaviour
20. Dow Theory: Price discounts everything; price movements not random; what > why
21. Dow Theory waves: Major (tides), Intermediate (waves), Short-run (ripples)
22. Charts: Line, Bar, Point & Figure, Candlestick
23. Reversal vs Continuation patterns
24. Head and Shoulders: bearish reversal; Inverted: bullish reversal
25. Double Top: bearish reversal; Double Bottom: bullish reversal
26. RSI: 0-100; overbought > 70; oversold < 30
27. Stochastic: %K (fast) and %D (slow); overbought > 70; oversold < 30
28. Elliott Wave: 5-3 pattern; impulsive and corrective waves
29. Technical vs Fundamental: complementary, not substitutes

Comprehensive Formula Handbook – Module 5

EPS

Total Earnings $\div$ No. of Equity Shares

P/E Ratio	$\text{Stock Price} \div \text{EPS}$
PEG Ratio	$\text{P/E} \div \text{Annual EPS Growth}$
P/S Ratio	$\text{Share Price} \div \text{Revenue Per Share}$
P/B Ratio	$\text{Share Price} \div \text{Book Value Per Share}$
Dividend Yield	$\text{Annual Dividend} \div \text{Market Price}$
Dividend Payout	$\text{Dividends} \div \text{Net Income}$
Book Value Per Share	$(\text{Equity} - \text{Preference}) \div \text{Outstanding Shares}$
DuPont ROE	$\text{Net Margin} \times \text{Asset Turnover} \times \text{Equity Multiplier}$
Sustainable Growth	$(1 - \text{Payout}) \times \text{ROE}$
Market Price (Constant Div)	$D \div K_e$
Market Price (Growing Div)	$D_1 \div (K_e - g)$
Market Price (EPS based)	$\text{EPS} \div K_e$
Fair Value	$(\text{Book Value} + \text{Market Value}) \div 2$
RSI	$100 - [100 \div (1 + \text{Avg Gain} / \text{Avg Loss})]$

One-Night Revision Notes – Module 5

Last Night Before Exam – Module 5

- **Security Analysis:** Two approaches – Fundamental and Technical.
- **Top-Down:** Economy → Industry → Company.
- **Economic Factors:** GDP, inflation, interest, BoP, monsoon, infrastructure, demographics, political stability.
- **Industry Life Cycle:** Pioneering → Rapid Growth → Mature Growth → Stabilization → Decline.
- **Porter's Five Forces:** Entrants, Rivalry, Substitutes, Buyers, Suppliers.
- **Company Analysis:** SWOT, ratios, EPS, P/E, PEG, P/B, DuPont.
- **Valuation:** Book Value = Assets – Preference; Market Price = D/K_e or EPS/K_e ; Fair Value = Average.
- **Dow Theory:** Price discounts everything; movements not random; what > why.
- **Chart Patterns:** Head & Shoulders (bearish); Inverted (bullish); Double Top (bearish); Double Bottom (bullish); Flags; Pennants; Rounding Bottom.
- **Indicators:** RSI (overbought >70, oversold <30); Stochastic (overbought >70, oversold <30); Moving Averages; Elliott Wave (5-3 pattern).
- **Technical vs Fundamental:** Complementary, not substitutes.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Fundamental vs Technical Analysis – 5–10 marks
- Top-down vs Bottom-up approach – 5 marks
- Economic Analysis factors – 5–10 marks
- Industry Life Cycle stages – 5–10 marks
- Porter's Five Forces Model – 5–10 marks
- Company Analysis – SWOT, ratios – 5–10 marks
- DuPont Analysis – 5 marks
- Valuation of Shares – 5–10 marks
- Dow Theory – 5–10 marks
- Chart Patterns – 5–10 marks
- Technical Indicators – 5 marks

Final Checklist – Module 5

✓ Before Moving to Module 6

- Can I differentiate between fundamental and technical analysis?
- Can I explain the top-down approach with all three levels?
- Can I list and explain macroeconomic factors?
- Can I explain the five stages of industry life cycle?
- Can I apply Porter's Five Forces model?
- Can I perform company analysis using SWOT and ratios?
- Can I compute EPS, P/E, PEG, P/B, DuPont ROE?
- Can I value shares using book value, market value and fair value methods?
- Can I explain Dow Theory and its three principles?
- Can I identify and explain at least 5 chart patterns?
- Can I explain RSI, Stochastic, Moving Averages, Elliott Wave?
- Have I memorised all formulas in the formula sheet?
- Have I practised writing at least 5 theory answers from this module?

END OF MODULE 5

Module 6 – Equity and Bond Valuation and Evaluation of Performance

will be generated upon request.

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MANAGEMENT**

06

Equity and Bond Valuation and Evaluation of Performance

Master Revision Handbook · December 2026 Edition

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Module 6 – Equity and Bond Valuation and Evaluation of Performance

Module Objective

Primary Objective

To equip oneself with the knowledge of application of various techniques in security evaluation, building a portfolio, measuring its performance and making revisions to optimise the returns. To understand various alternative approaches of valuation of equity shares and learn various techniques of valuation of bonds and relation between bond prices and bond yields.

Mapped CMLO: 3a

Learning Outcomes

Students will be able to...	Application Skill
Understand various alternative approaches of valuation of equity shares.	Apply DCF and relative valuation techniques to determine the intrinsic value of shares.
Learn various techniques of valuation of bonds and relation between bond prices and bond yields.	Calculate bond prices, YTM, YTC, and realized compound yield; analyse price-yield relationship.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
6.1	Equity Valuation – DCF Based, Relative Valuation using Multiples and Weights	HIGH 8%	Numerical + Theory
6.2	Bond Valuation – Prices & Yields	HIGH 7%	Numerical + Theory

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- Dividend Discount Model (DDM) – Zero, Constant, Multiple Growth – **5–10 marks**
- Two-stage and Three-stage Growth Models – **10 marks**
- P/E Ratio and Determinants – **5 marks**
- Bond Pricing – **5–10 marks**
- Yield to Maturity (YTM) – **5–10 marks**
- Yield to Call (YTC) – **5 marks**
- Realized Compound Yield – **5 marks**
- Price-Yield Relationship – **5 marks**
- Types of Bonds – **5 marks**

Frequently Tested Concepts

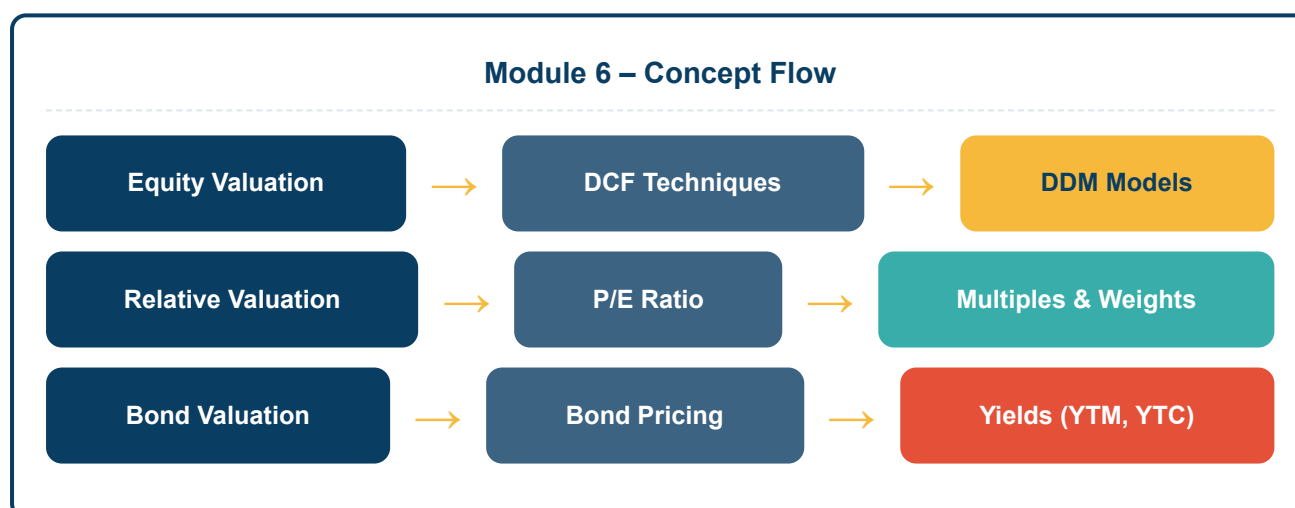


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★ FREQUENTLY ASKED – MODULE 6

- **DDM – Constant Growth (Gordon)** – numerical
- **Multiple Growth Model** – two-stage/three-stage numerical
- **P/E Ratio and determinants** – theory + numerical
- **Bond Pricing** – annual and semi-annual
- **YTM calculation** – numerical
- **Yield to Call** – numerical
- **Price-Yield Relationship** – theory + numerical

6.1 Equity Valuation

Chapter Overview

This chapter covers the two basic approaches to valuing common stocks: (i) Discounted Cash Flow (DCF) techniques, and (ii) Relative Valuation techniques. The DCF approach uses the Dividend Discount Model (DDM) in its various forms – zero growth, constant growth, and multiple growth. Relative valuation uses multiples like the P/E ratio.

Learning Objectives

- Understand the discounted cash flow approach to equity valuation
- Apply the Zero Growth, Constant Growth (Gordon), and Multiple Growth models
- Determine intrinsic value and compare with market price
- Understand the P/E ratio and its determinants
- Apply relative valuation techniques

6.1.1 Discounted Cash Flow Techniques – Introduction

Basic Concept

The value of a security is estimated by a present value process involving the capitalization (discounting) of expected future cash flows. The estimated value of a security is equal to the discounted (present) value of the future stream of cash flows that an investor expects to receive from the security.

General Valuation Model

$$V_0 = \sum_{t=1}^{\infty} [C_t \div (1 + k)^t]$$

V_0 : Present value of asset at time 0 **C_t :** Payment at time t

k: Discount rate / capitalization rate / required rate of return

 **The basis of all DCF valuation models**

💡 Two Components of DCF

- **Required Rate of Return (k):** Minimum expected rate of return necessary to induce an investor to buy a particular stock, given its risk
- **Expected Future Cash Flows:** The stream of dividends (the only cash flow stream directly received by investors under normal conditions)

Σ Dividend Discount Model (DDM)

$$V_0 = D_1/(1+k)^1 + D_2/(1+k)^2 + \dots + D_\infty/(1+k)^\infty$$

$$V_0 = \sum_{t=1}^{\infty} [D_t \div (1 + k)^t]$$

D_t: Dividend expected in each future period **k:** Required rate of return / discount rate / opportunity cost

✓ **Foundation for understanding fundamental valuation of common stocks**

6.1.2 Dividend Discount Model – Zero Growth

Concept

A zero growth rate equal to a fixed money (rupee) dividend. For example, a firm pays a dividend of ₹10 per share annually and has no plans to change this amount. The zero growth rate dividend case reduces to a perpetuity.

Zero Growth Model

$$V_0 = D_0 \div k$$

D_0 : Constant annual dividend k : Required rate of return

 **Use when dividends are expected to remain constant forever (e.g., preference shares)**

 *This is the perpetuity formula: $PV = \text{Annual Cash Flow} \div \text{Discount Rate}$*

Illustration – Zero Growth Model

India Incorporated currently pays a dividend of ₹10 per share and it will be constant during the lifetime of the corporation. If the required rate of return of the investor is 14% a year, what will be the value of the stock using zero growth rate model?

$$V_0 = D_0 \div k = 10 \div 0.14 = ₹71.43$$

Value of the stock = ₹71.43

6.1.3 Constant Growth Model (Gordon Growth Model)

Concept

Under this model, dividends are expected to grow at a constant growth rate over time. This constant or normal growth rate model is used for mature companies with stable dividend growth.

Σ Constant Growth Model

$$V_0 = D_0(1+g) \div (k - g) = D_1 \div (k - g)$$

D₀: Current dividend **D₁**: Next year's expected dividend = $D_0(1+g)$ **g**: Constant growth rate

k: Required rate of return

✓ **Use for mature companies with stable growth; k must be > g**

△ *If $k < g$, the model breaks down (negative value). This is a limitation.*

Σ Modified Constant Growth Model (with EPS)

$$V_0 = E_1(1 - b) \div (k - g)$$

E₁: Next year's EPS **b**: Retention rate **(1 - b)**: Payout ratio **g = b × ROE**

Illustration – Constant Growth Model

MN Limited is expected to grow at 8% per annum and currently pays ₹10 as dividend. For investments at this risk level, investor requires a return of 15% a year. What is the estimated value of the stock?

$$D_1 = D_0 \times (1 + g) = 10 \times 1.08 = ₹10.80$$

$$V_0 = D_1 \div (k - g) = 10.80 \div (0.15 - 0.08) = 10.80 \div 0.07 = ₹154.29$$

Estimated value = ₹154.29

Exam Presentation: Show D_1 calculation separately, then apply the formula. State that $k > g$ is satisfied.

Sensitivity of Constant Growth Model

One of the major limitations of the DDM is that it is very sensitive. A relatively small change in the inputs (k or g) can change the value by large percentage amounts.

- If k increases from 15% to 16%, value decreases from ₹154.29 to ₹135 (12.5% decrease)
- If g increases from 8% to 9%, value increases from ₹154.29 to ₹181.67 (17.74% increase)
- If k increases to 18% and g drops to 4%, value drops to ₹74.29 (51.85% decrease)

6.1.4 Multiple Growth Rate Model

Concept

Many firms grow at a rapid rate for a number of years and then slow down to an "average" growth rate. Many companies do not pay dividends at their early growth stage. The constant growth model is unable to tackle this situation. The multiple growth model uses two or more growth rates (one of which could be zero).

Three Steps in Multiple Growth Model

- 1 **Step I:** Compute PV of dividend stream during super normal growth period
- 2 **Step II:** Calculate value of share at end of initial growth period using constant growth model, then discount to present
- 3 **Step III:** Add Steps I and II to find present value (V_0)

Multiple Growth Rate Model

$$V_0 = \sum_{t=1}^n [D_t \div (1+k)^t] + [D_{n+1} \div (k - g_n)] \times [1 \div (1+k)^n]$$

D_t : Dividend during super normal growth period g_a : Super normal growth rate

g_n : Normal growth rate after super normal period $D_{n+1} = D_1(1+g_a)^{n-1}(1+g_n)$

 **Use when company has high growth initially then slows to stable growth**

Illustration – Two-Stage Growth Model

Consider the equity share of India Incorporated:

$D_0 = ₹3.00$; $n = 5$ years (super normal growth period); $g_a = 25\%$; $g_n = 7\%$; $k = 14\%$

Find the price of the equity share under Multiple Growth Rate Model.

Step I: Dividend stream during super normal growth period

$D_1 = 3.00(1.25) = 3.75$; $D_2 = 3.00(1.25)^2 = 4.6875$; $D_3 = 3.00(1.25)^3 = 5.859$; $D_4 = 3.00(1.25)^4 = 7.324$; $D_5 = 3.00(1.25)^5 = 9.155$

PV of dividends $= 3.75/(1.14)^1 + 4.6875/(1.14)^2 + 5.859/(1.14)^3 + 7.324/(1.14)^4 + 9.155/(1.14)^5$
 $= 3.29 + 3.61 + 3.96 + 4.34 + 4.76 = ₹19.96$

Step II: Price at end of 5 years

$D_6 = D_5 \times (1 + g_n) = 9.155 \times 1.07 = 9.796$

$P_5 = D_6 \div (k - g_n) = 9.796 \div (0.14 - 0.07) = 9.796 \div 0.07 = ₹139.94$

Discounted value $= 139.94 \div (1.14)^5 = 139.94 \div 1.9254 = ₹72.71$

Step III: Total Value

$V_0 = ₹19.96 + ₹72.71 = ₹92.67$

Intrinsic value = ₹92.67



Three-Phase Model

In the three-phase model, dividends grow at a constant rate 'g' for period 'A' years, then the growth rate declines linearly for 'B' years, and afterwards there is perpetual growth rate ' g_n '. The perpetual growth rate is the firm's long-run normal growth rate.

6.1.5 Intrinsic Value and Market Price

Importance of Intrinsic Value

Situation	Interpretation	Action
$V_0 > P_0$	Asset is undervalued (intrinsic value exceeds market price)	Purchase or hold if already acquired
$V_0 < P_0$	Asset is overvalued (intrinsic value less than market price)	Avoid, sell if held, or sell short
$V_0 = P_0$	Asset is correctly priced (equilibrium)	Indifferent

6.1.6 Relative Valuation – P/E Ratio and Determinants

Concept

The P/E ratio or earnings multiplier approach is the best known and most widely used valuation technique. The P/E ratio is simply the number of times investors value earnings expressed in the stock price.

P/E Ratio Definition

$$P_0 = E_0 \times (P_0/E_0)$$

P_0 : Current stock price E_0 : Most recent 12-month earnings per share P_0/E_0 : P/E multiple

Determinants of P/E Ratio

$$P_0/E_1 = (D_1/E_1) \div (k - g)$$

D_1/E_1 : Expected dividend payout ratio k : Required rate of return g : Expected growth rate of dividends

 Derived from the constant growth DDM

💡 Factors Affecting P/E Ratio

- Higher expected payout ratio → Higher P/E ratio
- Higher expected growth rate (g) → Higher P/E ratio
- Higher required rate of return (k) → Lower P/E ratio

💡 Relationship: Growth, P/E, and Dividend Yield

- As expected growth in dividends increases, expected return depends more on capital gains and less on dividend yield
- P/E ratio increases as expected growth rate increases
- High dividend yield + Low P/E ratio → Limited growth prospects
- Low dividend yield + High P/E ratio → Considerable growth prospects

Σ P/E and Growth

$$g = b \times \text{ROE}$$

$$P_0/E_1 = (1 - b) \div [k - (\text{ROE} \times b)]$$

b: Retention rate **(1 - b):** Payout ratio **ROE:** Return on equity **k:** Required rate of return

✅ The growth rate of a growing firm that is sustainable equals P_0/E_1

Illustration – P/E Ratio

A company has an EPS of ₹5 for the current year and a DPS of ₹2. The earnings growth rate during the past four years was 4% and expected to grow at 2% a year in the long run. Currently, it is trading at 7 times its earnings. If the required rate of return is 14%, compute: (a) An estimate of the P/E ratio (b) The long-term growth rate implied by the current P/E ratio.

(a) Estimate of P/E ratio:

$$P_0 = D_0(1+g) \div (k - g) = 2(1.02) \div (0.14 - 0.02) = 2.04 \div 0.12 = ₹17$$

$$\text{P/E ratio} = P_0 \div \text{EPS} = 17 \div 5 = 3.4$$

(b) Long-term growth rate implied by current P/E ratio:

$$P_0/E_0 = 7 \text{ (given)}$$

$$(1 - b) \times (1 + g) \div (k - g) = 7$$

$$(2/5) \times (1 + g) \div (0.14 - g) = 7$$

$$0.4(1+g) = 7(0.14 - g)$$

$$0.4 + 0.4g = 0.98 - 7g$$

$$7.4g = 0.58$$

$$g = 0.0784 \text{ or } 7.84\%$$

(a) P/E ratio = 3.4

(b) Implied growth rate = 7.84%

10 10 MARKS AREA – Equity Valuation

Comprehensive numerical covering DDM – constant growth, multiple growth, P/E ratio, and intrinsic value vs market price. Frequently asked.

6.2 Bond Valuation – Prices & Yields

Chapter Overview

This chapter covers the valuation of bonds and the relationship between bond prices and yields. It explains bond characteristics, types of bonds, pricing of annual and semi-annual bonds, and various yield measures including current yield, YTM, YTC, and realized compound yield.

Learning Objectives

- Understand bond characteristics and types of bonds
- Apply bond pricing formula for annual and semi-annual bonds
- Calculate various yield measures: Current Yield, YTM, YTC, RCY
- Understand the price-yield relationship
- Appreciate the concept of duration and bond volatility

6.2.1 Bond Characteristics and Types



Bond Characteristics

Characteristic	Description
Face Value	Stated on the face of the bond; also known as par value. Normally issued at ₹1,000
Coupon Rate	Specific rate of interest paid by the issuer to the holder. Interest typically paid semi-annually
Maturity	Specific period after which the bond is repaid. Corporate: 7-10 years; Government: up to 30 years
Redemption Value	Value bondholder gets on maturity. May be at par, premium, or discount
Market Value	Price at which bond is bought or sold. May differ from redemption value
Call Date	Date at which a callable bond can be redeemed by the issuer prior to maturity
Call Price	Amount issuer has to pay to call a callable bond
Required Return	Rate of return demanded currently by an investor on a bond
Yield to Call (YTC)	Rate of return if bond is bought at current market price and held until called
Yield to Maturity (YTM)	Rate of return if bought at current market price and held until maturity

Types of Bonds



Zero Coupon Bond

Issued at discount; repaid at face value; no periodic interest



Convertible Bond

Carries option to convert into equity at fixed conversion price



Bearer Bonds

Official certificate issued without recording name of holder; risky



Registered Bonds

Ownership recorded by issuer or transfer agent



Term Bonds

Run for specific term; then become due and payable



Serial Bonds

Specific principal amounts become due on specified dates prior to maturity



Puttable Bonds

Bondholder can sell issue back to issuer at par on designated dates



Callable Bonds

Issuer can pay off debt before maturity at option of issuer



Exchangeable Bonds

Bondholder can exchange bonds for common stock of another firm



Fixed Rate Bonds

Coupon rate remains constant throughout life of bond



High Yield Bonds

Rated below investment grade; also called junk bonds



Mortgage Bonds

Secured through lien against property of firm



Subordinated Bonds

Lower priority than secured debts, debentures, other bonds



Guaranteed Bonds

Obligation guaranteed by another entity



Perpetual Bonds

Also called perpetuities; no maturity date



Global Bonds

Designed for immediate trading in any domestic capital market and Euro market



Easy Exit Bonds

Provide easy liquidity and exit route to investors by way of redemption or buyback



Option Bonds

Cumulative and non-cumulative; interest payable on maturity or periodically



Double Option Bonds

Face value ₹5,000; two parts: principal certificate and interest certificate



Floating Rate Bonds

Interest rate not fixed; floats depending on market conditions



Inflation Bonds

Interest rate adjusted for inflation; investor

protected from inflation
effects

6.2.2 Bond Pricing – Annual and Semi-Annual

Valuation Principle

The price of a bond should equal the present value of its expected cash flows. The coupons and the principal repayment of face value are known, and the present value (or price) can be determined by discounting these future payments from the issuer at an appropriate required yield (r) for the issue.

Bond Pricing Formula – Annual

$$P_0 = \sum_{t=1}^n [C_t \div (1+r)^t] + [FV \div (1+r)^n]$$

$$P = C \times PVIFA_{r,n} + FV \times PVIF_{r,n}$$

P_0 : Present value or price of bond today **C :** Annual coupon or interest payment

FV : Face value (or par value) of bond **n :** Number of years until bond matures

r : Appropriate discount rate or market yield

Bond Pricing Formula – Semi-Annual

$$P = \sum_{t=1}^{2n} [(C/2) \div (1+r/2)^t] + [FV \div (1+r/2)^{2n}]$$

$$P = (C/2) \times PVIFA_{r/2,2n} + FV \times PVIF_{r/2,2n}$$

$C/2$: Semi-annual coupon payment **$r/2$:** Periodic applicable to half year period

$2n$: Maturity period expressed in half yearly periods

 **Most bonds pay interest semi-annually**

Illustration – Bond Pricing (Annual)

Consider a 10-year, 12% coupon bond with a par value of ₹10,000. Assume that the required yield on this bond is 13%. Find out the value of the bond.

$$\begin{aligned}\text{Coupon payment} &= 12\% \times ₹10,000 = ₹1,200 \text{ per year} \\ P &= 1200 \times \text{PVIFA}(13\%, 10) + 10,000 \times \text{PVIF}(13\%, 10) \\ P &= 1200 \times 5.426 + 10,000 \times 0.295 \\ P &= 6,511.2 + 2,950 = ₹9,461.2\end{aligned}$$

Value of the bond = ₹9,461.2

Exam Presentation: Show coupon calculation, PVIFA and PVIF values, and final addition clearly.

Illustration – Bond Pricing (Semi-Annual)

Consider an 8-year, 12% coupon bond with a par value of ₹1,000 on which interest is payable semi-annually. The required rate of return on this bond is 14%. Find out the value of the bond.

$$\begin{aligned}\text{Semi-annual coupon} &= 12\% \times 1,000 \div 2 = ₹60 \\ \text{Number of periods} &= 8 \times 2 = 16 \\ \text{Semi-annual yield} &= 14\% \div 2 = 7\% \\ P &= 60 \times \text{PVIFA}(7\%, 16) + 1,000 \times \text{PVIF}(7\%, 16) \\ P &= 60 \times 9.447 + 1,000 \times 0.339 \\ P &= 566.82 + 339 = ₹905.82\end{aligned}$$

Value of the bond = ₹906 (approx.)

Bond Price and Required Yield

Relationship	Bond Price	Bond Type
Coupon Rate > Required Yield	Price > Par	Premium Bond
Coupon Rate = Required Yield	Price = Par	Par Bond
Coupon Rate < Required Yield	Price < Par	Discount Bond

6.2.3 Bond Yields – Current Yield, YTM, YTC, RCY



Current Yield

Measures rate of return earned on a bond if purchased at current market price and coupon interest received.

Formula: $\text{Annual Interest} \div \text{Current Market Price}$.

Not a true measure of return as it ignores difference between purchase price and redemption at par.



Yield to Maturity (YTM)

Promised compounded rate of return if bond held to maturity and coupons reinvested at YTM. It is the discount rate that equates present value of future cash flows to current price. Also called IRR of the bond.



Yield to Call (YTC)

Rate of return if bond is bought at current market price and held until called. More realistic for bonds likely to be called.



Realized Compound Yield (RCY)

Measures compound yield actually earned over investment period, taking into account all immediate cash flows and reinvestment rates. $\text{RCY} = [(\text{Total ending wealth} \div \text{Purchase price})^{1/n} - 1]$

Σ Current Yield

$$\text{Current Yield} = \text{Annual Interest} \div \text{Current Market Price}$$

Example: 10% bond with market price ₹920 → Current Yield = $100 \div 920 = 10.87\%$

Σ Yield to Maturity (YTM) – Trial and Error

$$P_0 = \sum_{t=1}^n [C_t \div (1+YTM)^t] + [FV \div (1+YTM)^n]$$

YTM is the discount rate that makes PV of future cash flows equal to current price

Found through interpolation between two rates

△ YTM assumes bond held to maturity AND coupons reinvested at YTM

Σ YTM Approximation Formula

$$\text{YTM} \approx [C + (M - P)/n] \div [0.4M + 0.6P]$$

C: Annual coupon payment **M:** Maturity value **P:** Present value (price) of bond **n:** Years to maturity

✓ Quick approximation method to find YTM without trial and error

Σ Zero Coupon Bond YTM

$$\text{YTM} = (\text{FV} \div \text{P})^{1/n} - 1$$

Only cash flow is face value at maturity

Illustration – YTM Calculation

Consider a ₹1,000 par value bond whose current market price is ₹850. The bond carries a coupon rate of 8% and has a maturity period of 9 years. What is the YTM?

Approximation Method:

$$\begin{aligned}\text{YTM} &\approx [80 + (1000 - 850)/9] \div [0.4(1000) + 0.6(850)] \\ &= [80 + 16.67] \div [400 + 510] \\ &= 96.67 \div 910 = 10.62\%\end{aligned}$$

Exact (Spreadsheet): YTM = 10.67% p.a. (annual); 10.63% (semi-annual)

YTM ≈ 10.62% (approximation); 10.67% (exact)

Illustration – Yield to Call

Suppose the 8% coupon, 20-year maturity bond sells for ₹1,120 and is callable in 10 years at a call price of ₹1,090. Calculate YTM and YTC.

YTM Calculation:

Coupon payment = 40 (semi-annual), Number of periods = 40, Final payment = 1,000, Present price = 1,120

YTM = 7.00% (from spreadsheet)

YTC Calculation:

Coupon payment = 40, Number of periods = 20, Final payment = 1,090, Present price = 1,120

YTC = 6.95% (from spreadsheet)

YTM = 7.00%; YTC = 6.95%

Realized Compound Yield (RCY)

Σ Realized Compound Yield

$$\text{RCY} = [(\text{Total Ending Wealth} \div \text{Purchase Price of Bond})^{1/n}] - 1$$

Total Ending Wealth: Sum of all reinvested coupons + principal **n:** Investment period

✓ **Use when reinvestment rate differs from YTM**

Illustration – Realized Compound Yield

An investor had ₹1,000 to invest 2 years ago. The investor purchased a 10% coupon bond with a two-year maturity at face value. The promised YTM for this bond was 10%. Assume that investor invested exactly at 10% at the end of each year and after 2 years the amount would come exactly at ₹1,210.

At time 0: Investment = ₹1,000

Add: Interest at end of 1st year reinvested @ 10% = ₹100

Opening balance at beginning of year 2 = ₹1,100

Add: Interest at end of 2nd year reinvested @ 10% = ₹110

Ending value = ₹1,210

$$P_2 = P_0[(1+r)^2]$$

$$₹1,000(1+r)^2 = ₹1,000[(1+0.10)^2] = ₹1,210$$

$$r = 0.10 = 10\%$$

RCY = 10% (equal to YTM when reinvestment rate = YTM)

Exam Tip: When reinvestment rate equals YTM, RCY = YTM. If reinvestment rate differs, RCY will differ from YTM.

6.2.4 Price-Yield Relationship

Basic Property

The basic property of a bond is that **its price varies inversely with yield**. If the required yield decreases, the present value of the cash flow increases; hence the price of the bond increases. Conversely, when the required yield increases, the present value of cash flow decreases.

Price-Yield Relationship

Yield Movement	Bond Price	Relationship
Yield decreases	Price increases	Inverse
Yield increases	Price decreases	Inverse

Key Relationships

- **Coupon Rate > Required Yield → Price > Par (Premium Bond)**
- **Coupon Rate = Required Yield → Price = Par**
- **Coupon Rate < Required Yield → Price < Par (Discount Bond)**
- The higher the coupon rate, the smaller the percentage price change due to any given change in interest rate
- The graph of the price-yield relationship for a bond has a convex shape
- Bond volatility is inversely related to both coupon rate and yield to maturity
- Bond volatility is directly related to term to maturity

Example – Price-Yield Relationship

Consider a bond carrying a coupon rate of 14% issued 3 years ago for ₹1,000 (par value) by XYZ Co. The original maturity of bond was 10 years; residual maturity is now 7 years. Interest rates have fallen in the last 3 years and investors now expect a return of 10% from this bond.

Price of the bond now:

$$P = 140 \times PVIFA(10\%, 7) + 1,000 \times PVIF(10\%, 7)$$

$$P = 140 \times 4.868 + 1,000 \times 0.513 = 681.52 + 513 = ₹1,194.70$$

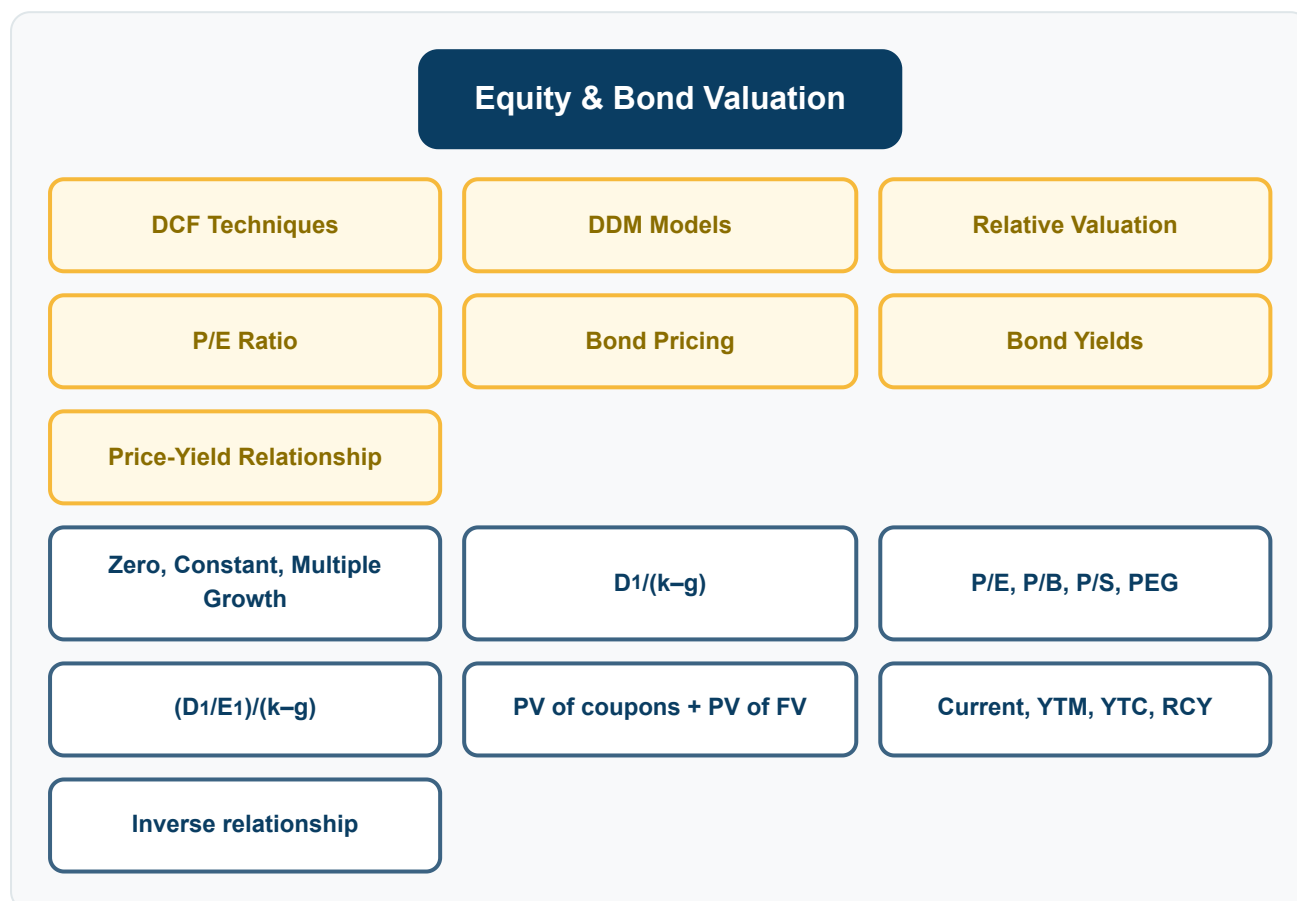
Since required yield (10%) < coupon rate (14%), the bond sells at a **premium**.

10 10 MARKS AREA – Bond Valuation

Comprehensive numerical covering bond pricing, YTM, YTC, and price-yield relationship. Frequently asked.

Module 6 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 6



Key Points for Revision

1. DCF value = PV of expected future cash flows
2. DDM = PV of future dividends
3. Zero growth: $V_0 = D_0 \div k$
4. Constant growth: $V_0 = D_1 \div (k - g)$
5. Gordon model requires $k > g$
6. Multiple growth: Super normal growth → Normal growth
7. Three-step method for multiple growth model
8. Three-phase model: Constant → Declining → Perpetual
9. Intrinsic value > Market price → Underpriced → Buy
10. Intrinsic value < Market price → Overpriced → Sell
11. Intrinsic value = Market price → Correctly priced → Hold
12. P/E ratio = Stock price ÷ EPS
13. P/E determinants: Payout ratio, growth rate, required return
14. Higher payout → Higher P/E; Higher growth → Higher P/E; Higher k → Lower P/E
15. P/E and interest rates have inverse relationship
16. Bond price = PV of coupons + PV of face value
17. Semi-annual: Divide coupon and yield by 2; multiply periods by 2
18. Coupon rate > Yield → Premium; Coupon < Yield → Discount
19. Current Yield = Annual Interest ÷ Market Price
20. YTM = Discount rate equating PV of cash flows to price
21. YTM approximation: $[C + (M - P)/n] \div [0.4M + 0.6P]$
22. YTC = Yield if bond called before maturity
23. RCY = Actual compound yield considering reinvestment
24. Price and yield have inverse relationship
25. Bond volatility inversely related to coupon and yield; directly to maturity
26. Zero coupon bond: $YTM = (FV/P)^{1/n} - 1$
27. Bond price-yield curve is convex

Comprehensive Formula Handbook – Module 6

General DCF

$$V_0 = \sum C_t \div (1+k)^t$$

DDM

$$V_0 = \sum D_t \div (1+k)^t$$

Zero Growth	$V_0 = D_0 \div k$
Constant Growth (Gordon)	$V_0 = D_1 \div (k - g)$
Multiple Growth	$\Sigma D_t / (1+k)^t + [D_{n+1} / (k - g_n)] / (1+k)^n$
P/E Ratio	$P/E = \text{Stock Price} \div \text{EPS}$
P/E Determinants	$(D_1 / E_1) \div (k - g)$
Bond Price (Annual)	$C \times \text{PVIFA}_{r,n} + \text{FV} \times \text{PVIF}_{r,n}$
Bond Price (Semi-Annual)	$(C/2) \times \text{PVIFA}_{r/2,2n} + \text{FV} \times \text{PVIF}_{r/2,2n}$
Current Yield	$\text{Annual Interest} \div \text{Market Price}$
YTM (Approx)	$[C + (M - P)/n] \div [0.4M + 0.6P]$
Zero Coupon YTM	$(\text{FV}/P)^{1/n} - 1$
RCY	$[(\text{Total Ending Wealth} \div \text{Purchase Price})^{1/n}] - 1$

One-Night Revision Notes – Module 6

Last Night Before Exam – Module 6

- **DDM:** PV of future dividends. Zero growth: D_0/k . Constant: $D_1/(k-g)$. Multiple: Super normal + Normal.
- **Gordon Model:** $V_0 = D_1/(k-g)$. Requires $k > g$.
- **Intrinsic Value vs Market Price:** $V_0 > P_0 \rightarrow \text{Buy}$; $V_0 < P_0 \rightarrow \text{Sell}$; $V_0 = P_0 \rightarrow \text{Hold}$.
- **P/E Ratio:** Stock Price $\div$ EPS. Determinants: Payout, growth, required return.
- **P/E relationship:** Higher payout $\rightarrow$ Higher P/E; Higher growth $\rightarrow$ Higher P/E; Higher $k \rightarrow$ Lower P/E.
- **Bond Pricing:** PV of coupons + PV of face value. Semi-annual: divide C and r by 2, multiply n by 2.
- **Premium Bond:** Coupon $>$ Yield. **Discount Bond:** Coupon $<$ Yield.
- **Current Yield:** Annual Interest $\div$ Market Price.
- **YTM:** Discount rate where PV of cash flows = price. Approximation: $[C + (M-P)/n] \div [0.4M + 0.6P]$.
- **YTC:** Yield if bond called. **RCY:** Actual compound yield with reinvestment.
- **Price-Yield:** Inverse relationship. Price-yield curve is convex. Volatility inversely related to coupon and yield; directly to maturity.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- DDM – Zero, Constant, Multiple Growth – 5–10 marks
- Two-stage/Three-stage Growth Model – 10 marks
- P/E Ratio and Determinants – 5 marks
- Bond Pricing – Annual and Semi-Annual – 5–10 marks
- YTM Calculation – 5–10 marks
- Yield to Call – 5 marks
- Realized Compound Yield – 5 marks
- Price-Yield Relationship – 5 marks
- Types of Bonds – 5 marks

Final Checklist – Module 6

Before Moving to Module 7

- Can I apply Zero Growth, Constant Growth, and Multiple Growth models?
- Can I calculate intrinsic value and compare with market price?
- Can I compute P/E ratio and its determinants?
- Can I price annual and semi-annual bonds?
- Can I calculate Current Yield, YTM, YTC, and RCY?
- Can I explain the price-yield relationship?
- Can I list and explain types of bonds?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 10 numericals from this module?

END OF MODULE 6

Module 7 – Mutual Funds

will be generated upon request.

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MANAGEMENT

07

Mutual Funds

Master Revision Handbook · December 2026 Edition

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Module 7 – Mutual Funds

Module Objective

Primary Objective

To equip oneself with the knowledge of application of various techniques in security evaluation, building a portfolio, measuring its performance and making revisions to optimise the returns. To understand the basic concepts associated with mutual funds, appreciate relevant regulations relating to mutual funds in India, learn the process of calculation of NAV of mutual funds units, understand various ways of measuring the performance of mutual funds, and learn basic concepts associated with ETFs, REITs and InvITs.

Mapped CMLO: 3a

Learning Outcomes

Students will be able to...	Application Skill
Understand the basic concepts associated with mutual funds, appreciate relevant regulations, and learn the process of calculation of NAV.	Compute NAV, evaluate mutual fund performance, and interpret regulatory framework.
Understand various ways of measuring the performance of mutual funds and learn basic concepts associated with ETFs, REITs and InvITs.	Apply Sharpe, Treynor, and Jensen measures; analyse ETFs, REITs, and InvITs.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
7.1	Meaning, Advantages and Disadvantages, Structure and Types	HIGH 2%	Theory
7.2	Regulations	MEDIUM 1%	Theory
7.3	Computation of NAV	HIGH 1%	Numerical
7.4	Evaluation of Performance and Movements in NAVs	HIGH 0.5%	Numerical + Theory
7.5	ETF, REIT, InvIT	MEDIUM 0.5%	Theory

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- NAV computation – **5 marks**
- Performance evaluation – Sharpe, Treynor, Jensen – **5–10 marks**
- Mutual fund structure and types – **5 marks**
- SEBI regulations – **5 marks**
- ETF, REIT, InvIT – **5 marks**
- Difference between open-end and close-end funds – **5 marks**

Frequently Tested Concepts

Module 7 – Concept Flow

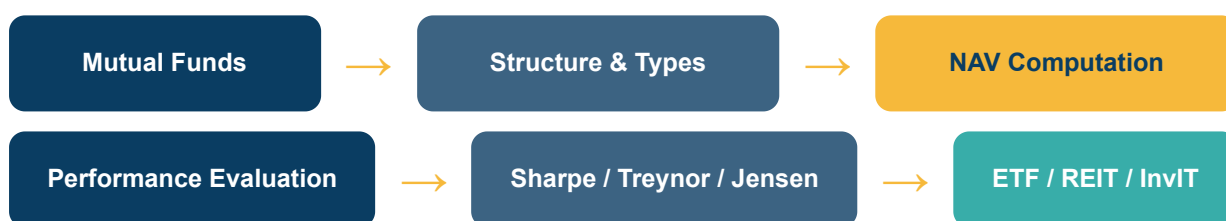


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★ FREQUENTLY ASKED – MODULE 7

- **NAV calculation** – numerical
- **Sharpe, Treynor, Jensen** – numerical + theory
- **Open-end vs Close-end funds** – comparison
- **SEBI regulations** – investment limits
- **ETF, REIT, InvIT** – features and differences

7.1 Meaning, Advantages and Disadvantages, Structure and Types

Chapter Overview

This chapter introduces the concept of mutual funds, the entities involved in their structure, the historical development in India, and the various types of mutual fund schemes available to investors.

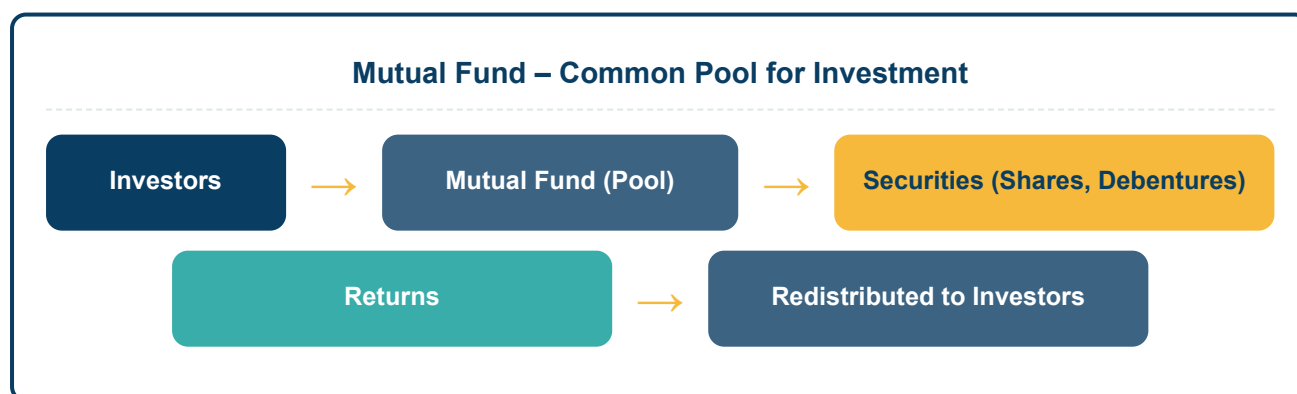
Learning Objectives

- Understand the meaning and concept of mutual funds
- Identify the entities involved in a mutual fund structure
- Trace the history and growth of mutual funds in India
- Classify mutual fund schemes by operation and investment objective
- Appreciate the advantages and disadvantages of mutual funds

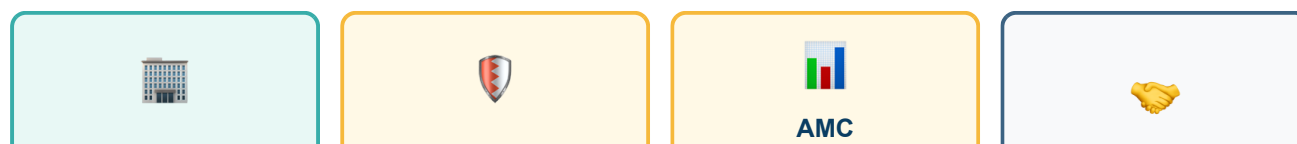
7.1.1 Meaning of Mutual Fund

Definition

A Mutual Fund is a trust that pools the savings of a number of investors who share a common financial goal. The money thus collected is then invested in capital market instruments such as shares, debentures and other securities. The income earned through these investments and the capital appreciations realized are shared by its unit holders in proportion to the number of units owned by them.



7.1.2 Entities Involved





💡 SEBI Guidelines for AMC

- Headed by independent non-interested and non-executive chairman
- Managing director and other executive staff should be full-time employees
- 50% of board of trustees should be outside directors not connected with AMC
- AMC not permitted to conduct merchant banking or issue management activities

7.1.3 History of Mutual Fund in India

Five Phases of Mutual Fund Industry in India

Phase	Period	Key Developments
Phase I	1964–1987	Establishment and Growth of Unit Trust of India (UTI); US-64 launched; RBI control until 1978; transferred to IDBI
Phase II	1987–1993	Entry of Public Sector Funds; SBI, PNB, Canara Bank, Bank of India, Bank of Baroda, LIC, GIC set up mutual funds
Phase III	1993–1996	Emergence of Private Sector Banks; Kothari Pioneer (now Franklin Templeton) first private sector mutual fund (July 1993)
Phase IV	1996–2004	Growth and SEBI Regulation; SEBI (Mutual Funds) Regulation 1996; tax benefits; investor awareness programmes
Phase V	2004 Onwards	Growth and Consolidation; mergers and acquisitions; entry of international players like Fidelity, Franklin Templeton

7.1.4 Types of Schemes

Classification of Mutual Funds



By Operations

Open-Ended, Close-Ended, Interval



By Investment Objectives

Growth, Income, Balanced, Money Market, Gilt, Floating Rate, High Yield Debt, Monthly Income, Sector



Others

Index, Tax-Saving, ETF, Gold ETF, Fund of Funds, Assured Return, Arbitrage, Load/Unload, Life Style

Open-Ended vs Close-Ended Funds

Aspect	Open-Ended Funds	Close-Ended Funds
Initial Subscription	Available for subscription all through the year	Open for subscription only during a specified period
Maturity	No fixed maturity	Stipulated maturity period (3 to 15 years)
Subsequent Transactions	Buy and sell units at NAV related prices	Buy/sell units on stock exchanges where listed
Repurchase	Any time at NAV	Based on terms of fund; periodic repurchase at NAV
Corpus	Changes daily	Remains fixed till redemption
Listing	Not required to be listed	Listed on stock exchanges
Liquidity	High; direct with MF	Depends on stock exchange trading

Classification by Investment Objectives

 Growth Fund Capital appreciation over medium to long-term; invests in equity and equity-linked instruments; higher risk	 Income Fund Regular and constant income; invests in fixed income securities; less risky than equity	 Balanced Fund Both capital appreciation and periodic returns; typically 60% equity and 40% debt	 Money Market Funds Easy liquidity, preservation of capital, moderate income; invest in treasury bills, CDs, commercial paper
 Gilt Funds Exclusively in Government securities; highest safety; low returns	 Floating Rate Funds Securities with floating rate interest; short-term and long-term types	 High Yield Debt Funds Invest in lower credit ratings; also called junk bond funds; popular abroad, not prevalent in India	 Monthly Income Plan (MIP) Marginal equity product; conservative investors; low to medium risk
 Sector Funds Allocate capital in specified sector/industry; no diversification; higher risk			

Other Funds

 Index Fund Replicates performance of well-established stock market index; invests in all stocks in same proportion as index	 Tax-Saving Funds (ELSS) Offer rebates under Section 80C; lock-in period of 3 years	 Exchange Traded Funds (ETFs) Basket of stocks tracking a sector, style, geography or market; traded on exchanges	 Gold ETFs Track price of physical gold; each unit allows ownership of 1g gold; no physical transaction; no carrying cost
 Fund of Funds (FOFs) Mutual fund that invests in other mutual funds; greater diversification	 Assured Return Schemes Assure specific return to investors irrespective of	 Arbitrage Funds Derive benefits from price differences between cash and futures; low risk, moderate returns	 Load Fund Charges percentage of NAV for entry or exit; used for marketing and distribution

	performance; stated in offer document		
 Life Style Fund Asset mix determined by risk and return appropriate for individual investor; based on age, risk appetite, purpose			

7.1.5 Advantages and Disadvantages of Mutual Funds

Advantages of Mutual Funds

 Professional Management Managed by highly experienced professional managers with requisite skills and research team	 Diversification Funds allocated across industries and sectors; diversified portfolio with small investment	 Convenient Administration Reduces administrative jargons; saves time; avoids bad deliveries, delayed payments	 Return Potential Potential to provide high return over medium to long-term
 Low Costs Brokerage, custodial and other fees relatively less than direct investing	 Liquidity Open-ended: prompt money back at NAV; Close-ended: sell on stock exchange	 Transparency Regular disclosure of NAV, portfolio, proportion invested, fund manager's strategy	 Flexibility SIP, SWP, dividend reinvestment plans; switch between funds
 Choice of Schemes Cater to different investor needs; switch from growth to income and vice-versa	 Investment Strategy Large corpus allows small investor to benefit from affordability	 Well Regulated Registered with SEBI; strict regulations; regular monitoring	

Limitations of Mutual Funds

 No Guarantee Against Loss Diversification reduces risk but does not ensure against losses during turmoil	 Poor Performance Many funds perform below benchmark due to poor fund managers and policies	 No Choice Investors have no option while choosing securities they want to invest in	 Below Benchmark Returns Many funds provide positive returns but well below benchmark level
 Past Performance Not Guarantee Past performance of mutual funds may not	 Timing Constraints Most mutual funds cannot be bought/sold mid-day;	 Dilution Diversification has disadvantage of dilution; single security may	 Excessive Fees Annual fund operative fees 1-3%; charged

guarantee good return in future

only at end of day once NAV calculated

double/triple while MF counts small part

regardless of performance



Cash Reserves

Large cash reserves maintained against withdrawals; lowers potential return

5 5 MARKS AREA – Advantages & Disadvantages

List and explain the advantages and disadvantages of mutual funds. Frequently asked as a 5-mark theory question.

7.2 Regulations

Chapter Overview

This chapter covers the regulatory framework governing mutual funds in India, including SEBI regulations, investment restrictions, investor rights, and the role of trustees and AMCs.

Learning Objectives

- Understand SEBI regulations for mutual funds
- Identify restrictions and conditions for investments by mutual funds
- Appreciate investor rights and obligations
- Understand the role and eligibility of trustees
- Learn criteria for appointment of AMC and other conditions

7.2.1 Establishment of a Mutual Fund

SEBI Regulations

- Mutual Funds must be registered with SEBI for collecting funds from the public
- Governed by SEBI (Mutual Funds) Regulations, 1996
- Subject to monitoring and inspection by SEBI

Sponsor – Conditions

- Sound track record and general reputation of fairness and integrity
- Carrying on business in financial services for not less than five years
- Net worth positive in all immediately preceding five years
- Net worth in immediately preceding year more than capital contribution of sponsor in AMC
- Profits after providing depreciation, interest and tax in three out of immediately preceding five years
- Contribute at least 40% to Net Worth of AMC
- Deed executed by Sponsor in favour of trustees named in instrument of trust

7.2.2 Restrictions and Conditions for Investments by Mutual Funds

Instrument / Investment in	Quantum of Investment
Debt instruments of a single issuer and Mortgage backed Securitised Debt	15% of NAV of the Scheme; 20% with approval of Board of Trustees and AMC
Unrated Debt Instruments (with approval of Board of Trustees and AMC)	Individually – 10% of NAV of Scheme; Aggregate Investment – 25% of NAV of Scheme
Share Capital of a Company	10% of the Company's Paid Up Capital
Scheme under same AMC or other Mutual Fund under same management	5% of the NAV of the Mutual Fund
Equity Shares or Equity Related instruments of a Company	10% of the NAV of the Scheme; not applicable to index/sector specific schemes
Unlisted Equity Shares/Equity Related instrument – Open Ended Scheme	5% of the NAV of the scheme
Unlisted Equity Shares/Equity Related instrument – Close Ended Scheme	10% of the NAV of the scheme

Prohibited Investments

- Any unlisted security of an Associate or Group Company of the Sponsor
- Any security issued by way of private placement by an Associate or Group Company of the Sponsor
- Listed securities of Group Companies of the Sponsor in excess of 25% of Net Assets
- Any Fund of a Fund Scheme

7.2.3 Investors' Rights & Obligations



Right to Beneficial Ownership

Proportionate right in beneficial ownership of scheme assets and dividend/income declared



Right to Receive Dividend

Dividend warrant within 42 days



Right to Terminate AMC

75% of unit holders can terminate AMC



Right to Inspect Documents

Material contracts, MoA, AoA of AMC, Offer Document



Right to Approve Changes

75% of unit holders for changes in close-ended scheme



Right to Annual Statement

Every unit holder right to receive copy of annual statement



Limitations to Investors' Rights

- **No right against Trust:** Unit holders cannot sue the Trust but can initiate proceedings against Trustees if cheated
- **No right to sue for lower returns:** AMC cannot assure specified level of return except in certain circumstances



Investors' Obligations

- Study risk factors and other information in Offer Document
- Monitor schemes by studying Reports and Financial Statements

7.2.4 Criteria for Appointment of AMC

Criteria	Requirements
Financial Performance	Sound track record (net worth and profitability), good reputation, fairness in transactions; Minimum Net Worth = ₹10 Crores
Directors / Key Personnel	Adequate professional experience in finance and financial services; clean records; no prior employment with suspended AMC/MF/Intermediary
Independent Directors	Board of Directors of AMC to have at least 50% Independent Directors (not associated with sponsor or its subsidiaries or Trustees)
Chairman	Chairman of AMC should not be Trustee of any Mutual Fund

Restrictions on Activities of AMC

- Not to act as Trustee of any Mutual Fund
- Cannot undertake other business activities except Portfolio Management Services, Management and advisory services to Offshore Funds, Pension Funds, Provident Funds, Venture Capital Funds, etc.
- Should not invest in any of its schemes unless full disclosure in offer document

5 5 MARKS AREA – SEBI Regulations

Investment limits, prohibited investments, investor rights, and AMC eligibility criteria. Frequently asked as a short note or part of a larger question.

7.3 Computation of NAV

Chapter Overview

This chapter explains the concept of Net Asset Value (NAV), its computation, utility, and the process of calculating returns on mutual fund investments.

Learning Objectives

- Understand the meaning and concept of NAV
- Compute NAV of a mutual fund scheme
- Calculate returns on mutual fund investments
- Appreciate the utility of NAV in investment decisions
- Apply NAV in performance measurement

Definition of NAV

Net Asset Value (NAV) of a mutual fund scheme is the market value per unit of all the assets of the scheme. In simple words, NAV is the market value of the securities held by the scheme. NAV per unit is the market value of securities of a scheme divided by the total number of units of the scheme on any particular date.

Net Asset Value (NAV)

$$\text{NAV} = \text{Net Asset Value of the Fund} \div \text{Number of Units Outstanding}$$

$$\text{Net Assets} = (\text{Market Value of Investments} + \text{Receivables} + \text{Accrued Income} + \text{Other Assets}) - (\text{Accrued Expenses} + \text{Payables} + \text{Other Liabilities})$$

NAV per unit: Amount holder of one unit will get if scheme is dissolved/liquidated

Reflects realizable value for unit holder

 **NAV is the performance indicator of a mutual fund scheme; plays important part in investor's decisions to enter or exit**

Illustration – NAV Calculation

Calculate the NAV of Excellent Fund from the following data:

Size of the fund: ₹300 crore; Face value: ₹10 per unit; Market value of investment: ₹360 crore; Receivables: ₹6 crore; Accrued income: ₹4 crore; Liabilities: ₹2 crore; Accrued expenses: ₹1 crore.

Number of units = Size of fund ÷ Face value = 300 crore ÷ 10 = 30 crore units

Net Assets = Market value of investment + Receivables + Accrued income – Liabilities – Accrued expenses

= 360 + 6 + 4 – 2 – 1 = ₹367 crore

NAV = 367 crore ÷ 30 crore = ₹12.23 per unit

NAV = ₹12.23 per unit

Rate of Returns

Σ Total Return

Total Return = (Change in NAV + Distribution) ÷ NAV at beginning of period

= [(NAV_{end} – NAV_{begin}) + Dividend + Capital Gains] ÷ NAV_{begin}

Change in NAV: NAV_{end} – NAV_{begin} **Distribution:** Dividend + Capital gains distribution

Illustration – Total Return

A mutual fund has NAV of ₹50 at beginning of year. During year, sum of ₹4 distributed as income (dividend) and ₹3 as capital gains distribution. At year end, NAV was ₹55. Calculate total return.

Total Return = (55 – 50) + 4 + 3 = 12

Total Return % = 12 ÷ 50 = 0.24 or 24%

Total Return = 24%

Illustration – NAV with Dividend Reinvestment

Mr. Ajay on 1.7.2020 invested in 10,000 units having face value ₹10 each. On 31.3.2021, dividend of 10% was paid and annualized yield was 153.33%. On 31.12.2022, 20% dividend was given. On 31.3.2023, Mr. X redeemed all his balance of 11,296.11 units when annualized yield was 73.52%. What are NAVs as on 31.3.2021, 31.12.2022 and 31.3.2023?

31.3.2021:

Annualized Return = Return ÷ 0.75 year = 153.33% → Return = 115%

Investment grown to ₹2,15,000

Let NAV = X; $X \times [10,000 + (10,000/X)] = 2,15,000$

NAV = ₹20.50; Total units = 10,487.80

31.12.2022:

No of units issued = 11,296.11 – 10,487.80 = 808.20

NAV = $(10,487.80 \times 2) \div 808.20 = ₹25.95$

31.3.2023:

Annualized Return = Return ÷ 2.75 years = 73.52% → Return = 202.18%

Investment of ₹1,00,000 grown to ₹3,02,180

NAV = $3,02,180 \div 11,296.11 = ₹26.75$

NAV as on 31.3.2021 = ₹20.50

NAV as on 31.12.2022 = ₹25.95

NAV as on 31.3.2023 = ₹26.75

5 5 MARKS AREA – NAV Computation

Simple NAV calculation or total return calculation. Frequently asked as a short numerical.

7.4 Evaluation of Performance

Chapter Overview

This chapter covers the various methods for evaluating the performance of mutual funds, including Sharpe Ratio, Treynor Ratio, and Jensen's Alpha. It also covers computation of time-weighted and rupee-weighted rates of return, and valuation of traded and non-traded securities.

Learning Objectives

- Apply Sharpe Ratio, Treynor Ratio, and Jensen's Alpha for performance evaluation
- Compute Time Weighted and Rupee Weighted Rate of Return
- Understand valuation of traded and non-traded securities
- Differentiate between different performance measures
- Evaluate mutual fund performance in different market conditions

Performance Evaluation Methods



Sharpe Ratio

Reward to total volatility trade-off.
Uses Standard Deviation as measure of risk. Takes into account both systematic and unsystematic risk.



Treynor Ratio

Reward to volatility ratio. Uses Beta as measure of risk. Assumes completely diversified portfolio.



Jensen's Alpha

Absolute measure. Compares desired performance (CAPM) with actual performance. Considers only systematic risk.

Σ Sharpe Ratio

$$\text{Sharpe Ratio} = (R_P - R_F) \div \sigma_P$$

R_P : Return on Portfolio R_F : Risk Free Return σ_P : Standard Deviation of Portfolio

✓ **Appropriate for overall portfolio comparison**

△ *Higher Sharpe ratio indicates better risk-adjusted performance*

Σ Treynor's Ratio

$$\text{Treynor's Ratio} = (R_P - R_F) \div \beta_P$$

R_P : Return on Portfolio R_F : Risk Free Return β_P : Beta of Portfolio

✓ Appropriate for completely diversified portfolio

Σ Jensen's Alpha

$$\text{Jensen's Alpha } (\alpha) = \text{Actual Return} - \text{Return under CAPM}$$

$$\alpha_P = R_P - [R_F + \beta_P(R_M - R_F)]$$

R_P : Actual return on portfolio R_F : Risk-free rate β_P : Beta of portfolio R_M : Market return

✓ Absolute measure of performance; positive alpha indicates outperformance

Illustration – Sharpe and Treynor

Following information is available regarding four mutual funds:

Mutual Fund	Return	Risk (σ)	β (Beta)	Risk free rate
P	13	16	0.90	10
Q	17	23	0.86	10
R	23	39	1.20	10
S	15	25	1.38	10

Fund	Sharpe $[(R_P - R_F) \div \sigma_P]$	Rank	Treynor $[(R_P - R_F) \div \beta_P]$	Rank
P	0.19	4	3.33	4
Q	0.31	2	8.14	2
R	0.33	1	10.83	1
S	0.20	3	3.63	3

Inference: Ranks obtained as per Sharpe Ratio and Treynor's Ratio is same. All mutual funds seem reasonably well diversified.

Illustration – Jensen's Alpha

Compare performance of three portfolios using Jensen model:

Portfolio 1: Return 14.5%, $\beta = 1.2$

Portfolio 2: Return 9.5%, $\beta = 0.8$

Portfolio 3: Return 18.0%, $\beta = 1.4$

Return on market portfolio = 12%; Risk-free rate = 6%

Required return based on CAPM:

Portfolio 1: $6\% + (12\% - 6\%) \times 1.2 = 13.2\%$

Portfolio 2: $6\% + (12\% - 6\%) \times 0.8 = 10.8\%$

Portfolio 3: $6\% + (12\% - 6\%) \times 1.4 = 14.4\%$

Alpha (α):

Portfolio 1: $14.5 - 13.2 = +1.30\%$

Portfolio 2: $9.5 - 10.8 = -1.30\%$

Portfolio 3: $18.0 - 14.4 = +3.60\%$

Best performance: Portfolio 3 (highest positive alpha)

Next best: Portfolio 1

Underperforming: Portfolio 2 (negative alpha)

7.4.1 Time Weighted and Rupee Weighted Rate of Return



Time Weighted Rate of Return (TWROR)

Rate of return earned per rupee invested over a period of time. Eliminates effect of additional cash flows and return on such cash flows. Measures fund manager's investment skill.



Rupee Weighted Rate of Return (RWROR)

Measures internal rate of return based on absolute movements in cash with reference to the mutual fund. Affected by timing and magnitude of cash flows.

Σ Time Weighted Rate of Return

$$\text{TWROR} = [(1 + R_1) \times (1 + R_2) \times \dots \times (1 + R_n)]^{1/T} - 1$$

R_n : Holding period return for each sub-period T : Total number of periods

✓ Measures fund manager's performance independent of cash flow timing

Σ Money Weighted Rate of Return (MWROR)

$$F_T = F_0(1+i)^T + C_{t1}(1+i)^{T-t1} + \dots + C_{tn}(1+i)^{T-tn}$$

F_T : End value of fund at time T F_0 : Value of Fund at time 0 C_t : Net cash flows at various times

i : Effective annual rate of interest (IRR)

✓ MWROR is the IRR over the period

Illustration – TWROR and MWROR

Fund A has the following market values:

Year 0: ₹1,000 (no cash flow)

Year 1: ₹1,100 (cash flow ₹100)

Year 2: ₹1,200 (cash flow ₹150)

Year 3: ₹1,300 (cash flow ₹80)

Year 4: ₹1,500 (no cash flow)

Calculate MWROR and TWROR.

MWROR (IRR):

$$1000(1+i)^4 + 100(1+i)^3 + 150(1+i)^2 + 80(1+i) = 1500$$

By iteration: $i \approx 3.46\%$

TWROR:

$$i = [(1100/1000) \times (1200/1200) \times (1300/1350) \times (1500/1380)]^{1/4} - 1$$

$$i = (1.1514)^{1/4} - 1 = 3.56\%$$

MWROR = 3.46%; TWROR = 3.56%

Exam Tip: TWROR is higher than MWROR because it eliminates the effect of cash flow timing and measures the fund manager's skill.

7.4.2 Value of Traded and Non-Traded Securities

Traded Securities

- Valued at last quoted closing price on Stock Exchange
- If traded on more than one exchange, valuation as per principal exchange
- If not traded on principal exchange, value at which traded on another exchange may be used

Non-Traded Securities

- Security not traded for 60 days prior to valuation date → valued as non-trade scrip
- Valued in good faith by AMC on basis of valuation methods approved by AMC
- **Equity Instruments:** Capitalization of earnings, P/E ratios of comparable traded securities with appropriate discount for lower liquidity
- **Debt Instruments:** YTM basis; capitalization factor determined for comparable traded securities with appropriate discount for lower liquidity
- **Government Securities:** Valued at YTM based on prevailing market rate
- **Money Market Instruments:** Valued at Cost Plus Accruals
- **Convertible Debentures/Bonds:** Non-convertible component as debt; Convertibles as equity

7.4.3 Expenditure Incurred by Mutual Fund

Initial Issue Expenses

- **Close End Scheme:** Amortized on weekly basis over period of scheme
- **Open Ended Scheme:** Amortized over period not exceeding 5 years
- Issue expenses incurred during life of open end scheme cannot be amortized

Total Expenses Limits (SEBI)

Average Weekly Net Assets	Maximum Expense Ratio
First ₹100 Crores	1.5%
Next ₹300 Crores	2.25%
Next ₹300 Crores	2.0%
Balance of assets	1.75%

7.5 ETF, REIT, InvIT

Chapter Overview

This chapter covers three modern investment vehicles – Exchange Traded Funds (ETFs), Real Estate Investment Trusts (REITs), and Infrastructure Investment Trusts (InvITs). These are innovative instruments that provide investors with exposure to specific asset classes.

Learning Objectives

- Understand the concept and features of ETFs
- Appreciate the structure and working of REITs
- Understand the structure and benefits of InvITs
- Compare ETFs, REITs and InvITs
- Evaluate the advantages and disadvantages of each

7.5.1 Exchange Traded Funds (ETF)

Concept

ETFs are mutual fund units that investors can buy or sell at the stock exchange. This is in contrast to a normal mutual fund unit that an investor buys or sells from the AMC (directly or through a distributor). In the ETF structure, the AMC does not deal directly with investors or distributors. Units are issued to a few designated large participants called Authorised Participants (APs).



Dynamic Pricing

Traded intra-day on stock exchanges like shares; continuously priced



Similar to Derivatives

Track a given underlying (share, bond, metal, index); value fluctuates with underlying



High Transparency

Designed to replicate performance; frequent disclosure of expense ratio, portfolio holdings



Tax Efficiency

Passively managed; lower turnover; less realized capital gains; tax efficient



Low Cost

Passive management → lower management and administrative fees



High Liquidity

Shares traded real-time; investors can easily sell holdings



Diversification & Precision

Index ETFs provide multiple securities; other ETFs provide precision in specific asset class

Advantages and Disadvantages of ETFs vs Mutual Funds

Advantages of ETF over MF	Disadvantages of ETF over MF
Continuously traded; can be sold or purchased on margin	Prices can depart from NAV (unlike open-end fund)
No capital gains tax triggers when ETF is sold	Broker fee when buying and selling (unlike no-load fund)
Investors buy from brokers; eliminates cost of direct marketing to small investors → lower management fees	—

7.5.2 Real Estate Investment Trusts (REIT)

Concept

A Real Estate Investment Trust is a corporation or a business trust that combines the capital of many investors to acquire (or provide financing for) various real estate assets. Investors are able to invest in a professionally managed portfolio of real estate assets. The structure also qualifies as a pass-through entity and distributes maximum portion of its earnings as dividends to shareholders.

REIT Regulations

- Structured as corporation, business trust or similar association
- Board of Directors or trustees must manage it
- Shares fully transferable
- Minimum number of shareholders should be 100 and five or less members should not hold more than 50% of shares
- 90% of income must be distributed as dividend
- 80% of investment must be in properties that generate revenue
- Only 10% of total investment in real-estate under construction
- Derive at least 75% of gross income from rents or mortgage interest
- No more than 20% of assets in stock in taxable REIT subsidiaries
- Asset base of ₹500 crore
- NAVs need to be updated twice in each financial year

Types of REITs



Equity REITs

Own real estate properties; lease to companies/individuals; income distributed as dividend



Mortgage REITs

Get EMLs against property from owners and builders; earnings via net interest margin



Hybrid REITs

Invest in both equity and mortgage REITs

7.5.3 Infrastructure Investment Trusts (InvIT)

Concept

An InvIT is established as a trust and is registered with the SEBI. It is a pooled investment vehicle like a mutual fund. While mutual funds invest the sum received in financial securities, an InvIT invests the same in real infrastructure assets like roads, power plants, transmission lines, pipelines etc. InvITs are a hybrid between equity and debt investment.

Structure of InvITs in India

Element	Role
Trustee	Registered with SEBI as debenture trustees; invest at least 80% into infra assets generating steady revenue
Sponsor	Body corporate, LLP, promoter or company with net worth of at least ₹100 crore; hold at least 15% of total InvITs with minimum lock-in of 3 years
Investment Manager	Body corporate or LLP; supervises operational activities surrounding InvITs
Project Manager	Responsible for executing projects; in PPP projects, serves as entity supervising ancillary responsibilities

Advantages of InvITs



Diversification

Multiple assets offer opportunity to diversify investment portfolio; lowers risk



Fixed Income

Redistribute risks and accrue fixed income; especially for retirees



Liquidity

Easy to enter or exit; enhances liquidity aspect



Quality Asset Management

Professionally managed assets; prevents fragmentation of holdings

Disadvantages of InvITs



Regulatory Risk

Slightest change in regulatory framework has ripple effect



Inflation Risk

High inflation increases operating cost; lowers returns



Asset Risk

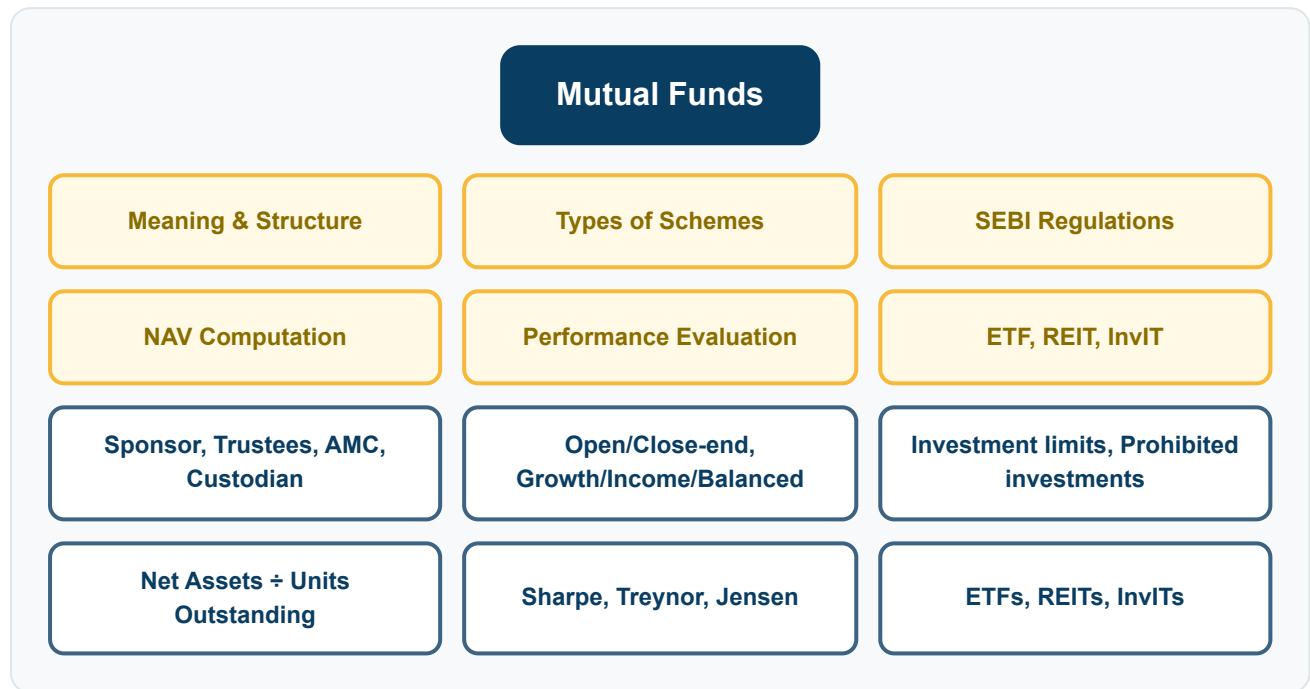
Long gestation period delays returns; impacts cash flow

5 5 MARKS AREA – ETF, REIT, InvIT

Explain features of ETF, REIT, and InvIT. Frequently asked as a short note or comparison.

Module 7 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 7



Key Points for Revision

1. Mutual fund = trust that pools savings of investors with common financial goal
2. Entities: Sponsor, Trustees, AMC, Distributors, Custodian, Registrar & Transfer Agents
3. Sponsor contributes at least 40% to AMC net worth
4. 2/3 trustees must be independent persons
5. AMC minimum net worth = ₹10 crores
6. History phases: UTI (1964), Public Sector (1987), Private Sector (1993), SEBI Regulation (1996), Growth & Consolidation (2004)
7. Open-end funds: No fixed maturity; subscription throughout year
8. Close-end funds: Stipulated maturity (3-15 years); listed on exchanges
9. Growth fund: Capital appreciation; invests in equity
10. Income fund: Regular income; invests in fixed income securities
11. Balanced fund: Both growth and income; 60% equity and 40% debt
12. Money market funds: Treasury bills, CDs, commercial paper
13. Gilt funds: Exclusively Government securities
14. Index funds: Replicate performance of market index
15. ELSS: Tax saving; lock-in 3 years
16. NAV = Net Assets ÷ Number of Units Outstanding
17. Net Assets = (Market value of investments + Receivables + Accrued income + Other assets) – (Accrued expenses + Payables + Other liabilities)
18. Total Return = (Change in NAV + Distribution) ÷ NAV at beginning
19. Sharpe Ratio = $(R_P - R_F) \div \sigma_P$
20. Treynor Ratio = $(R_P - R_F) \div \beta_P$
21. Jensen's Alpha = Actual Return – CAPM Return
22. Positive alpha = Outperformance; Negative alpha = Underperformance
23. TWROR = $[(1+R_1)(1+R_2)\dots(1+R_n)]^{1/T} - 1$
24. MWROR = IRR of all cash flows
25. SEBI investment limit: 10% of NAV in equity shares of a company
26. SEBI investment limit: 10% of company's paid-up capital
27. Total expenses: 1.5% for first ₹100 Cr, 2.25% for next ₹300 Cr, 2.0% for next ₹300 Cr, 1.75% for balance
28. ETF: Traded on exchanges; low cost; tax efficient; high liquidity
29. REIT: 90% income distributed; 80% in revenue-generating properties; asset base ₹500 Cr
30. InvIT: Invests in infrastructure; 80% in infra assets; hybrid between equity and debt

Comprehensive Formula Handbook – Module 7

NAV	Net Asset Value of Fund ÷ Number of Units Outstanding
Net Assets	(Investments + Receivables + Accrued Income + Other Assets) – (Accrued Expenses + Payables + Other Liabilities)
Total Return	(Change in NAV + Dividend + Capital Gains) ÷ NAV _{begin}
Sharpe Ratio	$(R_P - R_F) \div \sigma_P$
Treynor Ratio	$(R_P - R_F) \div \beta_P$
Jensen's Alpha	$R_P - [R_F + \beta_P(R_M - R_F)]$
TWROR	$[(1+R_1)(1+R_2)\dots(1+R_n)]^{1/T} - 1$
MWROR	IRR of all cash flows ($F_T = F_0(1+i)^T + \sum C_t(1+i)^{T-t}$)
Expense Ratio	Total Expenses ÷ Average Net Assets
NAV per unit	Net Assets ÷ Units Outstanding

One-Night Revision Notes – Module 7

Last Night Before Exam – Module 7

- **Mutual Fund:** Trust that pools savings; invests in securities; returns shared proportionately.
- **Entities:** Sponsor, Trustees, AMC, Distributors, Custodian, Registrar & Transfer Agents.
- **Open-End:** No fixed maturity, subscription throughout year. **Close-End:** Fixed maturity, listed on exchanges.
- **NAV:** Net Assets ÷ Units Outstanding. Net Assets = (Investments + Receivables + Accrued Income) – (Liabilities + Accrued Expenses).
- **Total Return:** $(\text{Change in NAV} + \text{Dividend} + \text{Capital Gains}) \div \text{NAV}_{\text{begin}}$.
- **Sharpe Ratio:** $(R_P - R_F) \div \sigma_P$. Higher = better.
- **Treynor Ratio:** $(R_P - R_F) \div \beta_P$. Higher = better.
- **Jensen's Alpha:** Actual Return – CAPM Return. Positive = Outperformance.
- **TWROR:** Eliminates cash flow timing effect; measures manager skill.
- **MWROR:** IRR of all cash flows; affected by timing and magnitude.
- **SEBI Investment Limits:** 10% NAV in equity shares; 10% of company's paid-up capital; 15% NAV in debt instruments.
- **ETF:** Traded on exchanges; low cost; tax efficient; high liquidity.
- **REIT:** 90% income distributed; 80% revenue-generating properties; asset base ₹500 Cr.
- **InvIT:** 80% in infra assets; hybrid between equity and debt; professionally managed.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- NAV computation – 5 marks
- Performance evaluation – Sharpe, Treynor, Jensen – 5–10 marks
- Mutual fund structure and types – 5 marks
- SEBI regulations – 5 marks
- ETF, REIT, InvIT – 5 marks
- Difference between open-end and close-end funds – 5 marks
- Total return calculation – 5 marks
- TWROR vs MWROR – 5 marks

Final Checklist – Module 7

✓ Before Moving to Module 8

- Can I define mutual funds and explain the structure?
- Can I list and explain the entities involved?
- Can I differentiate between open-end and close-end funds?
- Can I classify mutual fund schemes by investment objective?
- Can I compute NAV and total return?
- Can I apply Sharpe, Treynor, and Jensen's measures?
- Can I calculate TWROR and MWROR?
- Can I list SEBI investment limits and prohibited investments?
- Can I explain the features of ETFs, REITs, and InvITs?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 5 numericals from this module?

END OF MODULE 7

Module 8 – Portfolio Theory and Practice

will be generated upon request.

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MANAGEMENT**

08

Portfolio Theory and Practice

Master Revision Handbook · December 2026 Edition

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Module 8 – Portfolio Theory and Practice

Module Objective

Primary Objective

To equip oneself with the knowledge of application of various techniques in security evaluation, building a portfolio, measuring its performance and making revisions to optimise the returns. To understand the basic concepts relating to risk and returns of portfolios, appreciate the process of diversification of portfolio risks, learn about optimal portfolio, efficient frontier and capital market line, and understand alternative principles of asset allocation in a portfolio.

Mapped CMLO: 3a

Learning Outcomes

Students will be able to...	Application Skill
Understand the basic concepts relating to risk and returns of portfolios, appreciate the process of diversification of portfolio risks.	Compute portfolio risk and return; apply diversification strategies.
Learn about optimal portfolio, efficient frontier and capital market line; understand alternative principles of asset allocation in a portfolio.	Construct optimal portfolio; identify efficient frontier; apply CML and asset allocation strategies.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
8.1	Portfolio Return and Risk, Systematic and Unsystematic Risk, Diversification strategies (Naïve vs Markowitz)	HIGH 2.5%	Numerical + Theory
8.2	Optimal Portfolio, Efficient Frontier, Capital Market Line	HIGH 1.5%	Theory + Concept
8.3	Principles of Asset Allocation, Active and Passive Asset Allocation	MEDIUM 1%	Theory

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- Portfolio return and risk calculation – **5–10 marks**
- Covariance and correlation coefficient – **5 marks**
- Minimum variance portfolio – **5 marks**
- Systematic and unsystematic risk decomposition – **5 marks**
- Beta calculation – **5 marks**
- Efficient Frontier and CML – **5 marks**
- Asset Allocation strategies – **5 marks**
- Markowitz Model assumptions – **5 marks**

Frequently Tested Concepts

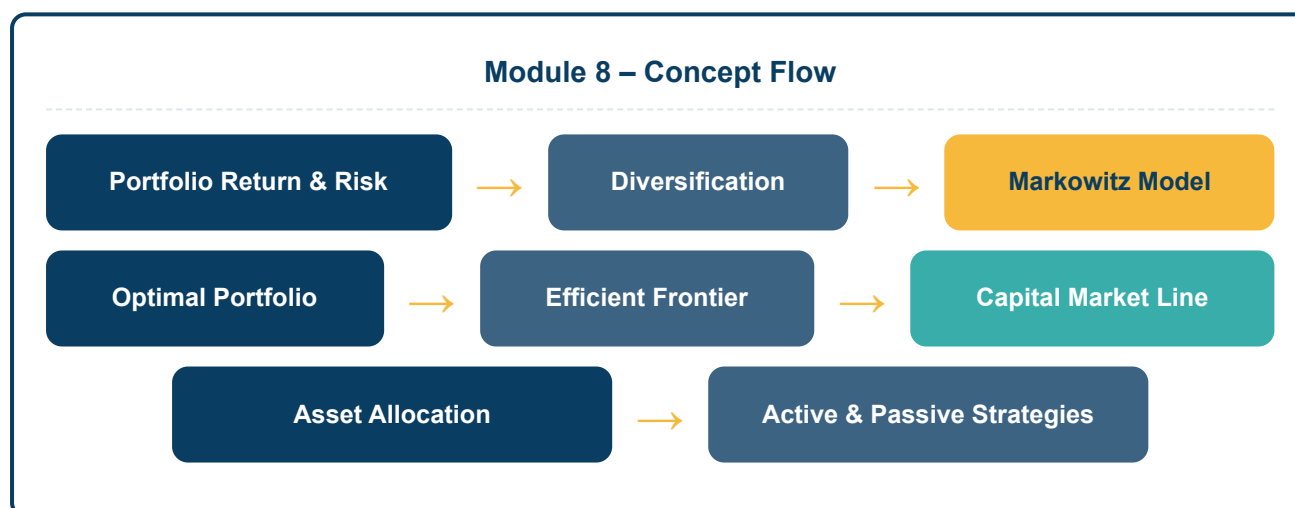


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★ FREQUENTLY ASKED – MODULE 8

- **Portfolio Return and Risk** – numerical
- **Covariance and Correlation** – numerical
- **Minimum Variance Portfolio** – numerical
- **Beta and Systematic/Unsystematic Risk** – numerical
- **Markowitz Model assumptions** – theory
- **Efficient Frontier and CML** – theory + concept
- **Asset Allocation strategies** – theory

8.1 Portfolio Return and Risk

Chapter Overview

This chapter introduces the fundamental concepts of portfolio management – return and risk of a portfolio, systematic and unsystematic risk, diversification strategies (Naïve vs Markowitz Model), and the concept of beta as a measure of systematic risk.

Learning Objectives

- Compute portfolio return and risk
- Differentiate between systematic and unsystematic risk
- Understand beta and its computation
- Apply diversification strategies – Naïve vs Markowitz
- Compute covariance, correlation coefficient, and minimum variance portfolio

8.1.1 Portfolio Return

Concept

Harry Markowitz, the father of modern portfolio theory, published an article in the Journal of Finance in March 1952. It was the first scientific approach to determine risk, return, and covariance of securities and developed a methodology for determining the optimum portfolio. Portfolio return is the weighted average of the returns of individual securities in the portfolio.

Portfolio Return (Historical)

$$R_P = \sum_{i=1}^n W_i \times R_i$$

R_P : Return of the portfolio **W_i** : Weight of security i (proportion of investment) **R_i** : Return of security i
 n : Number of securities in portfolio

 **Portfolio return is always a weighted average of individual security returns**

Σ Portfolio Return (Ex-ante / Expected)

$$E(R_P) = \sum P_i \times R_i$$

P_i : Probability of state i R_i : Return under state i

✓ Used for future expected returns

Illustration – Portfolio Return

A portfolio manager invests in five portfolios P, Q, R, S and T in the ratio of 30%, 20%, 25%, 15% and 10% and the respective returns are 12%, 14%, –20%, 10% and 9%. Calculate the combined portfolio return.

$$\begin{aligned} R_P &= 0.30 \times 0.12 + 0.20 \times 0.14 + 0.25 \times (-0.20) + 0.15 \times 0.10 + 0.10 \times 0.09 \\ &= 0.036 + 0.028 - 0.050 + 0.015 + 0.009 = 0.038 \text{ or } 3.8\% \end{aligned}$$

Portfolio return = 3.8%

Σ Holding Period Yield

$$HPY = [(P_1 - P_0) + D_1] \div P_0$$

P_0 : Price at beginning of year P_1 : Price at end of year D_1 : Dividend received during year

✓ Used for historical return measurement

8.1.2 Portfolio Risk

Concept

Portfolio risk or variance measures the amount of uncertainty in portfolio returns. Unlike return, portfolio risk is **not** the weighted average of the risks of individual securities because it also considers the correlation between securities.

Portfolio Variance (Two Securities)

$$\sigma_P^2 = W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \text{Cov}_{AB}$$

W_A, W_B : Weights of securities A and B σ_A, σ_B : Standard deviations

Cov_{AB} : Covariance between A and B

Portfolio Standard Deviation (Two Securities)

$$\sigma_P = \sqrt{[W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \sigma_A \sigma_B \rho_{AB}]}$$

ρ_{AB} : Correlation coefficient between A and B

Portfolio Risk (Three Securities) – Formula Approach

$$\sigma_{ABC} = \sqrt{[\sigma_A^2 W_A^2 + \sigma_B^2 W_B^2 + \sigma_C^2 W_C^2 + 2\sigma_A W_A \sigma_B W_B \rho_{AB} + 2\sigma_A W_A \sigma_C W_C \rho_{AC} + 2\sigma_B W_B \sigma_C W_C \rho_{BC}]}$$

Extends to any number of securities

💡 Matrix Approach for Portfolio Variance

The matrix approach is used for n securities. For 3 securities (A, B, C), the matrix has 9 cells:

Securities	A (W_A)	B (W_B)	C (W_C)
A (W_A)	$W_A^2 \sigma_A^2$	$W_A W_B \text{Cov}_{AB}$	$W_A W_C \text{Cov}_{AC}$
B (W_B)	$W_B W_A \text{Cov}_{AB}$	$W_B^2 \sigma_B^2$	$W_B W_C \text{Cov}_{BC}$
C (W_C)	$W_C W_A \text{Cov}_{AC}$	$W_C W_B \text{Cov}_{BC}$	$W_C^2 \sigma_C^2$

Sum all 9 cells to get portfolio variance.

Σ Covariance

$$\text{Cov}_{AB} = \rho_{AB} \times \sigma_A \times \sigma_B$$

$$\text{Cov}_{AB} = \beta_A \times \beta_B \times \sigma_M^2$$

ρ_{AB} : Correlation coefficient σ_M^2 : Variance of market β : Beta of security

Σ Correlation Coefficient

$$\rho_{AB} = \text{Cov}_{AB} \div (\sigma_A \times \sigma_B)$$

Value between -1 and +1 $\rho = +1$: Perfect positive correlation $\rho = -1$: Perfect negative correlation
 $\rho = 0$: No correlation

8.1.3 Systematic and Unsystematic Risk

 **Total Risk = Systematic Risk + Unsystematic Risk**



Systematic Risk

Also called Non-Diversifiable Risk. Arises from external and uncontrollable factors. Affects all securities. Cannot be eliminated by diversification. Measured by Beta.



Unsystematic Risk

Also called Diversifiable Risk. Arises from firm-specific factors. Can be eliminated by diversification. Also called Residual Risk.

Types of Systematic Risk



Market Risk

Risks triggered by social, political and economic events; changes in demand/supply, investor expectations



Interest Rate Risk

Uncertainty of future market values due to fluctuations in general level of interest; security prices move inversely to interest rates



Purchasing Power Risk

Erosion in value of money due to inflation

Types of Unsystematic Risk



Business Risk

Volatility in revenues and profits due to market conditions, product mix, competition; external or internal reasons



Financial Risk

Associated with capital structure; higher financial leverage → higher financial risk; liquidity problems, working capital shortage



Default Risk

Default in meeting financial obligations on time; increases insolvency and bankruptcy costs



Risk in Government Securities

- **Interest Rate Risk:** Inverse relation of price and interest; can be eliminated if investment horizon matches term of security
- **Re-investment Risk:** Risk that rate at which interim cash flows are re-invested may fall
- **Default Risk:** Always zero for Government Securities; small variant is Maturity Risk (likelihood of Government issuing new security in place of redeeming existing)

Σ Components of Risk (Variance Approach)

$$\text{Total Risk } (\sigma_s^2) = \text{Systematic Risk} + \text{Unsystematic Risk}$$

$$\sigma_s^2 = \beta_s^2 \times \sigma_M^2 + \sigma_s^2 \times (1 - \rho_{SM}^2)$$

$\beta_s^2 \sigma_M^2$: Systematic Risk $\sigma_s^2(1 - \rho_{SM}^2)$: Unsystematic Risk ρ_{SM}^2 : Coefficient of determination

8.1.4 Beta – Measure of Systematic Risk

Concept of Beta

- **Measure of Sensitivity:** Beta of a security measures the sensitivity of the security with reference to a broad based market index like BSE Sensex, NIFTY
- **Measure of Systematic Risk:** Beta measures systematic risk i.e., that which affects the market as a whole and hence cannot be eliminated through diversification
- **Factors:** Standard Deviation of the Security/Portfolio, Standard deviation of the Market, Correlation between Security and Market

Beta of a Security

$$\beta_s = (\sigma_s \div \sigma_m) \times \rho_{SM}$$

$$\beta_s = \text{Cov}_{SM} \div \sigma_m^2$$

σ_s : SD of security σ_m : SD of market ρ_{SM} : Correlation between security and market

Cov_{SM} : Covariance between security and market

Beta from Basic Data

$$\beta_s = [\Sigma R_M R_S - n \times \bar{R}_M \times \bar{R}_S] \div [\Sigma R_M^2 - n \times \bar{R}_M^2]$$

n : Number of pairs (years/months/days) $\Sigma R_M R_S$: Aggregate of product

ΣR_M^2 : Aggregate of Return Square $\bar{R}_M, \bar{R}_S$: Mean returns

Interpretation of Beta Values

Beta Value	Security Type	Interpretation
$\beta < 1$	Less risky than market	Defensive security
$\beta = 1$	As risky as market	Normal beta security; if market moves 10%, security moves 10%
$\beta > 1$	More risky than market	Aggressive/High beta security; if market moves 10%, security moves 20%
$\beta = 0$	No systematic risk	Risk-free security; no relationship with market
$\beta < 0$	Negative beta	Inverse relationship with market; e.g., gold

Illustration – Beta Calculation

The rates of return on Security S and Market Portfolio for 10 periods are given below:

Market: 22, 20, 18, 16, 20, 8, -6, 5, 6, 11

Security S: 20, 22, 25, 21, 18, -5, 17, 19, -7, 20

Calculate Beta of Security S.

$$R_M = (22+20+18+16+20+8-6+5+6+11) \div 10 = 120 \div 10 = 12$$

$$R_S = (20+22+25+21+18-5+17+19-7+20) \div 10 = 150 \div 10 = 15$$

R_M	R_S	D_M	D_S	D_M^2	D_S^2	$D_M \times D_S$
22	20	10	5	100	25	50
20	22	8	7	64	49	56
18	25	6	10	36	100	60
16	21	4	6	16	36	24
20	18	8	3	64	9	24
8	-5	-4	-20	16	400	80
-6	17	-18	2	324	4	-36
5	19	-7	4	49	16	-28
6	-7	-6	-22	36	484	132
11	20	-1	5	1	25	-5
Total				706	1148	357

$$\sigma_M^2 = 706 \div 10 = 70.6$$

$$\text{Cov}_{SM} = 357 \div 10 = 35.7$$

$$\beta_S = \text{Cov}_{SM} \div \sigma_M^2 = 35.7 \div 70.6 = 0.51$$

Beta of Security S = 0.51

8.1.5 Correlation and Diversification

Diversification

Diversification refers to investing in more than one security, i.e., dividing the Portfolio into different stocks and not investing the money in one particular stock. Some of the risks associated with individual assets can be eliminated by forming a Portfolio by way of spreading an investment across assets.

Relationship Between Correlation and Diversification

Correlation Coefficient	Nature	Diversification
$\rho = +1$	Perfectly positively correlated	Investments do not offset each other; no diversification
$\rho = -1$	Perfectly negatively correlated	Investments offset each other totally; full diversification achieved; risk can be reduced to zero
$\rho = 0$	No correlation	No predictability of movement; not a good diversification

Features of Diversification

- Reduces risks because prices of different stocks do not move exactly together
- Helps to reduce Portfolio risk by eliminating unsystematic risk for which investors are not rewarded
- Investors are rewarded for taking market risk
- Averages the returns of the assets within the Portfolio
- Protects against business risk and financial risk

Σ Portfolio Risk with Different Correlations

When $\rho = +1$: $\sigma_P = W_A\sigma_A + W_B\sigma_B$ (Maximum risk, no diversification)

When $\rho = -1$: $\sigma_P = |W_A\sigma_A - W_B\sigma_B|$ (Minimum risk, full diversification possible)

When $\rho = 0$: $\sigma_P = \sqrt{W_A^2\sigma_A^2 + W_B^2\sigma_B^2}$

Illustration – Portfolio Risk with Different Correlations

Two securities A and B have standard deviations of 10% and 20%. The weights are 60% and 40%. Calculate portfolio risk when (i) $\rho = +1$, (ii) $\rho = 0$, (iii) $\rho = -1$.

(i) $\rho = +1$:

$$\sigma_P = 0.60 \times 10 + 0.40 \times 20 = 6 + 8 = 14\%$$

(ii) $\rho = 0$:

$$\begin{aligned}\sigma_P &= \sqrt{(0.60)^2(10)^2 + (0.40)^2(20)^2} \\ &= \sqrt{36 + 64} = \sqrt{100} = 10\%\end{aligned}$$

(iii) $\rho = -1$:

$$\sigma_P = |0.60 \times 10 - 0.40 \times 20| = |6 - 8| = 2\%$$

(i) 14% (ii) 10% (iii) 2%

As correlation decreases from +1 to -1, portfolio risk decreases.

8.1.6 Minimum Variance Portfolio

Concept

The minimum variance portfolio is the combination of two securities that results in the lowest possible portfolio risk (variance). It is found by optimally allocating weights between the two securities.

Minimum Variance Portfolio – Proportions

$$W_A = (\sigma_B^2 - \text{Cov}_{AB}) \div (\sigma_A^2 + \sigma_B^2 - 2\text{Cov}_{AB})$$

$$W_B = 1 - W_A$$

σ_A^2, σ_B^2 : Variances of securities A and B Cov_{AB} : Covariance between A and B

 Use to find optimal weights that minimize portfolio risk

Illustration – Minimum Variance Portfolio

An investor has decided to invest ₹1,00,000 in the Shares of two Companies, namely ABC and XYZ. The projections of Returns from the Shares of the two Companies along with their probabilities are as follows:

Probability	ABC (%)	XYZ (%)
0.20	12	16
0.25	14	10
0.25	-7	28
0.30	28	-2

You are required to find out the proportion of each of the above Shares to formulate a minimum Risk Portfolio.

Step 1: Expected Returns

$$R_{ABC} = 0.20 \times 12 + 0.25 \times 14 + 0.25 \times (-7) + 0.30 \times 28 = 2.4 + 3.5 - 1.75 + 8.4 = 12.55\%$$

$$R_{XYZ} = 0.20 \times 16 + 0.25 \times 10 + 0.25 \times 28 + 0.30 \times (-2) = 3.2 + 2.5 + 7.0 - 0.6 = 12.10\%$$

Step 2: Variances and Covariance

$$\sigma_{ABC}^2 = 167.75; \sigma_{ABC} = 12.95\%$$

$$\sigma_{XYZ}^2 = 126.98; \sigma_{XYZ} = 11.27\%$$

$$\text{Cov}(ABC, XYZ) = -143.39$$

Step 3: Minimum Variance Portfolio Weights

$$W_{ABC} = [\sigma_{XYZ}^2 - \text{Cov}_{ABC,XYZ}] \div [\sigma_{ABC}^2 + \sigma_{XYZ}^2 - 2\text{Cov}_{ABC,XYZ}]$$

$$= [126.98 - (-143.39)] \div [167.75 + 126.98 - 2(-143.39)]$$

$$= 270.37 \div [167.75 + 126.98 + 286.78]$$

$$= 270.37 \div 581.51 = 0.4650 \text{ or } 46.50\%$$

$$W_{XYZ} = 1 - 0.4650 = 0.5350 \text{ or } 53.50\%$$

Proportion of Investment in ABC = 46.50%

Proportion of Investment in XYZ = 53.50%

10 10 MARKS AREA – Portfolio Risk & Return

Comprehensive numerical covering expected returns, variance, covariance, correlation, and minimum variance portfolio. Frequently asked.

8.2 Optimal Portfolio, Efficient Frontier, Capital Market Line

Chapter Overview

This chapter covers the Markowitz Model of Risk-Return Optimization, the concept of Efficient Frontier, Capital Market Line (CML), Security Market Line (SML), and Characteristic Line.

Learning Objectives

- Understand the Markowitz Model and its assumptions
- Construct efficient frontier
- Understand Optimal Portfolio selection
- Apply Capital Market Line (CML)
- Differentiate between CML and SML
- Understand Characteristic Line

8.2.1 Markowitz Model of Risk-Return Optimization

Assumptions of the Markowitz Model

- 1 Return on an investment adequately summarises the outcome of the investment.
- 2 Investors can visualise a probability distribution of rates of return.
- 3 Investors' risk estimates are proportional to the variance of return they perceive for a security or portfolio.
- 4 Investors base their investment decisions on two criteria i.e. expected return and variance of return (Risk).
- 5 Investors are risk averse. For a given expected return, they prefer minimum risk; for a given level of risk, they prefer maximum expected return.
- 6 Investors are assumed to be rational in so far as they would prefer greater returns to lesser ones given equal or smaller risk.
- 7 'Return' could be any suitable measure of monetary inflows, but yield has been the most commonly used measure of return.

Steps in Portfolio Decisions (Markowitz)

1. To select the securities of one's choice and to construct all possible portfolios.
2. To classify these portfolios into two parts: (a) Efficient and (b) Inefficient.
3. A portfolio is inefficient if:
 - It is rejected by application of Set A, or
 - There exists some other portfolio which is better than this portfolio in both respects (higher return and lower risk).

Efficiency Criteria

A portfolio is not efficient if there is another portfolio with:

- Higher expected value of return and a lower standard deviation (risk)
- Higher expected value of return and the same standard deviation (risk)
- Same expected value but a lower standard deviation (risk)

8.2.2 Efficient Frontier

Concept

The envelope curve that contains the best of all possible combinations is referred to as the efficient frontier. Specifically, the efficient frontier represents that set of portfolios that has the maximum rate of return for every given level of risk, or the minimum risk for every level of return.

Efficient Frontier – Characteristics



Maximum Return

For every given level of risk



Minimum Risk

For every level of return



Dominance

Portfolios on frontier dominate those beneath



Upper Boundary

Extends from minimum variance portfolio to maximum return portfolio

Features of Efficient Frontier

- Every portfolio on the efficient frontier has either a higher rate of return for equal risk or lower risk for an equal rate of return than some portfolio beneath the frontier.
- Portfolio A dominates Portfolio C if it has an equal rate of return but substantially less risk.
- Portfolio B dominates Portfolio C if it has equal risk but a higher expected rate of return.
- Because of the benefits of diversification among imperfectly correlated assets, the efficient frontier is made up of portfolios of investments rather than individual securities.
- Two possible exceptions arise at the end points, which represent the asset with the highest return and that asset with the lowest risk.
- No portfolio on the efficient frontier can dominate any other portfolio on the efficient frontier.
- All of these portfolios have different return and risk measures, with expected rates of return that increase with higher risk.

💡 Utility Analysis and Investor Types

Investor Type	Utility Curve	Characteristic
Risk Averse	Concave, decreasing utility ($U = W^{1/2}$)	Rejects fair gamble; disutility of loss > utility of equivalent gain
Risk Neutral	Linear, constant utility ($U = W$)	Indifferent to fair gamble; expected utility = expected value
Aggressive / Risk Lover	Convex, increasing utility ($U = W^2$)	Accepts fair gamble; expected utility of investing > not investing

💡 Risk Penalty

Utility = Expected Return – Risk Penalty

Risk Penalty = $(\text{Risk})^2 \div \text{Risk Tolerance}$

Where: Risk squared = Variance of return; Risk tolerance = number from 0 to 100

Example: Expected return = 16%, Variance = 289%, Tolerance = 60

Risk Penalty = $289 \div 60 = 4.82\%$

Utility = $16\% - 4.82\% = 11.18\%$

8.2.3 Capital Market Line (CML)

Concept

The Markowitz mean-variance model is modified by introducing the concept of risk-free asset. If the investor has access to risk-free securities (e.g., Treasury bills) in addition to the universe of risky securities, then he can construct a new set of portfolios. The efficiency boundary becomes the straight line drawn from R_f which is a tangent to the original risky portfolio efficiency boundary. This is termed as 'Capital Market Line' (CML).

Market Price of Risk

$$\text{Market Price of Risk } (\lambda) = (R_M - R_F) \div \sigma_M$$

R_M : Market Return R_F : Risk Free Rate of Return σ_M : Standard Deviation of Market Portfolio

Expected Return on Portfolio under CML

$$E(R_P) = R_F + \lambda \times \sigma_P$$

$E(R_P)$: Expected Return on Portfolio R_F : Risk Free Rate of Return

λ : Market Price of Risk (Risk Premium per unit of Market Risk)

σ_P : Risk of the Portfolio (Standard Deviation)

 **CML provides the best risk and return tradeoff for an investor**

Features of CML

- Portfolio is assumed to be efficient i.e., exact replication of the market portfolio in terms of risks and rewards.
- CML assumes no unsystematic risk i.e., all the unsystematic risk is completely taken care of by proper diversification similar to that of market portfolio.
- Capital Market Line estimates the return for a portfolio based on the Total Risk Route i.e., it assumes existence of perfect correlation between the portfolio return and market return.
- Individual securities do not lie on Capital Market Line. This is because they have some extent of unsystematic risk associated with their returns.

Illustration – CML

Portfolio A, a fully diversified Portfolio, has a Standard Deviation of 6%. The NIFTY has yields a Return of 16.5%, with a Standard Deviation of 4%. Ascertain the expected Return of Portfolio A under the following cases:

- (1) 5.80% ₹100 Central Government guaranteed RBI Bonds is traded at ₹116
- (2) Market's Attitude towards risk is 3
- (3) Risk Free Return is 7%

Case 1: Risk Free Return = $(100 \times 5.8\%) \div 116 = 5\%$

$$\lambda = (16.5\% - 5\%) \div 4\% = 2.875$$

$$E(R_P) = 5\% + (2.875 \times 6\%) = 5\% + 17.25\% = 22.25\%$$

Case 2: $\lambda = 3$ (given)

$$E(R_P) = 4.5\% + (3 \times 6\%) = 4.5\% + 18\% = 22.50\%$$

$$(\text{Since } (16.5 - R_f) \div 4 = 3 \rightarrow R_f = 16.5 - 12 = 4.5\%)$$

Case 3: $R_F = 7\%$ (given)

$$\lambda = (16.5\% - 7\%) \div 4\% = 2.375$$

$$E(R_P) = 7\% + (2.375 \times 6\%) = 7\% + 14.25\% = 21.25\%$$

Case 1: 22.25%

Case 2: 22.50%

Case 3: 21.25%

8.2.4 Security Market Line (SML) and Characteristic Line

Security Market Line (SML)

Security Market Line (SML) reflects the linear relationship between Systematic Risk and Expected Return in financial markets that result when Expected Returns and Beta Coefficients are plotted across a graph. SML is the relationship between Expected Return and Beta, on which both portfolios and individual securities lie.

Evaluation Based on SML

Actual Return is	Inference	Security is
Above SML	Stock is yielding higher return than expected	Underpriced
On SML	Stock is yielding return equivalent to expected	Correctly Priced
Below SML	Stock is yielding lower return than expected	Overpriced

Differences Between Security Market Line and Capital Market Line

Aspect	Capital Market Line	Security Market Line
Risk Considered	Uses Standard Deviation (Total Risk) across x-axis	Uses Beta (Systematic Risk) across x-axis
Nature of Portfolios	Uses only efficient portfolios (perfect replication of market portfolio)	Uses both efficient and non-efficient portfolios
Combination	Every point is a proportional combination between risk free rate and market return	Graphs all portfolios and securities which lie on and off the CML

Characteristic Line

Characteristic Line is a graph depicting the relationship between Security's Returns and Market Index Returns. Security Characteristic Line is a time series graph. Return considered is the excess return, i.e., expected return over and above the Risk Free Rate of Return.

Purpose: Used to estimate beta and determine how a security return correlates to a market index return.

Beta: Beta estimate comes from the slope estimate of the security characteristic line.

Distinguish between SML and Characteristic Line

Aspect	Security Market Line	Characteristic Line
Scheme	Relationship between return and risk (systematic risk) of a security or portfolio	Relationship between returns of two securities or a security and the market return over time
Nature of Graph	Cross-sectional graph	Time Series Graph
Comparison	Graphs beta versus expected return	Graphs time series of Security Returns versus Index Returns
Utility	Used for estimating expected return for a security relative to its beta risk	To estimate beta and determine how a security return correlates to a market index return

5 5 MARKS AREA – CML vs SML

Difference between Capital Market Line and Security Market Line; Characteristic Line. Frequently asked as a short note.

8.3 Principles of Asset Allocation, Active and Passive Asset Allocation

Chapter Overview

This chapter covers the principles of asset allocation, the process of creating a diversified multi-asset class portfolio, and the various asset allocation strategies including Integrated, Strategic, Tactical, and Insured Asset Allocation.

Learning Objectives

- Understand the concept of asset allocation
- Apply different asset allocation strategies
- Differentiate between active and passive asset allocation
- Understand the principles of portfolio management

8.3.1 Asset Allocation

Concept

Asset allocation involves dividing an investment portfolio among different asset categories, such as stocks, bonds, and cash. It is an investment strategy that aims to balance risk and reward by apportioning a portfolio's assets according to an individual's goals, risk tolerance, and investment horizon.

The three main asset classes - equities, fixed-income, and cash and equivalents - have different levels of risk and return, so each will behave differently over time.

Two Steps in Creating a Diversified Portfolio

- 1 Asset Allocation Decision:** Determining long-term (strategic) exposures to available asset classes (or risk factors) that make up the investor's opportunity set
- 2 Implementation Decisions:** Determining the specific investments (individual securities, pooled investment vehicles, separate accounts) used to implement targeted allocations

8.3.2 Asset Allocation Strategies in Portfolio Management



**Integrated Asset
Allocation**



**Strategic Asset
Allocation**



**Tactical Asset
Allocation**



**Insured Asset
Allocation**

Capital Market conditions and Investor Objectives and Constraints are analysed; allocation that best serves investor's needs while incorporating Capital Market forecast

Optimal Portfolio mixes based on Returns, Risk, and Co-variances; generated using historical information; adjusted periodically to restore target allocation

Investor's risk tolerance assumed constant; Asset Allocation changed based on expectations about capital market conditions

Risk exposure for changing portfolio values (wealth) is adjusted; More value means more ability to take risk

8.3.3 Active and Passive Asset Allocation



Active Portfolio Strategy (APS)

Followed by Investment Professionals and aggressive Investors; strive to earn superior return after adjustment for risk. Involves researching individual companies, gathering extensive data to identify and invest in stocks that will produce better returns and beat the market.



Passive Portfolio Strategy

Based on assumption that Capital Market is fairly efficient with respect to available information. Involves creating a well-diversified portfolio at a pre-determined level of risk and holding it relatively unchanged over time.

💡 Techniques / Principles of Active Portfolio Strategy

Technique	Description
Market Timing	Based on explicit or implicit forecast of general market movement, using tools like business cycle analysis, moving average analysis, advance-decline analysis, econometric models
Sector Rotation	Applies to both Equity and Debt components. In Equity, weightage for various industry sectors based on asset outlook and future prospects. In Bonds, shift in composition in terms of quality, coupon rate, term of maturity
Security Selection	Search for under-priced security. In Equity, employ fundamental/technical analysis to identify stocks promising superior return. In Bonds, choose bonds offering highest YTM at given level of risk
Use of Specialised Investment Concept	Used particularly for investment in Stocks (Growth Stocks, Neglected/Out-of-Favour Stocks, Asset Stocks, Technology Stocks, Cyclical Stocks). Helps focus effort on certain kind of investment reflecting one's ability and talent

Passive Portfolio Strategy – Index Fund

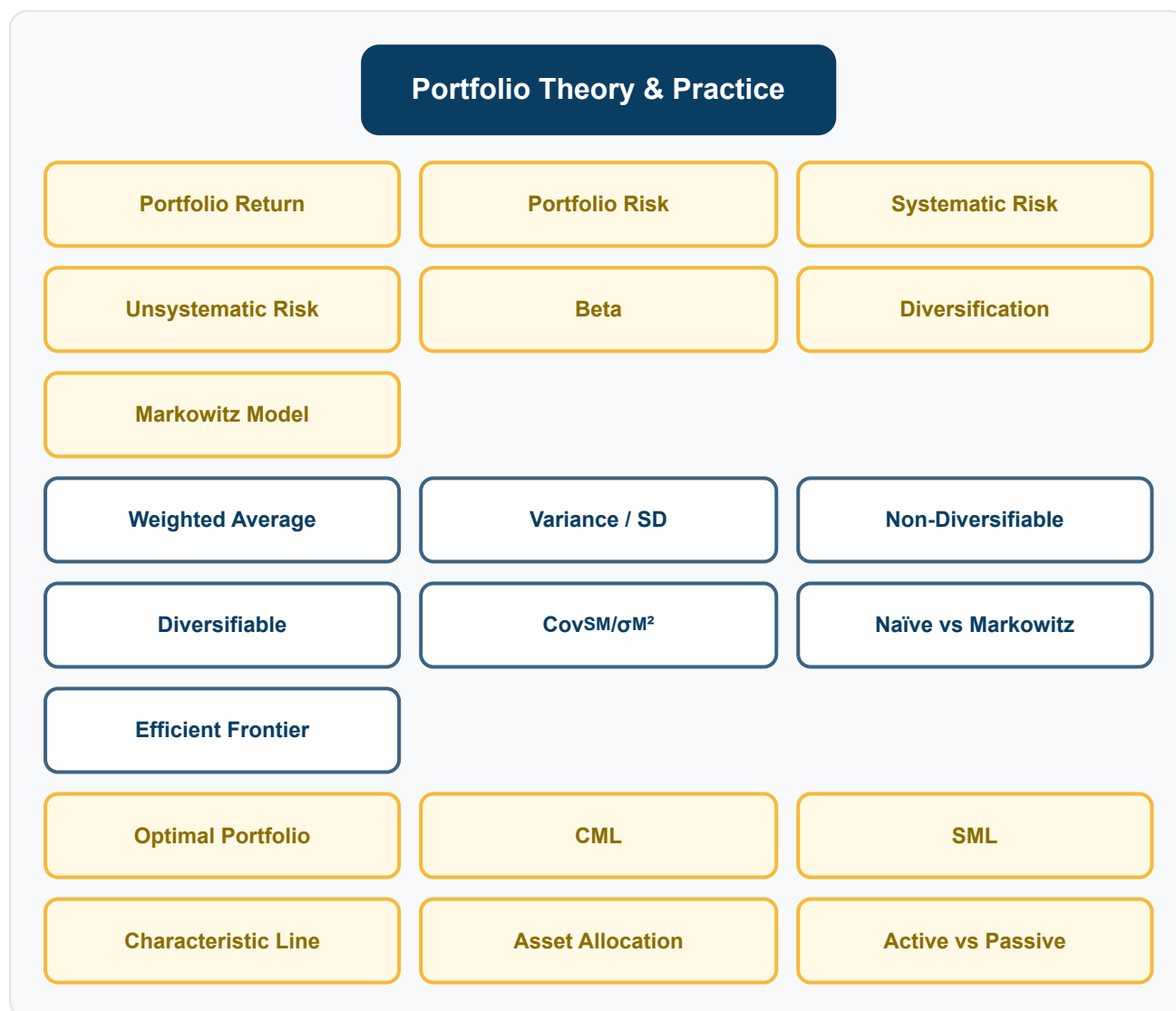
- An Index Fund is a Mutual Fund Scheme that invests in the securities of the Target Index in the same proportion or weightage
- An Index Fund's daily returns are the same as the daily returns obtained from an Index
- An Index Fund carries all the risks normally associated with the type of asset the fund holds
- An Index Fund does not mitigate market risks; indexing merely ensures that Investor's returns will not stray far from the returns on the Index

5 5 MARKS AREA – Asset Allocation

Principles of asset allocation, Active vs Passive strategies, and the four asset allocation strategies. Frequently asked as a short note.

Module 8 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 8



Key Points for Revision

1. Portfolio return = Weighted average of individual security returns
2. Portfolio risk $\neq$ Weighted average of individual security risks
3. Portfolio risk depends on correlation between securities
4. Systematic risk = Non-diversifiable; measured by Beta
5. Unsystematic risk = Diversifiable; can be eliminated
6. Total Risk = Systematic Risk + Unsystematic Risk
7. Beta = $\text{Cov}_{SM} \div \sigma_M^2$
8. Beta = $(\sigma_S \div \sigma_M) \times \rho_{SM}$
9. $\beta > 1$: Aggressive security; $\beta < 1$: Defensive security; $\beta = 1$: Normal
10. Covariance = $\rho_{AB} \times \sigma_A \times \sigma_B$
11. Covariance = $\beta_A \times \beta_B \times \sigma_M^2$
12. Correlation coefficient ranges from -1 to $+1$
13. $\rho = +1$: No diversification; $\rho = -1$: Full diversification possible
14. Minimum variance portfolio weights: $W_A = (\sigma_B^2 - \text{Cov}_{AB}) \div (\sigma_A^2 + \sigma_B^2 - 2\text{Cov}_{AB})$
15. Markowitz Model: Investors are risk averse; base decisions on expected return and variance
16. Efficient Frontier: Maximum return for given risk; minimum risk for given return
17. Efficient portfolios dominate inefficient portfolios
18. Utility = Expected Return – Risk Penalty
19. Risk Penalty = $(\text{Risk})^2 \div \text{Risk Tolerance}$
20. CML: $E(R_P) = R_F + \lambda \times \sigma_P$
21. Market Price of Risk (λ) = $(R_M - R_F) \div \sigma_M$
22. CML uses total risk (σ); SML uses systematic risk (β)
23. SML: Relationship between expected return and beta
24. Characteristic Line: Time series graph of security returns vs market returns
25. Asset Allocation: Dividing portfolio among different asset categories
26. Four Asset Allocation Strategies: Integrated, Strategic, Tactical, Insured
27. Active Strategy: Market timing, sector rotation, security selection
28. Passive Strategy: Index funds, buy and hold
29. Sharpe Ratio = $(R_P - R_F) \div \sigma_P$
30. Treynor Ratio = $(R_P - R_F) \div \beta_P$

Comprehensive Formula Handbook – Module 8

Portfolio Return	$R_P = \sum W_i \times R_i$
Expected Return	$E(R_P) = \sum P_i \times R_i$
Portfolio Variance (2 Securities)	$W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \text{Cov}_{AB}$
Portfolio SD (2 Securities)	$\sqrt{W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \sigma_A \sigma_B \rho_{AB}}$
Covariance	$\rho_{AB} \times \sigma_A \times \sigma_B$
Correlation Coefficient	$\text{Cov}_{AB} \div (\sigma_A \times \sigma_B)$
Beta	$\text{Cov}_{SM} \div \sigma_M^2$
Beta (alternate)	$(\sigma_s \div \sigma_m) \times \rho_{SM}$
Systematic Risk	$\beta_s^2 \times \sigma_M^2$
Unsystematic Risk	$\sigma_s^2 \times (1 - \rho_{SM}^2)$
Minimum Variance Weights	$W_A = (\sigma_B^2 - \text{Cov}_{AB}) \div (\sigma_A^2 + \sigma_B^2 - 2\text{Cov}_{AB})$
Market Price of Risk	$(R_M - R_F) \div \sigma_M$
CML Equation	$E(R_P) = R_F + \lambda \times \sigma_P$
Risk Penalty	$(\text{Risk})^2 \div \text{Risk Tolerance}$
Utility	Expected Return – Risk Penalty

One-Night Revision Notes – Module 8

Last Night Before Exam – Module 8

- **Portfolio Return:** Weighted average of individual security returns.
- **Portfolio Risk:** NOT weighted average; depends on correlation.
- **Systematic Risk:** Non-diversifiable; measured by Beta.
- **Unsystematic Risk:** Diversifiable; can be eliminated.
- **Beta:** $\text{Cov}_{SM}/\sigma_M^2$. $\beta > 1$: Aggressive; $\beta < 1$: Defensive; $\beta = 1$: Normal.
- **Minimum Variance Portfolio:** $W_A = (\sigma_B^2 - \text{Cov}_{AB})/(\sigma_A^2 + \sigma_B^2 - 2\text{Cov}_{AB})$.
- **Markowitz Model:** Investors risk averse; base decisions on expected return and variance.
- **Efficient Frontier:** Maximum return for given risk; minimum risk for given return.
- **CML:** $E(R_P) = R_F + \lambda \times \sigma_P$. Uses Total Risk (σ).
- **SML:** Relationship between Expected Return and Beta. Uses Systematic Risk (β).
- **Characteristic Line:** Time series graph; slope = Beta.
- **Asset Allocation Strategies:** Integrated, Strategic, Tactical, Insured.
- **Active Strategy:** Market timing, sector rotation, security selection.
- **Passive Strategy:** Index funds, buy and hold.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Portfolio return and risk calculation – 5–10 marks
- Covariance and correlation coefficient – 5 marks
- Minimum variance portfolio – 5 marks
- Beta calculation – 5 marks
- Systematic and unsystematic risk decomposition – 5 marks
- Efficient Frontier and CML – 5 marks
- CML vs SML – 5 marks
- Asset Allocation strategies – 5 marks
- Markowitz Model assumptions – 5 marks

Final Checklist – Module 8

✓ Before Moving to Module 9

- Can I compute portfolio return and risk?
- Can I calculate covariance and correlation coefficient?
- Can I differentiate between systematic and unsystematic risk?
- Can I compute Beta and interpret its values?
- Can I find minimum variance portfolio weights?
- Can I explain Markowitz Model and its assumptions?
- Can I construct and explain Efficient Frontier?
- Can I apply CML and distinguish it from SML?
- Can I explain Characteristic Line?
- Can I list and explain asset allocation strategies?
- Can I differentiate between Active and Passive strategies?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 10 numericals from this module?

END OF MODULE 8

Module 9 – Asset Pricing Theories

will be generated upon request.

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**CMA FINAL PAPER 14 · STRATEGIC FINANCIAL
MANAGEMENT**

09

Asset Pricing Theories

Master Revision Handbook · December 2026 Edition

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Module 9 – Asset Pricing Theories

Module Objective

Primary Objective

To equip oneself with the knowledge of application of various techniques in security evaluation, building a portfolio, measuring its performance and making revisions to optimise the returns. To understand the meaning and difference between single factor and multi-factor asset pricing theories, and learn applications of single factor and multi-factor asset pricing theories including CAPM and APT.

Mapped CMLO: 3a

Learning Outcomes

Students will be able to...	Application Skill
Understand the meaning and difference between single factor and multi-factor asset pricing theories.	Differentiate between CAPM (single factor) and APT (multi-factor); apply appropriate model.
Learn applications of single factor and multi-factor asset pricing theories including Levered Beta and Unlevered Beta.	Compute expected returns using CAPM and APT; calculate levered/unlevered beta; assess undervalued/overvalued securities.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
9.1	Single Factor and Multi-factor Asset Pricing Theories: CAPM and APT	HIGH 8%	Numerical + Theory
9.2	Concepts and Applications (including Levered Beta and Unlevered Beta)	HIGH 7%	Numerical + Theory

Expected Examination Areas – Dec 2026



DEC 2026 LIKELY AREAS

- CAPM – Expected return calculation – **5–10 marks**
- CAPM – Valuation (underpriced/overpriced) – **5–10 marks**
- APT – Multi-factor expected return – **5–10 marks**
- CML vs SML – **5 marks**
- Levered and Unlevered Beta – **5–10 marks**
- Project Beta and Pure Play Method – **5 marks**
- CAPM assumptions – **5 marks**
- Hedging using risk-free investments – **5 marks**
- Jensen's Alpha – **5 marks**
- Arbitrage Pricing Theory – **5–10 marks**

Frequently Tested Concepts

Module 9 – Concept Flow

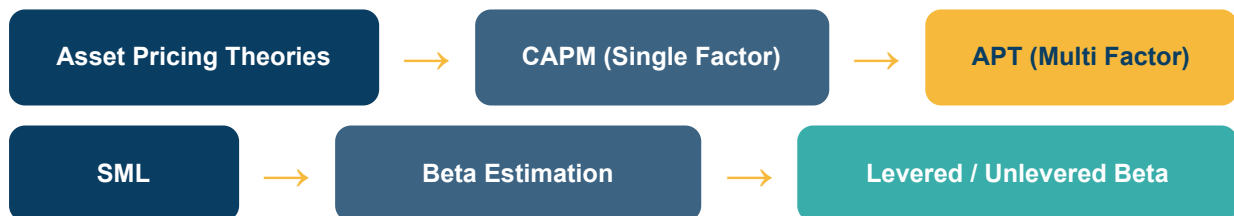


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★ FREQUENTLY ASKED – MODULE 9

- **CAPM – Expected return and valuation** – numerical
- **APT – Multi-factor model** – numerical
- **Levered / Unlevered Beta** – numerical
- **CML vs SML vs Characteristic Line** – theory
- **CAPM assumptions and features** – theory
- **Project Beta calculation** – numerical
- **Hedging with risk-free investments** – numerical

9.1 Single Factor and Multi-factor Asset Pricing Theories

Chapter Overview

This chapter covers the Capital Asset Pricing Model (CAPM), a single-factor model developed by William Sharpe and John Linter, and the Arbitrage Pricing Theory (APT), a multi-factor model developed by Ross. It explains the features, assumptions, formulas, and applications of these asset pricing theories.

Learning Objectives

- Understand the features and assumptions of CAPM
- Apply CAPM to compute expected return and value securities
- Distinguish between SML, CML and Characteristic Line
- Understand and apply the Arbitrage Pricing Theory (APT)
- Apply hedging strategies using risk-free investments
- Compute project beta

9.1.1 Capital Asset Pricing Model (CAPM) – Features and Assumptions

Introduction to CAPM

William F. Sharpe and John Linter developed the Capital Asset Pricing Model (CAPM). The model is based on the portfolio theory developed by Harry Markowitz. The model emphasises the risk factor in portfolio theory which is a combination of two risks — systematic risk and unsystematic risk. The model suggests that a security's return is directly related to its systematic risk which cannot be neutralized through diversification.



Feature 1

Explains relationship between Expected Return, Non-Diversifiable Risk (Systematic Risk), and valuation of securities



Feature 2

Based on premise that diversifiable risk of a security is eliminated when more and more securities are added to Portfolio



Feature 3

All securities do not have same level of systematic risk; required rate of return goes with level of systematic risk



Feature 4

Systematic Risk measured by Beta which is a function of: Total Risk of Market, Total Risk of Individual Securities, Correlation between the two

Assumptions of CAPM

CAPM Assumptions

Category	Assumption
With Reference to Investors	Investment goals of investors are rational. They desire higher return for any acceptable level of risk and lower risk for any desired level of return.
	Their objective is to maximize the utility of terminal wealth.
	Their choice is based on the risk and return of a security.
	They have homogeneous expectations of Risk and Return over an identical time horizon.
With Reference to Market	Information is freely and simultaneously available to all investors.
	Capital Market is not dominated by any individual investors.
	Investors can borrow and lend unlimited amount at the risk-free rate.
	No taxes, transaction costs, restrictions on short-term rates or other market imperfections.
	Total asset quantity is fixed, and all assets are marketable and divisible.

9.1.2 Formula for Computing Expected Return

Σ CAPM Formula

$$E(R_P) = R_F + \beta_P \times (R_M - R_F)$$

E(R_P): Expected Return on Portfolio **R_F**: Risk Free Rate of Interest/Return **β_P**: Portfolio Beta

R_M: Expected Return on Market Portfolio **(R_M – R_F)**: Market Risk Premium

β_P × (R_M – R_F): Risk Premium

✓ **Used to determine the minimum required return for a given level of systematic risk**

△ *Always ensure that beta and market return are consistent in terms of time period and market index*

Illustration 1 – CAPM Return

If the risk free rate of interest (R_f) is 10%, and expected return on market portfolio (R_m) is 15%, ascertain expected return of the portfolio if portfolio betas are — (a) 0.10 and (b) 0.30.

(a) β = 0.10:

$$E(R_P) = 10\% + 0.10 \times (15\% - 10\%) = 10\% + 0.5\% = 10.5\%$$

(b) β = 0.30:

$$E(R_P) = 10\% + 0.30 \times (15\% - 10\%) = 10\% + 1.5\% = 11.5\%$$

(a) 10.5% (b) 11.5%

Illustration 2 – Portfolio Beta and Expected Return

Subho has invested in four securities M, N, O and P, the particulars of which are as follows:

Security	M	N	O	P
Amount Invested (₹)	1,25,000	1,50,000	80,000	1,45,000
Beta (β)	0.60	1.50	0.90	1.30

If RBI Bonds carries an interest rate of 8% and NIFTY yields 14%, what is the expected return on portfolio? If investment in Security O is replaced by investment in RBI Bonds, what is the corresponding change in Portfolio Beta and expected return?

(i) Weighted Beta Calculation:

Security	Amount (₹)	Proportion	Beta	Weighted Beta
M	1,25,000	0.25	0.60	0.150
N	1,50,000	0.30	1.50	0.450
O	80,000	0.16	0.90	0.144
P	1,45,000	0.29	1.30	0.377
Total	5,00,000	1.00		1.121

$$\text{Expected Return} = 8\% + [1.121 \times (14\% - 8\%)] = 8\% + 6.726\% = 14.726\%$$

(ii) When Investment in O is replaced by RBI Bonds:

Security	Amount (₹)	Proportion	Beta	Weighted Beta
M	1,25,000	0.25	0.60	0.150
N	1,50,000	0.30	1.50	0.450
RBI Bonds	80,000	0.16	0.00	0.000
P	1,45,000	0.29	1.30	0.377
Total	5,00,000	1.00		0.977

$$\text{Expected Return} = 8\% + [0.977 \times (14\% - 8\%)] = 8\% + 5.862\% = 13.862\%$$

Original: $\beta = 1.121$; $E(R_P) = 14.726\%$

After replacement: $\beta = 0.977$; $E(R_P) = 13.862\%$

9.1.3 Security Market Line (SML) and Capital Market Line (CML)

Security Market Line (SML)

Security Market Line (SML) reflects the linear relationship between Systematic Risk and Expected Return in financial markets that result when Expected Returns and Beta Coefficients are plotted across a graph. SML is the relationship between Expected Return and Beta, on which both portfolios and individual securities lie.

Purpose: SML helps to determine if the investment is offering a return that is appropriate for its level of risk. Given its risk class, a security's return should be on the SML.

Evaluation Based on SML

Actual Return is	Inference	Security is
Above SML	Stock is yielding a higher return than what can be expected	Underpriced
On SML	Stock is yielding a return equivalent to what can be expected	Correctly Priced
Below SML	Stock is yielding a lower return than what can be expected	Overpriced

Capital Market Line (CML)

The Markowitz mean-variance model is modified by introducing the concept of risk-free asset. If the investor has access to risk-free securities in addition to the universe of risky securities, then he can construct a new set of portfolios. The efficiency boundary becomes the straight line drawn from R_f which is a tangent to the original risky portfolio efficiency boundary. This is termed as 'Capital Market Line' (CML).

Expected Return on Portfolio under CML

$$E(R_P) = R_F + \lambda \times \sigma_P$$

$$\lambda = (R_M - R_F) \div \sigma_M$$

λ : Market Price of Risk σ_P : Risk of the Portfolio (Standard Deviation)

Differences Between SML and CML

Aspect	Capital Market Line (CML)	Security Market Line (SML)
Risk Considered	Uses Standard Deviation i.e., Total Risks across the x-axis	Uses Beta or Systematic Risk across the x-axis (that part of Total Risk common to the whole market)
Nature of Portfolios	Uses only efficient portfolios (perfect replication of Market Portfolio in terms of risks and rewards)	Uses both efficient and non-efficient portfolios
Combination	Every point on CML is a proportional combination between Risk free Rate of Return and Market Return	Graphs all portfolios and securities which lie on and off the CML

9.1.4 Characteristic Line

Concept

Characteristic Line is a graph depicting the relationship between Security's Returns and Market Index Returns. Security Characteristic Line is a time series graph. Return considered for this is the excess return, i.e., expected return over and above the Risk Free Rate of Return.

Purpose: Used to estimate beta and also to determine how a security return correlates to a market index return.

Beta: Beta estimate comes from the slope estimate of the security characteristic line.

Distinguish Between SML and Characteristic Line

Aspect	Security Market Line	Characteristic Line
Scheme	Represents relationship between return and risk (systematic risk) of a security or portfolio	Represents relationship between returns of two securities or a security and the market return, over a period of time
Nature of Graph	Cross-sectional graph	Time Series Graph
Comparison	Graphs beta versus expected return	Graphs time series of Security Returns versus Index Returns
Utility	Used for estimating expected return for a security relative to its beta risk	To estimate beta and determine how a security return correlates to a market index return

9.1.5 Decision Making on Valuation of Portfolio / Security

CAPM as a Valuation Model

The Capital Asset Pricing Model (CAPM) is essentially a model for determining the Intrinsic Value or Equilibrium Price of an Asset. The Equilibrium or Intrinsic Price of an Asset is determined using the Expected Return as arrived at using the CAPM. Expected Return is the minimum return that the investors require from the asset in relation to the relative systematic risk of the Asset. Price of an asset is the Present Value of the Future Cash Flows generated by the Asset as discounted by the Expected Return as determined using the CAPM.

Situation	Inference	Action
1	CAPM Return < Estimated Return	BUY (Undervalued Security)
2	CAPM Return = Estimated Return	HOLD (Correctly Valued Security)
3	CAPM Return > Estimated Return	SELL (Overvalued Security)

9.1.6 Risk Return Ratio

Concept

Risk Return Ratio is the average return (in excess of the risk-free return) per unit of risk undertaken. It tends to measure the benefit of taking that extra risk. An investor would earn a return at risk-free rate, without assuming any risk. What return did he obtain for taking that extra risk, is measured by Risk-Return Ratio.

Risk Return Ratio

If Beta is taken as Measurement of Risk: Risk Return Ratio = $(R_s - R_f) \div \beta_s$

If Standard Deviation is taken as risk: Risk Return Ratio = $(R_s - R_f) \div \sigma_s$

R_s : Return of Security S R_f : Risk Free Return β_s : Beta of Security S

σ_s : Standard Deviation of Security S

9.1.7 Arbitrage Pricing Model (APT)

Concept

Unlike the CAPM which is a Single Factor Model, the APT is a Multi Factor Model having a whole set of Beta Values — one for each Factor. Arbitrage Pricing Theory states that the expected return on an investment is dependent upon how that investment reacts to a set of individual Macro-Economic factors (degree of reaction measured by the Betas) and the risk premium associated with each of those macro-economic factors.

The Arbitrage Pricing Theory developed by Ross (1976) holds that there are four factors which explain the risk premium relationship of a particular security. Several factors can be identified to have a bearing on the Return expectation of a security. Most factors such as inflation and money supply, interest rate, industrial production and personal consumption are inter-related. It seeks to identify the risk return relationship for each of the factors individually.

Capital Asset Pricing Model (CAPM) – Single Factor

$$\text{Expected Return} = R_F + RP \times \beta$$

R_F : Risk Free Rate RP : Average Risk Premium considering all factors put together i.e., $(R_M - R_F)$

Arbitrage Pricing Theory (APT) – Multi Factor

$$\text{Expected Return} = R_F + R_1\beta_1 + R_2\beta_2 + R_3\beta_3 + \dots + R_n\beta_n$$

R_n : Risk premium for each factor β_n : Measure of sensitivity of the particular security to each factor

 Use when multiple macroeconomic factors affect security returns

Illustration – APT vs CAPM

Estimate the stock return by using CAPM and APT model:

(a) The expected return of the market is 14% and the equity beta is 1.2. The risk free rate of interest is 6%.

(b) Factor sensitivities and risk premiums:

Factor	Market Price of Risk (%)	Sensitivity Index
Inflation	5	1.2
Industrial Production	1	0.9
Risk Premium	3	1.1
Interest Rate	4	−0.8

What explanations can you offer for the difference in the two estimates?

Return as per CAPM:

$$\begin{aligned}R_i &= R_f + (R_m - R_f) \times \beta_i \\&= 0.06 + (0.14 - 0.06) \times 1.2 \\&= 0.06 + 0.096 = 0.156 = \mathbf{15.60\%}\end{aligned}$$

Return under APT Model:

$$\begin{aligned}R_i &= R_F + [R_1\beta_{i1} + R_2\beta_{i2} + R_3\beta_{i3} + R_4\beta_{i4}] \\&= 0.06 + [0.05 \times 1.2 + 0.01 \times 0.9 + 0.03 \times 1.1 + (0.04 \times -0.8)] \\&= 0.06 + [0.06 + 0.009 + 0.033 - 0.032] \\&= 0.06 + 0.07 = \mathbf{13\%}\end{aligned}$$

CAPM Return = 15.60%

APT Return = 13%

The rates are different under two models due to usage of different variables. The rate under APT is much lower because of negative impact of interest rate factor.

Illustration – APT – HUL Stock Decision

Mr. Parekh is confused whether he should purchase stock of HUL or not. His financial analyst has provided the following information:

$$R_f = 6\%$$

Factor	λ_i	β_i
Interest Rate Risk	0.90	0.90
Purchasing Power Risk	0.8	1.70
Inflation Risk	1.4	1.50
Market Risk	0.7	-1.60

The probability of getting a return on HUL stock is given below:

Return %	Probability (%)
18	40
20	30
12	20
8	10

Advise Mr. Parekh.

APT Return:

$$\begin{aligned} R_i &= 6 + [0.90 \times 0.90 + 0.80 \times 1.70 + 1.4 \times 1.50 + (0.70 \times -1.60)] \\ &= 6 + [0.81 + 1.36 + 2.1 - 1.12] \\ &= 6 + 3.15 = \mathbf{9.15\%} \end{aligned}$$

Probable Return:

$$\begin{aligned} &= 18 \times 0.40 + 20 \times 0.30 + 12 \times 0.20 + 8 \times 0.10 \\ &= 7.20 + 6.00 + 2.40 + 0.80 = \mathbf{16.40\%} \end{aligned}$$

As probable return (16.40%) is much higher than APT required return (9.15%), Mr. Parekh should buy HUL stock.

9.1.8 Hedging of Risks Using Risk Free Investments

Concept

Risk-free investments have a beta of zero. By combining risk-free investments with a portfolio of risky assets, the overall beta of the combined portfolio can be adjusted upward or downward.

Hedging using Risk Free Investments to Increase Risk (Increase Portfolio Value)

- **Object:** Increase Beta value of the Portfolio
- **Action:** Buy Stock and Sell Risk free Investments
- **Formula:** Value of Risk Free Investments to be sold = Portfolio Value $\times$ [Desired Beta – Present Beta]
- **Reasoning:** Desired Beta is weighted average beta of risk-free investments and Beta of remaining investments. Risk-free Investments do not carry any Beta. By selling Risk-free investments and investing the same in the Portfolio, risk attached to the Portfolio increases, and thereby Portfolio Risk increases and portfolio return also increases.
- **Example:** Portfolio value is ₹1,00,000 and Beta is 1.20. Desired Beta is 2.00. Value of Risk Free Investments to be sold = ₹1,00,000 $\times$ (2.00 – 1.20) = ₹80,000

Hedging using Risk Free Investments to Reduce Risk (Reduce Erosion in Value)

- **Object:** Reduce Beta Value of the Portfolio
- **Action:** Sell Stock and Buy Risk free Investments
- **Formula:** Value of Risk Free Investments to be bought = Portfolio Value $\times$ [Present Beta – Desired Beta]
- **Reasoning:** Risk free Investments do not carry any Beta. By selling the Portfolio stock, and buying risk-free investments, Risk attached to the Portfolio gets reduced, and thereby Portfolio Risk reduces.
- **Example:** Portfolio value is ₹1,00,000 and Beta is 2.00. Desired Beta is 1.20. Value of Risk Free Investments to be bought = ₹1,00,000 $\times$ (2.00 – 1.20) = ₹80,000

Illustration – Hedging with Risk-Free Investments

Portfolio value is ₹67.50 Crores and Beta is 1.5. NIFTY index futures are quoted at 4500 with each contract underlying 100 units. The manager wants to hedge using index futures.

Value per Index Futures Contract = $4500 \times 100 = ₹4,50,000$

Value of Index Futures required to hedge = Beta $\times$ Portfolio Value
 $= 1.5 \times ₹67.50 \text{ Crores} = ₹101.25 \text{ Crores}$

Number of NIFTY index contracts to be sold = $₹101.25 \text{ Crores} \div ₹4.5 \text{ Lakhs} = 2250 \text{ contracts}$

Scenario: Market falls by 10%

Portfolio loss = $1.5 \times 10\% = 15\% \times ₹67.50 \text{ Cr} = (-)₹10.125 \text{ Cr}$

Gain on futures = $10\% \times ₹101.25 \text{ Cr} = +₹10.125 \text{ Cr}$

Net Gain/Loss = Nil

Number of contracts to be sold = 2250

The portfolio is perfectly hedged.

Illustration – Adjusting Portfolio Beta

Portfolio Value = ₹100 Crores; $\beta = 1.2$; Desired $\beta = 0.8$; Index Futures = 5500; Lot size = 100

Value per futures contract = $5500 \times 100 = ₹5,50,000$

Number of contracts = $(\beta^* - \beta) \times (\text{Portfolio Value} \div \text{Value of futures contract})$
 $= (0.8 - 1.2) \times (100 \text{ crores} \div 5,50,000)$
 $= (-0.4) \times 1818.18$
 $= -727.27 \approx \textbf{-727 contracts}$

Negative sign indicates selling (short) the futures.

Mr. Z should sell 727 index futures to reduce beta from 1.2 to 0.8.

9.1.9 Computation of Project Beta

Concept

Beta of a project is the weighted average of the Beta of all the Assets and the Projects. Project Beta = Beta of Assets = Beta of Liabilities. Beta of Assets = Weighted Average Beta of Equity and Debt Employed in the Project.

Project Beta (Single Project – Assuming No Taxes)

$$\beta_A = W_E \times \beta_E + W_D \times \beta_D$$

β_A : Beta of Project A W_E, W_D : Weights of Equity and Debt β_E, β_D : Beta of Equity and Debt

Project Beta (With Taxes)

$$\beta_P = [\beta_E \times E + \beta_{Debt} \times D \times (1 - T)] \div [E + D \times (1 - T)]$$

β_E : Beta of Equity of the Project β_{Debt} : Beta of Debt of the Project E : Equity D : Debt T : Tax Rate

△ When debt beta is zero (risk-free debt), the formula simplifies to: $\beta_P = \beta_E \times [E \div (E + D(1-T))]$

9.2 Concepts and Applications (including Levered Beta and Unlevered Beta)

Chapter Overview

This chapter covers the concepts of levered beta (equity beta) and unlevered beta (asset beta), their computation, and their applications in corporate finance and valuation.

Learning Objectives

- Understand the concept of levered beta and unlevered beta
- Compute levered and unlevered beta
- Understand the difference between levered and unlevered firms
- Apply proxy beta concept
- Use beta in capital budgeting and valuation decisions

9.2.1 Levered Beta

Concept

Levered beta (or geared Beta) takes debt and equity in its capital structure and then compares the risk of a firm to the volatility of the market. Also, it gives tax benefit to the company by adding debt to its capital structure. However, the more debt a company has, the more earnings are used to pay back that debt and this, in turn, increases the risk associated with the stock.

Levered beta is a financial calculation that indicates the systematic risk of a stock used in the capital asset pricing model (CAPM). Beta or levered beta is a measure of a firm's systematic risk in relation to the market. A key determinant of beta is leverage, i.e. the level of the firm's debt compared to equity.

Levered Beta Formula

$$\text{Levered Beta} = \text{Unlevered Beta} \times [1 + (1 - \text{Tax Rate}) \times (\text{Debt} \div \text{Equity})]$$

Levered Beta: Equity Beta (β_L) **Unlevered Beta:** Asset Beta (β_U) **Debt/Equity:** Debt-to-Equity Ratio

 **Use when measuring a company's systematic risk including the impact of financial leverage**

 *Levered beta is also known as equity beta*

Illustration – Levered Beta

Assume for the subject company:

Unlevered beta: 0.90

Tax rate: 0.30

Capital structure: 60% debt, 40% equity

Calculate levered beta.

$$\text{Debt/Equity} = 0.60 \div 0.40 = 1.5$$

$$\begin{aligned}\beta_L &= 0.90 \times [1 + (1 - 0.30) \times 1.5] \\ &= 0.90 \times [1 + 0.70 \times 1.5] \\ &= 0.90 \times [1 + 1.05] \\ &= 0.90 \times 2.05 \\ &= \mathbf{1.85}\end{aligned}$$

Levered Beta = 1.85

9.2.2 Unlevered Beta

Concept

It is a risk measurement metric that compares the risk of a company without any debt to the risk of the market. In simple language, unlevered beta is a company's beta without considering the debt. It is also referred to as asset beta because the risk of a firm after removing leverage is because of its assets. Unlevered beta takes only equity in its capital structure and then compares the risk of a firm to the risk of the market.

Unlevered beta is useful when comparing companies with different capital structures as it focuses on the equity risk and is also referred to as the "Asset Beta" since its value is determined by the assets (or businesses) owned by the firm.

Unlevered Beta Formula

$$\text{Unlevered Beta} = \text{Levered Beta} \div [1 + (1 - \text{Tax}) \times (\text{Debt} \div \text{Equity})]$$

Unlevered Beta: Asset Beta (β_U) **Levered Beta:** Equity Beta (β_L) **Debt/Equity:** Debt-to-Equity Ratio

✔ **Use to compare companies with different capital structures**

⚠ *Generally, Unlevered beta is lower than levered beta; could be higher in some cases when net debt is negative (more cash than debt)*

Why Use Unlevered Beta?

- Some industries or companies have a high level of debt on their balance sheet
- This leverage makes their earnings volatile, and investment in this company becomes risky
- Levered beta considers the risk of leverage and its impact on the company's performance
- Levered beta is not an ideal measure to compare two companies with different debt proportions
- Unlevered beta removes the effect of debt by "unlevering" the beta and facilitates a better comparison

9.2.3 Levered and Unlevered Firms, Proxy Beta

Definitions

Term	Definition
Unlevered Firm	If a Company finances its investments and projects completely with Equity (without leveraging Debt Finance), then the Company is known as an Unlevered Firm
Levered Firm	Levered Firm is the firm whose Capital Structure includes both the components of Debt and Equity
Proxy Beta	Proxy Beta is the beta of a Levered Firm, arrived at from the beta of an Unlevered Firm

Interpreting Levered Beta

- A beta equal to 1 indicates a stock's risk equal to the market risk
- A beta of less than 1 indicates a stock's risk lower than the market risk
- A beta of greater than 1 indicates a stock's risk greater than the market risk
- Beta does not take into account the unsystematic risk. Unsystematic risk specifically affects a stock, so it can be reduced by diversifying the portfolio
- To calculate the levered beta, we need to know the unlevered beta and the debt-to-equity ratio
- Levered beta is also known as equity beta

Risk of a Security's Performance

- A levered beta measures the sensitivity of that security's tendency to perform in relation to the overall market
- Levered beta includes a company's debt in the calculation of its sensitivity
- Security with positive levered beta signals that the security has a positive correlation with market performance
- Security with negative levered beta signals that the security has a negative correlation with market performance
- A levered beta greater than positive 1 or less than negative 1 means it has greater volatility than the market
- A levered beta between negative 1 and positive 1 has less volatility than the market

Illustration – Levered and Unlevered Beta Conversion

A company has an equity beta of 1.4 and is to be financed by a combination of 25% Debt and 75% Equity. Assume Debt Beta as zero, $R_f = 12\%$ and $R_m = 18\%$. Compute the required rate of return of the project.

Step 1: Compute Asset Beta (Unlevered Beta)

$$\beta_{\text{Asset}} = \beta_{\text{Equity}} \times [E \div (E + D(1-T))]$$

Since no tax rate is given, assume $T = 0$

$$\beta_{\text{Asset}} = 1.4 \times [0.75 \div (0.75 + 0.25 \times 1)] = 1.4 \times 0.75 = 1.05$$

Step 2: Required Rate of Return

$$E(R) = R_f + \beta_{\text{Asset}} \times (R_m - R_f)$$

$$= 12\% + 1.05 \times (18\% - 12\%)$$

$$= 12\% + 6.3\%$$

$$= \mathbf{18.30\%}$$

Required rate of return = 18.30%

Illustration – Calculating Levered Beta from Comparable Firm

Company A is an all-equity firm with an asset beta of 0.80. Company B operates in the same industry but has a debt-to-equity ratio of 0.5 and a tax rate of 30%. What is the equity beta for Company B?

$$\beta_{\text{Levered}} = \beta_{\text{Unlevered}} \times [1 + (1 - T) \times (D/E)]$$

$$= 0.80 \times [1 + (1 - 0.30) \times 0.5]$$

$$= 0.80 \times [1 + 0.35]$$

$$= 0.80 \times 1.35$$

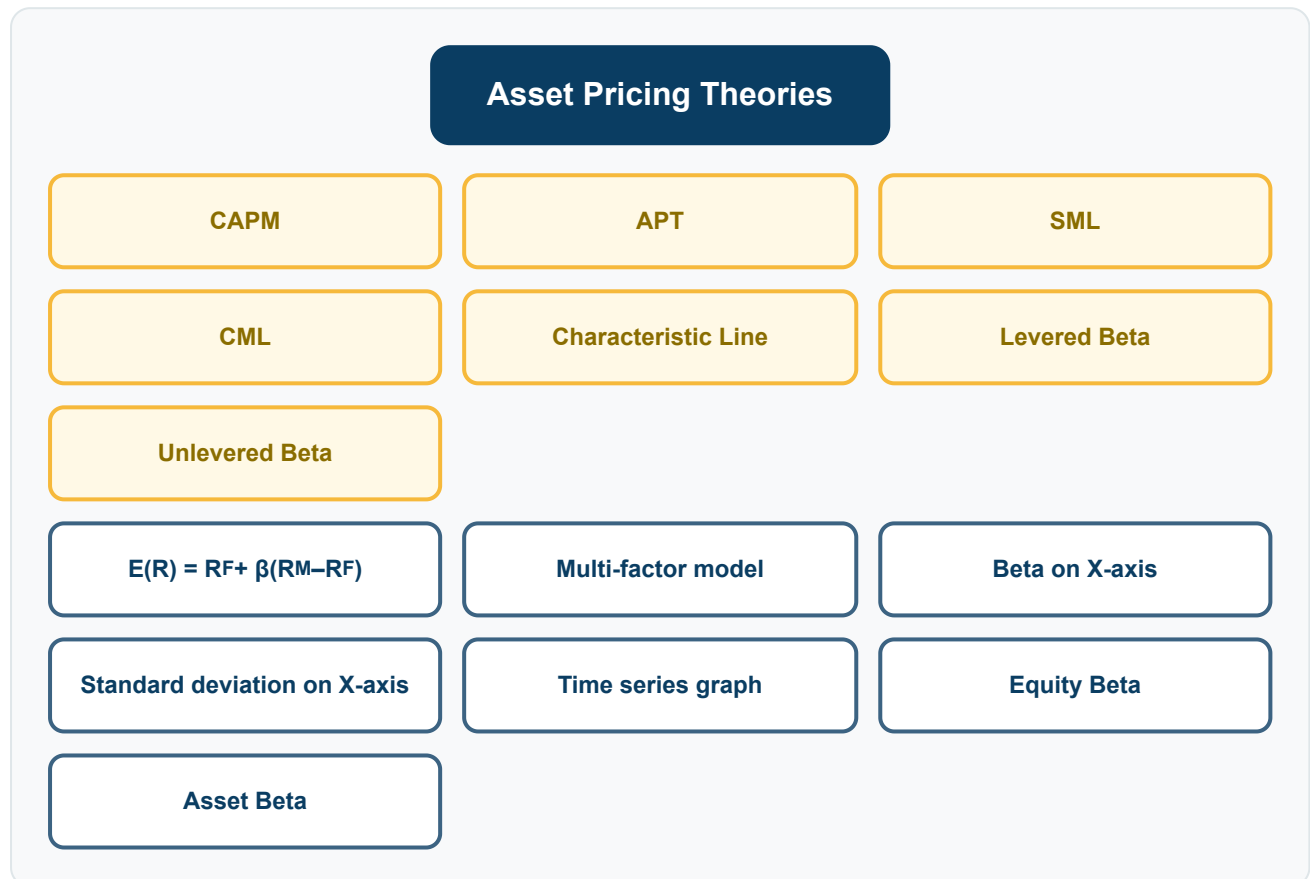
$$= \mathbf{1.08}$$

Equity Beta for Company B = 1.08

Shortcut: Remember — Unlevered (asset) beta is always lower than levered (equity) beta when the company has debt. The multiplier is $[1 + (1-T)(D/E)]$.

Module 9 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 9



Key Points for Revision

1. CAPM = Single factor model; developed by Sharpe and Linter
2. CAPM formula: $E(R_P) = R_F + \beta_P(R_M - R_F)$
3. CAPM based on Markowitz portfolio theory
4. Investors are rational and risk-averse
5. Homogeneous expectations; unlimited borrowing/lending at risk-free rate
6. No taxes, transaction costs, or market imperfections
7. SML: Relationship between Expected Return and Beta
8. SML uses systematic risk; CML uses total risk
9. CML uses only efficient portfolios; SML uses all portfolios
10. Above SML → Underpriced → Buy
11. Below SML → Overpriced → Sell
12. On SML → Correctly priced → Hold
13. Characteristic Line = Time series graph; slope = Beta
14. Risk Return Ratio = $(R_s - R_f) \div \beta_s$
15. APT = Multi-factor model; developed by Ross (1976)
16. APT: $E(R) = R_F + R_1\beta_1 + R_2\beta_2 + \dots + R_n\beta_n$
17. APT factors: Inflation, money supply, interest rate, industrial production, personal consumption
18. CAPM is a single-factor model; APT is a multi-factor model
19. Hedging to increase risk: Sell risk-free investments
20. Hedging to reduce risk: Buy risk-free investments
21. Project Beta = Weighted average Beta of Equity and Debt
22. $\beta_{\text{Asset}} = \beta_{\text{Equity}} \times [E \div (E + D(1-T))]$
23. Levered Beta = Unlevered Beta $\times [1 + (1-T)(D/E)]$
24. Unlevered Beta = Levered Beta $\div [1 + (1-T)(D/E)]$
25. Levered Beta = Equity Beta; Unlevered Beta = Asset Beta
26. Proxy Beta = Beta of levered firm from unlevered firm beta
27. $\beta > 1$: Aggressive; $\beta < 1$: Defensive; $\beta = 1$: Normal
28. Alpha = Actual Return – CAPM Return
29. Positive alpha → Underpriced; Negative alpha → Overpriced
30. For an all-equity firm, levered beta equals unlevered beta

Comprehensive Formula Handbook – Module 9

CAPM

$$E(R_P) = R_F + \beta_P(R_M - R_F)$$

APT

$$R_F + R_1\beta_1 + R_2\beta_2 + \dots + R_n\beta_n$$

CML

$$E(R_P) = R_F + \lambda \times \sigma_P$$

Market Price of Risk

$$\lambda = (R_M - R_F) \div \sigma_M$$

Risk Return Ratio (Beta)

$$(R_S - R_F) \div \beta_S$$

Risk Return Ratio (SD)

$$(R_S - R_F) \div \sigma_S$$

Jensen's Alpha

$$R_P - [R_F + \beta_P(R_M - R_F)]$$

Project Beta (No Taxes)

$$\beta_A = W_E\beta_E + W_D\beta_D$$

Project Beta (With Taxes)

$$[\beta_E \times E + \beta_D \times D(1-T)] \div [E + D(1-T)]$$

Levered Beta

$$\beta_U \times [1 + (1-T)(D/E)]$$

Unlevered Beta

$$\beta_L \div [1 + (1-T)(D/E)]$$

Hedging to Increase Beta

$$\text{Portfolio Value} \times [\text{Desired } \beta - \text{Present } \beta]$$

Hedging to Reduce Beta

$$\text{Portfolio Value} \times [\text{Present } \beta - \text{Desired } \beta]$$

Number of Futures Contracts

$$(\beta^* - \beta) \times \text{Portfolio Value} \div \text{Value of Futures Contract}$$

One-Night Revision Notes – Module 9

Last Night Before Exam – Module 9

- **CAPM:** $E(R_P) = R_F + \beta_P(R_M - R_F)$. Single factor model.
- **Assumptions:** Rational investors, homogeneous expectations, no taxes/transaction costs, unlimited borrowing/lending at risk-free rate.
- **SML:** Beta on X-axis. Above SML → Underpriced → Buy. Below SML → Overpriced → Sell.
- **CML:** Standard deviation on X-axis. Uses only efficient portfolios.
- **Characteristic Line:** Time series graph; slope = Beta.
- **APT:** Multi-factor model. $E(R) = R_F + R_1\beta_1 + \dots + R_n\beta_n$.
- **Levered Beta:** Equity Beta = $\beta_U \times [1 + (1-T)(D/E)]$.
- **Unlevered Beta:** Asset Beta = $\beta_L \div [1 + (1-T)(D/E)]$.
- **Project Beta:** Weighted average of equity and debt betas.
- **Hedging:** Sell risk-free to increase beta; buy risk-free to reduce beta.
- **Alpha:** Actual Return – CAPM Return. Positive → Underpriced; Negative → Overpriced.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- CAPM – Expected return calculation – 5–10 marks
- CAPM – Valuation (underpriced/overpriced) – 5–10 marks
- APT – Multi-factor expected return – 5–10 marks
- CML vs SML – 5 marks
- Levered and Unlevered Beta – 5–10 marks
- Project Beta and Pure Play Method – 5 marks
- CAPM assumptions – 5 marks
- Hedging using risk-free investments – 5 marks
- Jensen's Alpha – 5 marks
- Arbitrage Pricing Theory – 5–10 marks

Final Checklist – Module 9

✓ Before Moving to Module 10

- Can I state and explain the CAPM formula?
- Can I list and explain the assumptions of CAPM?
- Can I compute expected return using CAPM?
- Can I determine if a security is underpriced/overpriced using SML?
- Can I differentiate between SML, CML and Characteristic Line?
- Can I compute expected return using APT (multi-factor)?
- Can I calculate Levered and Unlevered Beta?
- Can I compute project beta with and without taxes?
- Can I apply hedging strategies to adjust portfolio beta?
- Can I calculate Jensen's Alpha?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 10 numericals from this module?

END OF MODULE 9

Module 10 – Portfolio Performance Evaluation and Portfolio Revision

will be generated upon request.

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10

Portfolio Performance Evaluation and Portfolio Revision

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Module 10 – Portfolio Performance Evaluation and Portfolio Revision

Module Objective

Primary Objective

To equip oneself with the knowledge of application of various techniques in security evaluation, building a portfolio, measuring its performance and making revisions to optimise the returns. To understand various techniques of evaluation of portfolio performance, and learn about market timing and style analysis to assess the performance of fund managers.

Mapped CMLO: 3a

Learning Outcomes

Students will be able to...	Application Skill
Understand various techniques of evaluation of portfolio performance.	Apply Sharpe, Treynor, and Jensen measures; compute MWROR and TWROR.
Learn about market timing and style analysis to assess the performance of fund managers.	Conduct performance attribution analysis; identify stock selection and market timing skills.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
10.1	Conventional Performance Evaluation	HIGH 3%	Numerical + Theory
10.2	Market Timing and Style Analysis	MEDIUM 2%	Theory + Concept

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- Sharpe, Treynor, Jensen measures – **5–10 marks**
- MWROR and TWROR – **5–10 marks**
- Performance Attribution Analysis – **5–10 marks**
- Style Analysis – **5 marks**
- Market Timing vs Stock Selection – **5 marks**
- Risk-adjusted performance evaluation – **5 marks**

Frequently Tested Concepts

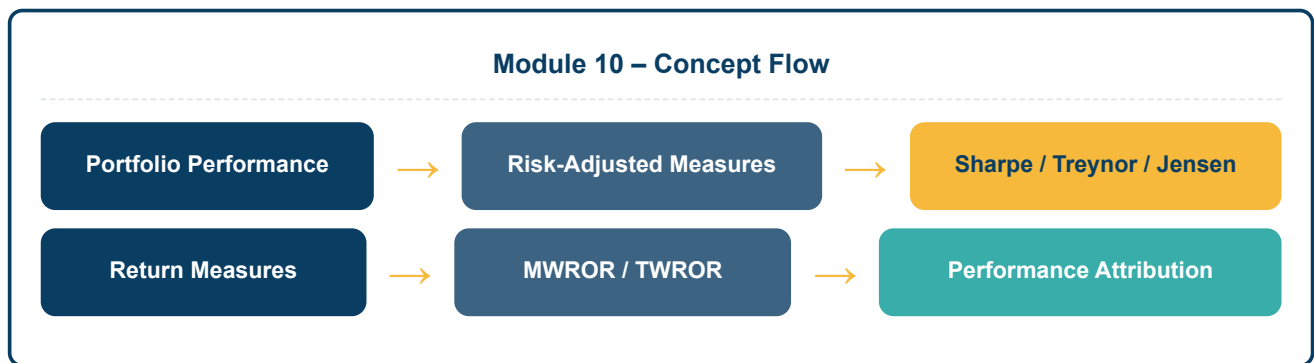


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★ FREQUENTLY ASKED – MODULE 10

- **Sharpe, Treynor, Jensen** – numerical + ranking
- **MWROR and TWROR** – numerical
- **Performance Attribution** – asset allocation and selection
- **Style Analysis** – returns-based vs holdings-based
- **Market Timing vs Stock Selectivity** – theory

10.1 Conventional Performance Evaluation

Chapter Overview

This chapter covers the various methods for evaluating portfolio performance, including measures of return without risk (MWROR and TWROR) and risk-adjusted performance measures (Sharpe, Treynor, and Jensen). It also covers performance attribution analysis.

Learning Objectives

- Understand the need for portfolio performance evaluation
- Compute Money Weighted Rate of Return (MWROR)
- Compute Time Weighted Rate of Return (TWROR)
- Apply Sharpe, Treynor, and Jensen measures
- Conduct performance attribution analysis

10.1.1 Performance Evaluation of Portfolios



Need for Performance Evaluation

After investing in the fund managed by efficient and experienced portfolio managers, the investors are interested to know the exact position of their fund compared with other funds and the market rate of return during a certain time period. Evaluation of the portfolio managers is required:

- To verify whether superior returns are attributable to the portfolio managers or not
- To monitor whether the investment strategy adopted is compatible with the investor's objectives or not

10.1.2 Measures of Return (Without Risk)



Money Weighted Rate of Return (MWROR)

Measures the performance of an investment; accounts for money invested; provides actual return earned on investment. Simply the IRR over the period.



Time Weighted Rate of Return (TWROR)

Calculates the compound growth rate of an investment portfolio; eliminates distorting effects of cash flows; measures fund manager's investment skill.

10.1.3 Money Weighted Rate of Return (MWROR)

Concept

The money-weighted rate of return (MWROR) is a measure of the performance of an investment. The money-weighted return accounts for the money invested and provides the investor with information on the actual return he earns on her investment. The MWROR is calculated by finding the rate of return that will set the present values (PV) of all cash flows equal to the value of the initial investment. MWROR is simply the internal rate of return over the period.

Two factors influence the money weighted rate of return:

- The beginning and the ending market values of the fund
- The timing of the net contributions to the fund, i.e. cash flows

Money Weighted Rate of Return

$$F_T = F_0(1+i)^T + C_{t1}(1+i)^{T-t1} + C_{t2}(1+i)^{T-t2} + \dots + C_{tn}(1+i)^{T-tn}$$

F_T : End value of fund at time T F_0 : Value of Fund at time 0 C_t : Net cash flows at times $t_1, t_2 \dots t_n$

i : Effective annual rate of interest earned by the fund

$$\text{Alternatively: } PVO = PVI = CF_0 + CF_1/(1+IRR) + CF_2/(1+IRR)^2 + \dots + CF_n/(1+IRR)^n$$

 **MWROR is a satisfactory measure of the individual fund's performance taken in isolation**

 *Not meaningful as a test of fund manager's investment skill as it is strongly influenced by timing and magnitude of cash flows*

Illustration – MWROR

Fund A has the following market value at the end of some successive years:

Period (Years)	Market Value (₹)	Cash Flows (net) (₹)
0	1,000	—
1	1,100	100
2	1,200	150
3	1,300	80
4	1,500	—

Calculate Money Weighted Rate of Returns.

Money Weighted Rate of Returns is actually internal rate of return.

$$F_0(1+i)^T + C_t(1+i)^{T-t} + \dots = F_T$$

$$1000(1+i)^4 + 100(1+i)^3 + 150(1+i)^2 + 80(1+i) = 1500$$

By using iterative process and substituting different values for 'i', it is found that 'i' lies between 3% and 4%.
By using interpolation, the true value of 'i' is 3.46%.

Hence, the MWROR for the fund is **3.46%**.

MWROR = 3.46%

10.1.4 Time Weighted Rate of Return (TWROR)

Concept

Time-weighted Rate of Return (TWROR) is a method for calculating the compound growth rate of an investment portfolio. The TWROR is used to calculate the annualised compound growth rate of an investment over a specific time period, by geometrically linking the holding period returns. TWROR seeks to eliminate the distorting effects of cash flows so that more valid comparisons of fund manager's investment skills can be made.

The first step in calculating the TWROR is to split the period under review into a number of shorter periods. Each period starts when there is a cash flow. Rate of return for these shorter periods are then combined to give TWROR for the whole period.

Σ Time Weighted Rate of Return

$$\text{TWROR} = [(1+R_1) \times (1+R_2) \times \dots \times (1+R_n)]^{1/T} - 1$$

R_n : Holding period return for each sub-period T : Total number of periods

$$\text{Alternatively: TWROR} = [F_{t1}/(F_{t0}+C_{t0}) \times F_{t2}/(F_{t1}+C_{t1}) \times \dots \times F_T/(F_{tn}+C_{tn})]^{1/T} - 1$$

✓ Better measure of fund manager's investment skill than MWROR

Illustration – TWROR

Using the data from the previous illustration (Fund A), calculate the TWROR.

$$i = [(1100/1000) \times (1200/1200) \times (1300/1350) \times (1500/1380)]^{1/4} - 1$$

$$= [(1.10) \times (1.00) \times (0.9630) \times (1.0870)]^{1/4} - 1$$

$$= (1.1514)^{1/4} - 1$$

$$= 1.0359 - 1 = 0.0359 \text{ or } \mathbf{3.56\%}$$

TWROR = 3.56%

Note: TWROR (3.56%) is higher than MWROR (3.46%). This is because TWROR eliminates the effect of cash flow timing and measures the fund manager's skill.

Illustration – MWROR and TWROR

A mutual fund starts the year with ₹50 million. By 1st year it has appreciated to ₹60 million, at which point it receives cash amounting to ₹20. In the second year, the fund appreciates by another 50%.

(a) What is the annual MWROR?

(b) What is the annual TWROR?

(c) Suppose that the fund has a 1st year cash outflow of ₹20 million rather than an inflow. Would this increase or reduce the TWROR?

Time (Years)	Market Value of Fund	Cash Flows (Net)
0	50	0
1	60	20
2	120	—

(a) MWROR:

$$50(1+i)^2 + 20(1+i) = 120$$

By iteration: $i \approx 36.2\%$

(b) TWROR:

$$i = [(60/50) \times (120/80)]^{1/2} - 1$$

$$= (1.2 \times 1.5)^{1/2} - 1$$

$$= (1.8)^{1/2} - 1$$

$$= 1.3416 - 1 = 34.1\%$$

(c) If 1st year cash outflow is ₹20 million instead of inflow:

$$i = [(60/50) \times (120/40)]^{1/2} - 1$$

$$= (1.2 \times 3.0)^{1/2} - 1$$

$$= (3.6)^{1/2} - 1$$

$$= 1.8974 - 1 = 89.74\%$$

Thus, the outflow increases the TWROR.

(a) MWROR = 36.2%

(b) TWROR = 34.1%

(c) TWROR = 89.74% (increases)

10.1.5 Risk-Adjusted Performance Measures

Three Major Risk-Adjusted Measures

1. **Sharpe's Measure:** Reward to total volatility trade-off; uses Standard Deviation
2. **Treynor's Measure:** Reward to volatility ratio; uses Beta
3. **Jensen's Alpha:** Differential return; absolute measure

The above risk-adjusted performance evaluation using mean-variance criteria came to light after capital asset pricing model had been staged.

10.1.6 Sharpe's Measure

Concept

Sharpe's measure evaluates the performance of a portfolio as excess return of the portfolio over risk-free return divided by the total risk or standard deviation of the portfolio. It measures the reward to total volatility trade off.

Sharpe Ratio

$$S = (\bar{R}_P - \bar{R}_F) \div \sigma_P$$

$\bar{R}_P$: Average return of the portfolio $\bar{R}_F$: Average rate of risk-free return σ_P : Standard deviation of the portfolio

 **Appropriate measure of performance for an overall portfolio when compared with another portfolio**

 *The bars over R_f and R_p denote that risk-free return may not be constant over the time period; we are taking a sample average for both*

Illustration – Sharpe's Measure

Mr. Mukherjee has been managing the portfolio of a large fund for the last 3 years. He found that his portfolio had earned a return of 40% with a standard deviation of 22%. During the same period, the market generated a return of 24% with a standard deviation of 16%. The risk-free rate of return during the same period was 8%. Determine the return of the fund using the Sharpe's measure as compared to the return of market.

Fund's Performance:

Risk Premium = 40% – 8% = 32%

Sharpe Ratio = 32% ÷ 22% = 1.45

Market's Performance:

Risk Premium = 24% – 8% = 16%

Sharpe Ratio = 16% ÷ 16% = 1.00

Return should have been as per CML:

$$R_{CML} = R_F + [(R_M - R_F) \div \sigma_M] \times \sigma_P$$

$$= 8\% + [(24\% - 8\%) \div 16\%] \times 22\%$$

$$= 8\% + 22\% = 30\%$$

Since actual return (40%) > CML return (30%), performance is better.

Sharpe Ratio (Fund) = 1.45

Sharpe Ratio (Market) = 1.00

Mr. Mukherjee's performance is better than the market.

10.1.7 Treynor's Measure

Concept

While Sharpe has considered the total risk, Treynor considers the systematic risk or beta of the portfolio.

Treynor's Ratio

$$T = (\bar{R}_P - \bar{R}_F) \div \beta_P$$

$\bar{R}_P$: Average return of the portfolio $\bar{R}_F$: Average risk-free rate of return β_P : Beta of the portfolio

 **Appropriate for completely diversified portfolio**

Illustration – Treynor's Measure

Mr. Singh has been managing the portfolio of a large mutual fund for the last 3 years. He found that his portfolio had earned a return of 40% and the portfolio had a beta of 1.2. During the same period the market return has been 25%. The risk-free rate of return is 8%. Compare the Return of the Portfolio with the market return using Treynor's Measure.

Risk Premium = 40% – 8% = 32%

Treynor's Measure = 32% ÷ 1.2 = **26.67%**

Market Return per unit of beta = (25% – 8%) ÷ 1 = 17%

Return as per SML = $R_F + (R_M - R_F) \times \beta$

= 8% + (25% – 8%) × 1.2

= 8% + 20.4% = 28.4%

Excess Return = 40% – 28.4% = 11.6%

Treynor's Measure = 26.67%

Mr. Singh has outperformed the market.

10.1.8 Jensen's Differential Return

Concept

The Sharpe and Treynor ratios measure the relative performance of various portfolios on a risk-adjusted basis. Jensen's measure provides absolute performance of the portfolios on a risk-adjusted basis with respect to definite standard against which performance of the various funds can be calculated. In simple terms, we are trying to assess if more than expected return can be earned at the particular level for the portfolio's risk.

The Jensen performance index is sometimes referred to as Jensen's alpha model because we calculate the value of alpha or differential return for the measurement of the portfolio's performance. This model is based on the CAPM model.

Jensen's Alpha

$$\alpha_p = r_p - [r_f + \beta_p(r_m - r_f)]$$

α_p : Jensen's Alpha (differential return) r_p : Realized average return of the portfolio r_f : Risk-free rate

β_p : Beta of the portfolio r_m : Average market return

 **Absolute measure; positive alpha indicates superior stock selection**

 *Intercept above origin → superior stock selection; below origin → under performance*

Illustration – Jensen's Alpha

Based on the data provided below, compare the performance of the portfolios using the Jensen model of the differential return.

Portfolio	Realized Return on Portfolio (%)	Portfolio (β)
1	14.5	1.2
2	9.5	0.8
3	18.0	1.4

Return on market portfolio, $R_m = 12\%$; Risk-free rate of interest = 6%

Required return based on CAPM:

Portfolio 1: $6\% + (12\% - 6\%) \times 1.2 = 6\% + 7.2\% = 13.2\%$

Portfolio 2: $6\% + (12\% - 6\%) \times 0.8 = 6\% + 4.8\% = 10.8\%$

Portfolio 3: $6\% + (12\% - 6\%) \times 1.4 = 6\% + 8.4\% = 14.4\%$

Alpha (α):

Portfolio 1: $14.5\% - 13.2\% = +1.30\%$

Portfolio 2: $9.5\% - 10.8\% = -1.30\%$

Portfolio 3: $18.0\% - 14.4\% = +3.60\%$

Best performance: Portfolio 3 ($\alpha = +3.60\%$)

Next best: Portfolio 1 ($\alpha = +1.30\%$)

Underperforming: Portfolio 2 ($\alpha = -1.30\%$)

Illustration – Sharpe, Treynor and Jensen – Comprehensive

A mutual fund analyst has collected the following past performance report of 6 funds and the sensex:

Name of Fund	Return (%)	Standard Deviation (%)	Beta
P	18.50	24.05	1.20
Q	16.30	22.37	1.10
R	9.0	14.59	0.90
S	21.25	28.10	1.30
T	16.80	19.58	1.05
U	12.25	16.00	0.80
Market	15.00	13.40	1.00

Risk-free rate of return is 6%. Based on the above information, you are required to rank the funds in a tabular form for (i) Sharpe's measure, (ii) Treynor's measure, and (iii) Jensen's alpha.

Fund	$R_i - R_f$	σ_i	β_i	Sharpe $[(R_i - R_f) / \sigma_i]$	Rank	Treynor $[(R_i - R_f) / \beta_i]$	Rank	CAPM Return $[6 + \beta(15 - 6)]$	Alpha $[R_i - \text{CAPM}]$	Rank
P	12.50	24.05	1.20	0.5198	4	10.4167	2	16.8	1.70	2
Q	10.30	22.37	1.10	0.4604	5	9.3636	4	15.9	0.40	4
R	3.00	14.59	0.90	0.2056	7	3.3333	7	14.1	-5.10	7
S	15.25	28.10	1.30	0.5427	3	11.7308	1	17.7	3.55	1
T	10.80	19.58	1.05	0.5516	2	10.2857	3	15.45	1.35	3
U	6.25	16.00	0.80	0.3906	6	7.8125	6	13.2	-0.95	6
Market	9.00	13.40	1.00	0.6716	1	9.0000	5	15.0	0.00	5

Sharpe Ranking: Market(1) > T(2) > S(3) > P(4) > Q(5) > U(6) > R(7)

Treynor Ranking: S(1) > P(2) > T(3) > Q(4) > Market(5) > U(6) > R(7)

Jensen Ranking: S(1) > P(2) > T(3) > Q(4) > Market(5) > U(6) > R(7)

10.1.9 Performance Attribution Analysis

Concept

The main goal of performance attribution analysis is to find the impact of all decisions made with respect to the management of the portfolio which includes asset allocation and selection decisions. A commonly followed method of performance attribution has four stages:

- 1 Establish a benchmark level of performance called the bogey
- 2 Asset allocation choice across the three broad asset classes, viz, stocks, bonds and cash
- 3 Sector choice within each asset class
- 4 Security selection within each sector

The difference between the return on index or benchmark or bogey portfolio with the managed portfolio will reflect the performance either in the form of asset allocation or security selection.

Illustration – Performance Attribution

Let us consider the following Benchmark index and the managed portfolio M:

Asset Class	Benchmark Portfolio (Month)		Managed Portfolio (Month)	
	Weight	Returns	Weight	Returns
Stocks (Nifty)	0.55	0.028	0.60	0.034
Bonds (ISEC)	0.40	0.014	0.30	0.021
Cash equivalent	0.05	0.002	0.10	0.003

Return on benchmark portfolio:

$$= (0.55 \times 0.028) + (0.40 \times 0.014) + (0.05 \times 0.002)$$

$$= 0.0154 + 0.0056 + 0.0001 = 0.0211$$

Return on managed portfolio:

$$= (0.60 \times 0.034) + (0.30 \times 0.021) + (0.10 \times 0.003)$$

$$= 0.0204 + 0.0063 + 0.0003 = 0.0270$$

Excess return on managed portfolio:

$$= 0.0270 - 0.0211 = 0.0059 \text{ or } 59 \text{ basis points}$$

Contribution due to asset allocation:

Asset Class	Actual Weight	Benchmark Weight	Excess Weight	Index Return	Contribution
Stock	0.60	0.55	0.05	0.028	0.0014
Bond	0.30	0.40	(0.10)	0.014	(0.0014)
Cash	0.10	0.05	0.05	0.002	0.0001
Total due to asset allocation					0.0001

Contribution due to security selection:

Asset Class	Portfolio Performance	Index Performance	Excess Performance	Portfolio Weight	Contribution
Stock	0.034	0.028	0.006	0.60	0.0036
Bond	0.021	0.014	0.007	0.30	0.0021
Cash	0.003	0.002	0.001	0.10	0.0001
Total due to security selection					0.0058

Total = $0.0001 + 0.0058 = 0.0059$ or 59 basis points

Asset allocation contribution = 1 basis point

Security selection contribution = 58 basis points

10 10 MARKS AREA – Performance Evaluation

Comprehensive numerical covering Sharpe, Treynor, Jensen measures, and performance attribution. Frequently asked for 10 marks.

10.2 Market Timing and Style Analysis

Chapter Overview

This chapter covers style analysis and performance attribution, which are important for a complete evaluation of portfolio performance. Style analysis seeks to determine the detailed investment style adopted by a money manager, while performance attribution analyses the reasons for a particular portfolio's return over a specified time period.

Learning Objectives

- Understand the concept of style analysis
- Differentiate between returns-based and holdings-based style analysis
- Understand performance attribution
- Differentiate between stock selection and market timing

10.2.1 Style Analysis

Concept

Style analysis considers a style box such as Morning Star or Value Line etc. A style box classifies a fund into one of nine cells in the box depending upon the market capitalization of the portfolio's stocks and whether they are growth or value stocks, or a blend. Such a classification reflects a portfolio manager's "style" characteristics.

A portfolio manager constructs the portfolio based on his or her investment philosophy, resulting in a unique portfolio. This causes the portfolio's returns to behave accordingly. We can describe this behaviour as the style of the portfolio. Style analysis seeks to identify the investing style of a portfolio in terms of asset classes, equity styles, or index returns.



Returns-Based Style Analysis

Compares a portfolio's return to the returns generated by a set of market indexes, each of which tracks a specific investment style (large cap growth, small-cap value, etc.)



Holdings-Based Style Analysis

Uses the stocks in a portfolio to describe a fund's allocation among asset classes or equity styles. Morningstar uses this approach.



Sharpe's Returns-Based Style Analysis

Sharpe developed returns-based style analysis using an asset class factor model (similar to a regression model). Sharpe favours using factor model instead of factor analysis. His analysis used multiple asset classes, ranging from treasury bills to several bond indexes to even more stock indexes, and also a mortgage-related securities index.

This type of style analysis typically requires at least 30-40 months of returns data.

Style Benchmark: Sharpe's analysis produces a "style benchmark" or customized benchmark which reflects an individualized weighting of a set of indexes that document the manager's style. Many portfolio managers prefer style benchmarks to single index benchmarks.

Style Consistency

One problem with style analysis is style "consistency". Standard and Poor has conducted a study of consistency and found that:

- Large-cap growth funds maintained a consistency level of about 70% over a five-year period
- Small cap blend funds maintained a consistency of only 18%
- All mid-cap funds have a consistency of only 31%
- All small-cap funds had a consistency of less than 40%
- All large-cap funds had a consistency over five-years of only 54%

10.2.2 Performance Attribution

Concept

The purpose of performance attribution is to decompose the total performance of a portfolio into specific components that can be associated with specific decisions made by the portfolio manager.

Typically, performance attribution is a top-down approach; it looks first at the broad issues and progresses by narrowing the investigation. It often begins with the policy statement that guides the management of the portfolio.

Steps in Performance Attribution

- 1 Begin with the policy statement that guides the management of the portfolio
- 2 Determine the portfolio weights to be used (asset allocation decision)
- 3 Analyse sector (industry) selection - did the manager concentrate on or avoid certain sectors?
- 4 Analyse security selection - which specific securities were selected?
- 5 Identify a benchmark of performance (bogey) to use in comparing the portfolio's results
- 6 Any differences between the portfolio's results and the bogey are attributable to decisions made by the portfolio manager

Two Sources of Performance Difference

Performance different from a properly constructed benchmark comes from one of the two sources, or both:

1. **Market Timing**
2. **Security Selection**

Techniques are available to decompose the performance of a portfolio into these two components.

10.2.3 Stock Selectivity and Market Timing



Stock Selection Ability (Stock Selectivity)

Application of knowledge and professional skills to make necessary predictions regarding movement of prices of stocks and classification of stocks whose prices are overrated and underrated. Aims at choosing individual stocks which are in profitable situation than choosing an entire set of stocks. Helps narrow down available options and find the best stock which may deliver higher systematic risk adjusted returns. Based on company specific events.



Market Timing

Act of mutual fund managers to foresee the market and make necessary predictions regarding future progress of market based on which portfolios can be prepared and placed. Act of moving funds in and out of the market or switching among various asset classes to earn higher return than a portfolio which remains invested in the market. Done based on predictions about bullish and bearish phases of the market using technical indicators or available economic data. Requires macro forecasting (economy specific).

Key Differences

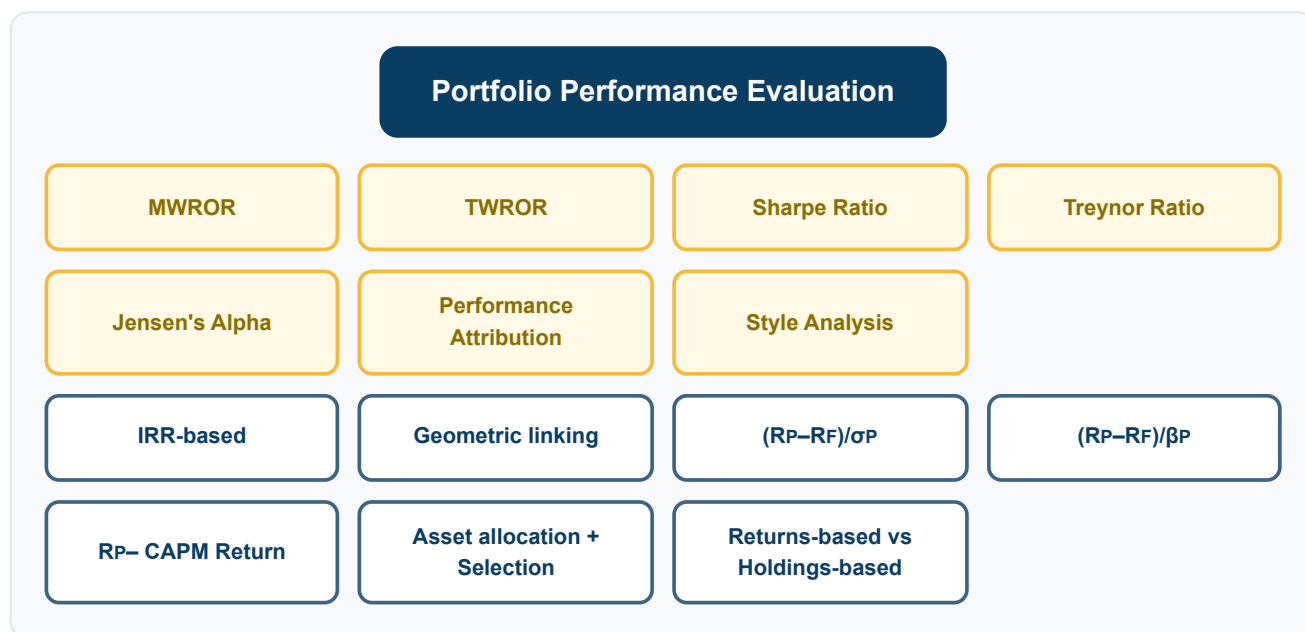
Aspect	Stock Selection	Market Timing
Focus	Micro forecasting (company specific)	Macro forecasting (economy specific)
Decision	Which specific stocks to buy/sell	When to move funds in/out of market
Based on	Company fundamentals, technical analysis	Technical indicators, economic data
Goal	Pick winners within a sector/asset class	Anticipate bullish/bearish phases
Both Skills	Equally important in generating positive or excess risk adjusted returns	

5 5 MARKS AREA – Market Timing and Style Analysis

Explain style analysis, performance attribution, and distinguish between stock selection and market timing. Frequently asked as a short note.

Module 10 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 10

Key Points for Revision

1. MWROR = Internal Rate of Return of all cash flows
2. MWROR is affected by timing and magnitude of cash flows
3. TWROR = Geometric linking of holding period returns
4. TWROR eliminates distorting effects of cash flows
5. TWROR measures fund manager's investment skill
6. Sharpe Ratio = $(R_P - R_F) \div \sigma_P$
7. Sharpe uses total risk (Standard Deviation)
8. Treynor Ratio = $(R_P - R_F) \div \beta_P$
9. Treynor uses systematic risk (Beta)
10. Jensen's Alpha = $R_P - [R_F + \beta(R_M - R_F)]$
11. Positive alpha → Superior performance
12. Negative alpha → Underperformance
13. Jensen's alpha is an absolute measure
14. Sharpe and Treynor are relative measures
15. Performance attribution decomposes total performance
16. Asset allocation decision: weights across asset classes
17. Security selection decision: which securities to buy/sell
18. Bogey = benchmark level of performance
19. Style analysis: returns-based vs holdings-based
20. Sharpe's style analysis uses asset class factor model
21. Style benchmark = customized benchmark reflecting manager's style
22. Stock selection = micro forecasting (company specific)
23. Market timing = macro forecasting (economy specific)
24. Both stock selection and market timing are equally important
25. Ranks may differ across Sharpe, Treynor and Jensen measures
26. All three measures should be used together for comprehensive evaluation

Comprehensive Formula Handbook – Module 10

MWROR

$$F_T = F_0(1+i)^T + \sum C_t(1+i)^{T-t}$$

TWROR

$$[(1+R_1)(1+R_2)\dots(1+R_n)]^{1/T} - 1$$

Sharpe Ratio

$$(R_P - R_F) \div \sigma_P$$

Treynor Ratio

$$(R_P - R_F) \div \beta_P$$

Jensen's Alpha

$$R_P - [R_F + \beta_P(R_M - R_F)]$$

CML Return

$$R_F + [(R_M - R_F)/\sigma_M] \times \sigma_P$$

SML Return

$$R_F + \beta_P(R_M - R_F)$$

Asset Allocation Contribution

$$\Sigma (\text{Actual Weight} - \text{Benchmark Weight}) \times \text{Index Return}$$

Security Selection Contribution

$$\Sigma (\text{Portfolio Return} - \text{Index Return}) \times \text{Portfolio Weight}$$

Excess Return

$$\text{Managed Portfolio Return} - \text{Benchmark Return}$$

One-Night Revision Notes – Module 10

Last Night Before Exam – Module 10

- **MWROR:** IRR of all cash flows; affected by timing and magnitude of cash flows.
- **TWROR:** Geometric linking of returns; eliminates cash flow timing effect; measures manager skill.
- **Sharpe Ratio:** $(R_P - R_F) \div \sigma_P$. Uses Total Risk. Higher is better.
- **Treynor Ratio:** $(R_P - R_F) \div \beta_P$. Uses Systematic Risk. Higher is better.
- **Jensen's Alpha:** $R_P - \text{CAPM Return}$. Positive = Outperformance. Absolute measure.
- **Performance Attribution:** Decompose total return into asset allocation + security selection.
- **Bogey:** Benchmark level of performance.
- **Style Analysis:** Returns-based (Sharpe's factor model) vs Holdings-based (Morningstar).
- **Stock Selection:** Micro forecasting (company specific).
- **Market Timing:** Macro forecasting (economy specific).
- **Both skills** are equally important in generating excess risk adjusted returns.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Sharpe, Treynor, Jensen measures – 5–10 marks
- MWROR and TWROR – 5–10 marks
- Performance Attribution Analysis – 5–10 marks
- Style Analysis – 5 marks
- Market Timing vs Stock Selection – 5 marks
- Risk-adjusted performance evaluation – 5 marks
- Ranking of funds using all three measures – 10 marks

Final Checklist – Module 10

Before Moving to Module 11

- Can I compute MWROR using IRR method?
- Can I compute TWROR using geometric linking?
- Can I apply Sharpe, Treynor, and Jensen measures?
- Can I rank funds using all three measures?
- Can I conduct performance attribution analysis?
- Can I differentiate between returns-based and holdings-based style analysis?
- Can I distinguish between stock selection and market timing?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 5 numericals from this module?

END OF MODULE 10

Module 11 – Efficient Market Hypothesis

will be generated upon request.

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11

Efficient Market Hypothesis

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Module 11 – Efficient Market Hypothesis

Module Objective

Primary Objective

To equip oneself with the knowledge of application of various techniques in security evaluation, building a portfolio, measuring its performance and making revisions to optimise the returns. To understand the concept of efficient markets, appreciate various forms of market efficiency, and understand the implications of market efficiency.

Mapped CMLO: 3a

Learning Outcomes

Students will be able to...	Application Skill
Understand the concept of efficient markets and appreciate various forms of market efficiency.	Differentiate between weak, semi-strong, and strong forms of EMH; identify which form exists in a given market.
Understand the implications of market efficiency.	Apply EMH concepts to investment decisions, portfolio management, and performance evaluation.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
11.1	Definition – Efficient Market, EMH, Fair Game Concept	HIGH 2%	Theory
11.2	Forms of Market Efficiency – Weak, Semi-strong, Strong	HIGH 2%	Theory + Concept
11.3	Implications	MEDIUM 1%	Theory

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- Weak, Semi-strong, Strong form of EMH – **5–10 marks**
- Random walk theory – **5 marks**
- Fair game concept – **5 marks**
- Empirical evidence on EMH – **5 marks**
- Anomalies – Size effect, P/E effect, BV/MV effect – **5 marks**
- Implications of EMH – **5–10 marks**
- Insider trading and SEBI rules – **5 marks**

Frequently Tested Concepts

Module 11 – Concept Flow

Random Walk Theory



Efficient Market Hypothesis



Fair Game Concept

Weak Form



Semi-Strong Form



Strong Form

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★ FREQUENTLY ASKED – MODULE 11

- **Three forms of EMH** – definition and comparison
- **Random walk theory** – concept and implications
- **Fair game concept** – interpretation
- **Empirical evidence** – event studies, anomalies
- **Insider trading regulations** – SEBI rules
- **Implications for portfolio management**

11.1 Definition

Chapter Overview

This chapter introduces the concept of efficient markets, beginning with the random walk theory and progressing through the Efficient Market Hypothesis (EMH), its characteristics, assumptions, and the fair game concept.

Learning Objectives

- Understand the concept of random walk theory
- Define an efficient market
- Explain the Efficient Market Hypothesis
- Identify characteristics and assumptions of EMH
- Understand the fair game concept

11.1.1 Random Walk Theory

Concept

Eugene Fama, a Noble Laureate in 2013, first introduced the concept of 'efficient' capital market and observed that tremendous competition in the capital market leads to 'fair pricing' of debt and equity securities. Before Mr. Fama, Mr. Maurice Kendall, a noted statistician first observed that the movement of stock and commodity price changes are independent and not at all related to the previous price changes.

Put differently, successive price changes are independent of one another. It means that stock price changes are at random which states that price changes are independent and normally distributed. This is the famous **random walk theory**.

Discovered Links (Random Walk Theory)

- Information is the key to the determination of stock prices and therefore is the central issue.
- All known information, including past information such as last quarter's earnings or last year's results as well as all current information or events that have been announced but are still forthcoming such as stock split, etc.
- Current price changes have no relation to previous price changes.
- New information can't be predicted in advance so future forecast also can't be predicted in advance, so theory of 'random walk' exists.
- It is believed that due to severe competition amongst investors and particularly institutional investors all available information will reflect instantly into stock prices. The stock price thus reflects the intrinsic value.

11.1.2 Efficient Market

Definition

An efficient market is defined as one in which the prices of all securities quickly and fully reflect all available information about the financial assets. This concept postulates that investor will assimilate all relevant information into prices in making their buy and sell decisions.

Key Points

- The important question arises: Since on average investors are clearly not fully informed about all securities, how could the market reach a state in which the prices of all securities fully reflect all information that is both relevant and available?
- The answer to this question is that prices are not established by the consensus of all investors. Prices are set by those marginal investors who actively trade in stock.
- The concept that markets are efficient does not claim, or require, a perfect adjustment in price following new information.
- Rather, the correct statement involved with this concept is that the adjustment in prices resulting from trade information is **"unbiased"** (this means that the expected value of the adjustment error is zero).
- The new price does not have to be the new equilibrium price, but only an unbiased estimate of the final equilibrium price that will be established after investors have fully assessed the input of the information.

Price Adjustment – Efficient vs Inefficient Market

Market Type	Price Behaviour
Efficient Market	Immediate increase in price to new fair value; price continues at new level; no additional adjustment
Inefficient Market	Lag in adjustment of stock prices to new information; price eventually adjusts to new fair value as information disseminates

Assume a stock is trading at ₹200 and new fair value is ₹205. In an efficient market, price immediately increases to ₹205 (represented by solid line). If market is inefficient, a lag occurs and price eventually adjusts to ₹205 (represented by dotted line).

11.1.3 Efficient Market Hypothesis

Concept

The share prices appear to follow a random walk is an interesting result and proving it or attempting to disprove it occupied many researchers. But what remained to be shown was why share prices followed a random walk. There was plenty of evidence, but the formal theory was missing. What was needed was a model of share price behaviour to explain the random walk. This gap was filled by a more general model based on the concept of efficiency of the markets in which shares are traded — the Efficient Market Hypothesis (EMH).

The EMH is a theory that capital markets operate to a high degree of perfection. Its roots lie in the random walk hypothesis, which postulates that share price changes are of a random, rather than correlated, nature. The EMH put forth the argument that, since the market efficiently prices all the stocks on an ongoing basis, any opportunities for excess returns derived from fundamental or technical analysis will be almost immediately used away by the market participants.

Basic Assumptions of EMH

- Efficient capital markets exist – markets with a large number of rational investors and speculators who are trying to maximize profits by predicting future earnings, dividends, and value of shares.
- Information is known freely to all investors, spontaneously transmitted to the markets to establish share prices.
- The price established tends to be fair price.
- As the market is efficient, the adjustment process tends to allow prices to vary randomly around the competitive norms.
- As new information is learnt, prices move, and because of the adjustment process, the movement will be up and down depending upon the stimulus.
- As investors or speculators overreact, the adjustment process becomes random in character.
- Whenever any new event occurs, it too is transmitted to a market place that has no memory – one where each price is independent of the previous one.
- This theory suggests that chartists are wrong.

11.1.4 Characteristics and Assumptions of EMH



Timely and Accurate Information

Information on price and volume of past transactions and on prevailing supply and demand



Liquidity

Asset can be sold or bought quickly at a price close to the price of the previous transaction assuming no new information



Low Transaction Cost

All aspects of transaction entail low costs, including cost of reaching market, brokerage, and transfer of security



Quick Adjustment of Prices

Prices of securities quickly adjust to new information



Three Conditions for Market Efficiency

- 1 All available information is costless to all market participants
- 2 There are no transaction costs
- 3 All investors take similar views on the implications of available information for current prices and distribution of future prices of each security

11.1.5 Fair Game Concept



Concept

It can be seen from the EMH that the ability of investors to pick winners and make excess returns using new information is directly related to the speed and efficiency of a market at absorbing that information. So, efficiency can be considered in terms of the 'fair game' concept.

A market can be regarded as efficient with respect to a particular set of information if investors using that information are faced with a fair game, that is, they receive on average the return expected for the risk involved and make no consistent abnormal returns.

The fair game for investors is an outcome of a market being efficient. If a market is efficient, then investing is a fair game. This fair game concept is useful in that it allows the different levels of the EMH to be tested.

Relationship Between Concepts

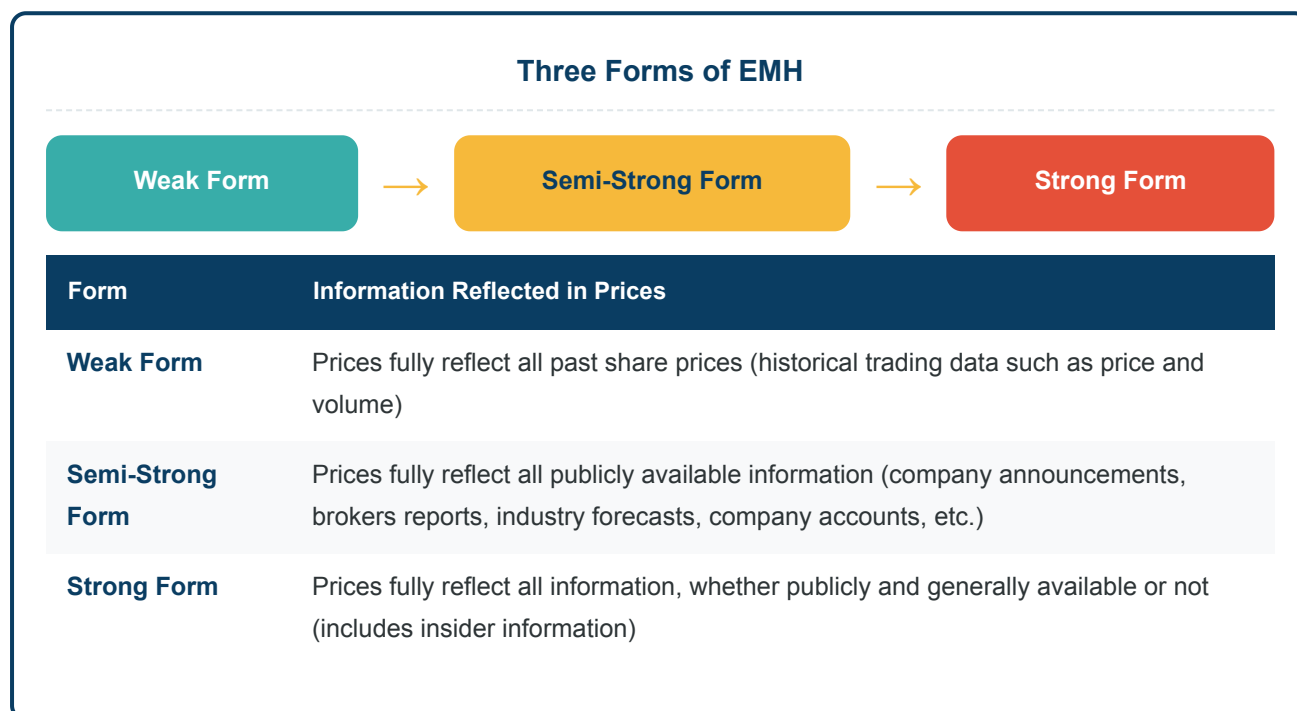


EMH is a more comprehensive model of share price behaviour than random walk theory, referring not just to past share price movements but to all information pertaining to the share.

11.2 Forms of Market Efficiency

Chapter Overview

Fama (1970) defined three levels of market efficiency, each level reflecting the type or scope of information quickly and fully reflected in price. These three levels correspond to different types of 'picking winners' investment strategies used in practice.



11.2.1 Weak-form Hypothesis

Concept

The weak-form hypothesis asserts that stock prices already reflect all information that can be derived by examining market trading data such as the history of past prices, trading volume or short interest. This version of the hypothesis implies that trend analysis is fruitless.

Past stock price data are publicly available and virtually free of cost to obtain. The weak-form hypothesis holds that if such data ever conveyed reliable signals about future performance, all investors already would have learned to exploit the signals. Ultimately, the signals lose their value as they become widely known because a buy signal, for instance, would result in an immediate price increase.

Implications

- Technical analysis is of little or no value
- Chart reading cannot produce superior returns
- Past price patterns do not predict future prices
- Earnings momentum strategies are unlikely to yield abnormal returns

11.2.2 Semi-Strong Form Evidence

Concept

Semi-strong form tests are tests of the speed of price adjustments of publicly available information. The question is whether investors can use publicly available information to earn excess returns after proper adjustments. As noted earlier, Fama has changed the traditional notion of semi-strong-form efficiencies to studies of announcements of various types, which involves event studies.

This empirical research often involves an **event study**, which means that a company's stock returns are examined to determine the impact of a particular event on the stock price.

Abnormal Return (Event Study)

$$AR_{it} = R_{it} - E(R_{it})$$

AR_{it} : Abnormal rate of return for security i during period t

R_{it} : Actual rate of return on security i during period t

$E(R_{it})$: Expected rate of return for security i during period t based on market model relationship

Cumulative Abnormal Return (CAR)

$$CAR_i = \sum_{t=1}^n AR_{it}$$

CAR_i: Cumulative abnormal return for stock i **n**: Number of periods examined

✓ **Sum of individual abnormal returns over period under examination**

Event Studies – Key Findings



Stock Split Announcements

Fama, Fisher, Jensen and Roll (1969) – NYSE 1929-1959. Good rally of 25-30% within 2 months before actual split. Stock split is leading indicator.



Economic News

Money supply, real economic activity, inflation, RBI monetary policy – impact on prices lasted beyond announcement day only briefly (within 1 hour).



Takeover Rumours

Market efficient at responding to published takeover rumours; excess returns could not be earned on average.



Accounting Changes

Change from WDV to SLM for reporting – no positive price changes. Firms making such changes typically performing poorly.



Exchange Listing

Prices increase before listing announcements; consistently decline after actual listing. Short-run profit opportunities – does not support semi-strong EMH.



P/E Ratios

Low P/E stocks outperform high P/E stocks on risk-adjusted basis. Basu (1977) – publicly available P/E ratios possess valuable information – inconsistent with semi-strong efficiency.

The Size Effect

Concept

Banz (1981) examined the impact of size (measured by total market value) on the risk adjusted rate of return. The risk-adjusted returns for extended periods (20 to 35 years) indicated that the small firms consistently experienced significantly larger risk adjusted returns than the larger firms.

Reinganum (1981) contended that it was the size, not the P/E ratio, that caused the results. But this contention was disputed by Basu (1983). In summary, firm size is a major efficient market anomaly.

The two strongest explanations are higher risk measurements due to infrequent trading and the higher transaction costs. Keim (1983) also related it to seasonality. These results indicate that the size effect must be considered in any event study that considers long time periods and contains a sample of firms with significantly different market values.

11.2.3 Strong-Form Evidence

Concept

The strong form of the EMH states that the stock prices quickly adjust to reflect all information including private information. Thus, no group of investors has information that allows them to earn abnormal profits consistently, even those investors with monopolistic access to information. Note that investors are prohibited not from possessing monopolistic information but from profiting the use of such information.

How to Test Strong Form Efficiency

- One way to test strong form efficiency is to examine the performance of groups presumed to have access to 'true' non-public information.
- If such groups can consistently earn above-average risk-adjusted returns, at least an extreme version of the strong form will not be supported.
- Consider corporate insiders, a group that presumably falls into that category of having monopolistic access to information.
- Another aspect of the strong form is the ability of any investor to earn excess returns as a result of using information in a superior manner.
- This aspect has been examined in several ways, including analyzing the returns of the professional money managers such as those of mutual funds and pension funds and examining the value of what security analysts do.

11.2.4 Corporate Insiders

Definition and Regulation

Insider trading is the trading of a public company's stock or other securities (such as bonds or stock options) by individuals with access to non-public information about the company. A corporate insider is an officer, director or major stockholder of a corporation who might be expected to have valuable inside information.

In USA, the Securities and Exchange Commission (SEC) requires insiders (officers, directors and owners of more than 10% of a company's stock) to report their monthly purchase and sale transactions to the SEC by the tenth of the next month. This information is made public in the SEC's monthly publication, official summary of Security Transaction and Holdings (official summary).

Information is often said to be the most famous commodity on Wall Street and even Dalal Street and the competition for it is intense. Sometimes the quest for a competitive advantage can tip over into a search for illegal inside information. In 2011, Raj Rajaratnam, the head of the Galleon Group hedge fund which once managed \$6.5 billion was convicted on insider trading charges for soliciting tips from a network of corporate insiders and traders.

11.2.5 Insider Trading in India – SEBI Rules

SEBI (Prohibition of Insider Trading) Regulations

- **Insider:** Means a person who is (i) a connected person or (ii) in possession of or having access to unpublished price sensitive information.
- **Prohibition on Communication:** An insider should not communicate/provide/allow access to any price sensitive information relating to a company, its listed/proposed to be listed securities to any person including other obligations.
- **Disclosure by Promoters/KMP/Directors:** Every promoter, key managerial personnel and director of a listed company should disclose his holding of securities of the company. Every person on appointment as key managerial personnel/director or upon becoming a promoter should disclose his holdings as on the date of appointment/becoming a promoter to the company within seven days.
- **Disclosure of Transactions:** Every promoter, employee, director should disclose to the company the number of such securities acquired or disposed of within two trading days of the transaction if the value of the securities traded, over any calendar quarter, aggregate to a traded value in excess of ₹10 lakh or a SEBI-specified value. Every company should notify the particulars of such trading to the concerned stock exchange within two trading days of receipt of the disclosure or from becoming aware of such information.

11.2.6 Portfolio Management with Superior Analysts

With Superior Analysts

- A portfolio manager with access to superior analysts who have unique insights and analytical ability should follow their recommendations.
- The superior analysts should be encouraged to concentrate their efforts in mid-cap and small-cap stocks that possess the liquidity required by institutional portfolio managers.
- Because these stocks typically do not receive the attention given by the top tier stocks, the markets for these neglected stocks may be less efficient than the market for large well-known stocks that are being analyzed by numerous analysts.
- New information on top tier stocks is well publicized and rigorously analyzed so the price of these securities should adjust rapidly to reflect the new information.
- In contrast, mid-cap and small-cap stocks receive less publicity and fewer analysts follow these firms, so prices may differ from intrinsic value.
- Therefore, the possibility of finding temporarily undervalued securities among these neglected stocks is greater.
- These superior analysts should pay particular attention to B/V to M/V ratio, to the size of stocks being analyzed, and to the monetary policy environment.

Without Superior Analysts

A portfolio manager (or investor) who does not have access to superior analysts should proceed as follows:

- 1** Determine and quantify the risk preferences
- 2** Construct the appropriate risk portfolio by dividing the total portfolio between risk free assets and a risky asset portfolio
- 3** Diversify completely on a global basis to eliminate all unsystematic risks
- 4** Maintain the specified risk level by rebalancing when necessary
- 5** Minimize total transaction costs

11.2.7 Book-Market Value Ratio

Concept

This ratio relates the book value (BV) of a firm's equity to the market value (MV) of its equity. Rosenberg, Reid and Lanstein (1985) found a significant relationship between current values for this ratio and future stock returns and contended that such a relationship between available public information on the BV/MV ratio and future returns was evidence against the EMH.

11.2.8 The Rationale and Use of Index Funds and Exchange Traded Funds

Concept

Efficient capital markets and a lack of superior analysts imply that many portfolios should be managed passively to match the performance of the aggregate market, minimizing the costs of research and trading. In response to this demand, several institutions have introduced index funds, which are security portfolios designed to duplicate the composition and performance of a selected market index series.

When financial planners want a given asset class in their portfolios, they often use index funds or ETFs to fulfill this need. Index funds or ETFs are less costly in terms of research and commissions, and they generally provide the same or better performance than the majority of the active portfolio managers.

An innovation suggested by Amolt, Hsu and West (2008) is to weigh the stocks in an index based on fundamentals such as earnings, cash flow, and/or dividends rather than market values.

11.2.9 Some Conclusions about Market Efficiency

Conclusions

Considering the evidence of market efficiency discussed previously, what conclusions can be drawn? In reality, no definitive conclusion about the market efficiency can be drawn. The evidence in support of market efficiency has convinced many market observers because of the large amount of research done over the years by investigators. And almost certainly the widespread availability of information and data on the internet along with the numerous investment tools provided there has made the market even more efficient.

It is the belief by many technicians and fundamentalists that they can really outperform the market considering over the cost element.

Some anomalies do exist and the reasons why these anomalies exist remain unsettled. The quantity and quality of the research in this area has undermined the extreme view that the market is so perfectly efficient that no opportunities for excess returns could possibly exist. The anomalies that have been reported are not conclusive proof of market inefficiencies. It may be that better testing procedures and/or better data may explain some of those anomalies away.

Eugene Fama, a long time proponent of market efficiency, argues that the evidence on anomalies does not disprove the efficient market proposition. He believes that many of the studies showing anomalies contain statistical problems. He also believes that overreaction and underreaction are about equally likely to be found which suggests that markets are efficient because this behaviour can be attributable to chance.

11.3 Implications

Chapter Overview

This chapter discusses the practical implications of the Efficient Market Hypothesis for investors, portfolio managers, and financial analysts.

Major Implications of EMH

The Efficient Markets Hypothesis (EMH) is an investment theory primarily derived from concepts attributed to Eugene Fama's research, "Efficient Capital Markets: A Review of Theory and Empirical Work." Fama put forth the basic idea that it is virtually impossible to consistently "beat the market" – to make investment returns that outperform the overall market average as reflected by major stock indexes such as the S&P 500 Index.

Fama's investment theory – which carries essentially the same implication for investors as the Random Walk Theory – is based on a number of assumptions about securities markets and how they function. The assumptions include the one idea critical to the validity of the efficient markets hypothesis: the belief that all information relevant to stock prices is freely and widely available, "universally shared" among all investors.



Market Efficiency Implication

As there are always a large number of both buyers and sellers in the market, price movements always occur efficiently (i.e., in a timely, up-to-date manner). Thus, stocks are always trading at their current fair market value.



Random Walk

If the flow of information is unimpeded and information is immediately reflected in stock prices, then tomorrow's price change will reflect only tomorrow's news and will be independent of the price changes today. But news is by definition unpredictable and, thus, resulting price changes must be unpredictable and random.



Conclusion

Since stocks always trade at their fair market value, it is virtually impossible to either buy undervalued stocks at a bargain or sell overvalued stocks for extra profits.



Investment Strategy Implication

Neither expert stock analysis nor carefully implemented market timing strategies can hope to average doing any better than the performance of the overall market. If that's true, then the only way investors can generate superior returns is by taking on much greater risk.

Practical Implications for Different Groups

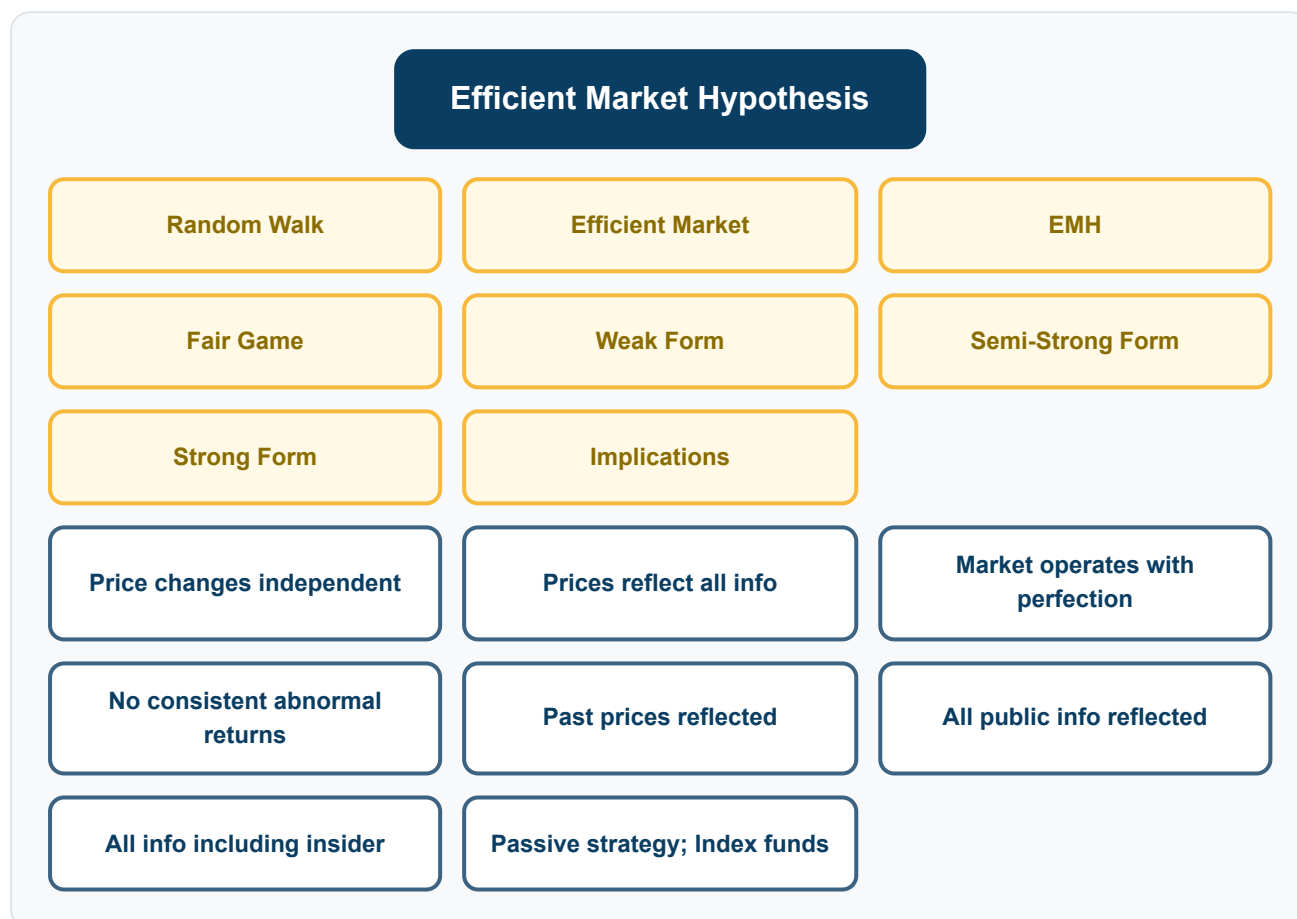
Group	Implication
Investors	Should adopt a passive investment strategy; use index funds or ETFs; avoid frequent trading; minimize transaction costs; diversify globally
Portfolio Managers	Should focus on asset allocation rather than security selection; minimize research costs; index funds may be preferred; superior analysts should focus on mid/small cap neglected stocks
Financial Analysts	The value of fundamental analysis is questioned; technical analysis is fruitless; focus should be on providing value-added services beyond stock picking
Corporate Managers	Cannot time equity issues to exploit mispricing; should focus on fundamental value creation; insider trading regulations must be strictly followed
Regulators	Focus on ensuring free flow of information; prevent insider trading; ensure timely and accurate disclosure; reduce transaction costs

5 5 MARKS AREA – Implications of EMH

Explain the practical implications of EMH for investors, portfolio managers, and financial analysts. Also discuss the debate on market efficiency and anomalies.

Module 11 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 11



Key Points for Revision

1. Random walk theory: Successive price changes are independent of one another
2. Price changes are independent and normally distributed
3. Efficient market: Prices of all securities quickly and fully reflect all available information
4. EMH: Capital markets operate to a high degree of perfection
5. EMH roots lie in random walk hypothesis
6. Competition among investors ensures all available information reflects instantly into stock prices
7. Stock price reflects the intrinsic value
8. Characteristics: Timely/accurate info, liquidity, low transaction costs, quick price adjustment
9. Conditions: Costless info, no transaction costs, homogeneous views
10. Fair game: Investors receive on average the return expected for the risk involved
11. Three forms: Weak, Semi-strong, Strong
12. Weak form: Prices reflect all past share prices and trading data
13. Weak form implies technical analysis is fruitless
14. Semi-strong form: Prices reflect all publicly available information
15. Semi-strong form tested through event studies
16. Abnormal Return = Actual Return – Expected Return
17. Cumulative Abnormal Return = Sum of individual ARs
18. Stock split studies: Fama, Fisher, Jensen and Roll (1969)
19. P/E effect: Low P/E stocks outperform high P/E stocks – anomaly
20. Size effect: Small firms consistently experience larger risk-adjusted returns – anomaly
21. Strong form: Prices reflect all information including insider information
22. Insider trading prohibited but insiders may possess information
23. SEBI rules on insider trading disclosure
24. Portfolio management with superior analysts: Focus on mid/small cap neglected stocks
25. Portfolio management without superior analysts: Passive strategy, global diversification
26. BV/MV ratio: High BV/MV stocks outperform – anomaly
27. Index funds and ETFs: Passive investment vehicles for efficient markets
28. Implications: Passive investing; index funds; global diversification; minimize costs
29. Market anomalies exist but are not conclusive proof of inefficiency
30. Fama: Overreaction and underreaction about equally likely – attributable to chance

Comprehensive Concept Handbook – Module 11

Random Walk Theory

Successive price changes are independent

Efficient Market	Prices quickly and fully reflect all available information
EMH	Capital markets operate to a high degree of perfection
Fair Game	Investors receive on average the return expected for the risk involved
Weak Form	Prices reflect all past share prices and trading data
Semi-Strong Form	Prices reflect all publicly available information
Strong Form	Prices reflect all information including insider information
Abnormal Return	$AR_{it} = R_{it} - E(R_{it})$
Cumulative Abnormal Return	$CAR_i = \sum AR_{it}$
Anomalies	P/E effect, Size effect, BV/MV effect
Implication	Passive strategy; Index funds; Global diversification

One-Night Revision Notes – Module 11

Last Night Before Exam – Module 11

- **Random Walk:** Price changes are independent and normally distributed.
- **Efficient Market:** Prices quickly and fully reflect all available information.
- **EMH:** Capital markets operate to a high degree of perfection; roots in random walk.
- **Fair Game:** Investors receive on average the return expected for the risk involved.
- **Weak Form:** Prices reflect all past prices and trading data → Technical analysis is fruitless.
- **Semi-Strong Form:** Prices reflect all publicly available information → Fundamental analysis has limited value.
- **Strong Form:** Prices reflect all information including insider info → Even insiders cannot earn abnormal profits.
- **Event Study:** $AR = \text{Actual Return} - \text{Expected Return}$; $CAR = \text{Sum of ARs}$.
- **Anomalies:** P/E effect, Size effect, BV/MV effect – evidence against semi-strong EMH.
- **Insider Trading:** Prohibited by SEBI; disclosure requirements for promoters, KMP, directors.
- **Implications:** Passive investing; index funds; global diversification; minimize costs.
- **With Superior Analysts:** Focus on mid/small cap neglected stocks.
- **Without Superior Analysts:** Passive strategy; global diversification; rebalancing.

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Weak, Semi-strong, Strong form of EMH – 5–10 marks
- Random walk theory – 5 marks
- Fair game concept – 5 marks
- Empirical evidence on EMH – 5 marks
- Anomalies – Size effect, P/E effect, BV/MV effect – 5 marks
- Implications of EMH – 5–10 marks
- Insider trading and SEBI rules – 5 marks
- Portfolio management with/without superior analysts – 5 marks

Final Checklist – Module 11

✓ Before Moving to Module 12

- Can I explain the random walk theory?
- Can I define an efficient market?
- Can I explain the EMH and its assumptions?
- Can I differentiate between weak, semi-strong, and strong forms?
- Can I explain the fair game concept?
- Can I conduct an event study and compute AR and CAR?
- Can I list and explain the major market anomalies?
- Can I explain SEBI rules on insider trading?
- Can I differentiate between portfolio management with and without superior analysts?
- Can I explain the implications of EMH for investors and portfolio managers?
- Have I memorised all key concepts?

END OF MODULE 11

Section B – Security Analysis and Portfolio Management Completed

Next: Section C – Financial Risk Management (Modules 12–13)

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12

Risks in Financial Market

Master Revision Handbook · December 2026 Edition

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Module 12 – Risks in Financial Market

Module Objective

Primary Objective

To develop a detailed understanding of the sources and impact of risks to which an organisation is exposed to in a dynamic business environment and the techniques for managing the same to sustain competitive advantages.

Mapped CMLO: 3b, 3c

Learning Outcomes

Students will be able to...	Application Skill
Understand the meaning of risk and importance of risk management.	Identify and classify different types of risks in a business environment.
Obtain a preliminary understanding of various types of risks.	Prepare risk reports to be submitted to management for strategic decision making.
Develop an idea over the various risk mitigating techniques.	Evaluate alternative risk management techniques for financial risks.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
12.1	Concept of Risk	HIGH 5%	Theory
12.2	Types of Risks	HIGH 5%	Theory
12.3	Concept of Risk Management	HIGH 5%	Theory
12.4	Financial Risk Assessment and Mitigation	HIGH 5%	Theory + Concept

Expected Examination Areas – Dec 2026



DEC 2026 LIKELY AREAS

- Meaning and types of risk – **5 marks**
- Risk management process steps – **5–10 marks**
- Market risk and its types – **5 marks**
- Credit risk and its types – **5 marks**
- Liquidity risk – **5 marks**
- Risk mitigation techniques – **5 marks**
- Case study on risk identification – **5 marks**

Frequently Tested Concepts

Module 12 – Concept Flow



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★ FREQUENTLY ASKED – MODULE 12

- **Types of risks** – classification
- **Risk management process** – six steps
- **Market risk** – equity, interest, inflation, commodity, currency
- **Credit risk** – default, spread, downgrade, concentration, country
- **Liquidity risk** – market and funding liquidity
- **Risk mitigation** – avoidance, reduction, transfer, acceptance

12.1 Concept of Risk

Chapter Overview

This chapter introduces the concept of risk, its definition from various professional bodies, and the distinction between risk and uncertainty. Risk is an integral element of a business, and its management is imperative for survival and growth.

Learning Objectives

- Understand the meaning and concept of risk
- Distinguish between risk and uncertainty
- Appreciate the importance of risk management
- Identify different definitions of risk

Introduction

Risk is an integral element of a business. An organisation faces various types of risks, some of which are controllable while others are not. These risks essentially create an impact on the organisation which very often lead to negative consequences. Thus, for an organisation, management of risks is imperative to survive and grow. A systematic approach towards risk management enables an organisation to convert challenges into opportunities.

Among various types of risks to which an organisation is exposed to, financial risk demands greater consideration as they impact the bottom-line almost directly. Hence, a detailed understanding of various elements of financial risk, their impact and possible mitigation strategies is of utmost importance.

Definitions of Risk



Oxford English Dictionary

'Risk' refers to 'a chance or possibility of danger, loss, injury or other adverse consequences' and the definition of 'at risk' is 'exposed to danger'.



CIMA's Official Terminology

'Risk' is a condition in which there exists a quantifiable dispersion in the possible outcomes from an activity.



International Federation of Accountants (IFA)

'Uncertain future events which could influence the achievement of the organisation's strategic, operational and financial objectives.'

Definition of Risk

Risk = Uncertainty of an event the outcome of which may lead to either a positive or a negative impact on the organisation's objectives

Risk can result in **positive outcome** (opportunity) or **negative outcome** (threat)

Risk vs Uncertainty

Although the terms 'risk' and 'uncertainty' are often used interchangeably, they are, in fact, not synonymous.

Risk	Uncertainty
There are a number of specific, probable outcomes	Even the probabilities of possible outcomes are unknown
Probabilities of occurrence can be determined based on past experience	Reflects a total lack of knowledge of what may happen
Risk is measurable	Uncertainty is not measurable

5 5 MARKS AREA – Concept of Risk

Define risk and distinguish between risk and uncertainty. Frequently asked as a short theory question.

12.2 Types of Risks

Chapter Overview

Risks have been classified by different experts and professional institutions in different ways. This chapter covers the classification based on controllability (systematic and unsystematic) and the CIMA classification (operational, financial, country, environmental, reputational, and strategic risks).

Learning Objectives

- Classify risks based on controllability
- Understand CIMA's classification of risks
- Differentiate between systematic and unsystematic risks
- Identify various types of business risks

12.2.1 Classification Based on Controllability / Ability to Diversify



Systematic Risk

Also referred to as **non-diversifiable risk**. Fluctuations in returns on securities that occur due to macroeconomic factors. Factors could be political, social or economic factors that affect the business. Can be caused due to unfavourable reasons such as an act of nature like a natural disaster, changes in government policy, international economic components, changes in the nation's economy, etc.



Unsystematic Risk

Fluctuations in returns of a company arising due to **firm-specific factors**. These risk factors exist within the company and can be avoided if necessary action is taken. The risk factors can include the production of undesirable products, labour strikes, etc.

12.2.2 CIMA Classification of Risks



Operational Risk

Related to activities carried out within an organization, arising from structure, systems, people, products or processes. Refers to potential losses that can occur due to inadequate systems, management failure, faulty controls, fraud, or human errors.



Financial Risk

Related to the financial operations of an entity. An outcome of financial transactions undertaken by the organization with the outside world.



Country Risk

Associated with undertaking transactions with, or holding assets in, a particular country. Risk might be political, economic or stem from regulatory instability.



Environmental Risk

Risks that may occur due to political, economic, socio-cultural, technological, environmental and legal changes.



Reputational Risk

Damage to an entity's reputation as a result of failure to manage other risks.



Strategic Risk

Risks stemming from the entity's strategy and pose the greatest threat to the achievement of the strategy.

5 5 MARKS AREA – Types of Risks

List and explain the various types of risks based on CIMA classification or systematic/unsystematic classification. Frequently asked.

12.3 Concept of Risk Management

Chapter Overview

This chapter covers the risk management process, which is an iterative process used by organizations to support the identification and management of risk and reduce the changes and/or effects of adverse events while enhancing the realization of opportunities.

Learning Objectives

- Understand the importance of risk management
- Learn the six steps of the risk management process
- Identify various risk responses
- Appreciate the iterative nature of risk management

Concept

Risks to which an organisation is exposed may bring serious consequences for the organisation in form of decline in profitability, loss of customers, decline in shareholders' wealth and reputation. Again, if properly handled they may offer rewards such as increased market share, higher revenue growth and improved profitability. Thus, managing risk is not only important for successful survival of a firm in cut throat competition but also to emerge as a market leader.

Risk management is the process by which risks are identified, assessed, measured, and managed in order to create economic value. It is an iterative process used by organizations to support the identification and management of risk (or uncertainty) and reduce the changes and/or effects of adverse events while enhancing the realization of opportunities and the ability to achieve company objectives such as profit, value creation etc.

12.3.1 Risk Management Process – Six Steps

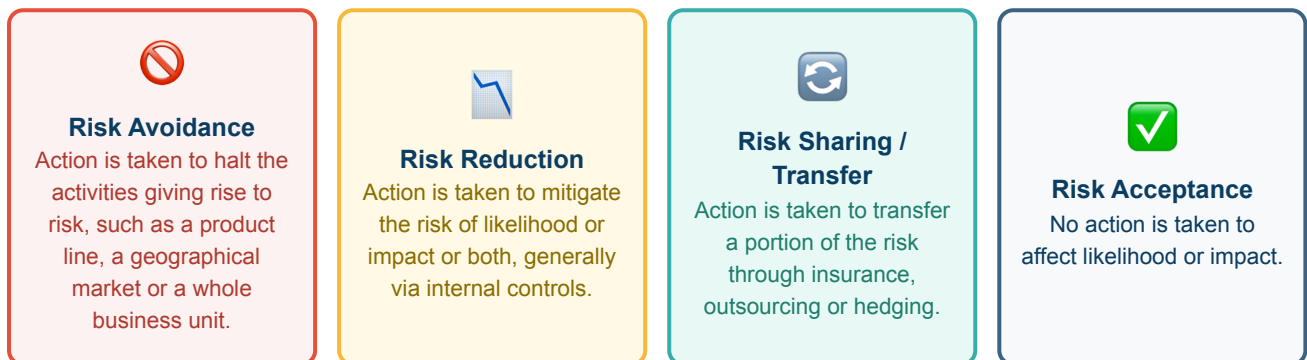


- 1 Setting the Objectives:** Determination of objectives is essential step in risk management. The objective may be to protect/enhance profits or to develop competitive advantage. The objectives must be decided by the management and in this process company's risk tolerance must be taken into account. Risk tolerance is the level of risk that the company is able and willing to take on. The ability to handle risk is primarily driven by the company's financial health and depends on its level of earnings, cash flows, and equity capital.
- 2 Identification of Risk:** Every firm faces different types of risks - based on its organizational structure, nature of business, the economic conditions, social and political factors, the status of the industry it operates. Any risk needs to be identified initially and then categorized as per its nature and character. Risk identification is usually based on a firm's exposure on various aspects. It can be either identified by top level or middle level management.
- 3 Measurement and Prioritization of Risk:** Once the risks are identified, they need to be evaluated for ascertaining their significance. The significance of a particular risk depends upon the size of the loss (expected severity of consequences) that it may result in, and the probability of the occurrence of such loss (or, expected frequency). On the basis of these two factors, various risks faced by a company need to be classified as critical risks, important risks and not-so-important risks. Critical risks are those that may result in bankruptcy of the firm. Important risks are those that may not result in bankruptcy, but may cause severe financial distress, if they are not dealt properly. The not-so-important risks are those that may result in losses, which the firm may easily bear in the normal course of business. This may be termed as risk prioritization.
- 4 Development of Strategy:** Strategy setting is an important task in managing risk, as it sets a direction for the business as a whole. A strategy is essentially an action plan, which specifies the nature of risk to be managed and the timing. It also specifies the tools, techniques and instruments that can be used to manage these risks. Besides, it also deals with tax and legal problems.
- 5 Implementation of Strategy:** Once the policies and strategies are in place, they need to be implemented for actually managing the risks; where actual execution of risk management takes place.

This includes finding the best deal in case of risk transfer, providing for contingencies - in case of risk retention, designing and implementing risk control programs, etc. It also includes eyeing for operational details, like the back-office work, to ensure compliance controls.

- 6 Monitoring Risk:** Risk monitoring is the last major element of risk management - but certainly not the least important. The function of risk management needs to be reviewed periodically, depending on the costs involved. The factors that affect the risk management decisions keep changing, thus necessitating the need to monitor the effectiveness of the decisions taken previously and to change the risk response if need to arises. Obviously, for this, the process of risk management has to be flexible.

12.3.2 Risk Responses



10 10 MARKS AREA – Risk Management Process

Explain the six steps of risk management process in detail. Also discuss the various risk responses. Frequently asked for 10 marks.

12.4 Financial Risk Assessment and Mitigation

Chapter Overview

This chapter covers the three major types of financial risks – market risk, credit risk, and liquidity risk – their assessment, and mitigation techniques.

Learning Objectives

- Understand the concept of market risk and its types
- Assess and mitigate market risk
- Understand credit risk and its types
- Assess and mitigate credit risk
- Understand liquidity risk and its relationship with other risks
- Assess and mitigate liquidity risk

12.4.1 Market Risk

Concept

Market risk or price risk is the risk of uncertain movements and adverse fluctuations in the financial market variables like security prices, commodity prices, interest rates and exchange rates. Price is a market driven measure of value. A buyer's intention is to pay the least possible price for the security or commodity it wants to sell and hence fears a potential rise in prices at the time of purchase. On the other hand, a seller's intention is to sell the security or commodity for the highest possible price and fears a potential fall in prices at the time of sale. Thus, the possibility of not realizing the desired price is known as price risk.

In short, the possibility for an investor to experience losses due to factors that affect the overall performance of the financial markets is market risk. The risk that a major natural disaster will cause a decline in the market as a whole is an example of market risk, other examples of market risk are recessions, political turmoil, changes in interest rates and terrorist attacks, credit policy etc. Market risk is the risk of losses in positions arising from movements in market prices.

Types of Market Risk



Equity Risk

Risk associated with a common stock which is



Interest Rate Risk

Variability in a security's return resulting from changes in the level of interest rates. Other things being equal,



Inflation Rate Risk

Change in the inflation rates changes the purchasing power. Change in inflation rate also changes interest



Commodities Risk

When the demand and supply of the commodity are not at equilibrium level, the commodity price fluctuations may be

interpreted in terms of the variability of its return.

security prices move inversely to interest rates.

rates and results in decline in the value of securities.

expected. This is known as commodity risk.



Currency Risk

Currency risk arises when the organization is involved in international operations and goods and services are invoiced at foreign currency.

Appreciation or depreciation of foreign currency against the home currency results into fluctuations in the value of foreign currency denominated assets and liabilities.

Value at Risk (VaR)

As with other forms of risk, the potential loss amount due to market risk may be measured in a number of ways or conventions. Traditionally, one convention is to use Value at Risk (VaR). The conventions of using Value at risk are well established and accepted in the short-term risk management practice. However, it contains a number of limiting assumptions that constrain its accuracy. The first assumption is that the composition of the portfolio measured remains unchanged over the specified period. Over short time horizons, this limiting assumption is often regarded as reasonable. However, over longer time horizons, many of the positions in the portfolio may have been changed. The Value at Risk of the unchanged portfolio is no longer relevant.

The Variance Covariance and Historical Simulation approach to calculate Value at Risk also assumes that historical correlations are stable and will not change in the future or breakdown under times of market stress.

In addition, care has to be taken regarding the intervening cash flow, embedded options, changes in floating rate interest rates of the financial positions in the portfolio. They cannot be ignored if their impact can be large.

Market risk cannot be eliminated through diversification, though it can be hedged against. Market risk can at least partially be moderated by diversification. The returns from different assets are highly unlikely to be perfectly correlated and the correlation may sometimes be negative. However, share prices are driven by many factors, such as the general health of the economy which will increase the correlation and reduce the benefit of diversification. If one constructs a portfolio by including a wide variety of equities, it will tend to exhibit the same risk and return characteristics as the market as a whole, which many investors see as an attractive prospect. However, history shows that even over substantial periods of time there is a wide range of returns that an index fund may experience; so an index fund by itself is not "fully diversified". Greater diversification can be obtained by diversifying across asset classes; for instance a portfolio of many bonds and many equities can be constructed in order to further narrow the dispersion of possible portfolio outcomes.

12.4.2 Credit Risk

Concept

Credit risk refers to the risk that an obligor will default, either wilfully or due to incapacity on any type of debt by failing to make payments which it is obligated to do. The risk is primarily with that of the lender and includes lost principal and interest, disruption to cash flows, and increased collection costs. The loss may be complete or partial and can arise in a number of circumstances.

Types of Credit Risk



Default Risk

Is the chance of failing of an issuer to meet its obligations. Default risk can also be sub-divided into different forms of transaction such as non-payment of principal or interest in case of loan, default of obligations in case of treasury operation by counterparties, default while settlement in case of securities trading, or default arising from the flow of foreign exchange due to restrictions or limitations imposed on remittances out of the country in the case of cross border obligations.



Credit Spread Risk

Is the chance that the spread between the risky bond and risk-free securities will vary after purchase.



Downgrade Risk

Is a chance that a rating agency will lower its rating on the issuer or the probability of loss from a fall in issuers rating because of deterioration in its financial condition.



Concentration Risk

It is the risk associated with any single exposure or group of exposures with the potential to produce large enough losses to threaten a lender's core operations. It may arise in the form of single firm concentration or industry concentration.



Country Risk

The risk of loss arising from sovereign state freezing foreign currency payments (transfer/conversion risk) or when it defaults on its obligations (sovereign risk).

Techniques for Credit Risk Management

- **Credit Risk Department:** Significant resources and sophisticated programs are used to analyze and manage credit risk. Some companies run a credit risk department whose task is to assess the financial health of their customers, and decide whether to extend credit (or not).
- **In-house Programs:** They may use in-house programs to advise on avoiding, reducing and transferring risk.
- **Third-Party Intelligence:** They also use third party provided intelligence. Companies like Standard & Poor's, Moody's, Fitch Ratings, and Dun and Bradstreet provide such information for a fee.
- **Credit Scorecards:** Most lenders employ their own models (credit scorecards) to rank potential and existing customers according to credit risk, and then apply appropriate strategies.
- **Risk-Based Pricing:** With products such as unsecured personal loans or mortgages, lenders charge a higher price for higher risk customers and vice versa.
- **Credit Limits:** With revolving products such as credit cards and overdrafts, risk is controlled through the setting of credit limits.
- **Security:** Some products also require security, most commonly in the form of property.
- **Credit Scoring Models:** Credit scoring models also form part of the framework used by banks or lending institutions to grant credit to clients. For corporate and commercial borrowers, these models generally have qualitative and quantitative sections outlining various aspects of the risk including, but not limited to, operating experience, management expertise, asset quality, and leverage and liquidity ratios, respectively.

12.4.3 Liquidity Risk

Types of Liquidity Risk

Liquidity risk can be of two types – Market Liquidity Risk and Funding Liquidity Risk.



Market Liquidity Risk

The risk that a given security or asset cannot be traded quickly enough in the market at the desired price to prevent a loss (or make the required profit). This risk reflects the inability to sell an asset due to lack of liquidity in the market. Market liquidity risk becomes particularly important to parties who are about to hold or currently holding an asset, since it affects their ability to trade.



Funding Liquidity Risk

Refers to the inability of a firm in meeting its contractual liabilities/obligations as and when they fall due thereby making it difficult for the firm to roll over its funds at reasonable cost. An institution might lose liquidity if its credit rating falls, it experiences sudden unexpected cash outflows, or some other event causes counterparties to avoid trading with or lending to the institution. A firm is also exposed to liquidity risk if markets on which it depends are subject to loss of liquidity.

Relationship Between Funding and Market Liquidity Risks

Market and funding liquidity risks compound each other as it is difficult to sell when other investors face funding problems and it is difficult to get funding when the collateral is hard to sell. Liquidity risk also tends to compound other risks. If a trading organization has a position in an illiquid asset, its limited ability to liquidate that position at short notice will compound its market risk. Suppose a firm has offsetting cash flows with two different counterparties on a given day. If the counterparty that owes it a payment defaults, the firm will have to raise cash from other sources to make its payment. Should it be unable to do so, it too will default. Here, liquidity risk is compounding credit risk.

Assessing and Mitigating Liquidity Risk

Techniques for Liquidity Risk Management

- **Hedging:** A position can be hedged against market risk but still entail liquidity risk. This is true in the above credit risk example — the two payments are offsetting, so they entail credit risk but not market risk. Accordingly, liquidity risk has to be managed in addition to market, credit and other risks.
- **Isolation difficulty:** Because of its tendency to compound other risks, it is difficult or impossible to isolate liquidity risk. In all but the simplest of circumstances, comprehensive metrics of liquidity risk do not exist.
- **Asset-Liability Management:** Certain techniques of asset-liability management can be applied to assess liquidity risk.
- **Net Cash Flow Analysis:** A simple test for liquidity risk is to look at future net cash flows on a day-by-day basis. Any day that has a sizeable negative net cash flow is of concern.
- **Stress Testing:** Such an analysis can be supplemented with stress testing.
- **Scenario Analysis:** Analyses such as these cannot easily take into account contingent cash flows, such as cash flows from derivatives or mortgage-backed securities. If an organization's cash flows are largely contingent, liquidity risk may be assessed using some form of scenario analysis.

General approach using scenario analysis:

- 1 Construct multiple scenarios for market movements and defaults over a given period of time.
- 2 Assess day-to-day cash flows under each scenario.

Because components of balance sheets differ so significantly from one organization to the next, there is little standardization in how such analyses are implemented.

10 MARKS AREA – Financial Risk Assessment

Explain market risk, credit risk and liquidity risk in detail with their types and mitigation techniques. Frequently asked for 10 marks.

Solved Case Study – Module 12

Case Study – Risk Identification and Classification

X Ltd. is a multinational corporation having its headquarters in U.S.A. It has a subsidiary in India. The management of X Ltd. identified the following exposures which they feel are the potential sources of risks.

- a. The purchase manager has imported a raw material for which the payment has to be made in US dollar after 3 months.
- b. The bank rate has been raised by RBI.
- c. X Ltd. has an investment of the company in Y Ltd. Recently Y Ltd. has become delisted.
- d. The Rating Agencies have downgraded Z Ltd. from which X Ltd. was supposed to receive Rs.1 lakh in two months.
- e. X Ltd. has huge unsold stock of goods in its current assets.

The management wants to categorize the exposures in different types of risks with as much detailing as possible, so that appropriate risk response can be undertaken. You have been appointed as an expert risk manager. Advise the management in identifying the type of risk.

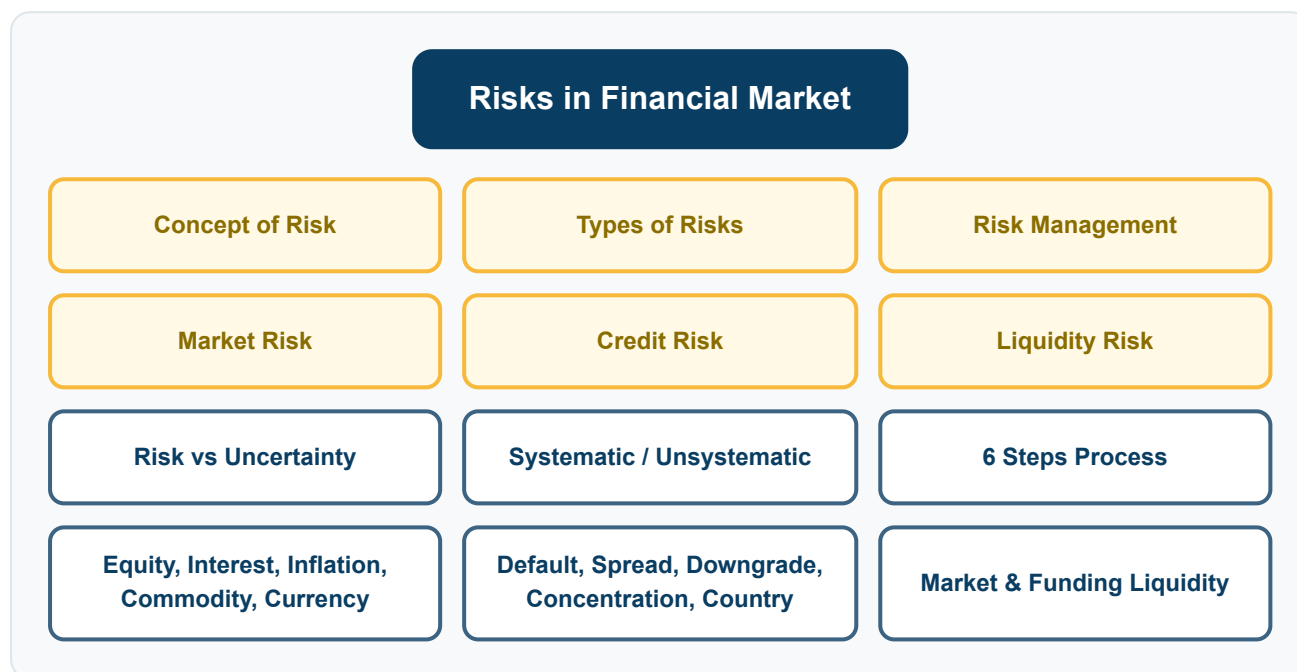
Solution – Risk Classification

Exposures	Type of Risks
a. The purchase manager has imported a raw material for which the payment has to be made in US dollar after 3 months.	Foreign Currency Risk
b. The bank rate has been raised by RBI.	Interest Rate Risk
c. X Ltd. has an investment of the company in Y Ltd. Recently Y Ltd. has become delisted.	Market Liquidity Risk
d. The Rating Agencies have downgraded Z Ltd. from which X Ltd. was supposed to receive Rs.1 lakh in two months.	Downgrade Risk (within Credit Risk)
e. X Ltd. has huge unsold stock of goods in its current assets.	Funding Liquidity Risk

Conclusion: Proper identification and classification of risks helps in designing appropriate risk responses – avoidance, reduction, transfer or acceptance.

Module 12 – Comprehensive Revision

Module Summary – Mind Map





Key Points for Revision

1. Risk = Uncertainty of an event with positive or negative impact on objectives
2. Risk is measurable; uncertainty is not measurable
3. Risk = quantifiable dispersion in possible outcomes
4. Systematic risk = Non-diversifiable; macro factors
5. Unsystematic risk = Diversifiable; firm-specific factors
6. CIMA classification: Operational, Financial, Country, Environmental, Reputational, Strategic
7. Risk management = Process by which risks are identified, assessed, measured and managed
8. 6 Steps of risk management: Objectives, Identification, Measurement & Prioritization, Strategy Development, Implementation, Monitoring
9. Risk tolerance = Level of risk company is able and willing to take
10. Risk responses: Avoidance, Reduction, Sharing/Transfer, Acceptance
11. Market risk = Risk of losses from movements in market prices
12. Market risk types: Equity, Interest Rate, Inflation Rate, Commodities, Currency
13. Value at Risk (VaR) = Convention to measure potential loss due to market risk
14. Market risk cannot be eliminated through diversification; can be hedged
15. Credit risk = Risk that obligor will default on debt
16. Credit risk types: Default, Credit Spread, Downgrade, Concentration, Country
17. Credit risk mitigation: Credit risk department, scorecards, risk-based pricing, credit limits, security, scoring models
18. Liquidity risk types: Market Liquidity and Funding Liquidity
19. Market liquidity risk = Cannot trade quickly enough at desired price
20. Funding liquidity risk = Cannot meet contractual obligations as they fall due
21. Liquidity risk compounds other risks – particularly credit risk
22. Liquidity risk assessment: Net cash flow analysis, stress testing, scenario analysis
23. Case study: Match exposure with appropriate risk type

One-Night Revision Notes – Module 12

Last Night Before Exam – Module 12

- **Risk:** Uncertainty of an event with positive/negative impact; measurable
- **Uncertainty:** Not measurable; total lack of knowledge
- **Systematic Risk:** Non-diversifiable; macro factors
- **Unsystematic Risk:** Diversifiable; firm-specific factors
- **CIMA Risks:** Operational, Financial, Country, Environmental, Reputational, Strategic
- **Risk Management Process:** Objectives → Identification → Measurement → Strategy → Implementation → Monitoring
- **Risk Responses:** Avoidance, Reduction, Sharing/Transfer, Acceptance
- **Market Risk:** Equity, Interest Rate, Inflation Rate, Commodities, Currency
- **Credit Risk:** Default, Credit Spread, Downgrade, Concentration, Country
- **Liquidity Risk:** Market Liquidity, Funding Liquidity
- **VaR:** Value at Risk – measure potential loss due to market risk
- **Liquidity Risk Assessment:** Net cash flow analysis, stress testing, scenario analysis

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Meaning and types of risk – 5 marks
- Risk management process steps – 5–10 marks
- Market risk and its types – 5 marks
- Credit risk and its types – 5 marks
- Liquidity risk – 5 marks
- Risk mitigation techniques – 5 marks
- Case study on risk identification – 5 marks
- Risk responses – 5 marks

Final Checklist – Module 12

✓ Before Moving to Module 13

- Can I define risk and distinguish it from uncertainty?
- Can I classify risks as systematic and unsystematic?
- Can I explain CIMA's classification of risks?
- Can I list and explain the six steps of risk management?
- Can I explain the four risk responses?
- Can I explain market risk and its five types?
- Can I explain credit risk and its five types?
- Can I explain liquidity risk and its two types?
- Can I discuss techniques for assessing and mitigating each type of risk?
- Have I memorised all key concepts?

**CMA FINAL PAPER 14 · STRATEGIC FINANCIAL
MANAGEMENT**

13

Financial Derivatives – Instruments for Risk Management

Master Revision Handbook · December 2026 Edition

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Module 13 – Financial Derivatives – Instruments for Risk Management

Module Objective

Primary Objective

To develop a detailed understanding of the sources and impact of risks to which an organisation is exposed to in a dynamic business environment and the techniques for managing the same to sustain competitive advantages. To understand the meaning of financial derivatives and their role in risk management, develop an understanding of forward and future pricing and hedging using futures, acquire in-depth knowledge of option pricing and developing option strategies for hedging and speculation, understand the process of designing swap deals in interest rate swaps, and develop an idea about other interest rate derivatives and their uses in risk management.

Mapped CMLO: 3b, 3c

Learning Outcomes

Students will be able to...	Application Skill
Understand the meaning of financial derivatives and their role in risk management.	Identify and explain various types of financial derivatives and their applications.
Develop an understanding of forward and future pricing and hedging using futures.	Calculate theoretical forward/futures prices; design hedging strategies using futures.
Acquire in-depth knowledge of option pricing and developing option strategies for hedging and speculation.	Apply Binomial and Black-Scholes models; design option strategies (straddle, strangle, spread, etc.).
Understand the process of designing swap deals in interest rate swaps.	Structure interest rate swap deals; compute savings for counterparties.
Develop an idea about other interest rate derivatives and their uses in risk management.	Apply FRA, Interest Rate Futures, Caps, Floors, and Collars.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
13.1	Introduction to Financial Derivatives	HIGH 5%	Theory
13.2	Forward and Futures – Meaning, Difference, Pricing, Hedging	HIGH 10%	Numerical + Theory
13.3	Options	HIGH 10%	Numerical + Theory
13.4	Swaps	HIGH 5%	Numerical + Theory
13.5	Interest Rate Derivatives – FRA, Futures, Options, Caps, Floors, Collars	HIGH 5%	Numerical + Theory

Expected Examination Areas – Dec 2026



DEC 2026 LIKELY AREAS

- Forward and Futures pricing – **5–10 marks**
- Hedging through futures – **10 marks**
- Option pricing – Binomial and Black-Scholes – **10–15 marks**
- Option strategies – Straddle, Strangle, Spread – **10–15 marks**
- Put-Call Parity – **5 marks**
- Interest Rate Swaps – **10 marks**
- Credit Default Swaps – **5 marks**
- FRA and Interest Rate Futures – **5–10 marks**
- Interest Rate Caps, Floors, Collars – **5 marks**

Frequently Tested Concepts

Module 13 – Concept Flow

Financial Derivatives



Forwards & Futures



Options

Swaps



Interest Rate Derivatives



FRA, Caps, Floors, Collars

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★ FREQUENTLY ASKED – MODULE 13

- **Forward & Futures pricing** – numerical
- **Hedging through futures** – numerical
- **Option pricing** – Binomial & Black-Scholes
- **Option strategies** – Straddle, Strangle, Spreads
- **Put-Call Parity** – numerical
- **Interest Rate Swaps** – structuring deals
- **FRA settlement** – numerical
- **Caps, Floors, Collars** – numerical + theory

13.1 Introduction to Financial Derivatives

Chapter Overview

This chapter introduces the concept of financial derivatives, their functions in the derivative market, features, benefits, and types based on nature of contract and underlying assets.

Learning Objectives

- Understand the concept of derivatives
- Appreciate the economic functions of the derivative market
- Identify the features and benefits of financial derivatives
- Classify financial derivatives based on nature and underlying assets

13.1.1 Concept of Derivatives

Definition

In financial literature, the term 'derivative' refers to a contract which has no independent value but whose value is entirely derived from the value of the underlying asset. The underlying asset can be securities, commodities, bullion, currency, livestock or anything else. These are essentially financial products.

13.1.2 Functions of the Derivative Market



Price Discovery

Prices in an organized derivatives market reflect the perception of market participants about the future and lead the prices of underlying to the perceived future level. The prices of derivatives converge with the prices of the underlying at the expiration of the derivative contract. Thus, derivatives help in discovery of future as well as current prices.



Risk Transfer

The derivatives market helps to transfer risks from those who have them but do not like them to those who have an appetite for them.



Liquidity and Volume Trading

Derivatives, due to their inherent nature, are linked to the underlying cash markets. With the introduction of derivatives, the underlying market witnesses higher trading volumes. This is because of participation by more players who would not otherwise participate for lack of an arrangement to transfer risk.



More Participation

An important incidental benefit that flows from derivatives trading is that it acts as a catalyst for new entrepreneurial activity. The derivatives have a history of attracting many bright, creative, well-educated people with an entrepreneurial attitude. They often energize others to create new businesses, new products and new employment opportunities, the benefit of which are immense.

13.1.3 Financial Derivatives – Features and Benefits

Features of Financial Derivatives



Future Contract

A derivative instrument relates to the future contract between two parties. It means there must be a contract-binding on the underlying parties and the same to be fulfilled in future.



Derived Value

The derivative instruments have the value which derived from the values of other underlying assets.



Specified Obligation

In general, the counter parties have specified obligation under the derivative contract.



Direct or Exchange Traded

The derivatives contracts can be undertaken directly between the two parties or through the particular exchange like financial futures contracts.



Off-Balance Sheet

In general, the financial derivatives are carried off-balance sheet. The size of the derivative contract depends upon its notional amount. The payoff of derivative products differs from the payoff that their notional amount might suggest.



No Delivery

Usually, in derivatives trading, the taking or making of delivery of underlying assets is not involved; rather underlying transactions are mostly settled by taking offsetting positions in the derivatives themselves.



Deferred Delivery

Derivatives are also known as deferred delivery or deferred payment instrument. It means that it is easier to take short or long position in derivatives in comparison to other assets or securities.



Secondary Market

Derivatives are mostly secondary market instruments.



OTC and Exchange Traded

Though exchange traded derivatives are more popular, over-the-counter (OTC) traded derivatives are still in existence.

Benefits of Using Financial Derivatives

General Benefits

- A prudent use of financial derivatives can provide a new mechanism to manage or reduce various business risks at low transaction costs.
- The innovative use of financial derivatives can greatly help end-users to cut their financing cost.
- Financial derivatives can provide more access to financial markets, especially to unfamiliar ones at lower costs. Put another way, they can create more complete markets to investors.
- Financial derivative instruments play an important role in asset management due to their lower transaction costs relative to the spot market instruments.
- The users of financial derivatives can expect to be offered opportunities on taking advantage of asymmetries in tax and regulatory requirements across different countries, markets or securities.
- Financial derivatives can be used to speculate and make profits by assuming certain risks, probably with suitable degree.

13.1.4 Types of Financial Derivatives

Classification of Financial Derivatives

Financial Derivatives



Based on Nature of Contract



Based on Underlying Assets

A. Based on the Nature of the Contract



Forwards

A forward contract is a customized contract between two entities, where settlement takes place on a specific date in the future at today's pre-agreed price. Forwards are very popular in foreign exchange market.



Futures

A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price. Futures contracts are special types of forward contracts in the sense that the former are standardized exchange-traded contracts. Unlike forward contracts, the counterparty to a futures contract is the clearing



Options

An option represents the right (but not the obligation) to buy or sell a security or other asset during a given time for a specified price (the "strike price"). Options are of two types - calls and puts.



Swaps

Swaps are private agreements between two parties to exchange cash flows in the future according to a prearranged formula. They can be regarded as portfolios of forward contracts. Swaps generally are traded OTC through swap dealers, which generally consist of large financial institutions,

corporation on the appropriate exchange.

or other large brokerage houses.

B. Based on the Underlying Assets



Equity Derivatives

Financial instruments whose value is derived from price movements of the underlying asset, where that asset is a stock or stock index. These are generally stock and index futures and option contracts.



Interest Rate Derivatives

Financial derivative contracts whose value is derived from one or more interest rates, prices of interest rate instruments, or interest rate indices. In India, popular interest rate derivatives include Interest Rate Futures or Interest Rate Options.



Foreign Exchange Derivatives

A financial derivative whose payoff depends on the foreign exchange rates of two (or more) currencies. These instruments are commonly used for hedging foreign exchange risk or for currency speculation and arbitrage. Specific foreign exchange derivatives include: foreign currency forward contracts, foreign currency futures, foreign currency swaps, currency options, and foreign exchange binary options.



Credit Derivatives

A contract whose value depends on the creditworthiness or a credit event experienced by the entity referenced in the contract. Credit derivatives include credit default swaps, collateralized debt obligations, total return swaps, credit default swap options, and credit spread forwards.

5 5 MARKS AREA – Introduction to Derivatives

Define derivatives, explain their functions and features, and classify them based on nature and underlying assets. Frequently asked as a short theory question.

13.2 Forward and Futures

Chapter Overview

This chapter covers the concept, features, and pricing of forward and futures contracts, the difference between them, marking to market, margin requirements, and hedging through futures.

Learning Objectives

- Understand the concept and features of forward contracts
- Understand the concept and characteristics of futures contracts
- Differentiate between forward and futures contracts
- Apply the cost of carry model for pricing forward and futures
- Apply hedging strategies using futures

13.2.1 Forward Contracts – Concept and Features

Concept

A forward contract is a simple tailor-made contract between two parties to buy or sell an asset at a certain time in the future for a pre-determined price. Unlike future contracts, they are not traded on an exchange, rather traded in the over-the-counter market, usually between two financial institutions or between a financial institution and one of its clients.

Example: An Indian company buys computer parts from USA with payment of ten million dollar due in 90 days. The importer, thus, owes dollars for future delivery. Suppose present price of dollar is ₹68. Over the next 90 days, however, dollar might rise against ₹68. The importer can hedge this exchange risk by negotiating a 90-days forward contract with a bank at a price ₹70. According to forward contract in 90 days the bank will give importer ten million dollar and importer will give the bank 700 million rupees hedging a future payment with forward contract. On the due date importer will make a payment of ₹700 million to bank and the bank will pay ten million dollar to importer, whatever rate of the dollar is after 90 days. So, this is a typical example of forward contract on currency.

Features of Forward Contract



Bilateral Contract



Custom Designed



Long and Short Position



Delivery Price

The pre-determined specified price in a forward contract is referred to as the delivery price. The forward price for a particular forward

Forward contracts are bilateral contracts, and hence, they are exposed to counter-party risk. There is risk of non-performance of obligation either of the parties.

Each contract is custom designed, and hence, is unique in terms of the asset type, quality, contract size and expiration date etc.

In forward contract, one of the parties takes a long position by agreeing to buy the asset at a certain specified future date. The other party assumes a short position by agreeing to sell the same asset at the same date for the same specified price.

contract at a particular time is the delivery price that would apply if the contract were entered into at that time. Thus, both are equal at the time the contract is entered into but, as time passes, the forward price is likely to change whereas the delivery price remains the same.



Synthetic Assets

In the forward contract, derivative assets can often be contracted from the combination of underlying assets, such assets are often known as synthetic assets in the forward market.



Settlement by Delivery

In the forward market, the contract has to be settled by delivery of the asset on expiration date.



Covered Parity

In the forward contract, covered parity or cost-of-carry relations are relation between the prices of forward and underlying assets. Such relations further assist in determining the arbitrage-based forward asset prices.



Popular in Forex

Forward contracts are very popular in foreign exchange market as well as interest rate bearing instruments.

13.2.2 Future Contracts – Concept and Characteristics

Concept

A future contract is a standardized agreement between the buyer and seller of the contract traded on a futures exchange, to buy or sell a specified underlying asset at a certain date in future, at a pre-set price. The future date is called the delivery date or final settlement date. The pre-set price is called the futures price. The price of the underlying asset on the delivery date is called the settlement price.

Thus, a future contract is a standard contract in which the seller is obligated to deliver a specified asset (security, index, commodity or foreign exchange) to the buyer on a specified date in future and the buyer is obligated to pay the seller the then prevailing futures price upon delivery.

Characteristics of a Future Contract



Exchange Traded

Future contracts are exchange traded. This provides a ready liquid market in which futures can be bought and sold. Some of these exchanges are Chicago Mercantile Exchange, Philadelphia Board of Trade, London International Financial Futures Exchange (LIFFE), Tokyo International Financial Futures Exchange (TIFFE), Sydney Futures Exchange, and Singapore



Selective Assets

The underlying of Financial Futures may be a security, index or foreign exchange. However, these are not available on all assets under a given category. For example, Stock Futures in NSE are available on 196 selected securities. Similarly, Index Futures are available on Nifty 50, Nifty Bank, Nifty Midcap Select, Nifty Financial Services.



Standardisation

The contract is standardised as to quantity, date and month of delivery and the minimum amount by which price would move. A brief explanation follows:

- **Quantity:** Each deal has a market lot. Thus, if you want to enter into a futures contract in Reliance stock, you will have to buy 100 Reliance, or in multiples thereof. Also referred to as the size of the contract, it specifies the quantity of the asset to be delivered for one contract.
- **Quality:** If you have entered into a futures contract to sell 100 Infosys stock futures you will have to deliver 100 Infosys shares and not 100 WIPRO shares.
- **Date and month of delivery:** The date and month of delivery is determined by the



Clearing House

In case of futures contracts, buyers and sellers do not come face-to-face. They operate through the clearing house. Clearing house is an entity that acts as counterparty to each transaction on futures market. Clearing house has the responsibility of maintaining accounts, margin payments and settlement of deliveries. A clearing house serves as the third party to all transactions. That is, the buyer of a futures

International Monetary Exchange (SIMEX). In India, currency futures are sold at BSE and NSE.

Currency futures, also, are not available on all foreign currencies.

exchange. As of now the exchange has fixed the last Thursday of the month for settlement and delivery. You cannot enter into a futures contract to deliver on say a Friday or a Wednesday. Further, if you have contracted to deliver in October, you have to deliver in October and cannot have it postponed to November.

- **Units of price quote:**
The minimum, and sometimes the maximum amount by which the price would change, is specified.

contract effectively buys from the clearing house and the seller of a futures contract sells to the clearing house. This reduces the counterparty risk.



Settlement Price

Since the futures contracts are performed through a particular exchange, so at the close of the day of trading, each contract is marked-to-market. For this the exchange establishes a settlement price. This settlement price is used to compute the profit or loss on each contract for that day. Accordingly, the member's accounts are credited or debited.



Daily Settlement and Margin

Another feature of a futures contract is that when a person enters into a contract, he is required to deposit funds with the broker, which is called as margin. The exchange usually sets the minimum margin required for different assets, but the broker can set higher margin limits for his clients which depend upon the credit-worthiness of the clients. The basic objective of the margin account is to act as collateral security in order to minimize the risk of failure by either party in the futures contract.



Cash Settlement

Most of the futures contracts are settled in cash by having the short or long to make cash payment on the difference between the futures price at which the contract was entered and the cash price at expiration date. This is done because it is inconvenient or impossible to deliver sometimes, the underlying asset such as in case of Index Futures.



Delivery

The futures contracts are executed on the expiry date. The counter parties with a short position are obligated to make delivery to the exchange, whereas the exchange is obligated to make delivery to the longs. The period during which the delivery will be made is set by the exchange which varies from contract to contract.



Regulation

Since Futures are exchange traded, they are well regulated by the market regulators. In India, RBI is empowered

to regulate the interest rate derivatives, foreign currency derivatives and credit derivatives. Regulation of other types of derivatives comes under the purview of SEBI.

13.2.3 Forward Contracts vs Future Contracts

S. No.	Feature	Currency Forward	Currency Futures
1	Size of Contract	Negotiated	Standardized
2	Available currencies	Majority of currencies	Selected currencies
3	Maturity	Negotiated	Standardized
4	Location of trading	Linkage by telephone/fax	Futures Exchange
5	Rates	Normally with bid-ask spread	Unified rates quoted on the exchange
6	Settlement	Generally with delivery of currencies	Mainly cash settled
7	Counterparties	Generally in contact with each other	Do not know each other. Clearing house is the counterparty to each side
8	Negotiation hours	Round the clock	During market sessions
9	Guarantee/Margin deposit	None	Initial and maintenance margins
10	Marking-to-market	No	Gains/losses settled everyday

13.2.4 Marking to Market and Margin Requirements

Marking to Market

Marking to market essentially means that at the end of the trading session (day), all outstanding contracts are repriced at the settlement price of that session (daily closing price). Margin account of those who made losses are debited and of those who gained are credited. The daily settlement reduces the default risk of futures contract relative to forward contracts.

Example: Suppose, an investor takes a long position (i.e., agreed to buy) in an ACC futures contract with lot size 250 that matures on Thursday afternoon. The agreed upon price is ₹2,100 per share. At the close of trading on Tuesday, the futures price has increased to ₹2,150. Due to the daily settlement feature, three things will occur. First, the investor will receive his cash profit of ₹12,500. Second, the existing futures contract with price of ₹2,100 will be cancelled and third the investor will receive a new futures contract with the prevailing price of ₹2,150.

Margin Requirement

Before entering into a futures contract, the prospective trader (investor) must deposit some funds with his broker which serve as a good faith deposit. In other words, an investor who enters into a futures contract is required to deposit funds with the broker called a margin. The basic objective of margin is to provide a financial safeguard for ensuring that the investors will perform their contract obligations.

In a futures market, there are three types of margin requirements:



Initial Margin

The initial margin is the original amount that must be deposited into account to establish futures position. It varies from stock to stock. To determine the initial margin, the exchange usually considers the degree of volatility of price movements in the past of the underlying asset. After that, the exchange sets the initial margin so that the clearing house covers losses on the position even in most adverse situation. The initial margin approximately equals the maximum daily price fluctuation permitted by the exchange for that underlying asset.



Maintenance Margin

The maintenance margin is the minimum amount which must be remained (kept) in a margin account. If the balance of margin account falls below the maintenance margin level, the broker will make a margin call and ask the investor to deposit the amount so that the balance again reach the initial margin level.



Variation Margin

If a margin call is made additional money is deposited by the trader/investor, to bring the account to the level of initial margin. This amount is called as the variation margin. In short variation margin is the amount needed to restore the initial margin once a margin call has been issued. The variation margin may change depending on how far the margin account has fallen below the maintenance margin level.

Illustration – Marking to Market

On June 15, Mr. X establishes a long position in 200 shares of Tata Steel on July 1 at a futures price ₹600 per share. Initial margin for contract is ₹30,000 and maintenance margin is ₹20,000. Future prices on June 16, 17, 18, 19, 21, 22, 23, 24 are ₹550, ₹650, ₹600, ₹605, ₹590, ₹580, ₹600, ₹620. Calculate his daily profit and loss, margin contribution/withdrawal and balance in the margin account.

Day	Future Price (₹)	Daily gain/loss	Margin Contributions (+)/Withdrawal (-)	Balance in Margin Account
June 15	600	–	–	30,000
June 16	550	(–) 10,000	–	20,000
June 17	650	+ 20,000	(–) 10,000	30,000
June 18	600	(–) 10,000	+ 10,000	30,000
June 19	605	+ 1,000	(–) 1,000	30,000
June 21	590	(–) 3,000	+ 3,000	30,000
June 22	580	(–) 2,000	+ 2,000	30,000
June 23	600	+ 4,000	(–) 4,000	30,000
June 24	620	+ 4,000	(–) 4,000	30,000

Initial margin = ₹30,000; Maintenance margin = ₹20,000

On June 16, balance falls to ₹20,000 (at maintenance level).

On June 17, gain of ₹20,000, withdrawal of ₹10,000 brings balance back to ₹30,000.

13.2.5 Pricing of Forward and Futures – Cost of Carry Model

Concept

The financial forward and futures contracts are priced using the Cost of Carry Model. With varying degrees of success, the model can also be used to value some non-financial contracts such as Gold.

The pricing is done in such a way that no arbitrage opportunities arise. Arbitrage refers to a trade which leads to a risk-free profit with no cash outlay. It is not expected to be present in the markets operating well, but market imperfections, such as transactions costs, etc., do allow arbitrage opportunities and, therefore, the actual prices may deviate from their theoretical values that are calculated by the model.

Assumptions of the Model

Markets are perfect

No transaction costs

All assets are
infinitely divisible

No bid-ask spreads
(only one price
prevails)

No restrictions on
short selling

Short sellers get full
proceeds of sales

Traders exploit
arbitrage
opportunities

Notations Used

Symbol	Meaning
T	Time remaining up to delivery date in the contract
S_0	Price of the underlying asset at present (spot price)
K	Delivery price in the contract at time T
F^*	Theoretical Forward or future price today (TFP)
F	Actual Forward or Future price today (AFP)
r	Risk free rate of interest per annum today

Σ The Model

$$\text{Forward (or Futures) Price} = \text{Spot Price} + \text{Carry Costs} - \text{Carry Return}$$

Spot Price: Current price of one unit of deliverable asset in market

Carry Costs: Holding costs including interest charges on borrowing (or opportunity cost of own funds), insurance, obsolescence, storage

Carry Return: Income such as dividends on shares which may accrue to investor

Pricing of Forward Contracts (on Investment Assets)

Σ A. Securities Providing No Income

$$F^* = S_0 \times e^{rt}$$

S_0 : Spot price of asset underlying contract

r : Risk-free rate of interest per annum with continuous compounding **t :** Time to maturity

✓ **Example: A share which is not expected to pay any dividend, or discount bonds**

△ If $TFP(F^*) > AFP(F)$, arbitrageur can buy asset and go short forward contract. If $TFP(F^*) < AFP(F)$, he can short asset and go long forward contract.

Illustration – No Dividend

Mr. X is long on a forward contract to purchase a non-dividend paying share in 3 months. The current market price of the share is ₹70 and the three-month risk-free rate of interest is 6% p.a. continuously compounded. Calculate the theoretical forward price. Is there any arbitrage opportunity if the actual forward price is (i) ₹73 and (ii) ₹71?

Given: $S_0 = ₹70$; $r = 6\%$ p.a.c.c; $t = 3 \text{ months} = 3/12 \text{ years}$

$$F^* = S_0 \times e^{rt} = 70 \times e^{0.06 \times 3/12} = 70 \times 1.0202 = \text{₹71.41}$$

(i) When forward price is ₹73:

Arbitrageur can borrow ₹70 @ 6% for 3 months, buy one share at ₹70 and short a forward contract for ₹71.41. At end of 3 months, sell share for ₹73, repay loan of ₹71.41 and make profit of $₹(73 - 71.41) = \text{₹1.59}$

(ii) When forward price is ₹71:

Arbitrageur can short one share, invest proceeds at 6% for 3 months, and have long position in 3-month forward contract. Proceeds grow to ₹71.41. Pay ₹71, take delivery of share, close short sale. Net gain = $₹(71.41 - 71) = \text{₹0.41}$

Theoretical forward price = ₹71.41

(i) Arbitrage profit = ₹1.59 (buy spot, sell forward)

(ii) Arbitrage profit = ₹0.41 (sell spot, buy forward)

Σ B. Securities Providing a Known Cash Income

$$F^* = (S_0 - I) \times e^{rt}$$

I: Present value of the known cash income

✓ **Example: A share expected to pay a dividend during life of contract**

Illustration – Known Cash Income

A 6-month forward contract on 100 shares with a price of ₹38 each is available. The risk-free rate of interest (continuously compounded) is 10% per annum. The share in question is expected to yield a dividend of ₹1.50 in 4 months from now. Determine the forward price.

Given: $S_0 = ₹38$; $r = 10\%$ p.a.c.c; $t = 6 \text{ months} = 6/12 \text{ years}$

$I = \text{PV of dividend} = 1.50 \times e^{-0.10 \times 4/12} = 1.4508$

$F^* = (S_0 - I) \times e^{rt} = (38 - 1.4508) \times e^{0.10 \times 6/12} = \text{₹38.4231}$

Forward price = ₹38.4231

Σ C. Securities Providing a Known Yield

$$F^* = S_0 \times e^{(r-y)t}$$

y: Yield (dividend yield) paid continuously at rate y per annum

✓ **Example: Stock indices where shares are expected to return dividends expressed as a percentage of prices**

Illustration – Known Yield

Consider a 6-month forward contract on a security where 4% p.a. continuous dividend is expected. The risk-free rate of interest is 10% p.a. continuously compounded. The asset's current price is ₹25. Determine the forward price.

Given: $S_0 = ₹25$; $r = 10\%$ p.a.c.c; $t = 6 \text{ months} = 6/12 \text{ years}$; $y = 4\%$ p.a.

$F^* = S_0 \times e^{(r-y)t} = 25 \times e^{(0.10 - 0.04) \times 6/12} = \text{₹25.76}$

Forward price = ₹25.76

Σ Value of a Forward Contract

$$\text{Value of Long Forward (f)} = (F^* - K) \times e^{-rt}$$

$$\text{Value of Short Forward (f)} = (K - F^*) \times e^{-rt}$$

F*: Forward price (current theoretical) **K**: Delivery price (original contract price) **r**: Risk-free rate
t: Time to maturity

Illustration – Value of Forward Contract

Consider a 6-month long forward contract on a non-dividend paying stock. The risk-free rate of interest is 6% p.a. continuously compounded. The current stock price is ₹60 and the delivery price is ₹56. Compute the value of the forward contract.

Given: $S_0 = ₹60$; $r = 6\%$ p.a.c.c; $t = 6 \text{ months} = 6/12 \text{ years}$; $K = ₹56$

$$F^* = S_0 \times e^{rt} = 60 \times e^{0.06 \times 6/12} = ₹61.80$$

$$\text{Value of long forward contract} = f = (F^* - K) \times e^{-rt} = (61.80 - 56) \times e^{-0.06 \times 6/12} = ₹5.62$$

Value of forward contract = ₹5.62

Pricing of Index Futures

Σ Index Futures Pricing

$$\text{a. No dividends: } F^* = S_0 \times e^{rt}$$

$$\text{b. Known dividend: } F^* = (S_0 - I) \times e^{rt}$$

$$\text{c. Known yield: } F^* = S_0 \times e^{(r-y)t}$$

13.2.6 Hedging through Futures

Concept

Hedge means to protect or lock in a value. In order to perform a hedge we need two assets. We need another asset to protect the one which we are holding and for which we are trying to create a hedge.

The behaviour of the two assets is the key in deciding the hedge. The asset chosen to hedge the existing asset can be positively correlated with the existing asset or it can be negatively correlated. If the asset chosen for the purpose of hedging is positively correlated with our existing asset, then we sell the asset else we buy that asset. The reason being when the asset prices fall, both the assets would lose value. In such a scenario, the asset which we have sold would give gains thereby offsetting the loss in the existing asset. On the same lines, when asset prices rise, the asset used for hedging would lose value, since we have sold them and again it would offset the gains of the existing asset. Thus, in both the scenarios, both the assets put together gives us net zero gains. In other words, the existing asset retains its original value i.e., original value is locked.

Hedging is adopted when we believe that the existing assets are likely to lose value and our intention is to protect the existing value. In other words, we expect the unfavourable event to occur. What happens if the original view (i.e., unfavourable event) does not materialize? The hedge does not provide any benefit; it simply locks in a value that existed when the hedge was initiated. Therefore, hedge is not adopted if unfavourable event is not expected to happen. Hedging is not aimed to make gains or reduce losses; it is aimed at locking a value of a commodity, stock or portfolio.

The goal of a hedge transaction is to create a position that, once added to an investor's portfolio, will offset the price risk of another. A hedge can be so constructed that one can have partial protection say to the extent of 50% or 75% etc. In that case we would have only that much protection and in an unfavourable situation we would be losing 50% or 25% respectively.

Hedging Strategies Using Futures

Hedging Strategies – Summary

Position	Action in Futures Market	Reason
Long in cash market (holding asset)	Sell futures (Short hedge)	Offset loss if price falls
Short in cash market (need to buy)	Buy futures (Long hedge)	Offset loss if price rises

Σ Number of Futures Contracts for Hedging

$$\text{No. of Contracts} = (\text{Portfolio Value} \times \text{Hedge Ratio}) \div \text{Value per Futures Contract}$$

Hedge Ratio (β): Beta of the portfolio/stock w.r.t. index

Value per Futures Contract: Index Price $\times$ Lot Size

✓ Use to determine how many futures contracts to buy/sell for hedging

Σ Adjusting Portfolio Beta

$$\text{No. of Contracts} = (\beta^* - \beta) \times (\text{Portfolio Value} \div \text{Value of Futures Contract})$$

β^* : Desired Beta β : Existing Beta If $\beta^* > \beta \rightarrow$ Buy Futures (positive contracts)

If $\beta^* < \beta \rightarrow$ Sell Futures (negative contracts)

Illustration – Hedging with Index Futures

Consider Mr. X, a portfolio manager managing a portfolio (beta 1.5) whose current market value is ₹67.50 Crores. It is expected that the markets are likely to correct downwards and hedging needs to be adopted using NIFTY index futures. Currently index futures are quoted at 4500 with each contract underlying 100 units. Let us examine a situation when markets correct 10% down and also a possibility market trend upwards by 10% against the belief of Mr. X. Assume Mr. X hedged 100% of his portfolio.

Value per NIFTY index contract = ₹4,500 × 100 = ₹4,50,000

Value of the portfolio = ₹67.50 Crores

Value of Index Futures required to be hedged = Beta × Value of portfolio
= 1.5 × ₹67.50 Crores = ₹101.25 Crores

Number of NIFTY index contracts to be sold = ₹101.25 Crores ÷ ₹4,50,000 = **2250 contracts**

Scenario 1: Market falls by 10%

Portfolio loss = 1.5 × 10% = 15% fall in portfolio value = –₹10.125 Crores

Gain on futures = 10% gain in futures = +₹10.125 Crores

Net Gain/Loss = **Nil**

Scenario 2: Market rises by 10%

Portfolio gain = 1.5 × 10% = 15% gain in portfolio value = +₹10.125 Crores

Loss on futures = 10% loss in futures = –₹10.125 Crores

Net Gain/Loss = **Nil**

Number of contracts = 2250

Portfolio is perfectly hedged.

Illustration – Adjusting Portfolio Beta

Mr. Z is holding a portfolio with beta 1.2 and current market value ₹100 Crores. He wants to reduce the beta of the portfolio to 0.80. Index futures are selling at 5500 level with lot size 100. How many index futures should he buy/sell?

Value per futures contract = $5500 \times 100 = ₹5,50,000$

Number of contracts = $(\beta^* - \beta) \times (\text{Portfolio Value} \div \text{Value of futures contract})$
= $(0.80 - 1.20) \times (100 \text{ crores} \div 5,50,000)$
= $(-0.40) \times 1818.18$
= **-727.27 $\approx$ -727 contracts**

Mr. Z should sell 727 index futures to reduce beta from 1.2 to 0.8.

Illustration – Cross Hedge

Bharat Investments Ltd is long on 25,000 shares of Trinayan Earth Moving Equipment Ltd (TEEL). Its shares are currently quoted at ₹180 per share. Bharat fears fall in prices of TEEL. It therefore wants to hedge its risk under the Futures Contract route. However, future rate is not available for TEEL. Therefore, Bharat is looking for cross hedge and the following particulars are made available:

Related index	NIFTY	Infrastructure Index	Iron and Steel Index	Bank Index
Beta of TEEL Related Index	0.8	1.1	1.3	1.0
Correlation of TEEL with Related Index	0.6	0.8	0.6	0.3
No. of Units of TEEL underlying every Futures Contract of Index	1000	500	1000	1250

Advise Bharat.

Choice of Index for Cross Hedge:

Object of Hedging: Hedging through Futures Contract is done to mitigate or eliminate price related risks. The object is to eliminate uncertainty about the future price movements and freeze the impact of price movement at a particular point.

Relevance of Beta Value:

Beta value is the sensitivity of the stock to be hedged (TEEL) to the changes in value of the indices. It is an indication of volatility of the stock with reference to the movement in index. It is also equal to the number of units of Index Future required to hedge one unit of the stock. High Beta or Low Beta value is not the sole factor determining the choice of a cross hedge. If however, transaction costs are high, and a low beta index may be preferred.

Correlation: Choice of the perfect cross hedge should be based on the correlation between the price of the stock to be hedged and the index used as a cross hedge. Higher the correlation with the index, better the index for cross hedging.

Evaluation of Different Indices:

Related Index [I]	NIFTY	Infrastructure Index	Iron and Steel Index	Bank Index
Beta of TEEL [β_{TL}]	0.8	1.1	1.3	1.0
Correlation of TEEL [ρ_{TL}]	0.6	0.8	0.6	0.3
No. of Units of TEEL underlying every Futures Contract of Index	1000	500	1000	1250
Ranking based on Correlation [Most correlated Index]	2	1	3	4

Conclusion: Bharat Investments should prefer to cross hedge using Infrastructure Index.

Course of Action:

Bharat is long in the cash market i.e. buy in the cash market. Therefore, it should take the opposite position in the Futures Market of Infrastructure Index. It should sell Infrastructure Index Futures.

No. of Infrastructure Contracts to be sold = Hedge Ratio $\times$ (Units of spot position requiring hedging $\div$ Units in one Futures Contract of Infra Index)
 $= 1.10 \times (25,000 \div 1,000) = 1.10 \times 25 = \mathbf{27.5 \text{ Future Contracts}}$

Bharat should sell 27.5 Infrastructure Index Futures.

13.3 Options

Chapter Overview

This chapter covers the concept, features, types, profitability, profit profiles, valuation, and strategies of options. It also covers the Put-Call Parity relationship, Binomial Model, Black-Scholes Model, and The Greeks.

Learning Objectives

- Understand the meaning, features and types of options
- Analyse profitability of options (ITM, ATM, OTM)
- Understand profit profile of option buyer and writer
- Compute intrinsic value and time value
- Identify determinants of option premium
- Apply various option strategies
- Understand Put-Call Parity relationship
- Apply Binomial and Black-Scholes models for option valuation
- Understand The Greeks (Delta, Gamma, Vega, Theta, Rho)

13.3.1 Meaning, Features and Types of Options

Concept

An option is a contractual agreement to buy or to sell a specified amount of the underlying asset at a future specified date at a pre-determined rate where the option buyer has the right, but not the obligation to execute the contract. Upon exercise of the right by the option holder, an option seller is obligated to deliver the specified instrument at the specified price.

Features of an Option

The buyer has the right to buy or sell the asset. The seller has a potential commitment to sell or buy the asset if the buyer exercises his right.

To acquire the right of an option, the buyer must pay a price to the seller. This is called the option price or the premium. Option premium is payable even if the option is not exercised.

The price at which an option is exercised is called the Exercise Price or the Strike Price. Determined at the time of entering into the option contract.

The option is to be exercised on a future specified date known as the expiry of the option.

In case of exchange traded options, the contract size is specified and not negotiable.

Each option has a pre-determined tenure (1 month, 3 months etc.).

Types of Options



Call Option

Gives the holder the right to BUY an asset, but not an obligation to buy. Seller/Writer is under an obligation to sell the underlying asset if the Buyer exercises his option to buy the shares/stock.



Put Option

Gives the holder the right to SELL an asset, but not an obligation to sell. Seller/Writer is under an obligation to buy the underlying asset if the Buyer exercises his option to sell his shares/stock.



American Option

Holder can exercise his right at any time before expiry date.



European Option

Holder can exercise his right only on the expiry date.



Stock Options

Underlying is an individual stock.



Index Options

Underlying is any index like Nifty 50.



Currency Options

Underlying is any foreign exchange.



Interest Rate Options

Underlying is the interest rate itself.

13.3.2 Profitability of Options – ITM, ATM, OTM

Option Positions – ITM, ATM, OTM

Situation	Call Option	Put Option	Resulting Profit/Loss
$S_T < X$	Out-of-the-money (OTM)	In-the-money (ITM)	Call: Loss = premium paid; Put: Profit = $(X - S_T) - P$
$S_T = X$	At-the-money (ATM)	At-the-money (ATM)	Both: Loss = premium paid
$S_T > X$	In-the-money (ITM)	Out-of-the-money (OTM)	Call: Profit = $(S_T - X) - C$; Put: Loss = premium paid

Break-even Price: For Call Option = $X + C$; For Put Option = $X - P$

Illustration – Call Option Buyer

On 29.06.2022, a trader buys a July 28, 2022 European Call Option on Reliance shares with a strike price of ₹2,620 at ₹330. Determine his profit or loss if the spot price of shares prevailing on expiry is ₹2390, ₹2620, ₹2,850, ₹2950, ₹3050. Also determine the break-even price.

Expected Spot Price (S_T) (₹)	Exercise Price (X) (₹)	Premium (C) (₹)	Position	Gross gain (₹) = ($S_T - X$)	Net Profit (₹) = ($S_T - X$) - C
2,390	2,620	330	Out of the Money	—	—
2,620	2,620	330	At the Money	—	—
2,850	2,620	330	In the Money	230	-100
2,950	2,620	330	In the Money	330	Nil
3,050	2,620	330	In the Money	430	+100

Break-even price = $X + C = 2,620 + 330 = ₹2,950$

Illustration – Put Option Buyer

On 29.06.2022, a trader buys a July 28, 2022 European Put Option on Infosys shares with a strike price of ₹1,380 at ₹25. Determine his profit or loss if the spot price of shares prevailing on expiry is ₹1,410, ₹1,380, ₹1,360, ₹1,355, ₹1,345. Also determine the break-even price.

Expected Spot Price (S_T) (₹)	Exercise Price (X) (₹)	Premium (P) (₹)	Position	Gross gain (₹) = $(X - S_T)$	Net Profit (₹) = $(X - S_T) - P$
1,410	1,380	25	Out of the Money	—	—
1,380	1,380	25	At the Money	—	—
1,360	1,380	25	In the Money	20	-5
1,355	1,380	25	In the Money	25	Nil
1,345	1,380	25	In the Money	35	+10

Break-even price = $X - P = 1,380 - 25 = ₹1,355$

13.3.3 Profit Profile of Option Buyer and Writer



Long Call

Bought a call option and paid premium. Profit potential: Unlimited; Loss potential: Limited to premium paid. Break-even = Strike + Premium.



Short Call

Written a call option and received premium. Profit potential: Limited to premium received; Loss potential: Unlimited. Break-even = Strike + Premium.



Long Put

Bought a put option and paid premium. Profit potential: Substantial; Loss potential: Limited to premium paid. Break-even = Strike – Premium.



Short Put

Written a put option and received premium. Profit potential: Limited to premium received; Loss potential: Substantial. Break-even = Strike – Premium.

Illustration – Long Call

Mr. A buys a July call option with a strike price of ₹3,500 at ₹50. Show his profit profile at alternative spot prices on expiration.

Spot Price (₹)	Strike Price (₹)	Premium (₹)	Status	Net Payoff (₹)
3,000	3,500	50	OTM	(–) 50
3,400	3,500	50	OTM	(–) 50
3,500	3,500	50	ATM	(–) 50
3,520	3,500	50	ITM	(–) 30
3,550	3,500	50	ITM	Nil (BEP)
3,600	3,500	50	ITM	+ 50

Maximum loss = ₹50 (premium paid)

Profit potential = Unlimited

BEP = Strike Price + Premium = 3,500 + 50 = ₹3,550

Illustration – Short Call

Mr. B writes a July call option with a strike price of ₹3,500 at ₹50. Show his profit profile at alternative spot prices on expiration.

Spot Price (₹)	Strike Price (₹)	Premium (₹)	Status	Net Payoff (₹)
3,000	3,500	50	OTM	+ 50
3,400	3,500	50	OTM	+ 50
3,500	3,500	50	ATM	+ 50
3,520	3,500	50	ITM	+ 30
3,550	3,500	50	ITM	Nil (BEP)
3,600	3,500	50	ITM	(–) 50

Maximum gain = ₹50 (premium received)

Loss potential = Unlimited

BEP = Strike Price + Premium = 3,500 + 50 = ₹3,550

13.3.4 Intrinsic Value and Time Value

Σ Intrinsic Value of an Option

Call Option: $IV = (S_T - X)$ when $S_T > X$; and = 0 otherwise

Put Option: $IV = (X - S_T)$ when $S_T < X$; and = 0 otherwise

IV: Intrinsic Value (gain on immediate exercise) **S_T :** Spot price **X :** Exercise price

Σ Time Value of an Option

$$\text{Time Value} = \text{Option Price (Premium)} - \text{Intrinsic Value}$$

Also referred to as extrinsic value Time value decays over time

Directly related to how much time an option has until expiration

At expiration, option would have only intrinsic value and no time value

Illustration – Intrinsic Value and Time Value

Suppose, the July, 2022 call option on Infosys shares having an exercise price of ₹1,380 is currently trading at ₹20. Now, if the current spot price for Infosys shares is ₹1,390, calculate intrinsic value and time value. What if the current spot price is ₹1,350?

When $S_T = ₹1,390$ (ITM):

Intrinsic Value = $1,390 - 1,380 = ₹10$

Time Value = $20 - 10 = ₹10$

When $S_T = ₹1,350$ (OTM):

Intrinsic Value = 0

Time Value = ₹20 (entire premium is time value)

ITM: IV = ₹10, TV = ₹10

OTM: IV = ₹0, TV = ₹20

13.3.5 Determinants of Option Premium

S. No.	Increase in	Impact on Call Premium	Impact on Put Premium
1	Time to maturity	Increase	Increase
2	Volatility	Increase	Increase
3	Forward Premium on foreign currency	Increase	Decrease
4	Forward Discount on foreign currency	Decrease	Increase
5	Domestic interest rate	Increase	Decrease
6	Foreign interest rate	Decrease	Increase
7	Exercise price	Decrease	Increase
8	Spot rate	Increase	Decrease

13.3.6 Option Strategies

Option Strategies – Overview



Elementary Strategies

Long Call, Long Put, Short Call, Short Put



Stock and Option Combinations

Covered Call, Protective Put, Short Stock + Long Call, Short Stock + Short Put



Spread Strategies

Vertical Spread, Horizontal Spread, Diagonal Spread, Butterfly Spread, Condor Spread



Other Strategies

Straddle, Strangle, Strap, Strip

I. Stock and Option Combinations



Covered Call

Strategy: Long Stock + Short Call

Expectation: Decline in stock price / gain from small price increase

Mechanism: As price declines, loss on stock increases but option gets OTM. Gain on writing option (premium) helps recover loss on stock. In case of small price rise up to strike price, option remains OTM and premium received is gain. For large price increase, option becomes ITM and loss on option consumes gain on stock.

When Effective: Small decline or small rise in price



Protective Put

Strategy: Long Stock + Long Put

Expectation: Decline in stock price / participate in bull run

Mechanism: As price declines, loss on stock increases but option becomes profitable. Profit on put option offsets loss on stock.

When Effective: Moderate to sharp decline in stock price



Short Stock + Long Call

Strategy: Short Stock + Long Call

Expectation: Increase in stock price

Mechanism: As price rises, loss on short stock is covered by profit on long call.

When Effective: Large price appreciation



Short Stock + Short Put

Strategy: Short Stock + Short Put

Expectation: Increase in stock price

Mechanism: As price rises, loss on short stock is covered by profit on short put.

When Effective: Small price decline

II. Spread Strategies



Bull Spread (Call)

Strategy: Buy Call with lower strike (ITM) + Sell Call with higher strike (OTM)

Risk: Limited to initial premium paid

Reward: Limited to difference between strikes minus net premium cost

When Effective: Investor is moderately bullish

BEP: Strike Price of Purchased call + Net Debit Paid



Bull Spread (Put)

Strategy: Sell Put with higher strike (OTM) + Buy Put with lower strike (Further OTM)

Risk: Limited

Reward: Limited to net premium credit

When Effective:

Moderately bullish

BEP: Strike Price of Short Put – Net Premium Received



Bear Spread (Call)

Strategy: Sell Call with lower strike (ITM) + Buy Call with higher strike (OTM)

Risk: Limited to difference between strikes minus net premium

Reward: Limited to net premium received

When Effective: Mildly bearish

BEP: Lower Strike + Net Credit



Bear Spread (Put)

Strategy: Buy Put with higher strike (ITM) + Sell Put with lower strike (OTM)

Risk: Limited to net amount paid

Reward: Limited to difference between strikes minus net premium paid

When Effective: Moderately bearish

Illustration – Bull Call Spread

Mr. PQR buys a Nifty Call with a Strike price ₹4,100 at a premium of ₹172.45 and he sells a Nifty Call option with a strike price ₹4,400 at a premium of ₹37.40. The net debit here is ₹135.05 which is also his maximum loss. Show his pay-off profile on expiration within a price range of ₹3,800 to ₹4,500.

Spot Price (S_T) (₹)	Pay-off on Long Call (₹)	Pay-off on Short Call (₹)	Net Pay-off (₹)
3,800	(-) 172.45	37.40	(-) 135.05
3,900	(-) 172.45	37.40	(-) 135.05
4,000	(-) 172.45	37.40	(-) 135.05
4,100	(-) 172.45	37.40	(-) 135.05
4,200	(-) 72.45	37.40	(-) 35.05
4,235.05	(-) 37.40	37.40	0
4,300	27.55	37.40	64.95
4,400	127.55	37.40	164.95
4,500	227.55	-62.60	164.95

Maximum loss = ₹135.05

Maximum gain = ₹164.95

BEP = ₹4,235.05

III. Other Strategies – Straddle, Strangle, Strap, Strip



Long Straddle

Strategy: Buy Put + Buy Call with same strike price and expiration date

Risk: Limited to initial premium paid

Reward: Unlimited

When Effective: Investor thinks underlying stock/index will experience significant volatility in near term

Upper BEP: Strike Price of Long Call + Net Premium Paid

Lower BEP: Strike Price of Long Put – Net Premium Paid



Short Straddle

Strategy: Sell Put + Sell Call with same strike price and expiration date

Risk: Unlimited

Reward: Limited to premium received

When Effective: Investor thinks underlying stock/index will experience very little volatility in near term

Upper BEP: Strike Price of Short Call + Net Premium Received

Lower BEP: Strike Price of Short Put – Net Premium Received



Long Strangle

Strategy: Buy OTM Put + Buy OTM Call

Risk: Limited to premium paid

Reward: Unlimited

When Effective: Investor thinks underlying stock/index will experience very high levels of volatility in near term

Upper BEP: Strike Price of Long Call + Net Premium Paid

Lower BEP: Strike Price of Long Put – Net Premium Paid



Short Strangle

Strategy: Sell OTM Put + Sell OTM Call

Risk: Unlimited

Reward: Limited to premium received

When Effective: Investor thinks underlying stock will experience little volatility in near term

Upper BEP: Strike Price of Short Call + Net Premium Received

Lower BEP: Strike Price of Short Put – Net Premium Received



Strap

Strategy: Buy Two Calls + Buy One Put (same strike, expiry, underlying)

When Effective: Investor is bullish on market and bullish on volatility

Risk: Limited to premium paid

Reward: Unlimited on upside



Strip

Strategy: Buy Two Puts + Buy One Call (same strike, expiry, underlying)

When Effective: Investor is bearish on market and bullish on volatility

Risk: Limited to premium paid

Reward: Substantial on downside



Long Call Butterfly

Strategy: Sell 2 ATM Call, buy 1 ITM Call Option and buy 1 OTM Call Option

Risk: Net debit paid

Reward: Difference between adjacent strikes minus net debit

When Effective: Investor is neutral on market direction and bearish on volatility

Upper BEP: Strike Price of Higher Strike Long Call – Net Premium Paid

Lower BEP: Strike Price of Lower Strike Long Call + Net Premium Paid



Condor

A non-directional options strategy that limits both gains and losses while seeking to profit from either low or high volatility. Long condor seeks to profit from low volatility; short condor seeks to profit from high volatility.

Illustration – Long Straddle

A trader buys a put and a call option with the same strike price of ₹3,500 and same expiration date. The call premium is ₹50 and the put premium is ₹45. Show the profit profile at different spot prices.

Spot Price (₹)	Call Payoff (₹)	Put Payoff (₹)	Total Premium (₹)	Net Payoff (₹)
3,300	0	200	95	+105
3,400	0	100	95	+5
3,405	0	95	95	0
3,500	0	0	95	–95
3,595	95	0	95	0
3,700	200	0	95	+105

Upper BEP = $3,500 + 95 = ₹3,595$

Lower BEP = $3,500 - 95 = ₹3,405$

Maximum loss = ₹95 (at spot = strike)

13.3.7 Put-Call Parity Relationship

Concept

Put-call parity shows the relationship that has to exist between European put and call options that have the same underlying asset, expiration, and strike prices. The concept says that the price or value of the European call option with a certain strike price and expiration date can be derived from the value of a European put option with same strike price and expiration date and vice-versa. The relationship is based on a 'no arbitrage' assumption.

Put-Call Parity Relationship

$$C + PV(X) = P + S_T$$

$$PV(X) = X \times e^{-rt}$$

C: Call price (premium) **P:** Put price (premium) **S_T:** Spot price **PV(X):** Present value of strike price
r: Risk-free rate continuously compounded **t:** Time to expiration

$$\text{Therefore: } C = P + S_T - X \times e^{-rt}$$

$$\text{Or: } P = C + X \times e^{-rt} - S_T$$

 *Not applicable in case of American options*

Illustration – Put-Call Parity

A stock is currently trading at ₹500. A call option with 3 months to maturity at an exercise price of ₹550 is available on the stock at a premium of ₹12. What should be the price of the put option on the same stock with same strike price and expiration? The risk-free rate of interest is 8% p.a. continuously compounded.

Given: $C = ₹12$; $X = ₹550$; $r = 8\%$ p.a.; $t = 3 \text{ months} = 3/12 \text{ year}$

Using Put-Call Parity: $P = C + X \times e^{-rt} - S_T$

$$= 12 + 550 \times e^{-0.08 \times 3/12} - 500$$

$$= 12 + 539.11 - 500$$

$$= ₹51.11$$

Price of put option = ₹51.11

Illustration – Put-Call Parity (Multiple Cases)

A put and a call option each have an expiration date 6 months hence and an exercise price ₹9. The interest rate for the 6-month period is 3 percent.

- (a) If the put has a market price of ₹2 and share is worth ₹10 per share, what is the value of the call?
- (b) If the put has a market price of ₹2 and the call ₹4, what is the value of the share per share?
- (c) If the call has a market value of ₹5 and market price of the share is ₹12 per share, what is the value of the put?

$$(a) C + X \times e^{-rt} = S_T + P$$

$$\begin{aligned} C &= S_T + P - X \times e^{-rt} \\ &= 10 + 2 - (9 \times e^{-0.03 \times 6/12}) \\ &= 12 - (9 \div 1.01511) \\ &= 12 - 8.86 = \text{₹}3.14 \end{aligned}$$

$$(b) S_T = C + X \times e^{-rt} - P$$

$$\begin{aligned} &= 4 + (9 \div 1.01511) - 1 \\ &= 4 + 8.86 - 1 = \text{₹}11.86 \end{aligned}$$

$$(c) P = C + X \times e^{-rt} - S_T$$

$$= 5 + 8.86 - 12 = \text{₹}1.86$$

$$(a) C = \text{₹}3.14$$

$$(b) S_T = \text{₹}11.86$$

$$(c) P = \text{₹}1.86$$

13.3.8 Option Valuation – Binomial Model

Concept

This model assumes that the underlying asset can have only two values at the time of maturity of an option. One will be higher than the strike price and the other will be lower than the strike price. The option premium calculated under this method provides risk-free rate of return, at either of the two prices, on the investment made by option writer.

Σ Binomial Model – Key Formulas

$$p = (f - d) \div (u - d)$$

$$\text{Value of Call} = [C_u \times p + C_d \times (1 - p)] \div f$$

$$\text{Value of Put} = [P_u \times p + P_d \times (1 - p)] \div f$$

$$u = 1 + \% \text{ increase} = FP_1/SP_0 \quad d = 1 + \% \text{ decrease} = FP_2/SP_0$$

$$f = e^{rt} \text{ (future value factor for continuous compounding)}$$

$$p = \text{Probability of asset price going upwards} \quad C_u, C_d = \text{Call payoffs at upper and lower limits}$$

$$P_u, P_d = \text{Put payoffs at upper and lower limits}$$

Illustration – Single Stage Binomial Model

A stock is currently trading at ₹50. It can either go up or down by 20% in a period of 3 months. If the risk-free rate of return is 8% p.a. continuously compounded, calculate the value of call and put option with strike price of ₹50 and maturity of 3 months using Single Stage Binomial Option Pricing Model.

Spot Price (SP ₀)	Exercise Price (EP)	Long Call Pay-off	Long Put Pay-off
+20% → 60	50	$C_u = 10$	$P_u = 0$
50	50		
-20% → 40	50	$C_d = 0$	$P_d = 10$

Here, $u = 1 + 20\% = 1.20$ and $d = 1 - 20\% = 0.80$ and $f = e^{0.08 \times 3/12} = 1.02$

$p = (f - d) \div (u - d) = (1.02 - 0.80) \div (1.2 - 0.8) = 0.55$ and $1 - p = 0.45$

Value of Call Option:

$= [10 \times 0.55 + 0 \times 0.45] \div 1.02 = 5.5 \div 1.02 = \text{₹}5.39$

Value of Put Option:

$= [0 \times 0.55 + 10 \times 0.45] \div 1.02 = 4.5 \div 1.02 = \text{₹}4.41$

Call Option = ₹5.39

Put Option = ₹4.41

13.3.9 Option Valuation – Black-Scholes Model

Concept

Fisher Black and Myron Scholes provided the first ever closed form of solution for pricing the European calls in 1973 and published the path-breaking paper titled "The pricing of options and corporate liabilities" in Journal of Political Economy. Prof. Scholes and Prof. Merton were awarded the Nobel Prize for their contributions in option pricing.

The pricing intuition involves constructing a replicating hedge portfolio comprising a long position in stock and a short position in a zero-coupon bond. The hedge portfolio will be constituted in such a way that at any given point of time its value will always be equal to the option's price at that time. If the option's price differs from the hedge portfolio's value, then arbitrageurs' actions will bring back the equilibrium relationship. The proportion of stocks and bonds will be determined by the Black-Scholes formula.

Assumptions of the Model

The underlying asset does not pay any dividend.

The market is efficient.

There are no transaction costs or taxes.

Risk-free rate of interest is constant during the life of the option and it is known.

Stock returns are log-normally distributed.

European exercise terms are used.

Σ Black-Scholes Option Pricing Model

$$C = S \times N(d_1) - X \times e^{-rt} \times N(d_2)$$

$$P = X \times e^{-rt} \times N(-d_2) - S \times N(-d_1)$$

$$d_1 = [\ln(S/X) + (r + \sigma^2/2)t] \div (\sigma\sqrt{t})$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

C: Value of call option **P:** Value of put option **S:** Spot price of the stock

X: Exercise price of the option **r:** Annual risk-free rate of return **t:** Time to expiry of the option

σ: Annual volatility of the stock **N:** Cumulative normal distribution function **ln:** Natural logarithm

Illustration – Black-Scholes Model

The current price of a stock is ₹90 per share. The risk-free interest rate is 8% (annualized, continuous compounding). If the volatility of the stock is 23% p.a., what is the price of the ₹80 call option expiring in 6 months?

$S = ₹90$; $X = ₹80$; $r = 8\%$ p.a.; $t = 6$ months = 0.5 years; $\sigma = 23\%$

$$\begin{aligned}d_1 &= [\ln(90/80) + (0.08 + 0.23^2/2) \times 0.5] \div (0.23\sqrt{0.5}) \\&= [0.1178 + (0.08 + 0.02645) \times 0.5] \div 0.1626 \\&= [0.1178 + 0.0532] \div 0.1626 \\&= 0.1710 \div 0.1626 = \mathbf{1.0517}\end{aligned}$$

$$d_2 = d_1 - \sigma\sqrt{t} = 1.0517 - 0.23 \times \sqrt{0.5} = 1.0517 - 0.1626 = \mathbf{0.8891}$$

$$N(1.0517) = 0.8535 \text{ and } N(0.8891) = 0.8130$$

$$\begin{aligned}\mathbf{C} &= \mathbf{S \times N(d_1) - X \times e^{-rt} \times N(d_2)} \\&= 90 \times 0.8535 - 80 \times e^{-0.08 \times 0.5} \times 0.8130 \\&= 76.815 - 80 \times 0.9608 \times 0.8130 \\&= 76.815 - 62.49 = \mathbf{₹14.33}\end{aligned}$$

$$\begin{aligned}\mathbf{P} &= \mathbf{X \times e^{-rt} \times N(-d_2) - S \times N(-d_1)} \\&= 80 \times e^{-0.08 \times 0.5} \times (1 - 0.8130) - 90 \times (1 - 0.8535) \\&= 80 \times 0.9608 \times 0.1870 - 90 \times 0.1465 \\&= 14.37 - 13.19 = \mathbf{₹1.18}\end{aligned}$$

Call Option = ₹14.33

Put Option = ₹1.18

Illustration – Black-Scholes with Dividend

What difference does it make to your calculation if a dividend of ₹1.50 is expected in two months?

In this case we must subtract the present value of the dividend from the stock price before using Black-Scholes.

$$S_0 = 50 - 1.50 \times e^{-0.10 \times 2/12} = 50 - 1.4752 = ₹48.5248$$

As before, $X = ₹50$, $t = 0.25$, $r = 0.10$, $\sigma = 0.30$

$$\begin{aligned} d_1 &= [\ln(48.5248/50) + (0.10 + 0.09/2) \times 0.25] \div (0.30\sqrt{0.25}) \\ &= [-0.0299 + 0.03625] \div 0.15 = \mathbf{0.0414} \end{aligned}$$

$$d_2 = d_1 - 0.30\sqrt{0.25} = 0.0414 - 0.15 = \mathbf{-0.1086}$$

The European put price is:

$$\begin{aligned} &= 50 \times e^{-0.10 \times 0.25} \times N(0.1086) - 48.5248 \times N(-0.0414) \\ &= 50 \times 0.9753 \times 0.532 - 48.5248 \times 0.4835 \\ &= 25.95 - 23.46 = \mathbf{₹2.49} \end{aligned}$$

European put price = ₹2.49

13.3.10 The Greeks

Concept

In options trading, you may notice the use of certain Greek alphabets when describing risks associated with various positions. They are known as "the Greeks" and we shall discuss the four most commonly used ones. They are delta, gamma, theta and vega.



Delta

Delta of a Stock Option is the ratio of the change in the price of the stock option to the change in the price of the underlying stock. It measures the sensitivity of Options Price to the movement in the prices of the underlying asset.

Delta of Call Option is always positive.
Delta of Put Option is always negative.

Formula: $\Delta = \frac{\text{Change in Option Price}}{\text{Change in Stock Price}}$

Interpretation of Delta Values:

In the Money: Almost Equal to ± 1
 At the Money: Approximately ± 0.50
 Out of the Money: Near to Zero

Application: Value of Delta is the number of units of the underlying stock which an investor should hold for each option sold in order to create a riskless hedge.

Delta Hedging: Creating a Riskless Hedge using Options and Underlying Stock is called Delta Hedging.



Gamma

The gamma of an option is defined as the rate of change of the option's delta with respect to the price of the underlying, when all else remains the same. It's the second partial derivative of the option price with respect to the underlying price. In other words, gamma is the rate at which delta will change. It is also called as Curvature.

Evaluation based on Gamma Values:

If Gamma is small, delta changes slowly, and re-balancing need not be done frequently.
 If Gamma value is high, delta is highly sensitive to the price of the underlying asset. This situation requires re-balancing on a frequent basis.



Vega or Lambda

Vega of the option measures the sensitivity of option price with respect to the volatility of the price of the underlying asset. It considers both movement in price and also decrease in period to expiry of an option.

It is calculated as change in the option premium for a unit change in the volatility of the price of the underlying asset.

For both call and put options, Vega lies between zero and infinity. Vega is maximum for at the money options with long term to expiration. High Vega reflects the higher chances of an option going "In-the-money" at any point in time during the currency of the contract. So, options with high Vega are attractive to the option buyer.

Vega is positive for



Theta

Theta measures the sensitivity of the option's price with respect to its time to expiry i.e. Time Value of an Option. It measures the change of the price of the option with the passage of time. It is also referred to as the time decay of the stock or portfolio.

Theta Values for both the Call and the Put Option lies between Zero and the Total Value of the Option. It will be positive or negative based on the nature of the investor (holder or writer).

Value of Theta is generally measured on per day basis, and therefore, value of Theta would vary for every trading day, based on the movement in Stock Prices. When Option Contract approaches the expiry date, option tends to become less valuable.

Rebalancing: Since Delta changes, the investor's position remains delta hedged for only a relatively short period. The hedge should be adjusted periodically. This is called re-balancing.

Option Buyer and negative for Option Seller.

p

Rho

Rho is the last and the least used Greek. Rho helps us to understand the change in option premium, which are not linked to the underlying stock movement. For instance, interest rates changes may cause a change in option premium.

Rho indicates the change in option value for a one percentage change in the interest rate.

Example: A Rho of 1.50 indicates the option's theoretical value will increase by 1.50 if the interest rate is decreased by 1%.

An increase in interest rates increases the value of calls and decreases the value of puts. A decrease in interest rates decreases the value of calls and increases the value of puts.

Long calls and short puts have positive Rho. Short calls and long puts have negative Rho.

10 10 MARKS AREA – Options

Comprehensive numerical covering option pricing (Binomial or Black-Scholes), option strategies, Put-Call Parity, and The Greeks. Frequently asked for 10–15 marks.

13.4 Swaps

Chapter Overview

This chapter covers the meaning, features, types, and benefits of swaps, including interest rate swaps and credit default swaps.

Learning Objectives

- Understand the concept of swaps
- Identify features and types of swaps
- Appreciate the benefits of swaps
- Understand and design interest rate swaps
- Understand credit default swaps

13.4.1 Meaning, Features, Types, Benefits of Swaps

Concept

A swap is an agreement between two parties to exchange sequences of cash flows for a set period of time. Usually, at the time the contract is initiated, at least one of these series of cash flows is determined by a random or uncertain variable, such as an interest rate, foreign exchange rate, equity price or commodity price. Conceptually, one may view a swap as either a portfolio of forward contracts, or as a long position in one bond coupled with a short position in another bond.

Unlike most standardized options and futures contracts, swaps are not exchange-traded instruments. Instead, swaps are customized contracts that are traded in the over-the-counter (OTC) market between private parties. Firms and financial institutions dominate the swaps market, with few (if any) individuals ever participating. Since swaps occur on the OTC market, there is always the risk of a counterparty defaulting on the swap.

Swap is a combination of forwards by two counterparties. It is arranged to reap the benefits arising from the fluctuations in the market - either currency market or interest rate market or any other market for that matter.

Features of Swap



Counterparties

Swaps involve the agreement between two or more parties to exchange cash flows or the parties interested in exchanging the liabilities.



Facilitators

The amount of cash flow exchange between parties is huge and also the process is complex. Therefore, to facilitate the transaction, an intermediary comes into picture which brings different parties together for big deal. These may be brokers whose objective is to initiate the counterparties to finalize the swap deal. While swap dealers are themselves counterparties who bear risk and provide portfolio management service.



Cash Flows

The present values of future cash flows are estimated by the counterparties before entering into a contract. Both the parties want to get assurance of exchanging same financial liabilities before the swap deal.



Less Documentation

Since these are not exchange traded, the requirement for documentation is comparatively low.



Transaction Costs

Swap involves a transaction cost in form of commission to the intermediary. However, transaction costs are found to be relatively low in swaps.



Benefit to Both Parties

The swap agreement is undertaken only when there is mutual benefit.



Termination

Since it is an agreement between two parties, it cannot be terminated at one's instance. The termination is required to be accepted by the counter party.



Default-Risk

Since swaps are mostly bilateral not exchange traded like futures or options, default risk is higher in swaps.

Types of Financial Swaps



Interest Rate Swaps

An interest rate swap, or simply a rate swap, is an agreement between two parties to exchange a sequence of interest



Currency Swaps

Cross currency swaps are agreements between counter-parties to exchange interest and principal payments in different currencies. In a currency swap, these streams of cash flows consist of a stream of interest and principal payments in one currency exchanged for a stream of interest and principal



Equity Swaps

An equity swap is a special type of total return swap, where the underlying asset is a stock, a basket of stocks, or a stock index. In an equity swap, there is an exchange of the potential



Credit Default Swaps

Credit Default Swap is a financial instrument for swapping the risk of debt default. Credit default swaps may be used for emerging market bonds, mortgage-backed securities, corporate bonds and local government bond. The buyer of a credit default swap pays a premium for effectively insuring against a debt default. He

payments without exchanging the underlying debt.

payments of the same maturity in another currency. Due to the exchange and re-exchange of notional principal amounts, the currency swap generates a larger credit exposure than the interest rate swap.

appreciation of equity's value and dividends for a guaranteed return plus any decrease in the value of the equity.

receives a lump sum payment if the debt instrument is defaulted. The seller of a credit default swap receives monthly payments from the buyer. If the debt instrument defaults, they have to pay the agreed amount to the buyer of the credit default swap.

Benefits of Swap



Borrowing at Lower Cost

Swap facilitates borrowings at lower cost. It works on the principle of the theory of comparative cost as propounded by Ricardo. One borrower exchanges the comparative advantage possessed by him with the comparative advantage possessed by the other borrower. The net result is that both the parties are able to get funds at cheaper rates.



Access to New Financial Markets

Swap is used to have access to new financial markets for funds by exploring the comparative advantage possessed by the other party in that market. Thus, the comparative advantage possessed by parties is fully exploited through swap. Hence, funds can be obtained from the best possible source at cheaper rates.



Hedging of Risk

Swap can also be used to hedge risk. For instance, a company has issued fixed rate bonds. It strongly feels that the interest rate will decline in future due to some changes in the economic scene. So, to get the benefit in future from the fall in interest rate, it has to exchange the fixed rate obligation with floating rate obligation. Thus, risks due to fluctuations in interest rate can be overcome through swap agreements.



Tool to Correct Asset-Liability Mismatch

Swap can be profitably used to manage asset-liability mismatch. For example, a bank has acquired a fixed rate bearing asset on the one hand and a floating rate of interest-bearing liability on the other hand. In case the interest rate goes up, the bank would be much affected because with the increase in interest rate, the bank has to pay more interest. This can be conveniently managed by swap.



Additional Income

By arranging swaps, financial intermediaries can earn additional income in the form of brokerage.

13.4.2 Interest Rate Swaps

Concept

An interest rate swap is a financial contract between the two parties who want to exchange the interest payments or receipts in the same currency on assets or liabilities to a different basis. There is no exchange of principal amount here. In other words, it is an exchange of interest payment for a specific maturity on an agreed upon notional amount. Here, the term 'notional' refers to the theoretical principal underlying the swap. The principal amount applies only for the purpose of calculating the interest to be exchanged under an interest rate swap.

The simplest example of interest rate swap is the exchange of fixed for floating rate interest payments between two parties in the same currency. This is also known as plain vanilla swap, or coupon swap. It involves credit differentials between two borrowers in the fixed and floating debt markets which generate substantial cost savings for both the counter parties.

Features of Interest Rate Swaps



Notional Principal

In the interest rate swap agreement, the interest amount whether fixed or floating is calculated on a specified amount borrowed or lent. It is notional because the parties do not exchange this amount at any time.



Fixed Rate

This is the rate, which is used to calculate the size of the fixed payment. Banks or the other financial institutions who make market in interest rate swaps quote the fixed rate, they are willing to pay if they are fixed rate payers in a swap (bid swap rates), they are willing to receive if they are floating rate payers in a swap (ask swap rate).



Floating Rate

Floating rate in swaps is determined on the basis of market indexes like LIBOR, MIBOR, Treasury Bill rate, etc.

Interest Rate Swap Mechanism

Example of Interest Rate Swap

Suppose, there are two firms X and Y. Firm X is an institution that invests \$100 million in fixed rate mortgages yielding 9.5 percent. Assume firm X is not the high rated firm and funding its assets through a floating rate loan from the banks, i.e., charging six-month London Inter Bank Offer Rate (LIBOR) plus 5 basis point (a basis equals 0.01 percent).

Firm X	Firm Y
Mortgage Portfolio: \$100 million portfolio with 5-year average maturity	Loan Portfolio: \$100 million portfolio with 5-year average maturity
Yield: 9.5%	Yield: LIBOR + 0.75%
Borrowed at: LIBOR + 0.5%	Borrowed at: 7.25%

In order to eliminate interest rate risk, Firm X may enter into interest rate swap deal with Top Bank. Assume that 7.50 percent will be paid by Firm X to Top Bank for five years with payments calculated by multiplying that rate by \$100 million, the notional principal amount. In return, Top Bank agrees to pay Firm X six-month LIBOR over five years.

Result for Firm X:

Particulars	Rate
Receipt on Portfolio	9.5%
Pay to Top Bank	7.5%
Receive from Top Bank	LIBOR
Pay on loan	LIBOR + 0.5%
Cost of fund	$7.5\% + 0.5\% = 8\%$
Locked in spread	$9.5\% - 8\% = 1.5\%$

Result for Firm Y:

Particulars	Rate
Receipt on Portfolio	LIBOR + 0.75%
Pay to Top Bank	LIBOR
Receive from Top Bank	7.4%
Pay on Euro Bond	7.25%
Cost of fund	LIBOR + 7.25% – 7.40% = LIBOR – 0.15%
Locked in spread	0.90%

Result for Top Bank:

Particulars	Rate
Received from X	7.5%
Pay to Y	7.4%
Receive from Y	LIBOR
Pay to X	LIBOR
Net gain	0.10%

Thus, Top Bank receives $(100 \text{ million} \times 0.10\%) = \text{\$1,00,000}$ as the compensation from the swap deals.

💡 Types of Interest Rate Swaps



Plain Vanilla Swap

Also known as fixed-for-floating swap. One party with a floating interest rate liability is exchanged with fixed rate liability.



Zero Coupon to Floating

In a zero-coupon bond, the holders get the full amount of loan and interest accrued only at the maturity of the bond. In this swap, the fixed rate player makes a bullet payment at the end and floating rate player makes the periodic payment throughout the swap period.



Alternative Floating Rate

In this type of swap, the floating reference can be switched to other alternatives as per the requirement of the counter party. These alternatives may include three-month LIBOR, one-month commercial paper, T-Bill rate, etc.



Floating-to-Floating

In this swap, one counter party pays one floating rate, say, LIBOR while the other counter party pays another, for a specified time period. These swap deals are mainly used by the non-US banks to manage their dollar exposure.



Forward Swap

This swap involves an exchange of interest rate payment that does not begin until a specified future point in time. It is also a kind of swap involving fixed for floating interest rate.



Rate-Capped Swap

It is similar to fixed to floating rate swap, whereby the floating rate payments are capped. An upfront fee is paid by floating rate party to fixed rate party for the cap.



Extendable Swap

It contains an extendable feature, which allows the parties to extend the swap period.

Σ Valuation of Interest Rate Swaps

$$V = F_B - F_F$$

V: Value of the swap **F_B:** Value of fixed coupon bond **F_F:** Value of floating rate note

✅ While valuing plain vanilla interest rate swap, the fixed leg should be considered a fixed coupon bond and the floating rate should be considered a floating rate note

Illustration – Valuation of Interest Rate Swap

A bank has agreed to pay six-month LIBOR and receive 8 percent per annum (with semi-annual compounding) on a notional principal of \$100 million. The swap has a remaining life of 1.25 years. The relevant fixed rate of interest with continuous compounding for 3-month, 9-month and 15-month maturities are 10 percent, 10.5 percent and 11.0 percent respectively. The six-month LIBOR rate at the last payment date was 10.2 percent (with semi-annual compounding). The periodic fixed payment and floating payment are \$4.0 million and \$5.1 million respectively. Calculate the value of the swap.

$$F_B = 4e^{-0.25 \times 0.1} + 4e^{-0.75 \times 0.105} + 4e^{-1.25 \times 0.11} + 100e^{-1.25 \times 0.11}$$
$$= 3.901 + 3.700 + 3.453 + 87.185 = \mathbf{\$98.24 \text{ million}}$$

$$F_F = 5.1e^{-0.25 \times 0.1} + 100e^{-0.25 \times 0.1}$$
$$= 4.974 + 97.531 = \mathbf{\$102.51 \text{ million}}$$

$$\text{Value of swap} = F_B - F_F = 98.24 - 102.51 = \mathbf{(-) \$4.27 \text{ million}}$$

Value of swap = (-) \$4.27 million

If the bank takes the opposite position of paying fixed and receiving floating, the value of the swap then would be (+) \$4.27 million.

Illustration – Structuring a Swap

Companies X and Y face the following interest rates:

Particulars	X	Y
U.S. Dollars (floating rate)	LIBOR + 0.50%	LIBOR + 1.0%
Canadian Dollar (fixed rate)	5.0%	6.5%

Company X wants floating rate and Company Y wants fixed rate. Design a swap that will net a bank acting as intermediary at 0.5% per annum and be equally attractive to both the companies.

Step 1: Compute Quality Spread Differential

- a. Difference in floating rates = $(\text{LIBOR} + 1.0\%) - (\text{LIBOR} + 0.50\%) = 0.5\%$
- b. Difference in fixed rates = $6.5\% - 5.0\% = 1.5\%$
- c. Net difference = $|0.5\% - 1.5\%| = 1.0\%$
- d. Amount paid for arrangement of Swap Option = (0.5%)
- e. Net Gain = $1.0\% - 0.5\% = 0.5\%$
- f. Company X's share of gain = $0.5\% \times 50\% = 0.25\%$
- g. Company Y's share of gain = $0.5\% \times 50\% = 0.25\%$

Step 2: Structure the Swap

Company X will borrow at Fixed Rate (5.0%). Company Y will borrow at Floating Rate (LIBOR + 1.0%).

Company X:

Pays to bankers: 5.0%

Receives from Y: $(4.5\% - \text{LIBOR})$

Receives share of gain from Y: 0.25%

Effective Interest Rate: $5.0\% - (4.5\% - \text{LIBOR}) - 0.25\% = \text{LIBOR} + 0.25\%$

Company Y:

Pays to bankers: $\text{LIBOR} + 1.0\%$

Pays to X: $(4.5\% - \text{LIBOR})$

Pays share of gain to X: 0.25%

Pays commission to bank: 0.5%

Effective Interest Rate: $\text{LIBOR} + 1.0\% + (4.5\% - \text{LIBOR}) + 0.25\% + 0.5\% = 6.25\%$

Company X: Effective rate = LIBOR + 0.25%

Company Y: Effective rate = 6.25%

Bank: Earns 0.5% commission

13.4.3 Credit Default Swaps

Concept

A credit default swap (CDS) is a financial instrument for swapping the risk of debt default. In other words, a CDS is a credit derivative contract between two counterparties under which the buyer makes periodic payments to the seller and in return receives a payoff if the underlying financial instrument defaults or experiences a similar credit event. Here the underlying financial instrument may be emerging market bonds, mortgage-backed securities, assets backed securities, corporate bonds or local government bonds.

Forms of credit default swaps had been in existence from at least the early 1990s, with early trades carried out by Bankers Trust in 1991. J.P. Morgan & Co. is widely credited with creating the modern credit default swap in 1994. In 2000, credit default swaps became largely exempt from regulation by both the U.S. Securities and Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC). By 2007, the outstanding credit default swaps value stood at \$62.2 trillion. During the financial crisis of 2008, the value of CDS was hit hard, and it dropped to \$26.3 trillion by 2010 and \$25.5 trillion in 2012.

Uses of Credit Default Swaps



Hedging

Credit default swaps are often used to manage the risk of default which arises from holding debt. A bank, for example, may hedge its risk that a borrower may default on a loan by entering into a CDS contract as the buyer of protection. If the loan goes into default, the proceeds from the CDS contract will cancel out the losses on the underlying debt.



Arbitrage

Capital Structure Arbitrage is an example of an arbitrage strategy that utilizes CDS transactions. This technique relies on the fact that a company's stock price and its CDS spread should exhibit negative correlation; i.e., if the outlook for a company improves then its share price should go up and its CDS spread should tighten and vice-versa. Techniques reliant on this are known as capital structure arbitrage because they exploit market inefficiencies between different parts of the same company's capital structure; i.e., mis-pricings between a company's debt and equity.

Illustration – Credit Default Swap

A pension fund owns 5-year bonds issued by C Corp. with par value of ₹10 million. To protect itself from the loss arising on the possible default of C Corp., the pension fund buys a CDS from Derivative bank in a notional amount of ₹10 million. The CDS trades at 200 basis point (2% p.a.). There may arise the following two situations.

Particulars	No default at all	Default after three years
Premium paid ($10 \times 2\% \times 5$)	1	Premium paid ($10 \times 2\% \times 3$) = 0.6
Bond proceeds received from C Corp. on maturity	10	Proceeds received from bank on default of C Corp. (assuming zero recovery) = 10
Net proceeds (default risk avoided)	9	9.4

*Without CDS, loss would have been ₹10 million (subject to recovery)

Without default: Net proceeds = ₹9 million

With default: Net proceeds = ₹9.4 million

13.4.4 Swaptions – An Innovation

Concept

Swaptions are combination of the features of two derivative instruments, i.e., option and swap. Option interest rate swaps are referred as swaptions. The buyer of the swaption has the right to enter into an interest rate swap agreement by some specified date in the future. The swaption agreement will specify whether the buyer of the swaption will be a fixed rate receiver or a fixed rate payer. If the buyer exercises the option, then the writer of the option will become the counter party.

Swaption can be of two types: Call swaption or callable swap and put swaption or puttable swap. A callable swap provides the party making the fixed payments with the right to terminate the swap to its maturity. The writer, therefore, becomes the fixed rate receiver and floating rate payer. On the other hand, a puttable swap provides the party making the floating rate payments with a right to terminate the swap. The writer of the put swaption, therefore, becomes the floating rate receiver and fixed rate payer.

13.5 Interest Rate Derivatives

Chapter Overview

This chapter covers the concept and types of interest rate derivatives including Forward Rate Agreement (FRA), Interest Rate Futures, Interest Rate Options, Caps, Floors and Collars.

Learning Objectives

- Understand the concept of interest rate derivatives
- Apply Forward Rate Agreement (FRA)
- Understand Interest Rate Futures
- Apply Interest Rate Options
- Understand and apply Interest Rate Caps, Floors and Collars

13.5.1 Concept and Types of Interest Rate Derivatives

Concept

Interest Rate Derivative (IRD) is a financial derivative contract whose value is derived from one or more interest rates, prices of interest rate instruments, or interest rate indices. Interest rate derivatives are often used as hedges by institutional investors, banks, companies, and individuals to protect themselves against changes in market interest rates, but they can also be used to increase or refine the holder's risk profile or to speculate on rate moves. In practice, Interest Rate Derivatives are used to limit interest rate risks. By means of Interest Rate Derivatives, one can get protection against rising or falling interest rates.

Types of Interest Rate Derivatives



Forward Rate Agreement (FRA)

An FRA is an agreement between participants (normally the Bank and a Customer) to pay or receive the difference (called settlement money) between an agreed fixed rate (FRA rate) and the interest rate prevailing on a stipulated future date



Interest Rate Futures

An Interest Rate Futures contract is "an agreement to buy or sell a debt instrument at a specified future date at a price that is fixed today." At NSE the underlying security for Interest Rate Futures is either Government Bond or T-Bill. Exchange traded Interest Rate Futures on NSE are standardized contracts based on 6-year, 10 year and 13-year



Interest Rate Options

Interest Rate Option (IRO) is an option contract whose value is based on interest rates or interest rate instruments. At NSE, currently, IRO contracts are available on



Interest Rate Swaps

An interest rate swap is a financial contract between the two parties who want to exchange the interest payments or receipts in the same currency on assets or liabilities to a different basis. There is

(the fixing date) based on a notional amount for an agreed period (the contract period).

Government of India Security (NBF II) and 91-day Government of India Treasury Bill (91DTB). All futures contracts available for trading on NSE are cash settled.

Government of India securities.

no exchange of principal amount here.



Interest Rate Caps

An interest rate cap is a type of interest rate derivative in which the buyer receives payments at the end of each period in which the interest rate exceeds the agreed strike price (the maximum interest rate). An example of a cap would be an agreement to receive a payment for each month the LIBOR rate exceeds 2.5%. An Interest Rate Cap (Cap) is an interest rate risk management tool that provides the borrower with protection against adverse rate movements above an agreed "Strike" or maximum interest rate.



Interest Rate Floors

An interest rate floor is a derivative contract in which the buyer receives payments at the end of each period in which the interest rate is below the agreed strike price. An example of a floor would be an agreement to receive a payment for each month the LIBOR rate falls below 1.5%. An Interest Rate Floor (Floor) is an interest rate risk management tool that provides the borrower with protection against adverse rate movements below an agreed "Strike" or minimum interest rate.



Interest Rate Collars

An interest rate collar is an instrument that combines both a cap and a floor. The cap component of the instrument gives the investor protection against rising rates by guaranteeing that the investor will never pay above a pre-agreed rate. The floor component of the collar allows the investor to take advantage of the falling interest rates until the interest rate hits a predetermined rate known as floor rate. Thus, an Interest Rate Collar (Collar) is an interest rate risk management tool that effectively creates a band within which the borrower's variable interest rate will fluctuate, by combining an Interest Rate Cap with an Interest Rate Floor.

13.5.2 Forward Rate Agreement (FRA)

Concept and Mechanism

A Forward Rate Agreement (FRA) is a contract between the two parties, (normally between a banker and its customer or independent party), in which one party (the banker) gives the other (customer) a guaranteed future rate of interest to cover a specified sum of money over a specified period of time in the future. For example, two parties agree that a 6 percent per annum rate of interest will apply to one year deposit in six months' time. If the actual rate of interest proves to be different from 6 percent, then one party will pay and other receives the difference between the two sets of interest cash flows.

In an FRA, no actual lending or borrowing is done. It only fixes the rate of interest for a futures transaction. At the time of maturity, when the customer actually needs funds, then he has to borrow the funds at the prevailing rate of interest from the market. If the market rate of interest is higher than the FRA interest then the banker will have to pay to the other party (customer) the difference in the interest rate. However, if market interest is lesser than the FRA rate then the customer will have to pay the difference to the banker. This transaction is known as purchase of FRA from the bank.

Sometimes, a customer (depositor) may also make a FRA contract with the bank for his deposits for seeking a guaranteed rate of interest on his deposits. If the market rate on his deposit turns out to be lower than that guaranteed interest rate in the FRA, the bank will compensate him for the difference, i.e., FRA rate minus market interest.

In this way, purchase of FRA protects the customer against a rise in interest in case of borrowing from the bank. Similarly, sale of FRA will protect the customer from deposits point of view. The bank charges different rates of interest for borrowing and lending, and the spread between these two constitutes bank's profit margin. As a result, no other fee is chargeable for FRA contracts.

Determination of Settlement Amount

$$\text{Payment} = \text{Notional Amount} \times [(\text{Reference Rate} - \text{Fixed Rate}) \div (1 + \text{Reference Rate} \times \alpha)] \times \alpha$$

α : Day count function **Reference Rate**: Market rate on settlement date **Fixed Rate**: FRA rate agreed

Situation	Course of Action
Forward Rate > LIBOR	Buyer has to pay the decrease in interest cost i.e., FR – LIBOR
Forward Rate < LIBOR	Seller has to pay the increased interest cost i.e., LIBOR – FR

Illustration – FRA Settlement

Consider that a bank sells a 3 × 6 FRA worth \$3,00,00,000. The agreed rate with the buyer is 5.5%. There are actually 92 days in the three-month FRA period. Assume that three months from today the settlement rate is 4.875%. Determine how much the FRA is worth and who pays whom. Had the settlement rate been 6.125%, what is the answer?

Case 1: Settlement rate = 4.875%

Since settlement rate (4.875%) < agreed rate (5.5%), the buyer pays the seller.

$$\begin{aligned}\text{Payoff} &= \text{Notional Amount} \times [(\text{Reference Rate} - \text{Fixed Rate}) \div (1 + \text{Reference Rate} \times \alpha)] \times \alpha \\ &= 3,00,00,000 \times [(0.04875 - 0.055) \div (1 + 0.04875 \times 92/360)] \times 92/360 \\ &= 3,00,00,000 \times [-0.00625 \div 1.01246] \times 0.2556 \\ &= \mathbf{\$47,326.39}\end{aligned}$$

Case 2: Settlement rate = 6.125%

Since settlement rate (6.125%) > agreed rate (5.5%), the seller pays the buyer.

$$\begin{aligned}\text{Payoff} &= 3,00,00,000 \times [(0.06125 - 0.055) \div (1 + 0.06125 \times 92/360)] \times 92/360 \\ &= \mathbf{\$47,178.20}\end{aligned}$$

Case 1: Buyer pays seller \$47,326.39

Case 2: Seller pays buyer \$47,178.20

13.5.3 Interest Rate Futures

Concept and Features

Interest rate futures is standardized interest rate derivative contract traded on a stock exchange to buy or sell an interest-bearing instrument at a specified future date, at a price determined at the time of the contract. The contracts are exchange traded.

Features:

- These are exchange traded cash settled contracts.
- The contract size is kept at the minimum for wider participation.
- Transparency is the key to these contracts. Settlement is done at clean price.
- Contracts available across yields/benchmarks/maturities.
- There is centralized clearing supported by guaranteed settlement.
- They provide easier and cheaper access to rates trading.

Uses of Interest Rate Futures

Hedging

Managing the
Duration of a
Portfolio

Yield Locking

Using Calendar
Spread for
Speculation

Arbitrage

Directional Trading

Illustration – Hedging with Interest Rate Futures

Suppose an investor holds debt-oriented mutual fund. He expects that yield will rise and NAV will decrease. However, investor does not wish to redeem MF units. Here, the investor will short IRF to hedge.

On Trade Date (say on 22nd April, 2021)	Value
Investment Holding: Debt Oriented Mutual Fund 10,000 units @ NAV	₹13.30
Strategy Sell: 610GS2031 lot of 2,000 bonds i.e., 6.1% Govt. Securities maturing in 2031 with lot size 2,000 bonds	Future price of 6.10% GS 2031 (May contract) ₹104.20
On Expiry Date (26th May, 2021)	Value
NAV of MF	₹13.15
Final Settlement Price of 6.10% GS 2031 (May contract)	₹103.50

Loss on underlying MF = $10,000 \times (13.30 - 13.15) = \text{₹1,500}$

Profit in IRF = $2,000 \times (104.20 - 103.50) = \text{₹1,400}$

Net Profit / (Loss) = **(₹100)**

He successfully avoids the loss on mutual funds by hedging with IRF.

13.5.4 Interest Rate Options

Concept

Interest Rate Options are a derivative financial instrument that allows an investor to gain from the changes in the interest rates. These are connected to interest-bearing financial products, such as treasury notes. Moreover, these options trade on exchanges, such as CME Group, and are also available OTC (over the counter). An interest rate option works similarly to stock options, allowing buyers to speculate on the direction of the interest rate movement. However, unlike stock options, interest rate options depend on the actual rates. Moreover, Federal Reserve or any other authority can influence the interest rates. Thus, it is very important that investors in interest rate options have a good knowledge of the macroeconomic factors that can impact the interest rates.

There are two types of interest rate options – call and put. A call option gives the investor the right (not obligation) to gain from a rise in the interest rate. The holder of a call option will profit if the interest rate is above the strike rate at the time of the expiry. However, the holder will only make a profit if the interest rate at expiry is high enough to cover the premium cost as well.

In contrast, a put interest rate option gives the buyer the right (not obligation) to gain from the drop in the interest rates. The holder makes a profit if the interest rate drops below the strike rate and is enough to cover the premium cost as well. Such options are profitable when they are in the money.

13.5.5 Interest Rate Caps

Concept

An interest rate cap is an agreement between two parties in which one party, for an up-front premium, agrees to compensate the other party if a designated interest rate, called the reference rate, is different from a predetermined level. In other words, an interest rate cap is an option to fix a ceiling or maximum short term interest rate payment. The contract is written such that the buyer of the cap will receive a cash payment equal to the difference between the actual market interest rate and the cap strike rate on the notional principal, if the market rate rises above the strike rate. Usually, caps are designed to provide insurance against the rate of interest on a floating-rate loan going above a certain level. This level is known as the cap rate.

The buyer of an Interest Rate Cap pays premium to the seller for the right to receive the difference in interest cost (on notional principal) when a specified index of market interest rates rises above a stipulated "cap rate".

The buyer has no obligation or liability if interest rates fall below the specified cap rate.

Thus, a cap resembles an option which represents a right rather than an obligation to the buyer.

Interest rate caps cover periods ranging from 1-10 years with interest rate reset and payments dates most commonly set either 3 or 6 months apart.

Σ Valuation of Interest Rate Cap

$$\text{Amount of payment on settlement} = N \times \text{Max}(0, r - r_c) \times (dt/360)$$

N: Notional principal amount **r:** Index rate **r_c:** Cap rate

dt: Time gap between interest rate reset date and payment date (in days)

13.5.6 Interest Rate Floors

Concept

An interest rate floor guarantees the buyer of the floor option a minimum interest rate to be received on a specified notional amount for a specified period or series of periods. In other words, the floor writer pays the floor buyer when the reference rate falls below the contract rate, called floor rate. So, a floor places a lower limit on the interest rate that will be charged.

If a lending firm fears that interest rates may fall in future, it may wish to purchase a floor so that it can receive a minimum return on invested funds. If the actual market rate of interest falls even below the floor rate, the holder of the floor will receive from the writer of the floor a cash payment equal to the difference between the actual reference rate (say, LIBOR) and the floor rate.

The buyer of an Interest Rate Floor pays premium to the seller for the right to receive the difference in interest cost (on notional principal) when a specified index of market interest rates falls below a stipulated "floor rate".

The buyer has no obligation or liability if interest rates rise above the specified floor rate.

Thus, a floor resembles an option which represents a right rather than an obligation to the buyer.

Interest rate floors cover periods ranging from 1-10 years with interest rate reset and payments dates most commonly set either 3 or 6 months apart.

Σ Valuation of Interest Rate Floor

$$\text{Amount of payment on settlement} = N \times \text{Max}(0, r_f - r) \times (dt/360)$$

N: Notional principal amount **r:** Index rate **r_f:** Floor rate

dt: Time gap between interest rate reset date and payment date (in days)

13.5.7 Interest Rate Collars

Concept

An interest rate collar is a combination of an interest rate cap and an interest rate floor in which the buyer buys a cap and simultaneously sells a floor. So, collars specify both the upper and lower limits for the rate that will be charged. Collar can be constructed from two separate transactions (one for cap another for floor) or they can be combined into a single transaction. Since the collar has the effect of locking both the high side and the lower side interest rate, it is also called locking into a band. Further, if the collar is created by two separate contracts, so as a purchaser one will pay the premium, and as a seller the premium will be received. When the two premiums are equal, the position is often referred to as a zero-premium collar.

The basic objective of constructing a collar is to retain some of the benefits of declining rates while paying if the interest rate falls below a particular limit. Let us consider an example. Suppose that a firm holds a fixed rate assets which are yielding 11 percent. These assets are financed through floating rate liabilities tied to the LIBOR, assuming current rate at 9 percent. Suppose that the firm wants to cap the cost at 10.5 percent (buying a cap at 10.5 percent) then it has to pay upfront premium, assuming 0.5 percent p.a. If the firm feels that this premium is too high to pay, but, as it happens, the firm finds that it can sell a floor with a floor rate at 7 percent for a premium at 0.5 percent p.a. From the firm's perspective, its annual costs are now bounded between 7 percent to 10.5 percent. It means that when the LIBOR rises above 10.5 percent, the dealer pays the firm the difference. If LIBOR falls below 7 percent, the firm pays the difference to the dealer.

Illustration – Interest Rate Cap

Amit Company has borrowed \$200 million on floating basis for 3 years. The interest rates reset every year. The spread over LIBOR is 25 bps. The company buys a 3 year cap on a 1-year LIBOR with a strike rate of 9% and having a face value of \$200 million. The cap carries a premium of 2% of face value or \$4 million. Current 1 Year LIBOR is 9%. If the LIBOR at the end of 1, 2 and 3 years are 9.5%, 8.5% and 10%, what is the cash flow from cap each year? Amortize premium equally over three years.

The strike rate of the cap is Libor which is currently 9%. Since the spread over Libor is 25 bps, the interest rate applicable on the borrowing would be 9.75%, 8.75% & 10.25% respectively for the three years. Thus the interest payable in amount terms over three years would be: \$1,95,00,000, \$1,75,00,000 and \$2,05,00,000 respectively. Now, the premium paid for buying this cap is \$4 million. As given in the problem equal amortization would involve \$13,33,333 each year. The seller of the cap would part with the difference whenever Libor is above the strike price. Therefore we can construct the cash flow table as follows:

Time	Cash Flow: Loan	Amortization of premium	Cash Flow from Cap	Total
0	+20,00,00,000	–	–	+20,00,00,000
1	–1,95,00,000	–13,33,333	+10,00,000	–1,98,33,333
2	–1,75,00,000	–13,33,333	–	–1,88,33,333
3	–2,05,00,000	–13,33,333	+20,00,000	–1,98,33,333
3	–20,00,00,000	–	–	–20,00,00,000

Cash flow from cap: Year 1 = +\$10,00,000; Year 2 = Nil; Year 3 = +\$20,00,000

Illustration – Interest Rate Collar

DY has purchased ₹400 million cap (i.e., call options on interest rates) of 9% at a premium of 0.65% of face value. ₹400 million floor (i.e., put options on interest rates) of 4% is also available at premium of 0.69% of face value.

(a) If interest rates rise to 10%, what is the amount received by DY? What are the net savings after deducting the premium?

(b) If DY also purchases a floor, what are the net savings if interest rates rise to 11%? What are the net savings if interest rates fall to 3%?

(c) If, instead, DY sells (writes) the floor, what are the net savings if interest rates rise to 11%? What if they fall to 3%?

(d) What amount of floors should it sell in order to compensate for its purchases of caps, given the above premium?

(a) Premium for purchasing the cap = $0.65\% \times ₹400 \text{ million} = ₹26,00,000$

If interest rates rise to 10%, cap purchasers receive $₹400 \text{ million} \times 0.01 = ₹40,00,000$

The net savings is $₹40,00,000 - ₹26,00,000 = ₹14,00,000$

(b) If DY also purchases the floor:

Premium = $0.0069 \times ₹400 \text{ million} = ₹27,60,000$

Total premium = $₹27,60,000 + ₹26,00,000 = ₹53,60,000$

If interest rates rise to 11%, cap purchasers receive $0.02 \times ₹400 \text{ million} = ₹80,00,000$

Net savings = $₹80,00,000 - ₹53,60,000 = ₹26,40,000$

If interest rates fall to 3%, floor purchaser receive $0.01 \times ₹400 \text{ million} = ₹40,00,000$

Net savings = $₹40,00,000 - ₹53,60,000 = -₹13,60,000$

(c) If DY sells the floor:

Receives net $₹27,60,000 - \text{cost of cap } ₹26,00,000 = +₹1,60,000$

If interest rates rise to 11%, cap purchasers receive $0.02 \times ₹400 \text{ million} = ₹80,00,000$

Net savings = $₹80,00,000 + ₹1,60,000 = ₹81,60,000$

If interest rates fall to 3%, floor purchasers receive $0.01 \times ₹400 \text{ million} = ₹40,00,000$

Net savings to DY = $-₹40,00,000 + ₹1,60,000 = -₹38,40,000$

(d) DY needs to sell: $X \times 0.0069 = ₹26,00,000$, or $X = ₹37,68,11,594$ worth of 4 percent floors.

(a) ₹14,00,000

(b) Rise to 11%: ₹26,40,000; Fall to 3%: -₹13,60,000

(c) Rise to 11%: ₹81,60,000; Fall to 3%: –₹38,40,000

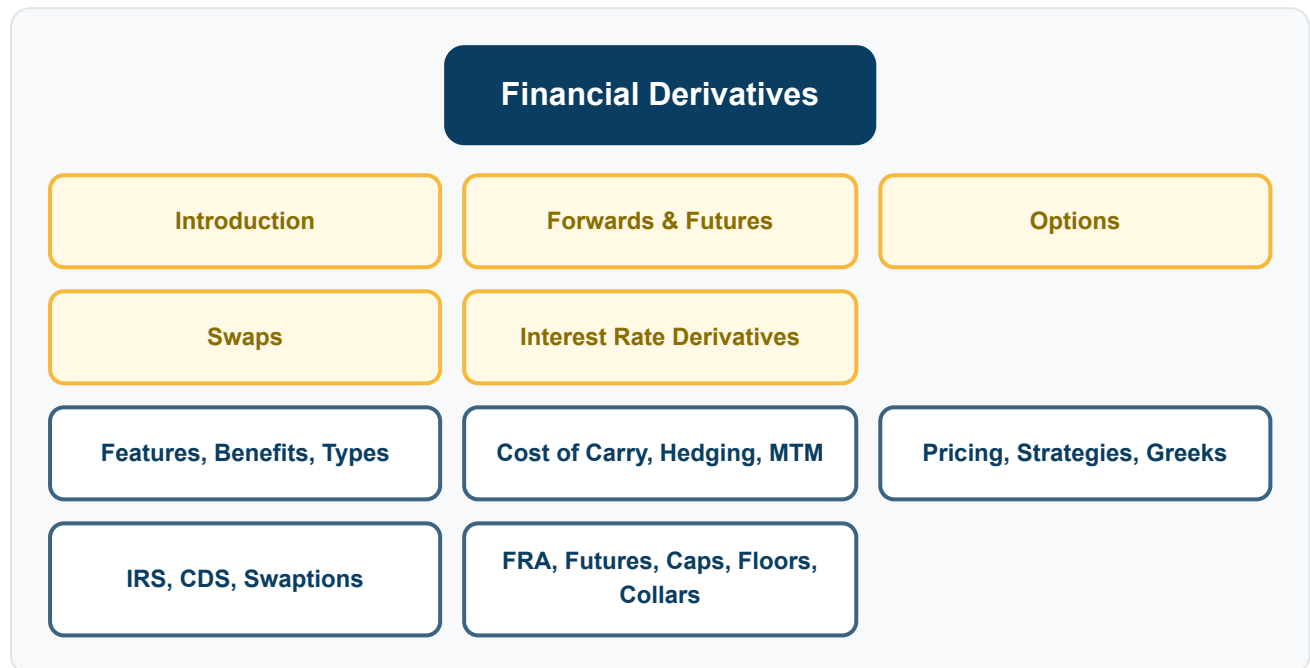
(d) Sell ₹37,68,11,594 worth of floors

10 10 MARKS AREA – Interest Rate Derivatives

Comprehensive numerical covering FRA settlement, Interest Rate Futures, Caps, Floors, and Collars. Frequently asked for 10 marks.

Module 13 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 13



Key Points for Revision

1. Derivative = Contract whose value derives from underlying asset
2. Functions: Price discovery, risk transfer, liquidity, more participation
3. Features: Future contract, derived value, specified obligation, off-balance sheet, deferred delivery
4. Types by nature: Forwards, Futures, Options, Swaps
5. Types by underlying: Equity, Interest Rate, Forex, Credit Derivatives
6. Forward Contract: Customized, OTC, bilateral, counterparty risk, settled by delivery
7. Futures Contract: Standardized, exchange traded, clearing house, daily settlement, margin
8. Forward vs Futures: 10 key differences (size, maturity, trading, settlement, etc.)
9. Marking to Market: Daily repricing at settlement price
10. Margin: Initial, Maintenance, Variation
11. Cost of Carry Model: $F^* = S_0 e^{rt}$ (no income); $F^* = (S_0 - I) e^{rt}$ (known income); $F^* = S_0 e^{(r-y)t}$ (known yield)
12. Hedging: Sell futures if holding asset; buy futures if need asset
13. Number of Contracts = $(\text{Portfolio Value} \times \text{Beta}) \div \text{Value per Futures Contract}$
14. Adjusting Beta: $(\beta^* - \beta) \times (\text{Portfolio Value} \div \text{Futures Value})$
15. Option: Right but not obligation; Call = Buy right; Put = Sell right
16. ITM, ATM, OTM: Based on relation between spot and strike price
17. Intrinsic Value = $\max(S_T - X, 0)$ for call; $\max(X - S_T, 0)$ for put
18. Time Value = Premium – Intrinsic Value
19. Option Strategies: Covered Call, Protective Put, Bull/Bear Spread, Straddle, Strangle, Strap, Strip, Butterfly, Condor
20. Put-Call Parity: $C + PV(X) = P + S_T$
21. Binomial Model: Two possible outcomes; risk-neutral probabilities
22. Black-Scholes Model: $C = S \times N(d_1) - X \times e^{-rt} \times N(d_2)$
23. The Greeks: Delta, Gamma, Vega, Theta, Rho
24. Swap: Agreement to exchange cash flows; IRS, CDS, Currency, Equity Swaps
25. Interest Rate Swap: Fixed for floating; comparative advantage
26. Credit Default Swap: Insurance against default
27. Swaption: Option on swap
28. FRA: Agreement to fix future interest rate; settlement = difference
29. Interest Rate Futures: Exchange traded; hedging, speculation
30. Interest Rate Cap: Ceiling on interest rate; buyer receives if rate > cap
31. Interest Rate Floor: Minimum interest rate; buyer receives if rate < floor
32. Interest Rate Collar: Combination of cap and floor; locks rate within band

Comprehensive Formula Handbook – Module 13

Forward Price (No Income)	$F^* = S_0 \times e^{rt}$
Forward Price (Known Income)	$F^* = (S_0 - I) \times e^{rt}$
Forward Price (Known Yield)	$F^* = S_0 \times e^{(r-y)t}$
Value of Long Forward	$f = (F^* - K) \times e^{-rt}$
Hedge Ratio	$(\text{Portfolio Value} \times \text{Beta}) \div \text{Value per Futures Contract}$
Adjust Beta	$(\beta^* - \beta) \times (\text{Portfolio Value} \div \text{Futures Value})$
Intrinsic Value (Call)	$\max(S_T - X, 0)$
Intrinsic Value (Put)	$\max(X - S_T, 0)$
Break-even (Call)	$X + C$
Break-even (Put)	$X - P$
Put-Call Parity	$C + X \times e^{-rt} = P + S_T$
Binomial Model – p	$p = (f - d) \div (u - d)$
Binomial Model – Call	$[C_u \times p + C_d \times (1-p)] \div f$
Black-Scholes – Call	$C = S \times N(d_1) - X \times e^{-rt} \times N(d_2)$
Black-Scholes – Put	$P = X \times e^{-rt} \times N(-d_2) - S \times N(-d_1)$
FRA Settlement	$N \times [(RR - FR) \div (1 + RR \times \alpha)] \times \alpha$
Cap Payoff	$N \times \text{Max}(0, r - r_c) \times (dt/360)$
Floor Payoff	$N \times \text{Max}(0, r_f - r) \times (dt/360)$
Swap Value	$V = F_B - F_F$
Delta	$\Delta = \text{Change in Option Price} \div \text{Change in Stock Price}$

One-Night Revision Notes – Module 13

Last Night Before Exam – Module 13

- **Derivative:** Value derived from underlying asset
- **Forward:** Customized, OTC, bilateral, counterparty risk
- **Futures:** Standardized, exchange traded, clearing house, daily settlement
- **Cost of Carry:** $F^* = S_0 e^{rt}$ (no income); $F^* = (S_0 - I)e^{rt}$ (known income); $F^* = S_0 e^{(r-y)t}$ (known yield)
- **Hedging:** Sell futures if holding asset; buy futures if need asset
- **Number of Contracts:** $(\text{Portfolio Value} \times \text{Beta}) \div \text{Futures Value}$
- **Option:** Right but not obligation
- **ITM, ATM, OTM:** Based on spot vs strike
- **Intrinsic Value:** Call: $\max(S - X, 0)$; Put: $\max(X - S, 0)$
- **Time Value:** Premium – Intrinsic Value
- **Put-Call Parity:** $C + PV(X) = P + S_T$
- **Binomial:** $p = (f - d) / (u - d)$; Call = $[C_u p + C_d (1 - p)] / f$
- **Black-Scholes:** $C = S \times N(d_1) - X \times e^{-rt} \times N(d_2)$
- **Greeks:** Delta (Δ), Gamma (Γ), Vega (v), Theta (Θ), Rho (ρ)
- **Swap:** Exchange cash flows; IRS, CDS, Currency, Equity
- **Interest Rate Swap:** Fixed for floating; comparative advantage
- **FRA:** Fix future interest rate; settlement = difference
- **Cap:** Ceiling; **Floor:** Minimum; **Collar:** Combination

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Forward and Futures pricing – 5–10 marks
- Hedging through futures – 10 marks
- Option pricing – Binomial and Black-Scholes – 10–15 marks
- Option strategies – Straddle, Strangle, Spread – 10–15 marks
- Put-Call Parity – 5 marks
- Interest Rate Swaps – 10 marks
- Credit Default Swaps – 5 marks
- FRA and Interest Rate Futures – 5–10 marks
- Interest Rate Caps, Floors, Collars – 5 marks

Final Checklist – Module 13

Before Moving to Section D

- Can I define derivatives and explain their features?
- Can I differentiate between forward and futures contracts?
- Can I apply the cost of carry model for pricing?
- Can I compute number of futures contracts for hedging?
- Can I analyse option profitability (ITM, ATM, OTM)?
- Can I compute intrinsic value and time value?
- Can I design option strategies (Straddle, Strangle, Spread)?
- Can I apply Put-Call Parity?
- Can I value options using Binomial Model?
- Can I value options using Black-Scholes Model?
- Can I explain The Greeks (Delta, Gamma, Vega, Theta, Rho)?
- Can I structure interest rate swaps?
- Can I value interest rate swaps?
- Can I explain credit default swaps?
- Can I apply FRA and compute settlement?
- Can I compute payoffs for Caps, Floors, and Collars?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 15 numericals from this module?

END OF MODULES 12 & 13

Section C – Financial Risk Management Completed

Next: Section D – International Financial Management (Modules 14–16)

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**CMA FINAL PAPER 14 · STRATEGIC FINANCIAL
MANAGEMENT**

14

The International Financial Environment

Master Revision Handbook · December 2026 Edition

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Module 14 – The International Financial Environment

Module Objective

Primary Objective

To develop a detailed understanding of the sources and impact of risks to which an organisation is exposed to in a dynamic business environment at national and international level and the techniques for managing the same to sustain competitive advantages. To understand the role of International Financial Institutions, develop an understanding of different sectors of International Financial Market, and acquire adequate knowledge about various sources of foreign currency.

Mapped CMLO: 3b, 3c

Learning Outcomes

Students will be able to...	Application Skill
Understand the role of International Financial Institutions.	Identify and explain the functions of IMF, World Bank, and Regional Development Banks.
Develop an understanding of different sectors of International Financial Market.	Analyse Foreign Exchange Market, International Money Market, Credit Market, Bond Market, and Stock Market.
Acquire adequate knowledge about various sources of foreign currency.	Evaluate Debt Route (Eurobonds, FCCBs, Syndicated Credits) and Equity Route (ADRs, GDRs, Warrants).

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
14.1	International Financial Institutions and Markets	HIGH 3%	Theory
14.2	Sources of Foreign Currency	HIGH 2%	Theory

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- IMF functions and lending schemes – **5 marks**
- World Bank Group institutions – **5 marks**
- Regional Development Banks – **5 marks**
- Types of Eurobonds – **5 marks**
- ADR vs GDR – **5–10 marks**
- FCCB features – **5 marks**
- Syndicated Credits – **5 marks**

Frequently Tested Concepts

Module 14 – Concept Flow

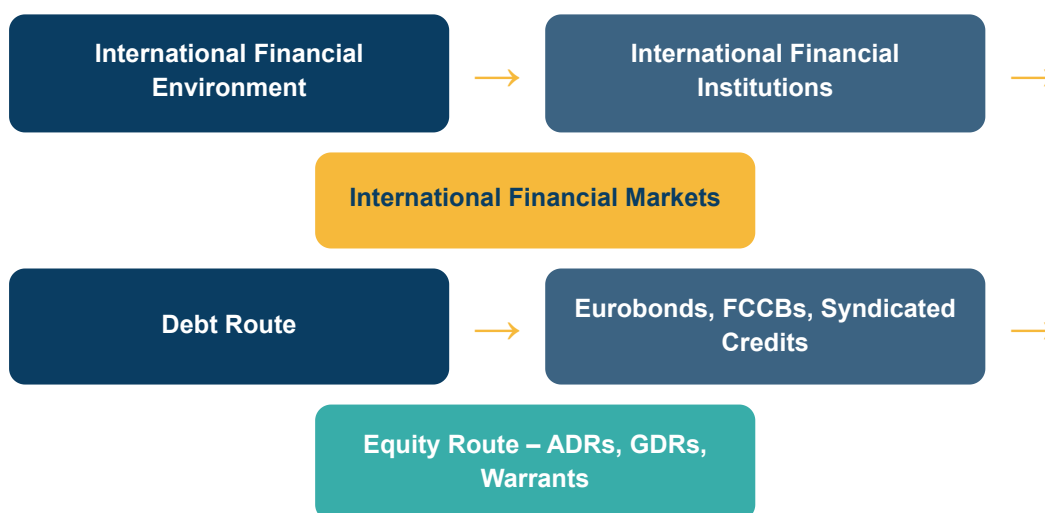


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★ FREQUENTLY ASKED – MODULE 14

- **IMF vs World Bank** – functions and differences
- **Types of foreign bonds** – Yankee, Samurai, Bulldog, Shibosai
- **ADR vs GDR** – features and differences
- **FCCB** – features, benefits, limitations
- **Syndicated Credits** – structure and types

14.1 International Financial Institutions and Markets

Chapter Overview

This chapter covers the role and functions of international financial institutions (IFIs), including the IMF, World Bank Group, and Regional Development Banks. It also introduces the various sectors of international financial markets.

Learning Objectives

- Understand the concept and role of IFIs
- Identify the functions of IMF and World Bank Group
- Appreciate the role of Regional Development Banks
- Understand different sectors of international financial markets

14.1.1 International Financial Institutions

Concept

An international financial institution (IFI) is basically a financial institution that has been established by more than one country, and hence is subject to international law. Its owners or shareholders are generally national governments, although other international institutions and other organisations also occasionally figure as shareholders. Generally, IFIs are the creations of multiple nations, although some bilateral financial institutions (created by two countries) do exist and should also technically be termed as IFIs.

The idea of IFIs was first conceived of under the Bretton Woods System post World War II. In 1944, representatives of 44 countries assembled in Bretton Woods, New Hampshire, USA, and signed an agreement to establish a new monetary system. Accordingly, two new institutions were established: the International Monetary Fund (IMF) and the World Bank.

14.1.2 IMF, World Bank Group and Regional Development Banks



International Monetary Fund (IMF)

Established July 1944 at Bretton Woods. Primary mission: ensure stability of international monetary system. Promotes international financial stability and monetary cooperation. Governed by and accountable to 190 member



World Bank Group

Established July 1944. Structured like a cooperative owned and operated for benefits of member countries. Two unique development institutions: IBRD (lends to middle-income and creditworthy low-income countries – 189 members) and IDA (interest-free loans/credits and



Regional Development Banks (RDBs)

Provide funds for financing of manufacturing, mining, agricultural, and infrastructure projects essential for development. Support projects promoting regional cooperation and economic integration. Repayment terms: 5–15 years at favorable

countries. Three main functions: overseeing economic development, lending, and capacity development.

grants to poorest countries – 174 members).

interest rates. Examples: EIB, IADB, ADB, AfDB, EBRD.

World Bank Group – Five Institutions

Institution	Function
IBRD – International Bank for Reconstruction and Development	Lends to governments of middle-income and creditworthy low-income countries. 189 member countries.
IDA – International Development Association	Provides interest-free loans (called credits) and grants to governments of poorest countries. 174 members.
IFC – International Finance Corporation	Largest global development institution focused exclusively on the private sector. Helps developing countries achieve sustainable growth by financing investment, mobilizing capital in international financial markets, and providing advisory services.
MIGA – Multilateral Investment Guarantee Agency	Created in 1988 to promote foreign direct investment into developing countries. Offers political risk insurance (guarantees) to investors and lenders.
ICSID – International Centre for Settlement of Investment Disputes	Provides international facilities for conciliation and arbitration of investment disputes.

14.1.3 International Financial Markets



Foreign Exchange Market

Global decentralized trading of international currencies. Facilitates international trade and investment.



International Money Market

Short-term borrowing and lending in international currencies.



International Credit Market

Medium and long-term loans from banks and financial institutions.



International Bond Market

Eurobonds, foreign bonds, global bonds.



International Stock Market

Cross-border listing and trading of equity securities; ADRs, GDRs.

5 5 MARKS AREA – International Financial Institutions

Explain the role and functions of IMF, World Bank Group, and Regional Development Banks. Frequently asked as a short theory question.

14.2 Sources of Foreign Currency

Chapter Overview

An organisation may obtain foreign currency financing either by Debt Route or by Equity Route. This chapter covers various instruments under each route including Eurobonds, Foreign Bonds, FCCBs, Syndicated Credits, Euro Notes, ADRs, GDRs, and Warrants.

Learning Objectives

- Understand the various debt instruments for foreign currency financing
- Differentiate between Eurobonds and Foreign Bonds
- Understand FCCBs, Syndicated Credits, and Euro Notes
- Understand ADRs, GDRs, and Warrants
- Appreciate the benefits and limitations of each instrument

14.2.1 Debt Route

A. Eurobonds

Concept

Eurobonds are bonds denominated in a currency other than that of the country in which they are issued. A bond denominated in Japanese Yen and issued in the UK, or a bond denominated in US dollars and issued in France or the UK are examples of Eurobonds. London is the preeminent market for Eurobonds along with other types of bonds. Eurobonds account for approximately 30% of the global bond market.

Advantages: Relatively easy to sell, have relatively low risk, fairly safe investment alternative, outside purview of official regulation of country of currency denomination.



Straight Debt Bonds

Fixed interest-bearing securities redeemable at face value. Unsecured bonds floated in domestic or international markets, denominated in respective currency with interest rates fixed based on certain formula applicable in given market.



Floating Rate Notes (FRN)

Bond issue with maturity period varying from 5–7 years having varying coupon rates – either pegged to another security or re-fixed at periodic intervals. Conventionally referred to as notes and not bonds. Spreads or margin above 6 months LIBOR for Eurodollar deposits.

B. Foreign Bonds

Concept

These are relatively lesser-known bonds issued by foreign entities for raising medium-to long-term financing from domestic money centers in their domestic currencies.

Type	Description
Yankee Bonds	US dollar denominated issues by foreign borrowers (usually foreign governments or entities, supranational and highly rated corporate borrowers) in the US bond markets.
Samurai Bonds	Bonds issued by non-Japanese borrowers in the domestic Japanese markets. Borrowers are supranational and have at least a minimum investment grade rating (A rated). Maturities range between 3–20 years.
Bulldog Bonds	Sterling denominated foreign bonds raised in the UK domestic securities market. Maturity: either very short periods (5 years) or very long maturities (25 years and above). Generally subscribed by long-term institutional investors like pension funds and life insurance companies.
Shibosai Bonds	Privately placed bonds issued in the Japanese markets. Qualifying criteria is less stringent as compared to Samurai or EuroYen bonds. Offered to a different market segment consisting of institutional investors, including banks.

C. Foreign Currency Convertible Bonds (FCCBs)

Concept

Foreign currency convertible bonds are bonds issued in a currency foreign to the investor. The bonds are convertible in nature, indicating that investors not only receive principal and coupon payments but also offer the option of converting their bonds into stocks. FCCBs are classified as quasi-debt instruments and tradable on the stock exchange. Investors are hedge-fund arbitrators or foreign nationals.



Benefits of FCCBs

- Coupon rates generally lower than traditional bank interest rates
- When converted, issuer reduces debt and gains equity capital
- Favorable exchange rate movement reduces cost of debt
 - Investors have assured minimum fixed rate of return
 - Investors can participate in price appreciation
- Flexibility to choose capital market or stable income



Limitations of FCCBs

- If stock market is down, demand decreases
- If converted, ownership diluted, EPS decreases
- Unfavorable exchange rate movement increases cost
 - Subject to credit risk
- Bondholders have no control over conversion rates and prices

D. Syndicated Credits

Concept

These are bank loans, usually at floating rate of interest with fixed maturity, arranged by one or more lead managers (banks) with a number of other banks participating in the loan. Generally, one, two or even three banks may act as the lead managers and distribute the loan among themselves and other participating banks. A typical Eurocredit has maturity between five and 10 years, amortization in semiannual instalments, and interest rate every three or six months with reference to LIBOR.

Types: Club loans (private arrangement between lending banks and borrower; small amounts; parties familiar; no information memorandum; not publicized) and Syndicated loans (well-publicized; larger amounts).

E. Euro Notes



Commercial Paper

Short-term unsecured promissory notes which repay a fixed amount on a certain future date. Euronotes underlying CP are unsecured and stand on general creditworthiness of issuers. Referred as Euro Commercial Paper. Not underwritten; maturities up to one year (mostly 3-month or 6-month paper).



Note Issuance Facilities (NIFs)

Medium-term legally binding commitment under which a borrower can issue short-term paper of up to one year. Underlying currency mostly US dollar. Issuer instructs lead manager to issue Euro notes at desired intervals. Maximum and minimum amounts specified.



Medium Term Notes (MTNs)

Sequentially issued fixed interest securities which have maturity of over one year. Typical MTN program enables issuer to issue Euronotes for different maturities, from over one year up to desired level. Essentially fixed rate funding arrangements.

F. Other Debt Instruments



Euro-bonds with Equity Warrants

Bonds carry coupon rate determined by market rates. Warrants are detachable. Pure bonds traded at discount. Fixed income funds' managers may invest for regular income.



Euro Convertible Bonds

Quasi-debt securities (unsecured) convertible into Depository Receipts or local shares at fixed price after minimum lock-in period. Price of Equity Shares at time of conversion has premium element. Bonds carry fixed rate of interest, payment in US Dollars. Options: Call Option (right to company to convert before maturity), Put Option (allows investors to get money back before maturity).



Euro-Convertible Zero Bonds

Structured as convertible bonds. No interest payable; conversion of bonds takes place on maturity at pre-determined price. Usually 5 years maturity. Treated as deferred equity issue.

14.2.2 Equity Route

A. Depository Receipts (DRs)

Concept

A depository receipt (DR) is a type of negotiable (transferable) financial security traded on a local stock exchange but represents a security, usually in the form of equity, issued by a foreign publicly listed company. The DR allows investors to hold shares in equity of other countries.

One of the most common types of DRs is the American Depository Receipt (ADR), which has been offering companies, investors and traders global investment opportunities since the 1920s. DRs have spread to other parts of the globe in the form of Global Depository Receipts (GDRs), European DRs and international DRs.



American Depository Receipts (ADR)

A certificate that represents shares of a foreign stock owned and issued by a U.S. bank. Foreign shares usually held in custody overseas, but certificates trade in U.S. Through this system, large number of foreign-based companies actively traded on one of three major U.S. equity markets (NYSE, AMEX, Nasdaq).



Global Depository Receipts (GDR)

Class of investment allowing international investors to own shares in foreign companies. Issued by international investment banks as certificates representing foreign shares but tradable on local stock exchange. Denominated in GB Pounds or US Dollars. Traded on London Stock Exchange or other exchanges.

Sponsored and Unsponsored DRs

Type	Description
Unsponsored DRs	Issued by one or more depositories in response to market demand, but without formal agreement with the company. Today considered obsolete; lack of control and hidden costs.
Sponsored Level I DRs	Simplest method for companies to access U.S. and non-U.S. capital markets. Traded in U.S. over-the-counter (OTC) market and on some exchanges outside U.S. Company does not have to comply with U.S. GAAP or full SEC disclosure.
Sponsored Level II and III DRs	Companies wishing to list securities on exchange in U.S. or raise capital use sponsored Level II or III DRs respectively. Requires different SEC registration and reporting, adherence to U.S. GAAP, meet listing requirements of national exchange or NASDAQ.
Private Placement (144A) DRs	Company can access U.S. and other markets outside U.S. through private placement of sponsored DRs. Raise capital by placing DRs with large institutional investors in U.S., avoiding SEC registration and to non-U.S. investors in reliance on Regulations.

B. Warrants

Concept

A warrant is a security that entitles the holder to buy the underlying stock of the issuing company at a fixed exercise price until the expiration date.

- A warrant is exercised when the holder informs the issuer of their intention to purchase the shares underlying the warrant.
- A warrant's "premium" represents how much extra you have to pay for your shares when buying them through the warrant as compared to buying them in the regular way.
- A warrant's "gearing" is the way to ascertain how much more exposure you have to the underlying shares using the warrant as compared to the exposure you would have if you buy the shares through the market.
- If you plan on exercising the warrant, you must do so before the expiration date. The more time remaining until expiration, the more time for the underlying security to appreciate, which, in turn, will increase the price of the warrant (unless it depreciates).
- Like options, there are different exercise types associated with warrants such as American style (holder can exercise any time before expiration) or European style (holder can only exercise on expiration date).

Illustration – GDR Issue

A Ltd. is considering an expansion project in USA. For the proposed project, it requires an investment of \$20 million (net of issue expenses/floatation cost). The floatation cost is estimated at 2%. The company has proposed to issue GDR to finance the project.

You have been appointed as the principal financial consultant for the project. Compute the number of GDRs to be issued and cost of the GDR with the help of following additional information.

- (i) Expected market price of share at the time of issue of GDR is ₹500 (Face Value ₹100)
- (ii) 2 Shares shall underly each GDR and shall be priced at 10% discount to market price.
- (iii) Expected exchange rate ₹72/\$.
- (iv) Dividend expected to be paid is 20% with growth rate 10%.

Net issue size = \$20 million

Gross Issue = \$20 million ÷ (1 – 0.02) = \$20.408 million

Issue price per GDR in ₹ = ₹(500 × 2 × 90%) = ₹900

Issue price per GDR in \$ = ₹900 ÷ ₹72 = \$12.50

Dividend per GDR (D_1) = ₹20 × 2 = ₹40

Net proceeds per GDR P_0 = ₹900 × (1 – 0.02) = ₹882

No. of GDRs to be issued = \$20.408 ÷ \$12.50 = **1.63264 million**

Cost of GDR (K_e) = (D_1/P_0) + g = (40/882) + 0.10 = **14.54%**

Number of GDRs to be issued = 1.63264 million

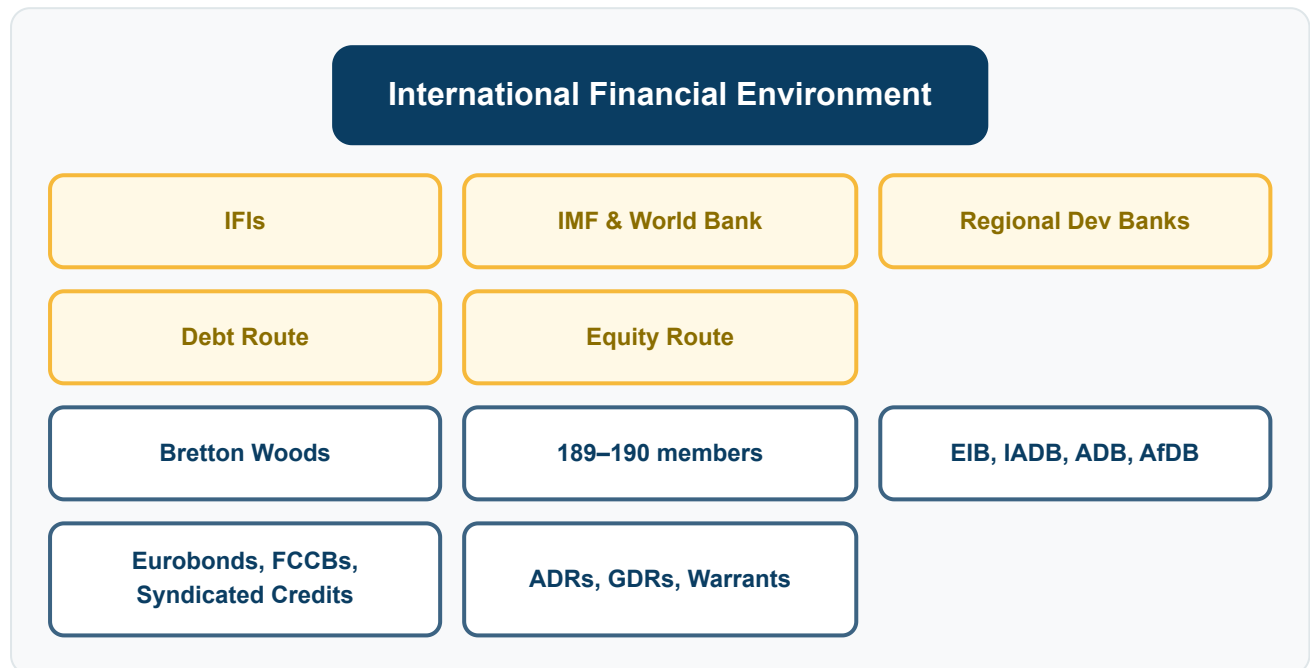
Cost of GDR = 14.54%

10 10 MARKS AREA – Sources of Foreign Currency

Comprehensive question on Eurobonds, Foreign Bonds, FCCBs, ADRs, GDRs, and Syndicated Credits. Frequently asked for 10 marks.

Module 14 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 14



Key Points for Revision

1. IFI = Financial institution established by more than one country
2. Bretton Woods System (1944) established IMF and World Bank
3. IMF primary mission: ensure stability of international monetary system
4. IMF governed by and accountable to 190 member countries
5. IMF functions: overseeing economic development, lending, capacity development
6. World Bank Group: IBRD, IDA, IFC, MIGA, ICSID
7. IBRD lends to middle-income and creditworthy low-income countries
8. IDA provides interest-free loans and grants to poorest countries
9. IFC focused exclusively on private sector
10. MIGA offers political risk insurance
11. ICSID provides facilities for conciliation and arbitration of investment disputes
12. Regional Development Banks: EIB, IADB, ADB, AfDB, EBRD
13. Eurobonds = bonds denominated in currency other than country of issue
14. Foreign Bonds: Yankee (US), Samurai (Japan), Bulldog (UK), Shibosai (Japan private)
15. FCCBs = quasi-debt instruments; convertible into stocks; lower coupon rates
16. Syndicated Credits = bank loans arranged by lead managers; club vs syndicated
17. Euro Notes: Commercial Paper, NIFs, MTNs
18. Depositary Receipts: ADRs (US), GDRs (Europe/global)
19. ADR = certificate representing shares of foreign stock issued by U.S. bank
20. GDR = certificates issued by international investment banks
21. Sponsored DRs: Level I (OTC), Level II (Listing), Level III (Offering), 144A (Private)
22. Warrants = security entitling holder to buy underlying stock at fixed price
23. International Financial Markets: Forex, Money, Credit, Bond, Stock

Comprehensive Formula Handbook – Module 14

Gross Issue Amount

$\text{Net Issue} \div (1 - \text{Floatation Cost})$

GDR Issue Price

$\text{Market Price} \times \text{No. of Shares} \times (1 - \text{Discount})$

Cost of GDR

$(D_1 \div P_0) + g$

Dividend per GDR

$\text{Dividend per Share} \times \text{No. of Shares per GDR}$

Number of GDRs

$\text{Gross Issue Amount} \div \text{Issue Price per GDR}$

One-Night Revision Notes – Module 14

Last Night Before Exam – Module 14

- **IFIs:** IMF, World Bank, Regional Development Banks
- **IMF:** 190 members; monetary stability; lending; capacity development
- **World Bank Group:** IBRD, IDA, IFC, MIGA, ICSID
- **Eurobonds:** Denominated in currency other than country of issue
- **Foreign Bonds:** Yankee (US), Samurai (Japan), Bulldog (UK), Shibosai (Japan private)
- **FCCBs:** Convertible; lower coupon; equity dilution
- **Syndicated Credits:** Club vs Syndicated; lead managers
- **Euro Notes:** Commercial Paper, NIFs, MTNs
- **ADRs:** US market; issued by US bank; dollar denominated
- **GDRs:** Global; issued by international banks; denominated in USD/GBP
- **Warrants:** Right to buy stock at fixed price; American/European
- **Sponsored DRs:** Level I (OTC), Level II (Listing), Level III (Offering), 144A (Private)

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- IMF functions and lending schemes – 5 marks
- World Bank Group institutions – 5 marks
- Regional Development Banks – 5 marks
- Types of Eurobonds – 5 marks
- Types of Foreign Bonds – 5 marks
- ADR vs GDR – 5–10 marks
- FCCB features – 5 marks
- Syndicated Credits – 5 marks
- GDR Issue numerical – 5–10 marks

Final Checklist – Module 14

✓ Before Moving to Module 15

- Can I explain the role and functions of IMF?
- Can I list and explain the World Bank Group institutions?
- Can I name the Regional Development Banks?
- Can I differentiate between Eurobonds and Foreign Bonds?
- Can I explain the types of Foreign Bonds?
- Can I explain FCCBs with their benefits and limitations?
- Can I explain Syndicated Credits and their types?
- Can I differentiate between ADRs and GDRs?
- Can I explain Sponsored and Unsponsored DRs?
- Can I compute GDR issue price and cost of GDR?
- Have I memorised all key concepts from this module?

**CMA FINAL PAPER 14 · STRATEGIC FINANCIAL
MANAGEMENT**

15

Foreign Exchange Market

Master Revision Handbook · December 2026 Edition

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Module 15 – Foreign Exchange Market

Module Objective

Primary Objective

To develop a detailed understanding of the sources and impact of risks to which an organisation is exposed to in a dynamic business environment at national and international level and the techniques for managing the same to sustain competitive advantages. To appreciate the meaning of foreign exchange and foreign exchange market, develop in-depth understanding of foreign exchange rate and associated issues, understand various segments of foreign exchange market and their interrelation, appreciate different types of foreign currency derivatives and their use in risk management, and understand various parity relationships and their impact on exchange rate.

Mapped CMLO: 3b, 3c

Learning Outcomes

Students will be able to...	Application Skill
Appreciate the meaning of foreign exchange and foreign exchange market.	Identify the structure and functions of the foreign exchange market.
Develop in-depth understanding of foreign exchange rate and associated issues.	Calculate spot and forward rates, cross rates, arbitrage opportunities.
Understand various segments of foreign exchange market and their interrelation.	Analyse spot market, forward market, and currency derivatives.
Appreciate different types of foreign currency derivatives and their use in risk management.	Apply currency forwards, futures, options, and swaps for hedging.
Understand various parity relationships and their impact on exchange rate.	Apply PPP, IRP, Fisher Effect, and IFE to predict exchange rate movements.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
15.1	Introduction – Structure of Foreign Exchange Market	HIGH 1%	Theory
15.2	Foreign Exchange Rate – Meaning, Determinants, Quotations	HIGH 3%	Numerical + Theory
15.3	Segments of Foreign Exchange Market – Spot, Forward, Arbitrage	HIGH 2%	Numerical + Theory
15.4	Foreign Currency Derivatives	HIGH 2%	Numerical + Theory
15.5	Parity Relationships	HIGH 2%	Numerical + Theory

Expected Examination Areas – Dec 2026



DEC 2026 LIKELY AREAS

- Spot, forward, and cross rates – **5–10 marks**
- Arbitrage – two-point and three-point – **5–10 marks**
- Forward premium/discount and annualized rates – **5 marks**
- Purchasing Power Parity – **5–10 marks**
- Interest Rate Parity – **5–10 marks**
- Fisher Effect and International Fisher Effect – **5 marks**
- Currency forwards, futures, options, swaps – **5–10 marks**
- Covered interest arbitrage – **5–10 marks**

Frequently Tested Concepts

Module 15 – Concept Flow

Forex Market



Exchange Rate Quotations



Spot & Forward Markets

Currency Derivatives



Parity Relationships



PPP, IRP, Fisher Effect

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★ FREQUENTLY ASKED – MODULE 15

- **Spot, Forward, Cross Rates** – numerical
- **Arbitrage** – two-point and three-point
- **Forward Premium/Discount** – annualized calculation
- **PPP** – expected spot rate calculation
- **IRP** – forward rate calculation
- **Fisher Effect and IFE** – numerical
- **Currency Derivatives** – forwards, futures, options, swaps
- **Covered Interest Arbitrage** – steps and profit calculation

15.1 Introduction – Structure of Foreign Exchange Market

Chapter Overview

This chapter introduces the foreign exchange market, its characteristics, functions, and structure including the various market participants.

Learning Objectives

- Understand the meaning of foreign exchange market
- Identify the characteristics of the foreign exchange market
- Appreciate the functions of the foreign exchange market
- Understand the structure and participants in the foreign exchange market

15.1.1 Introduction and Definition

Definition

The Foreign Exchange Market (Forex, FX, or currency market) is a form of exchange for the global decentralized trading of international currencies. Financial centers around the world function as anchors of trading between a wide range of buyers and sellers around the clock. The purpose of the foreign exchange market is to permit transfers of purchasing power denominated in one currency to another - that is, to trade one currency for another currency and thereby to assist international trade and investment.

15.1.2 Characteristics and Functions

Characteristics of Foreign Exchange Market



Not a Physical Place

Electronically linked network of banks, foreign exchange brokers, and dealers whose function is to bring together buyers and sellers of foreign exchange.



Not Confined to a Single Country

Dispersed throughout leading financial centers of the world: London, New York, Paris, Zurich, Amsterdam, Tokyo, Hong Kong, Toronto, Frankfurt, Milan, and other cities.



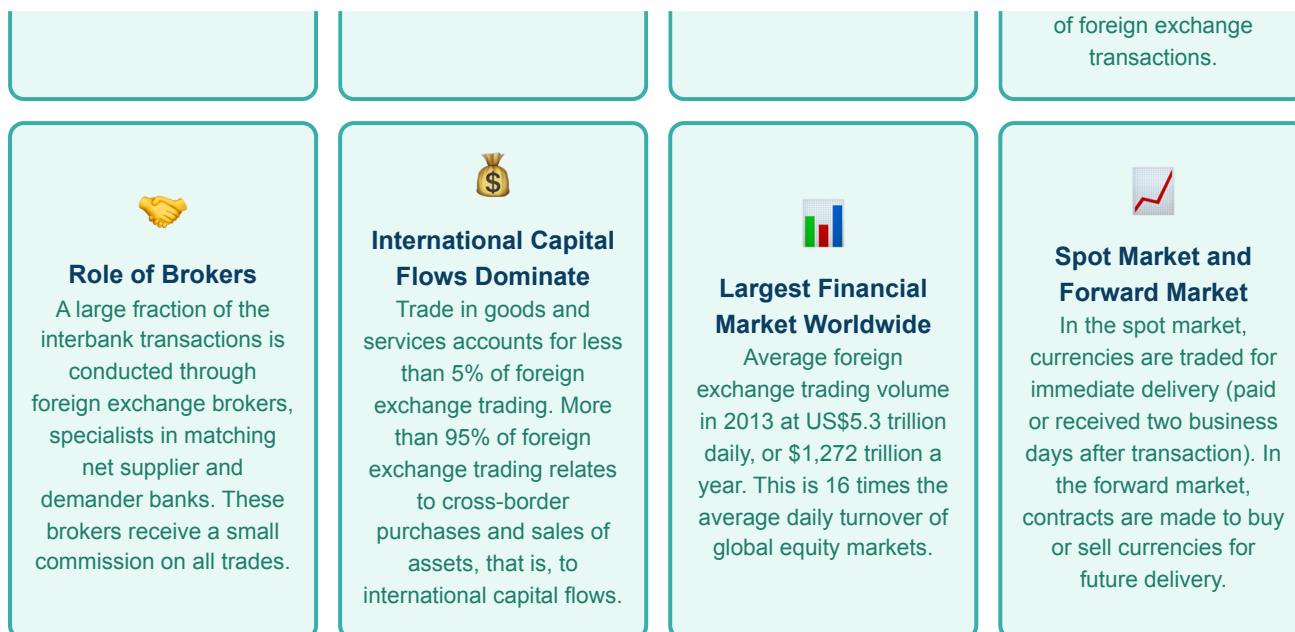
Round the Clock Operation

Currency trading takes place 24 hours a day, but the volume varies depending on the number of potential counterparties available.

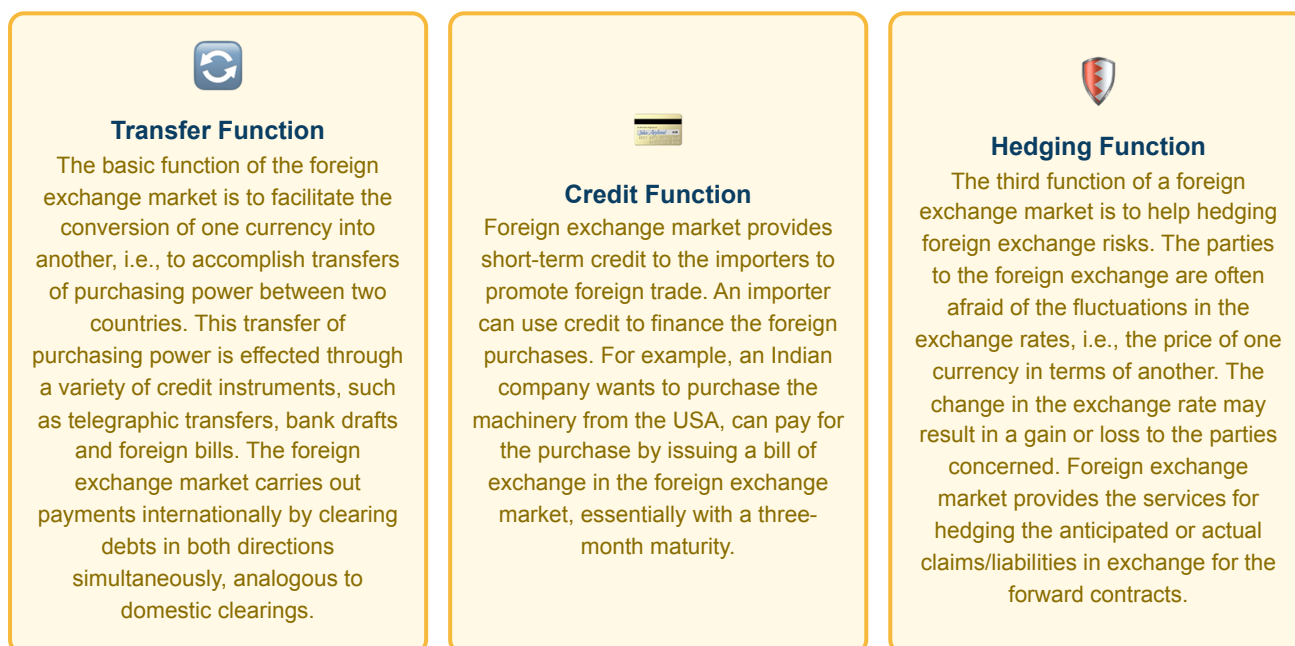


Predominantly an Interbank Market

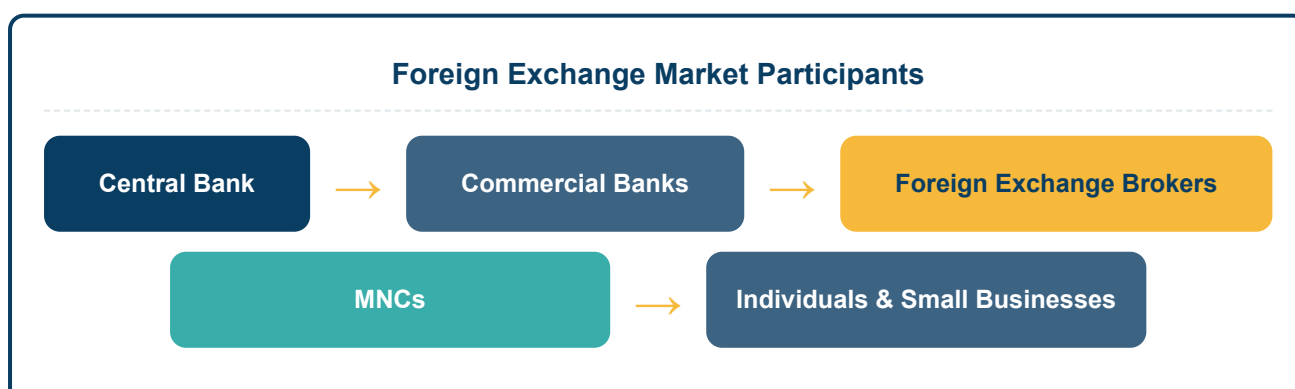
Most currency transactions are channelled through the worldwide interbank market, the wholesale market in which major banks trade with one another. This market accounts for about 95%



Functions of Foreign Exchange Market



15.1.3 Structure – Market Participants





Central Bank

Apex body in foreign exchange market which has power to regulate operations related to trading of foreign currency. Directly intervenes in the functioning of forex market to avoid aggressive fluctuations.

For controlling fluctuations, currency is sold off when it is overvalued and purchased in case it is undervalued. Central bank ensures that an exchange rate is at optimum that fulfils the needs of national economy.



Commercial Banks

Major participants in the foreign exchange market who provide the core of market. These banks across the globe act as the market makers. They serve their retail clients, the bank customers, in conducting foreign commerce or making international investment in financial assets that require foreign exchange. Banks operate at two levels: retail level (deal with customers) and wholesale level (interbank market).



Foreign Exchange Brokers

Work as an intermediary between the commercial bank and central bank and also between the commercial banks and buyers. Unlike the banks, brokers serve merely as matchmakers and do not put their own money at risk. They work on a commission basis while performing the task of striking the deal between the seller and buyer. Brokers actively and constantly monitor exchange rates offered by major international banks through computerized systems such as Reuters and are able to find quickly an opposite party for a client without revealing the identity of either party until a transaction has been agreed upon.



MNCs

Major non-bank participants in the forward market as they exchange cash flows associated with their multinational operations. MNCs often contract to either pay or receive fixed amounts in foreign currencies at future dates, so they are exposed to foreign currency risk. This is why they often hedge these future cash flows through the inter-bank forward exchange market.



Individuals and Small Businesses

Use foreign exchange market to facilitate execution of commercial or investment transactions. The foreign needs of these players are usually small and account for only a fraction of all foreign exchange transactions. For example, foreign tourists may need to exchange their local currency just to fund their foreign purchases. Even then they are very important participants in the market.

Some of the business participants use the market to hedge foreign exchange risk.

5 5 MARKS AREA – Foreign Exchange Market

Explain the characteristics and functions of the foreign exchange market. Also, list and explain the market participants. Frequently asked as a short theory question.

15.2 Foreign Exchange Rate – Meaning, Determinants, Quotations

Chapter Overview

This chapter covers the meaning of foreign exchange rate, its determinants, equilibrium exchange rate, and various types of exchange rate quotations including direct, indirect, American, and European quotes, bid-ask spread, and cross rates.

Learning Objectives

- Understand the meaning of foreign exchange rate
- Identify the determinants of foreign exchange rate
- Understand the concept of equilibrium exchange rate
- Differentiate between direct and indirect quotes
- Differentiate between American and European quotes
- Understand bid-ask spread and cross rates

15.2.1 Foreign Exchange Rate – Meaning and Determinants

Meaning

A foreign exchange rate, which is also called a forex rate or currency rate, represents the value of a specific currency compared to that of another country. For example, an interbank exchange rate of 91 Japanese yen (JPY, ¥) to the United States dollar (US\$) means that ¥91 will be exchanged for each US\$1 or that US\$1 will be exchanged for each ¥91. Exchange rates are determined in the foreign exchange market, which is open to a wide range of different types of buyers and sellers where currency trading is continuous: 24 hours a day except weekends.

Currency rates are applicable only on currency pairs. The currency listed on the left is called the reference (or base) currency while the one listed to the right is the quote (or term) currency. Exchange rates are always written in the form of quotations. A quotation reflects the number of quote currencies that can be bought by using a single unit of reference currency.

Determinants of Foreign Exchange Rates



Interest Rate Differentials

Higher rate of interest for an investment in a



Inflation Rate Differentials

Different countries have differing inflation rates,



Government Policies

Government may impose restriction on currency transactions. Through



Market Expectations

Expectations on changes in Government, changes

particular currency can push up the demand for that currency, which will increase the exchange rate in favour of that currency.

and as a result, purchasing power of one currency may depreciate faster than currency of some other country. This contributes to movement in exchange rate.

RBI, the Government, may also buy or sell currencies in huge quantity to adjust the prevailing exchange rates.

in taxation policies, foreign trade, inflation, etc. contribute to demand for foreign currencies, thereby affecting the exchange rates.



Investment Opportunities

Increase in investment opportunities in one country leads to influx of foreign currency funds to that country. Such huge inflow will amount to huge supply of that currency, thereby bringing down the exchange rate.



Speculations

Speculators and Treasury Managers influence movement in exchange rates by buying and selling foreign currencies with expectations of gains by exploiting market inefficiencies. The quantum of their operations affects the exchange rates.

15.2.2 Equilibrium Exchange Rate



Concept

Equilibrium Exchange Rate is the one that balances the value of nation's imports and exports. It is based on the flow of goods and services. Equilibrium Exchange Rate is also called as Trade Approach or Elasticity's Approach to determination of exchange rate.

If the value of the nation's imports exceeds the value of the nation's exports, then domestic currency will depreciate against the importing currency. Import requires payment in Forex and therefore importers will sell home currency to buy foreign currency, pushing up the demand and price of the foreign currency. Since Foreign Currency appreciates, the nation's exports become cheaper to Foreign Countries. Imports become more expensive to domestic residents. This results in increase in exports and fall in imports, until trade is balanced.

The speed of adjustment depends on how responsive or elastic imports and exports are to Exchange Rate changes. Hence, this approach to exchange rate determination is called Elasticity Approach.

15.2.3 Exchange Rate Quotations

Term	Description
Direct Quote	Refers to the expression of exchange rate where one unit of foreign currency is expressed in terms of number of units of local / domestic currency. Example: \$1 = ₹40.00 [in India]
Indirect Quote	Refers to quoting per unit of Local / Domestic Currency in terms of number of units of Foreign Currency. Example: ₹1 = \$0.025.
Two Way Quote	Refers to quoting Exchange Rates by an Exchange Dealer in terms of Buying (Bid) Rate and Selling (Ask) Rate.
Bid Rate	The price at which the Exchange Dealer will buy currency. It is also called as Buy Rate. [It is the rate at which a Customer can sell a Foreign Currency]
Offer Rate	The rate at which the Exchange Dealer will sell currency. It is also called as Sell Rate or Ask Rate. [It is the rate at which a Customer can Buy a Foreign Currency]
American Quote	Refers to quoting per unit of any currency in terms of American Dollars.
European Quote	Refers to quoting per unit of American Dollars in terms of any other currency an indirect quotation whereby the value of foreign currency is stated as per unit measure of the U.S Dollar.

15.2.4 Bid-Ask Rate and Spread

Concept

The bid price is the highest price that someone is willing to pay for buying an asset at that moment. The foreign exchange market is nothing more than an ongoing auction to buy and sell. Just as with any auction, buyers place bids.

The asking price is the lowest price at which someone is willing to sell at that moment. Think of it as when you sell a house or other item, you are "asking" a certain price for it. Sellers place asking prices.

Spread is the difference between the dealer's Ask Rate and Bid Rate.

If the exchange rate is expected to be stable, the spread will be narrow. If the exchange rate is volatile, the spread will be wider. Where volume of transactions is very high, the Bid-Offer Spread will be very low. In case of a thinly-traded currency, the spread will be wider.

Example: USD = ₹40.00 – ₹40.25. Spread is ₹0.25 (Ask Rate Less Bid Rate)

Σ Computation of Forward Rates

Nature of Appreciation	Forward Rate is Ascertained By
Foreign Currency is appreciating	Multiply the value of home currency by (1 + Appreciation Percentage)
Foreign Currency is depreciating	Multiply the value of home currency by (1 – Depreciation Percentage)
Home Currency is appreciating	Divide the value of home currency by (1 + Appreciation Percentage)
Home Currency is depreciating	Divide the value of home currency by (1 – Depreciation Percentage)

From Swap Points: If spread is positive (swap points increasing) → Add to Spot Rate. If spread is negative (swap points decreasing) → Reduce from Spot Rate.

Illustration – Forward Rate Computation

In the spot market USD 1 = ₹40, if in the forward market (1 Year) —

- (a) Dollar is appreciating by 10%
- (b) Dollar is depreciating by 10%
- (c) Rupee is appreciating by 10%
- (d) Rupee is depreciating by 10%

(a) Dollar appreciating by 10%: $\text{USD } 1 = ₹40 \times (1 + 10\%) = ₹40 \times 1.1 = ₹44.00$

(b) Dollar depreciating by 10%: $\text{USD } 1 = ₹40 \times (1 - 10\%) = ₹40 \times 0.9 = ₹36.00$

(c) Rupee appreciating by 10%: $\text{USD } 1 = ₹40 \div (1 + 10\%) = ₹40 \div 1.1 = ₹36.36$

(d) Rupee depreciating by 10%: $\text{USD } 1 = ₹40 \div (1 - 10\%) = ₹40 \div 0.9 = ₹44.44$

(a) ₹44.00 (b) ₹36.00 (c) ₹36.36 (d) ₹44.44

15.2.5 Cross Rates

Concept

Cross Rate denotes an exchange rate that does not involve the home currency. It is an exchange rate between the currencies of two countries that are not quoted against each other, but are quoted against one common currency.

Benefits: When a Foreign Currency (A) is not traded locally, or no exchange rates are available in terms of the local currency, but only in terms of some other Foreign Currency (B) and Currency B is traded locally, then Exchange Rate for Currency A can be obtained in terms of Local Currency.

Example: Exchange Rate for Peso is not available in terms of Rupee. However, quote for Peso is available per Euro (Euro 1 = Peso 17.50). Euro is traded in India at ₹57.50. Therefore, Rupee per Unit of Peso = $₹57.50 \times (1 \div 17.50) = \text{₹}3.2833 \text{ per Peso}$.

Cross Currency Using Two Way Quotes

$$\text{Bid Rate (A per unit of B)} = \text{Bid Rate of A per unit of C} \times \text{Bid Rate of C per unit B}$$

$$\text{Ask Rate (A per unit of B)} = \text{Ask Rate of A per unit of C} \times \text{Ask Rate of C per unit B}$$

$$\text{Bid Rate (A per Unit of B)} = 1 \div \text{Ask Rate (B per Unit of A)}$$

$$\text{Ask Rate (A per Unit of B)} = 1 \div \text{Bid Rate (B per Unit of A)}$$

15.3 Segments of Foreign Exchange Market – Spot, Forward, Arbitrage

Chapter Overview

This chapter covers the spot market, forward market, and currency arbitrage including two-point and three-point arbitrage.

Learning Objectives

- Understand the spot market and spot rate
- Understand the forward market and forward rate
- Apply two-point arbitrage
- Apply three-point (triangular) arbitrage

15.3.1 Spot Market

Spot Rate

Spot rate is the most commonly used term in the context of exchange rates. "The spot rate is the rate applicable for immediate settlement." However, both in India and internationally, by convention spot rate means the exchange rate at which the transaction will be settled on the second working day.

For example, if a spot transaction is concluded on a Friday, the settlement will be on the following Tuesday with Saturday and Sundays being holidays (Monday being the first working day and the second working day happens to be Tuesday). In some countries, e.g., Bahrain, the weekly closing day is a Friday and, Sunday a working day. The two-day time differential is a reasonable cushion for actual movement of funds through approved banking channels, necessitated by differed time zones.

15.3.2 Forward Market

Forward Rate

The Forward Rate (also a Forward rate) is "the rate contracted today for exchange of currencies at a specified future date." In other words, the price is decided today, the delivery and settlement is made on the specified future date. Once the rate is contracted, both parties, namely the customer and the dealer-banker, are obliged to perform on the specified future date irrespective of the exchange rate prevailing on that date.

Since a bank can buy a currency in forward market there is a forward bid price for the currency. Similarly since a bank can sell a currency in forward market, there is a forward ask price for the currency.

15.3.3 Currency Arbitrage – Two-point and Three-point

Concept

A forex strategy in which a currency trader takes advantage of different spreads offered by brokers for a particular currency pair by making trades. Different spreads for a currency pair imply disparities between the bid and ask prices. Currency arbitrage involves buying and selling currency pairs from different brokers to take advantage of this disparity.

Currency arbitrage involves the exploitation of the differences in quotes rather than movements in the exchange rates of the currencies in the currency pair. Forex traders typically practice two-currency arbitrage, in which the differences between the spreads of two currencies are exploited. Traders can also practice three-currency arbitrage, also known as triangular arbitrage, which is a more complex strategy.

Two-point Arbitrage

Concept

Two-point arbitrage concerns two currencies in two geographically separated markets. For example, let the spot exchange rate be £1 = \$1.55 in London and £1 = \$1.60 in New York. Here we are quoting both exchange rates against sterling. That is, we are quoting GBP/USD. This is the indirect quotation of sterling and the direct quotation of the dollar. Remember that the expression Currency A/Currency B gives you the amount of Currency B that exchanges for one unit of Currency A.

In practice, most exchange rates are quoted against the US dollar. If we were to do this, we would quote:

In London: USD/GBP £0.645

In New York: USD/GBP £0.625.

Thus, in relative terms, sterling is undervalued in London and overvalued in New York. Provided that capital was free to flow between the two centres, arbitrageurs would attempt to exploit, and hence profit from the differential by selling dollars for pounds in London and reselling the pounds in New York. Assume the arbitrageur sold \$1 million in London. For this, he would have received £645,161.29. Selling this in New York would have returned him £1,032,258.06 – a profit of 5 cents per £1. The sale of dollars in London would have strengthened sterling and pushed the value of the pound above \$1.55. At the same time, the sale of sterling in New York would have caused sterling to weaken there, pushing its value below \$1.60. The action of arbitrageurs would bring the rates of exchange in the two centres together.

In practice, the rates wouldn't come exactly into line because of the existence of transactions costs, but the rates should move to being 'transactions costs close'. There is another simplification in the above example since no regard is paid to the existence of bid and offer rates of exchange. In the real world, the rates may have been something like:

London: GBP/USD Bid 1.5495 Offer 1.5505

New York: GBP/USD Bid 1.5995 Offer 1.6005

Selling dollars in London, the arbitrageur would have been quoted the offer rate of 1.5505 and, thus, would have received £644,953.24. Buying dollars in New York, the arbitrageur would have been quoted the bid rate of 1.5995 and would have received £1,031,602.71. That is, the profits would have been lower because of the bid-offer spread.

Three-point (Triangular) Arbitrage

Concept

Exchange rates may be externally consistent but internally inconsistent. That is, exchange rates among different currencies may be mutually inconsistent. Arbitrageurs will then attempt to profit from these inconsistencies and in the process will eliminate discrepancies and establish mutually consistent cross-exchange rates. A cross-exchange rate is simply the price of a second currency expressed in terms of a third or an exchange rate calculated from two other rates. For example, the rate of the Euro against the Swedish krona derived as the cross rate from US\$ – Krona and US\$ against the Euro.

Illustration – Three-point Arbitrage

Imagine you are a British arbitrageur, holding sterling, in the following example:

Actual exchange rates:

GBP/USD £1 = \$1.5715-721

USD/JPY \$1 = ¥106.090-120

GBP/JPY £1 = ¥176.720-831

Start with £1,000,000.

- (a) List the steps you need to take to make a profit.
- (b) Calculate the rate of profit you will make.

Implied cross rates are £1 = ¥176.720-831. Thus, in the actual market, sterling is overpriced in relation to yen and we must sell sterling for yen.

(a) Steps to make riskless profit from arbitrage:

Step A: Use £ to buy yen

Step B: Use yen to buy \$

Step C: Use \$ to buy £

(b) Calculation of profit from arbitrage:

(i) Sell £ for yen; market-maker buys the foreign currency (¥) at the bid rate of ¥176.720. This gives ¥176,720,000.

(ii) Sell ¥ for \$; market-maker sells dollars at the offer rate of ¥106.120. This gives \$1,665,284.58

(iii) Sell \$ for £. The market-maker buys dollars at the higher rate of \$1.5721, which gives £1,059,273.95 or a profit of 5.9%.

This is, of course, a ridiculously high rate of profit, since it could be made in a matter of moments. In practice, rates only have to get slightly out of line before the arbitrageurs step in.

Profit = 5.9% by following the three-step arbitrage process.

10 10 MARKS AREA – Forex Market and Arbitrage

Comprehensive numerical covering spot rates, forward rates, cross rates, and arbitrage. Frequently asked for 10 marks.

15.4 Foreign Currency Derivatives

Chapter Overview

This chapter covers foreign currency derivatives including currency forwards, currency futures, currency options, and currency swaps.

Learning Objectives

- Understand currency forwards
- Understand currency futures
- Understand currency options
- Understand currency swaps

15.4.1 Currency Forwards

Concept

A currency forward is a customized, written contract between parties to buy or sell a specified amount of foreign currency at a fixed foreign currency exchange rate to be settled on a specified future date. The future date for which the currency exchange rate is fixed is usually the date on which the two parties plan to conclude a buy/sell transaction of goods.

Example: Suppose, A needs €1000 on a date sometime in near future. So, instead of buying this amount now and keeping it idle, A will enter into a currency forward contract with, say B. The contract will mature around the date when he needs €1000. Suppose the agreed upon rate is ₹86 per euro today. Once A enters into a contract to buy €1000 at ₹86 per euro, he will have to pay neither more nor less than ₹86 per euro irrespective of the actual spot rate on the date of delivery of the €1000.

Currency forward contracts are private agreements between the parties involved. Hence, they can be tailored to precisely fit the parties' respective needs regarding a monetary amount, the agreed-upon exchange rate, and the time frame that the contract covers. The currency exchange rate specified in a currency forward contract is usually determined in relation to prevailing interest rates in the home countries of the two currencies involved in a transaction.

As these contracts are highly customized, they are transacted as Over-the-Counter (OTC) products. Unlike Currency Futures which are extremely standardized, these are not traded at organised exchanges.

Currency forwards are used to hedge foreign currency exchange risk. Hence, often these are used by importers and exporters to hedge the risk arising out of foreign exchange rate fluctuations which may negatively impact their foreign currency payables or receivables.

Currency forward contracts create obligation for both the parties. However, being an OTC product, they suffer from high counter-party risk or default risk.

15.4.2 Currency Futures

Concept

A Currency Futures Contract is a commitment to either to buy or to sell a specified amount of a foreign currency on a future date at a specified exchange rate. Currency futures are conceptually similar to currency forward contracts. However, they are extremely standardized in terms of available currencies, delivery dates, contract size. The leverage is high, margin requirement is less and being an exchange traded product, counterparty risk is negligible.

In a futures market, only the members of the exchange are allowed to transact. They are known as the brokers. The non-members need to transact through the brokers for which the brokers charge commission.

The participants on currency futures market may be traders including large business enterprises as well as speculators. Business enterprises, operating through their brokers, buy or sell currency futures in order to cover or hedge their currency exposures. They are called hedgers for this reason. On the other hand, speculators take positions in futures market to make profits.

Characteristics of Currency Futures



Exchange Traded

Unlike currency forward contracts which are traded in an over-the-counter (OTC) market, currency futures are traded on organised exchanges. This provides a ready liquid market in which currency futures can be bought and sold. In India, currency futures are sold at BSE and NSE.



Selective Currencies

Currency futures are not available on all foreign currencies. Only a limited number of widely traded currencies have currency futures in various exchanges. For example, Currency Derivatives are available on four currency pairs viz. US Dollars (USD), Euro (EUR), Great Britain Pound (GBP) and Japanese Yen (JPY).



Standardization

Currency futures are standardised in terms of contract size, maturity date and minimum variation in their value.

Standardized Size: A certain minimum amount would constitute one futures contract in a particular currency.
Standardized Maturity Dates: Most currency futures contracts mature on third Wednesdays of March, June, September and December. **Minimum Variation:** Standardization also relates to minimum variation, called "tick".



Clearing House

In case of futures contracts, buyers and sellers do not come face-to-face. They operate through the clearing house. Clearing house is an entity that acts as counterparty to each transaction on futures market. Clearing house has the responsibility of maintaining accounts, margin payments and settlement of deliveries. A clearing house serves as the third party to all transactions. This reduces the counterparty risk.



Marking to Market

Marking to market essentially means that at the end of the trading session (day), all outstanding contracts are



Initial and Maintenance Margin

Only members of an exchange can trade in futures contract on the exchange. He is known as broker. A non-member uses the broker's

repriced at the settlement price of that session (daily closing price). Margin account of those who made losses are debited and of those who gained are credited. This daily settlement feature reduces the default risk of futures contract relative to forward contracts.

services. The broker must deposit with the clearing house a certain percentage of the contract value. This amount is known as the margin. If the actual margin falls below the maintenance level, the trader is required to make good any shortfall in margin account below the minimum margin.

Comparison Between Currency Forward and Currency Futures Contracts

S. No.	Feature	Currency Forward	Currency Futures
1	Size of Contract	Negotiated	Standardized
2	Available currencies	Majority of currencies	Selected currencies
3	Maturity	Negotiated	Standardized
4	Location of trading	Linkage by telephone/fax	Futures Exchange
5	Rates	Normally with bid-ask spread	Unified rates quoted on the exchange
6	Settlement	Generally with delivery of currencies	Mainly cash settled
7	Counterparties	Generally in contact with each other	Do not know each other. Clearing house is the counterparty to each side
8	Negotiation hours	Round the clock	During market sessions
9	Guarantee/Margin deposit	None	Initial and maintenance margins
10	Marking-to-market	No	Gains/losses settled everyday

15.4.3 Currency Options

Concept

A currency option, as the name suggests, gives its holder a right and not an obligation to buy or sell a currency at a predetermined rate on or before a specified maturity date. Options are traded on the Over-the-Counter (OTC) market as well as on organised exchanges. Currency options are used by different participants for different purposes. For example, enterprisers (known as hedgers) use options to cover their exposures while banks profit by speculating.

Standardised currency option contracts started being traded for the first time in 1982 on Philadelphia Stock Exchange (PHLX).



Call Option

A call option is the type of option that gives its holder a right, but not the obligation, to buy a currency at a pre-specified rate.



Put Option

A put option is the type of option that gives its holder a right, but not the obligation, to sell a currency at a pre-specified rate.



European Option

An option which can be exercised only on the maturity date is called a European Option.



American Option

An option which can be exercised at any date up to maturity is called an American Option.

Out-of-the-Money, At-the-Money and In-the-Money Option

Situation	Call Option	Put Option	Status
$S_T > X$	In-the-money	Out-of-the-money	ITM for Call, OTM for Put
$S_T = X$	At-the-money	At-the-money	ATM for both
$S_T < X$	Out-of-the-money	In-the-money	OTM for Call, ITM for Put

Thus, the break-even price for a call option is $S_T = X + C$. Similarly, BEP for a put option is $S_T = X - P$.

Illustration – Currency Put Option

The strike price of a put option on US\$ is ₹73.50/US\$. Put premium is ₹0.30/US\$ and contract size is US\$1000 (one contract). What will be your course of action and resultant profit/loss, if on expiration the spot price is ₹74.00/US\$, ₹73.50/US\$ and ₹72.50/US\$?

When spot price is ₹74.00/US\$:

Here the put option is out-of-the money as Spot Price (S_T) > Strike Price.

Hence, loss = premium paid (P) = ₹0.30 × 1000 = **₹300**

When spot price is ₹73.50/US\$:

Here the put option is at-the money as Spot Price (S_T) = Strike Price.

Hence, loss = premium paid (P) = ₹0.30 × 1000 = **₹300**

When spot price is ₹72.50/US\$:

Here the put option is in-the money as Spot Price (S_T) < Strike Price. Hence, the option will be exercised and

profit = $(X - S_T) - P = [(73.50 - 72.50) \times 1000] - 300 = \mathbf{₹700}$

Spot ₹74.00: Loss ₹300

Spot ₹73.50: Loss ₹300

Spot ₹72.50: Profit ₹700

Σ Put-Call Parity

$$C + PV(X) = P + S_T$$

C: Call price (premium) **P:** Put price (premium) **S_T :** Spot price **$PV(X)$:** Present value of strike price

Illustration – Put-Call Parity

With the data as given below, find the price of the call option:

$P = \text{US\$}0.039/\text{£}$, $X = \text{US\$}1.74/\text{£}$

$S_T = \text{US\$}1.7252/\text{£}$

Risk free rate of return = 8 per cent p.a., Time to expiration = 3 months.

We use the parity equation to find the value of C. That is,

$$\text{PV}(X) = 1.74 \times e^{-0.08 \times 3/12} = 1.74 \times 0.9802 = \$1.705548$$

$$\text{So, } C + \text{PV}(X) = P + S_T$$

$$\text{or, } C + 1.705548 = 0.039 + 1.7252$$

$$\text{or, } C = 0.058652 \text{ or } 0.059 \text{ (app.)}$$

So, the call premium is **US\$0.059/£**.

Call premium = US\$0.059/£

15.4.4 Currency Swaps

Concept

Currency Swaps refer to the arrangement where principal and interest payments in one currency are exchanged for such payments in another currency. Technically, a currency swap (sometimes also called a cross-currency swap) is an exchange of debt-service obligations denominated in one currency for the service on an agreed-upon principal amount of debt denominated in another currency. By swapping their future cash-flow obligations, the counterparties are able to replace cash flows denominated in one currency with cash flows in a more desired currency. In this way, company A, which has borrowed, say, Japanese yen at a fixed interest rate, can transform its yen debt into a fully hedged U.S. dollar liability by exchanging cash flows with counterparty B.

Financial institutions play very important role in swap deals. Through swaps, they enable their customers who are generally enterprises to get loans and make deposits in the currency of their (i.e., customers') choice.

Types of Currency Swaps



Fixed-to-Fixed Rate Currency Swaps

In a fixed-to-fixed swap, the two parties borrow at a fixed rate of interest. The swap deal enables them to get the desired currency at a favourable rate.



Fixed to Floating Currency Swaps

The steps to be followed in the fixed-to-floating rate swap are the same as in fixed-to-fixed swap. Here the only difference is that one currency has fixed rate while the other has floating rate.

Illustration – Currency Swap

D Ltd., an U.S. company, is looking to hedge some of its euro exposure by borrowing in euros. At the same time, a French manufacturer M Ltd. is seeking U.S. dollars to finance additional investment in the American market. Both want the equivalent of \$200 million in fixed-rate financing for 10 years.

Particulars	D Ltd.	M Ltd.
Dollar rate	7.5%	7.7%
Euro rate	8.25%	8.1%

Comment on the possibility of a currency swap.

Given that both companies have similar credit ratings, it is clear that the best way for them to borrow in the other's currency is to issue debt in their own currencies and then swap the proceeds and future debt-service payments.

Assuming a current spot rate of €1.1/\$, M would issue €220 million in 8.1% debt and D would float a bond issue of \$200 million at 7.5%. The coupon payments on these bond issues are €17,820,000 ($0.081 \times \text{€}220 \text{ million}$) and \$15,000,000 ($0.075 \times \$200 \text{ million}$), respectively, giving rise to the following debt-service payments:

Year	M Ltd.	D Ltd.
1–10	€17,820,000	\$15,000,000
10	€220,000,000	\$200,000,000

After swapping the proceeds at time 0 (now), D winds up with €220 million in euro debt and M has \$200 million in U.S. dollar debt to service. In subsequent years, they would exchange coupon payments and the principal amounts at repayment. The net result is that the swap enables D to borrow fixed-rate euros indirectly at 8.1%, saving 15 basis points relative to its 8.25% cost of borrowing euros directly, and M Ltd. can borrow U.S. dollars at 7.5%, saving 20 basis points relative to its direct cost of 7.7%.

Currency swap is beneficial to both D Ltd. (saves 15 bps) and M Ltd. (saves 20 bps).

10 10 MARKS AREA – Currency Derivatives

Comprehensive numerical covering currency forwards, futures, options, swaps, and Put-Call Parity. Frequently asked for 10 marks.

15.5 Parity Relationships

Chapter Overview

This chapter covers the five key theoretical economic relationships – Purchasing Power Parity (PPP), Fisher Effect, International Fisher Effect (IFE), Interest Rate Parity (IRP), and Unbiased Forward Rate Theorem (UFR).

Learning Objectives

- Understand the concept of parity relationships
- Apply Purchasing Power Parity
- Apply Interest Rate Parity
- Understand Fisher Effect and International Fisher Effect
- Understand Unbiased Forward Rate Theorem

15.5.1 Purchasing Power Parity (PPP)

Concept

Purchasing Power Parity (PPP) was first stated in a rigorous manner by the Swedish economist Gustav Cassel in 1918. He used the concept as the basis for recommending a new set of official exchange rates at the end of World War I that would allow for the resumption of normal trade relations. Subsequently, PPP has been widely used by regulators as a guide to establishing new par values for their currencies when the old ones were clearly in disequilibrium.

Absolute version: Purchasing power parity states that price levels should be equal worldwide when expressed in a common currency. In other words, a unit of home currency should have the same purchasing power around the world. This theory is just an application of the 'law of one price' (LOOP) to national price levels rather than to individual prices.

Relative version: States that the exchange rate between the home currency and any foreign currency will adjust to reflect changes in the price levels of the two countries.

Σ Purchasing Power Parity

$$e_t = e_0 \times [(1 + i_h)^t \div (1 + i_f)^t]$$

e_t : Expected spot rate after t periods e_0 : Spot exchange rate at beginning

i_h : Inflation rate in home country i_f : Inflation rate in foreign country

$$\text{Approximate: } (e_1 - e_0) \div e_0 = (i_h - i_f) \div (1 + i_f)$$

✓ PPP says that currencies with high rates of inflation should depreciate relative to currencies with lower rates of inflation

Illustration – PPP

Inflation rates in the UK and India are respectively 3 per cent and 6 per cent per annum. What is the expected exchange rate after one year, if it was ₹78/£ at the beginning? What will be the exchange rate after 2 years?

Given: $e_0 = ₹78/£$; $i_h = 6\%$; $i_f = 3\%$

Expected exchange rate after one year:

$$e_1 = 78 \times (1 + 0.06) \div (1 + 0.03) = 78 \times 1.06 \div 1.03 = \text{₹80.27/£}$$

Expected exchange rate after two years:

$$e_2 = 78 \times (1.06)^2 \div (1.03)^2 = 78 \times 1.1236 \div 1.0609 = \text{₹82.61/£}$$

Exchange rate after 1 year = ₹80.27/£

Exchange rate after 2 years = ₹82.61/£

Illustration – PPP Verification

The inflation rates in India and the UK are 2.5 per cent and 5.5 per cent respectively. If the exchange rate at time zero is ₹79/£, calculate expected exchange rate a year later and expected change in spot rate. Also calculate the inflation rate differential and verify if PPP holds good.

Given: $e_0 = ₹79/£$; $i_h = 5.5\%$; $i_f = 2.5\%$

$$e_1 = 79 \times (1 + 0.055) \div (1 + 0.025) = \text{₹}81.3122/£$$

$$\text{Expected change in spot rate} = (81.3122 - 79) \div 79 \times 100 = 2.93\%$$

$$\text{Inflation rate differential} = (0.055 - 0.025) \div (1 + 0.025) \times 100 = 2.93\%$$

Since expected change in spot rate = inflation rate differential, PPP holds good.

Expected exchange rate = ₹81.3122/£

Expected change = 2.93%

Inflation rate differential = 2.93%

PPP holds good.

15.5.2 Interest Rate Parity (IRP)

Concept

Spot and forward rates are closely linked to each other and to interest rates in different currencies through the medium of arbitrage. In other words, the movement of funds between two currencies to take advantage of interest rate differentials through the process of arbitrage is a major determinant of the forward premium or discount.

As per the interest rate parity (IRP) theory, the currency of the country with a lower interest rate should be at a forward premium in terms of the currency of the country with the higher rate. Thus, in an efficient market with no transaction costs, the interest differential should be (approximately) equal to the forward differential (premium or discount). When this condition is met, the forward rate is said to be at interest rate parity, and equilibrium prevails in the money markets.

Interest parity ensures that the return on a hedged (or "covered") foreign investment will just equal the domestic interest rate on investments of identical risk, thereby eliminating the possibility of having a money machine. This is why interest rate parity is also known as covered interest rate parity theory.

However, interest rate parity holds only when there is no restrictions on mobility of capital, taxes are absent and no government restriction on foreign currency borrowings.

Σ Interest Rate Parity

$$f_1 \div e_0 = (1 + r_h) \div (1 + r_f)$$

$$(f_1 - e_0) \div e_0 = (r_h - r_f) \div (1 + r_f)$$

f_1 : Forward rate e_0 : Spot rate r_h : Interest rate in home country r_f : Interest rate in foreign country

✓ **Forward premium or discount should be equal to interest rate differential**

Illustration – IRP

Interest rates on Indian rupee and pound sterling are 8% p.a. and 5% p.a. respectively. The current exchange rate is ₹79/£. Estimate the 6-month forward rate.

Given: $e_0 = ₹79/£$; $r_h = 8\%$ p.a. (for 6 months); $r_f = 5\%$ p.a. (for 6 months)

$$\begin{aligned} f_1 &= e_0 \times [(1 + r_h \times 6/12) \div (1 + r_f \times 6/12)] \\ &= 79 \times [(1 + 0.08 \times 0.5) \div (1 + 0.05 \times 0.5)] \\ &= 79 \times (1.04 \div 1.025) \\ &= \text{₹80.1561/£} \end{aligned}$$

6-month forward rate = ₹80.1561/£

Illustration – Covered Interest Arbitrage

Suppose, the interest rate on pound sterling is 12% p.a. in London and interest rate on a comparable dollar investment in New York is 7% p.a. The pound sterling spot rate is \$1.95/£ and one year forward rate is \$1.87/£. Is there any arbitrage opportunity? If so, explain the steps to earn arbitrage profit.

Given: $e_0 = \$1.95/£$; $f_1 = \$1.87/£$; $r_h = 7\%$ (USA); $r_f = 12\%$ (UK)

Here, $1 + r_h = 1.07$

and, $(f_1/e_0) \times (1 + r_f) = (1.87/1.95) \times 1.12 = 1.074$

Since $(1 + r_h) \neq (f_1/e_0)(1 + r_f)$, arbitrage opportunity exists.

Now, as $(1 + r_h) < (f_1/e_0)(1 + r_f)$, funds will move from home country to foreign country.

Steps to be followed by the arbitrageur:

1. Borrow \$1,000,000 in New York at 7%. Repay principal plus interest of \$1,070,000 at end of year.
2. Immediately convert the \$1,000,000 to British pounds at spot rate of £1 = \$1.95. This yields £512,820.51 available for investment.
3. Invest the principal of £512,820.51 in London at 12% for one year. At end of year, arbitrageur will have £574,358.97.
4. Simultaneously with other transactions, sell the £574,358.97 in principal plus interest forward at a rate of £1 = \$1.87 for delivery in one year. This transaction will yield \$1,074,051.28 next year.
5. At end of year, collect the £574,358.97, deliver it to bank's foreign exchange department in return for \$1,074,051.28, and use \$1,070,000 to repay loan. The arbitrageur will gain **\$4,051.28** on this set of transactions.

Arbitrage profit = \$4,051.28

15.5.3 Fisher Effect

Concept

The Fisher effect is a theory about the relationship between interest rates and inflation, basically stating that when one rises, so does the other. The Fisher Effect is an economic hypothesis stating that the real interest rate is equal to the nominal rate minus the expected rate of inflation. It states that, in response to a change in the money supply, the nominal interest rate changes in tandem with changes in the inflation rate in the long run.

In the late 1930s, U.S. economist Irving Fisher wrote a paper which posited that a country's interest rate level rises and falls in direct relation to its inflation rates.

Fisher Effect

$$1 + \text{Nominal rate} = (1 + \text{Real rate}) \times (1 + \text{Expected inflation rate})$$

$$r = a + i + ai$$

$$\text{Approximate: } r = a + i$$

r: Nominal interest rate **a:** Real interest rate **i:** Expected inflation rate

$$\text{Exact form: } (1 + r_h)/(1 + r_f) = (1 + i_h)/(1 + i_f)$$

✓ Currencies with high rates of inflation should bear higher interest rates than currencies with lower rates of inflation

Illustration – Fisher Effect

Assume that the real interest rate is 5.5% and the rate of inflation changes from 2.5% to 3.5%.
How will the nominal interest rate change?

When inflation rate was 2.5%:

Nominal Interest Rate = $(1.055) \times (1.025) - 1 = 0.081$ or **8.1%**

When inflation rate was 3.5%:

Nominal Interest Rate = $(1.055) \times (1.035) - 1 = 0.092$ or **9.2%**

Nominal interest rate will change from 8.1% to 9.2%.

15.5.4 International Fisher Effect

Concept

In foreign exchange terminology, the International Fisher Effect is based on the idea that a country with a higher interest rate will have a higher rate of inflation which, in turn, could cause its currency to depreciate. In theoretical terms, this relationship is expressed as an equality between the expected percentage exchange rate change and the interest rate differential.

It is based on present and future risk-free nominal interest rates rather than pure inflation, and is used to predict and understand present and future spot currency price movements. In order for this model to work in its purest form, it is assumed that the risk-free aspects of capital must be allowed to free flow between nations that comprise a particular currency pair.

International Fisher Effect

$$(e_1 - e_0) \div e_0 = (r_h - r_f) \div (1 + r_f)$$

Expected percent exchange rate change roughly equals the interest rate differential **e_1** : Future spot rate

e_0 : Current spot rate **r_h** : Home interest rate **r_f** : Foreign interest rate

 **The country with a higher interest rate will see a higher inflation rate and will experience a depreciation of its currency**

15.5.5 Unbiased Forward Rate Theorem

Concept

In the absence of government intervention in the foreign exchange market, the spot rate as well as the forward rate are heavily influenced by current expectations of future events. The two rates move in tandem, both reacting to the interest differentials. New information, such as a change in interest rate differentials, is reflected almost immediately in both spot and forward rates.

Ignoring risk, equilibrium will be achieved only when the forward differential equals the expected change in the exchange rate. At this point, there will be no longer any incentive to buy or sell the currency forward.

Unbiased Forward Rate Theorem

$$(f_1 - e_0) \div e_0 = (e_1 - e_0) \div e_0$$

$$f_t = e_t$$

f_t : Forward rate for settlement at time t e_t : Expected future exchange rate at time t

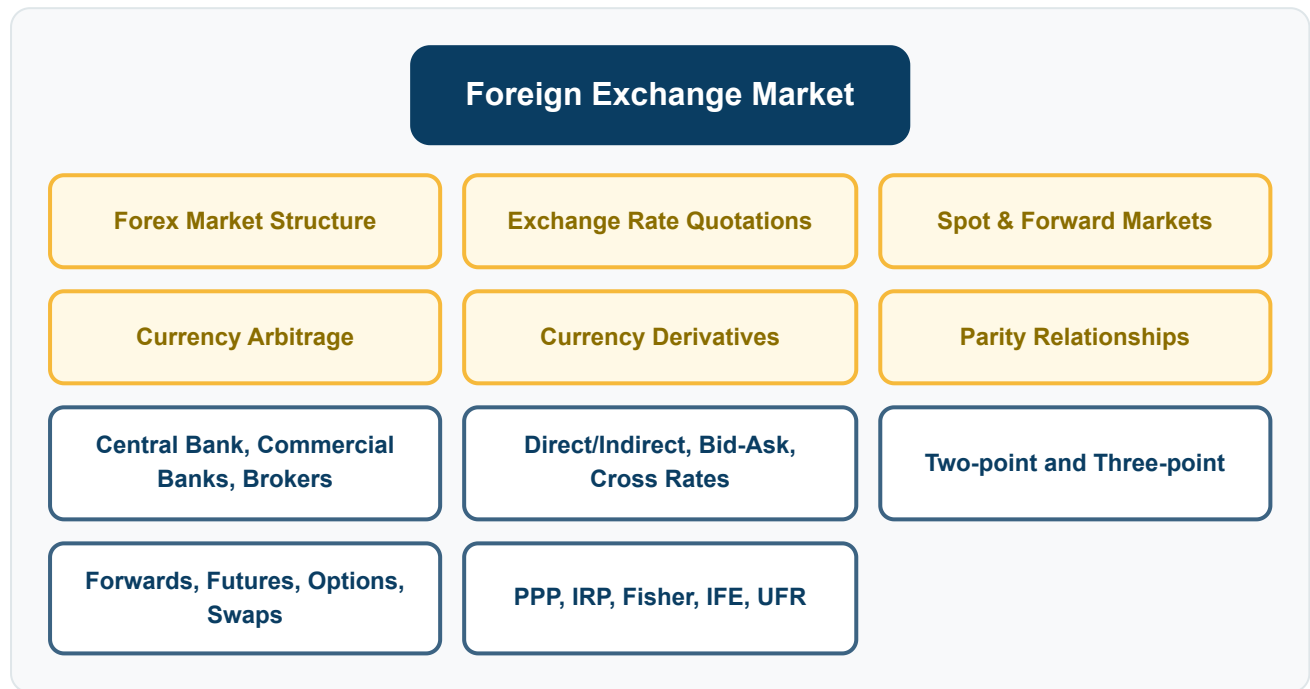
 **The forward rate should reflect the expected future spot rate on the date of settlement of the forward contract**

10 MARKS AREA – Parity Relationships

Comprehensive numerical covering PPP, IRP, Fisher Effect, IFE, and UFR. Frequently asked for 10–15 marks.

Module 15 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 15



Key Points for Revision

1. Forex market = Global decentralized trading of international currencies
2. Forex market not a physical place; electronically linked network
3. Round the clock operation; 24 hours a day except weekends
4. Predominantly interbank market (95% of transactions)
5. Largest financial market worldwide (\$5.3 trillion daily in 2013)
6. Functions: Transfer, Credit, Hedging
7. Participants: Central Bank, Commercial Banks, Brokers, MNCs, Individuals
8. Exchange rate = Price of one currency in terms of another
9. Determinants: Interest rate differentials, inflation differentials, government policies, market expectations, investment opportunities, speculations
10. Equilibrium exchange rate balances imports and exports
11. Direct Quote: One unit of foreign currency in domestic currency
12. Indirect Quote: One unit of domestic currency in foreign currency
13. Bid Rate: Dealer buys at this rate; Ask/Offer Rate: Dealer sells at this rate
14. Spread = Ask Rate – Bid Rate
15. Cross Rate = Exchange rate between two currencies not involving home currency
16. Spot Rate: Rate for immediate settlement (T+2)
17. Forward Rate: Rate contracted today for future delivery
18. Two-point Arbitrage: Two currencies, two markets
19. Three-point Arbitrage: Triangular, three currencies
20. Currency Forward: Customized, OTC, bilateral, counterparty risk
21. Currency Futures: Standardized, exchange traded, clearing house, daily settlement
22. Currency Options: Right but not obligation; Call and Put; American and European
23. ITM, ATM, OTM based on spot vs strike
24. Break-even for Call = $X + C$; for Put = $X - P$
25. Put-Call Parity: $C + PV(X) = P + S_T$
26. Currency Swap: Exchange principal and interest in different currencies
27. PPP: $e_t = e_0 \times [(1+i_h)^t \div (1+i_f)^t]$
28. IRP: $f_1/e_0 = (1+r_h)/(1+r_f)$
29. Fisher Effect: $1 + \text{Nominal} = (1 + \text{Real})(1 + \text{Inflation})$
30. International Fisher Effect: $(e_1 - e_0)/e_0 = (r_h - r_f)/(1+r_f)$
31. Unbiased Forward Rate: $f_t = e_t$
32. Covered Interest Arbitrage: Borrow in low interest currency, invest in high interest currency, cover with forward

Comprehensive Formula Handbook – Module 15

Forward Rate (Appreciation)	$\text{Spot Rate} \times (1 + \text{Appreciation}\%)$
Forward Rate (Depreciation)	$\text{Spot Rate} \times (1 - \text{Depreciation}\%)$
Cross Rate (A per B)	$(\text{A per C}) \times (\text{C per B})$
Bid-Ask Spread	$\text{Ask Rate} - \text{Bid Rate}$
PPP	$e_t = e_0 \times [(1+i_h)^t \div (1+i_f)^t]$
IRP	$f_1/e_0 = (1+r_h)/(1+r_f)$
Fisher Effect	$(1+r) = (1+a)(1+i)$
International Fisher Effect	$(e_1 - e_0)/e_0 = (r_h - r_f)/(1+r_f)$
Unbiased Forward Rate	$f_t = e_t$
Put-Call Parity	$C + X \times e^{-rt} = P + S_T$

One-Night Revision Notes – Module 15

Last Night Before Exam – Module 15

- **Forex Market:** Not a physical place; 24-hour operation; interbank market
- **Functions:** Transfer, Credit, Hedging
- **Participants:** Central Bank, Commercial Banks, Brokers, MNCs, Individuals
- **Direct Quote:** Foreign currency in domestic currency
- **Indirect Quote:** Domestic currency in foreign currency
- **Bid Rate:** Dealer buys; **Ask Rate:** Dealer sells
- **Spread:** Ask – Bid
- **Cross Rate:** Rate between two non-home currencies
- **Spot Rate:** T+2 settlement; **Forward Rate:** Future delivery
- **Arbitrage:** Two-point (two markets) and Three-point (triangular)
- **Currency Forward:** OTC, customized, counterparty risk
- **Currency Futures:** Exchange traded, standardized, clearing house
- **Currency Options:** Right not obligation; Call/Put; American/European
- **Put-Call Parity:** $C + PV(X) = P + S_T$
- **Currency Swap:** Exchange principal and interest in different currencies
- **PPP:** $e_t = e_0 \times [(1+i_h)/(1+i_f)]^t$
- **IRP:** $f_1/e_0 = (1+r_h)/(1+r_f)$
- **Fisher Effect:** $1 + \text{Nominal} = (1 + \text{Real})(1 + \text{Inflation})$
- **International Fisher Effect:** $(e_1 - e_0)/e_0 = (r_h - r_f)/(1 + r_f)$
- **Unbiased Forward Rate:** $f_t = e_t$
- **Covered Interest Arbitrage:** Borrow low, invest high, cover forward

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Spot, forward, and cross rates – 5–10 marks
- Arbitrage – two-point and three-point – 5–10 marks
- Forward premium/discount and annualized rates – 5 marks
- Purchasing Power Parity – 5–10 marks
- Interest Rate Parity – 5–10 marks
- Fisher Effect and International Fisher Effect – 5 marks
- Currency forwards, futures, options, swaps – 5–10 marks
- Covered interest arbitrage – 5–10 marks
- Put-Call Parity – 5 marks

Final Checklist – Module 15

Before Moving to Module 16

- Can I explain the structure and functions of the forex market?
- Can I compute spot, forward, and cross rates?
- Can I calculate forward premium/discount and annualized rates?
- Can I apply two-point and three-point arbitrage?
- Can I explain currency forwards, futures, options, and swaps?
- Can I apply Put-Call Parity?
- Can I apply Purchasing Power Parity?
- Can I apply Interest Rate Parity?
- Can I explain Fisher Effect and International Fisher Effect?
- Can I apply Unbiased Forward Rate Theorem?
- Can I compute covered interest arbitrage profit?
- Have I memorised all formulas in the formula sheet?
- Have I practised at least 15 numericals from this module?

**CMA FINAL PAPER 14 · STRATEGIC FINANCIAL
MANAGEMENT**

16

Foreign Exchange Risk Management

Master Revision Handbook · December 2026 Edition

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Module 16 – Foreign Exchange Risk Management

Module Objective

Primary Objective

To develop a detailed understanding of the sources and impact of risks to which an organisation is exposed to in a dynamic business environment at national and international level and the techniques for managing the same to sustain competitive advantages. To learn the techniques for measurement and management of transaction exposure, translation exposure, and operating exposure.

Mapped CMLO: 3b, 3c

Learning Outcomes

Students will be able to...	Application Skill
Learn the techniques for measurement and management of transaction exposure.	Identify internal and external techniques for managing transaction exposure.
Learn the techniques for measurement and management of translation exposure.	Apply translation methods (Current/Non-current, Monetary/Non-monetary, Temporal, Current Rate).
Learn the techniques for measurement and management of operating exposure.	Apply operational and currency risk mitigation strategies.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
16.1	Transaction Exposure	HIGH 5%	Numerical + Theory
16.2	Translation Exposure	HIGH 3%	Theory + Concept
16.3	Operating Exposure	HIGH 2%	Theory

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- Transaction exposure – internal and external techniques – **10 marks**
- Forward market hedge – **5–10 marks**
- Money market hedge – **5–10 marks**
- Translation exposure – methods and management – **5–10 marks**
- Operating exposure – management techniques – **5 marks**
- Cross-border leasing – **5 marks**
- Case study on hedging – **10 marks**

Frequently Tested Concepts

Module 16 – Concept Flow

Transaction Exposure



Translation Exposure



Operating Exposure

Internal Techniques



External Techniques



Hedging Strategies

Table of Contents – Module 16

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★ FREQUENTLY ASKED – MODULE 16

- **Transaction exposure** – internal and external techniques
- **Forward market hedge** – numerical
- **Money market hedge** – numerical
- **Translation exposure** – methods and management
- **Operating exposure** – management strategies
- **Cross-border leasing** – theory

16.1 Transaction Exposure

Chapter Overview

This chapter covers the meaning of transaction exposure, and the internal and external techniques for managing it.

Learning Objectives

- Understand the meaning of transaction exposure
- Identify internal techniques for managing transaction exposure
- Identify external techniques for managing transaction exposure
- Apply forward market hedge, money market hedge, options hedge, and futures hedge

16.1.1 Meaning of Transaction Exposure

Concept

Transaction risk refers to the effect of exchange rate movement associated with the time-gap between the date of the transaction and the date on which the consideration is settled. These generally occur at operational level.

When a business entity concludes a purchase or sale of an asset with a customer outside India, a transaction takes place. Transaction risk occurs when there is a time gap between date of the sale (or purchase) of goods and the date of receipt (or payment) of proceeds.

Example: A transaction takes place on Feb. 1 but the settlement (payment of consideration) takes place on 15th May. While the transaction (and hence the receivable or payable) is recorded on Feb. 1 at the prevailing exchange rate, the actual receipt or payment leading to settlement takes place on and is recorded on May 15, at the exchange rate prevailing on May 15. Since these two rates may not be the same, risk arises. In the above example, the difference in exchange rates between 1st Feb. and 15th May represents transaction risk.

16.1.2 Internal Techniques for Management of Transaction Exposure



Choice of Currency for Invoicing

A very simple way of eliminating the transaction exposure is to invoice all receivables and payables in the domestic currency. Invoice in home currency or foreign currency in



Leading and Lagging

A firm will accelerate or delay receipt from or payment to foreign counter parties,



Exposure Netting

Netting is a process under which debit balances are netted off against credit balances, so that only the net



Back-to-Back Credit Swap

Under this method, two companies, located in two

respect of an export and whether, to receive invoices home currency or foreign currency in respect of an import would depend on which way the currency is expected to move. The Rule is simple: "In the case of export, you should select that currency (home or foreign) which would lead to higher Rupee realisation. In the case of import you should select the currency (home or foreign) which would lead to a lower Rupee outflow."

depending upon what is beneficial to it in the context of the movement in exchange rate. In case, home currency is expected to depreciate, an importer would like to expedite or lead payments of the payables due. On the other hand, in the same situation, an exporter will be better off by delaying or lagging the receipts in foreign currency.

amounts remain due to be paid in actual currency flows. Very clearly, this is not a tool for managing exchanging risks. The objective here is to save on transaction costs, by netting off inter company balances, before payment is arranged. Bilateral Netting: Only two entities are involved. Multi-lateral Netting: Adopted mostly among three or more subsidiaries (or outfits) in the same group.

different countries, agree to exchange loans in their respective currencies. Loans are given for a pre-specified fixed period at a pre-specified exchange rate. On maturity, the sums are again re-exchanged. This arrangement can work effectively between MNCs of two different countries, each having subsidiaries in the country of the other.



Sharing Risk

Any two companies from two different countries can practice this technique. The basic principle underlying this technique is that both the parties will share the loss arising out of unfavorable movement of foreign exchange rate. This may be achieved by denominating the transaction partly in each of the domestic currencies of the parties involved. This way, the exposure for both the parties gets reduced.

Illustration – Leading and Lagging

Suppose a firm has payables of US\$1,00,000 due in one month. Anticipating appreciation of rupee against dollar it delays payment to 3 months. If the rates after one month and three months turn out to be ₹66 per dollar and ₹65.50 per dollar respectively, the firm will save ₹50,000 $[1,00,000 (66.00 - 65.50)]$ by delaying payments. Of course, it will have to negotiate with its counter party and as a result, the savings will be less than ₹50,000. Let us suppose that the counter party agrees to delay the settlement if it is paid US\$1,00,500 instead of US \$1,00,000. Therefore, the Indian firm will effectively be paying ₹6,582,750. Still the firm saves ₹17,250 $(100000 \times 66 - 100500 \times 65.50)$.

Savings from leading/lagging = ₹17,250

16.1.3 External Techniques for Management of Transaction Exposure



Hedging through Currency Forward Market

In order to hedge its transaction exposure, a company having a long position in a currency (having a receivable) will sell the currency forward, i.e., go short in the forward market, and a company having a short position in a currency (having a payable) will buy the currency forward, i.e., go long in the forward market. The idea behind buying or selling a currency in the forward market is to lock the rate at which the foreign currency transaction takes place, and hence, the costs or profits.



Hedging through Money Market

Money markets can also be used for hedging foreign currency receivables or payables. Let us say, a firm has a dollar payable after three months. It can borrow in the domestic currency now, convert it at the spot rate into dollars, invest those dollars in the money markets, and use the proceeds to pay the payable after three months. This process locks the exchange rate at which the firm needs to buy dollars. At the same time, it knows its total cost in advance in the form of the principal and interest it needs to repay in the domestic markets.



Hedging through Currency Options Market

Options can prove to be a useful and flexible tool for hedging transaction and translation exposure. A firm having a foreign currency receivable can buy a put option on the currency, having the same maturity as the receivable. Conversely, a firm having a foreign currency payable can buy a call option on the currency with the same maturity. Hedging through options has an advantage over hedging through forwards or futures. While the latter fixes the price at which the currency will be bought or sold, options limit the downside loss without limiting the upside potential.



Hedging through Currency Futures Market

Another way to hedge exposure is through futures. The rule is the same as in the forward market, i.e., go short in futures if you are long in the currency and vice versa. Hence, if an importer needs to pay \$5,50,000 after four months, he can buy dollar futures for the required sum and maturity. Futures can be similarly used for hedging translation exposure. Hedging through futures has an effect similar to hedging through forward contracts. As the gain/loss on the futures contract gets cancelled by the loss/gain on the underlying transaction, the exposure gets almost eliminated.

Illustration – Forward Market Hedge

An Indian importer has bought goods worth \$6,00,000 from an American company. The payables are due in three months. The US dollar has a tendency to appreciate. The rates available are as follows:

Spot rate: ₹64.00/\$

3-m forward rate: ₹65.50/\$

The value of payables on the date of transaction between the Indian and the American company is ₹32 million ($\$5,00,000 \times ₹64/\$$), but the importer will have to pay more than this amount, if US dollar appreciates during the three months that remain before settlement. To avoid this uncertainty, the importer covers his payables by buying US dollars in forward market. Once he does so, the value of his payable becomes ₹32.75 million ($\$5,00,000 \times ₹65.50/\$$).

After the import transaction, he waits for 3 months and then he pays ₹32.75 million to the foreign exchange dealer to receive \$500,000 which he pays to the American company. By covering in the forward market, he has ensured that he has to pay neither more nor less than ₹32.75 million.

Suppose the spot rate on the date of settlement turns out to be ₹66.00/\$. It is easy to see that by buying forward, the importer has made a notional gain of ₹0.50 per dollar. In other words, his total notional gain is ₹2,50,000 ($500,000 \times 0.50$).

Instead of appreciation, if dollar actually depreciates to ₹63.80/\$ on the date of settlement. In that case, the importer made a notional loss of ₹0.20/\$ ($₹64 - ₹63.80$) if compared with the spot exchange rate as it was on the date of transaction and a much bigger loss of ₹1.70/\$ ($₹65.50 - ₹63.80$) if compared with the forward rate.

However, as explained in the previous example, notional gains or losses are only post-event exercises. The main purpose of hedging was to reduce uncertainty about the amount in rupees to be paid out for the imports.

Locked-in payment = ₹32.75 million, with no uncertainty.

Illustration – Money Market Hedge

A French exporter has an exposure of £1 million in the form of receivables. The following money market data are given:

3-m interest rate: Euro: 5.5% p.a.; Pound Sterling: 8% p.a.

Spot exchange rate: €1.4120/£

Step 1: Borrow a sum of pound sterling at 8% p.a. interest for three months such that this sum become £1 million along with the interest after 3 months. Say, the borrowed amount is B. Thus,
 $B(1 + 0.08 \times 3/12) = \text{£1 million}$
 $B = \text{£1}/1.02 = \text{£0.98039 million}$

Step 2: Sell this borrowed sum of pound sterling in the spot currency market at the rate of €1.4120/£ to get euros. The amount in euros is going to be $\text{£0.98039} \times \text{€1.4120/£ million} = \text{€1.3843 million}$

Step 3: Place €1.3843 million for 3 months in the money market at the rate of 5.5% p.a. Thus, at the end of 3 months, the amount that the French exporter will have is:
 $\text{€1.3843} \times (1 + 0.055 \times 3/12) \text{ million} = \text{€1.4033 million}$

Step 4: Refund the loan and interest combined that works out to be £1 million as soon as this amount is received from the British company. It is clear that irrespective of the movement of the exchange rate, the exporter will have a definite amount of €1.4033 million. There is no uncertainty about this amount. This has been possible due to hedging in money market.

Locked-in receipt = €1.4033 million, with no uncertainty.

Illustration – Hedging through Options

A German company has payables of \$10 million due to be paid in one month. The company wants to hedge this exposure by using a call option. The data are as follows:

Spot exchange rate: \$1.20/€

Option strike price: \$1.19/€

Maturity: One month

Option premium: 2.5%

The German company knows that the dollar has tendency to appreciate in near future. So, it buys call option for the underlying dollar amount of \$10 million. For this, it pays the premium upfront, which works out to be:

$$€0.025 \times 10/1.20 \text{ million} = €0.2083 \text{ million}$$

Situation 1: Dollar appreciates, spot rate = \$1.175/€

Company exercises its call option and buys required amount of dollars at the rate of \$1.19/€.

Total sum paid = €10/1.19 + Premium already paid

$$= €8.4034 + €0.2083 \text{ million} = \mathbf{€8.6117 \text{ million}}$$

Situation 2: Spot rate = \$1.19/€

Company is indifferent between exercising and abandoning its call option. In either situation, it will pay:

$$€10/1.19 + €0.2083 \text{ million} = \mathbf{€8.6167 \text{ million}}$$

Situation 3: Dollar depreciates, spot rate = \$1.21/€

Company abandons its call option and buys required amount of dollars directly from the exchange market.

Total outgo = €10/1.21 + Premium paid

$$= €8.2645 + €0.2083 \text{ million} = \mathbf{€8.4728 \text{ million}}$$

Thus, the company does not have to pay more than €8.6167 irrespective of the degree of appreciation of dollar, but it benefits from the favorable movement (depreciation) of dollar.

Maximum outflow capped at €8.6167 million; benefits from favorable movement.

Illustration – Hedging through Currency Futures

An American company expects to receive €6 million in December from its European client. Euro is likely to depreciate against dollar between now and settlement date. The exchange data available now are as follows:

Spot rate: \$1.200/€

December euro futures: \$1.196/€

The American company decides to hedge its exposure in futures market. The standard size of euro futures is €125,000. The number of euro futures needed for hedging the exposure is:

$$\text{€}6000000/\text{€}125000 = 48$$

The number of euro futures required being an exact number, it is clear that the hedge ratio is 1 and the full amount of €6 million can be hedged.

The American company sells 48 December euro futures by depositing guarantee margin and follows daily movement of futures. It honours margin call whenever required or withdraws excess amount from its margin account.

On 20 December, it decides to close the futures contract by a reverse operation. The rates on 20 December are:

Spot rate: \$1.1925/€

December futures: \$1.1890/€

It is clear that the American company suffered a loss on spot market as the rate has come down from \$1.20/€ to \$1.1925/€. But on the future market, it makes a gain as the futures which was sold at \$1.196 is trading at a lower rate of \$1.1890/€.

Loss on spot market = \$6 million × (1.200 - 1.1925) = **\$0.045 million**

Gain on Futures = \$6 million × (1.196 - 1.189) = **\$0.042 million**

Thus, a part of the loss suffered on spot market has been compensated by the gain on futures market. The hedge efficiency is 93% (0.042/0.045).

Hedge efficiency = 93%

10 10 MARKS AREA – Transaction Exposure

Comprehensive numerical covering forward market hedge, money market hedge, options hedge, and futures hedge. Frequently asked for 10 marks.

16.2 Translation Exposure

Chapter Overview

This chapter covers the meaning of translation exposure, the four translation methods, and the management of translation exposure.

Learning Objectives

- Understand the meaning of translation exposure
- Apply the four translation methods
- Manage translation exposure using balance sheet hedge and indirect methods

16.2.1 Meaning of Translation Exposure

Concept

While transaction exposure arises out of day-to-day activities of the firm, translation exposure arises due to the need to translate the foreign currency values of assets and liabilities into the domestic currency. Translation of the balance sheet items from their value in foreign currency to that in domestic currency is done in order to consolidate the accounts of various subsidiaries. Therefore, translation exposure is also called Consolidation Exposure or Balance Sheet Exposure.

Example: Suppose, an Indian parent company has a subsidiary in the UK. In the beginning of the year, the UK subsidiary has plant and machinery, inventory and cash valued at £400,000, £200,000 and £40,000 respectively. The exchange rate is ₹65 per pound. Therefore, the translated value of these assets is ₹41,600,000. At the end of the year, the assets are £420,000 (plant and machinery), £210,000 (inventory) and £20,000 (cash) respectively. At the exchange rate of ₹66 per pound, the translated value becomes ₹42,900,000. Thus, there is a translation "gain" of ₹1,300,000 on asset side of the balance sheet. Similarly, there must have been a translation "loss" on liabilities of the subsidiaries such as, debts-denominated in pounds.

It may be noted in this context that the above gain and loss is only notional and there is no real inflow or outflow of cash as the assets and liabilities are not liquidated in practice.

16.2.2 Translation Rules/Methods



Current/Non-current Method

The basic principle behind the current/non-current method is that



Temporal Method

Under generally accepted accounting principles of

assets and liabilities are translated on the basis of their maturity. Under this method, all current assets and current liabilities of foreign affiliates are translated into the parent currency at current exchange rates. All noncurrent assets, non-current liabilities, and owners' equity are translated at historical exchange rates. Hence, under this method, there will be a translation gain (loss) if the foreign currency appreciates (depreciates) in case the subsidiary has net positive working capital.

Monetary/Non-monetary Method

As per this method, all monetary items of balance sheet of a foreign subsidiary are translated at the current exchange rate while all the non-monetary items in the balance sheet, including equity, are translated at the historical exchange rate. The income statement items, under this method, are translated at the average exchange rate for the accounting period.

historical accounting in the United States, the temporal method produces essentially the same results as the monetary/non-monetary method. The only difference is that under the monetary/non-monetary method, inventory is always translated at the historical rate. Under the temporal method, inventory is usually translated at the historical rate, but it could be translated at the current rate if inventory is carried at market prices or at replacement costs.



Current Rate Method

The current-rate method is the simplest; all assets and liabilities are translated at the current rate. Existing equity accounts such as common stock and paid-in capital are translated at the historical rate.

16.2.3 Management of Translation Exposure

Balance Sheet Hedge

A balance sheet hedge involves the selection of the currency in which exposed assets and liabilities are denominated so that an exchange rate change would make exposed assets equal to exposed liabilities. In order to do so, a company must maintain the same amount of exposed assets and exposed liabilities in a particular currency. Thus, a devaluation would affect both types of balance sheet accounts equally leading to a situation where gain in one will get offset by loss on the other. When an MNC has several subsidiaries, a variety of funds-adjustment techniques can be used to reduce its translation loss. These techniques require the company to adopt the following two basic strategies:

- The company must decrease soft-currency assets and increase soft-currency liabilities.
- The company must increase hard-currency assets and decrease hard-currency liabilities.

Hard currencies are those currencies that are likely to appreciate; soft currencies are those currencies that are likely to depreciate. Thus, if the company thinks that the local currency is likely to depreciate, it should reduce local-currency assets and/or increase local-currency liabilities to generate local-currency cash. In order to reduce translation exposure, these local-currency funds must be converted into hard-currency assets. This conversion can be accomplished, either directly or indirectly, by a variety of funds-adjustment techniques. Direct funds-adjustment techniques include pricing exports in hard currencies and imports in the local currency, investing in hard-currency securities, and replacing hard-currency loans with local-currency loans.

Indirect Funds Adjustment Methods

A variety of indirect funds-adjustment methods can be used to reduce foreign-currency exposure. These are as follows:

- **Exposure Netting:** Refer to discussion in Module 16.1.2
- **Leading and Lagging:** Refer to discussion in Module 16.1.2
- **Transfer Pricing:** Transfer prices are prices of goods and services sold between related parties, such as a parent and its subsidiary. Transfer prices are frequently different from arm's length prices (fair market prices) so that they can be used to avoid foreign-currency exposure. For example, an MNC can remove funds from soft-currency countries by charging higher transfer prices on goods sold to its subsidiaries in those countries. For the same reason, an MNC can keep funds at those subsidiaries in hard-currency countries by charging lower prices on goods sold to its subsidiaries in those countries. Governments usually assume that MNCs manipulate their transfer prices to avoid financial problems or to improve financial conditions. Thus, most governments set up policing mechanisms to review the transfer pricing policies of MNCs.

5 5 MARKS AREA – Translation Exposure

Explain the meaning of translation exposure, the four translation methods, and the management of translation exposure. Frequently asked as a short theory question.

16.3 Operating Exposure

Chapter Overview

This chapter covers the meaning of operating exposure and the various strategies for managing it.

Learning Objectives

- Understand the meaning of operating exposure
- Identify the sources of operating exposure
- Apply strategies for managing operating exposure
- Understand the relationship between economic exposure and operating exposure

16.3.1 Meaning of Operating Exposure

Concept

Operating exposure emanates from those items which have an impact on cash flows but whose values are not contractually defined, as is the case of transaction exposure. Some examples of operating exposure are as follows:

- A deal for buying or selling of goods is under negotiation. The price of goods being negotiated may be affected by fluctuations in the exchange rate.
- If a part of raw material is imported, the cost of production will increase following a depreciation of the home currency.
- Domestic inflation will increase input costs of the firm even if there is no change in the exchange rate. This will adversely affect its competitiveness vis-a-vis the firms of other countries.
- Tender submitted for a contract remains an item of operating exposure until the award of contract. Once the contract is awarded, it becomes transaction exposure.
- Interest cost on working capital requirements may increase if money supply is tightened following a depreciation of the home currency.

Unfavourable movement in exchange rate will affect future revenues as well as costs and hence operating profits of the firms. Consequently, these effects the long-term prospect and competitiveness of firms. This is why operating exposure is also called Strategic Exposure. It influences the long-term business decisions such as production, marketing, sources of supply and location of production facilities etc.

The two cash-flow exposures—operating exposure and transaction exposure—combine to equal a company's economic exposure. In technical terms, economic exposure is the extent to which the value of the firm, as measured by the present value of its expected cash flows, will change when exchange rates change.

16.3.2 Management of Operating Exposure



Diversifying Production Facilities and Markets

Diversifying the production facilities and sales to a number of markets rather than concentrating on one or two markets would mitigate the risk inherent. However, in such cases, the companies have to forego the advantage earned by economies of scale.



Choosing Currency Zones

Avoidance of inflexible currency zones and locating production and sales in many currency zones with high currency diversification benefit may help to minimize economic exposure.



Sourcing Flexibility

Companies may have alternative sources for acquiring key inputs. The substitute sources can be utilized in case the exchange rate fluctuations make the inputs expensive from one region.



Flexible Manufacturing

Creation of flexible manufacturing systems that allow rapid product differentiation for acquiring greater control over foreign currency prices and faster introduction of new products in overseas markets may also help firms to manage economic exposure. In addition, development of production systems that can promptly respond to product changes and can be used to tailor products to unique niches in the market place and also reduce the sensitivity of products to foreign currency price changes as well as provide the means to exploit exchange rate changes.



Diversifying Financing

A company can have access to capital markets in a number of major regions. This enables the company to gain flexibility in raising capital in the market with the cheapest cost of funds.



Making R&D Effort for Product Differentiation

R&D activity aims at strengthening competitive position of a firm against the adverse effect of exchange rate changes.

R&D can bring about gains in productivity, reduction in costs and, most importantly, differentiation in products that the firm offers. New or differentiated products have inelastic demand. That is, their demand is not or less sensitive to price variations. Price inelasticity would make the firm immune to economic exposure.



Hedging through Financial Products

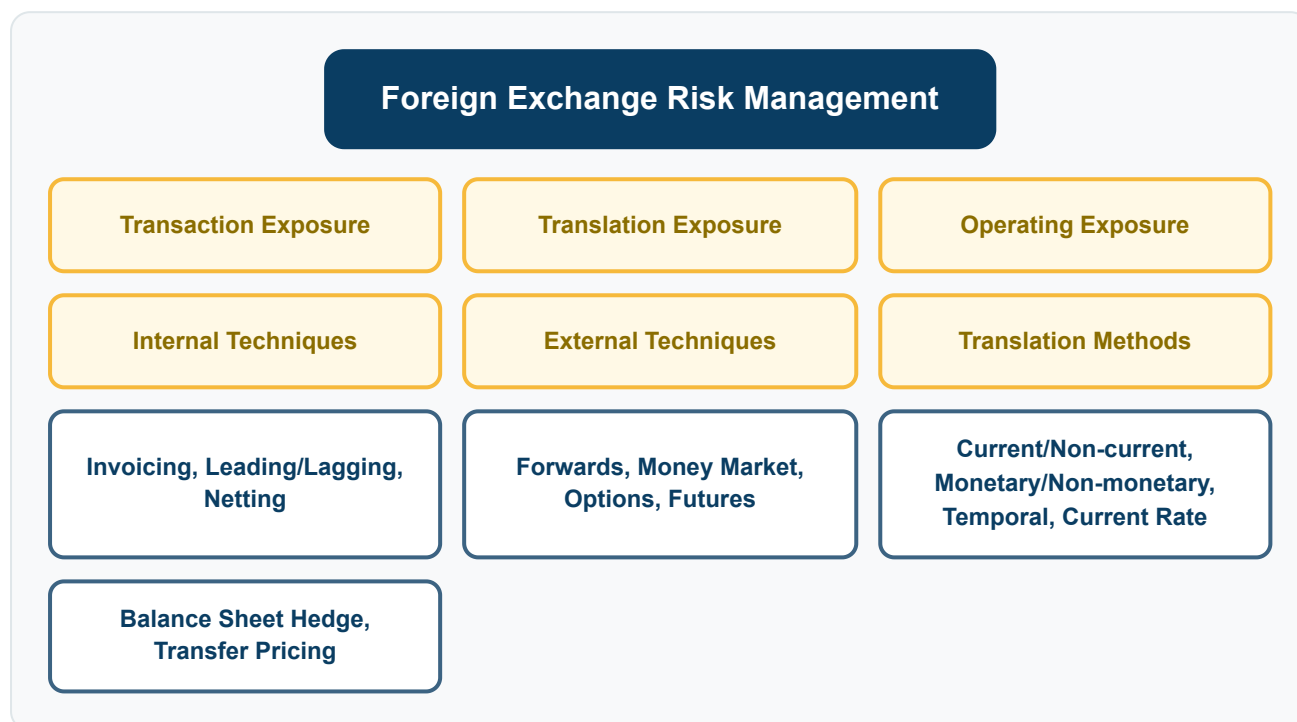
Though various ways outlined above will be necessary for effective management of economic exposure, financial products should be used as supplements as far as possible. The firm can use forward, futures or option contracts. These contracts can be rolled over several times, if the situation so demands. Also, the firm can borrow and/or lend foreign currencies on long-term basis.

5 5 MARKS AREA – Operating Exposure

Explain the meaning of operating exposure and the various strategies for managing it. Frequently asked as a short theory question.

Module 16 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 16



Key Points for Revision

1. Transaction exposure = Effect of exchange rate movement between transaction date and settlement date
2. Internal techniques: Choice of currency, Leading/Lagging, Netting, Back-to-back, Sharing risk
3. External techniques: Forward market, Money market, Options, Futures
4. Forward market hedge: Sell forward if receivable; buy forward if payable
5. Money market hedge: Borrow, convert, invest, repay
6. Options hedge: Buy put for receivable; buy call for payable
7. Futures hedge: Sell futures if long in currency; buy futures if short
8. Translation exposure = Consolidation exposure; balance sheet exposure
9. Translation methods: Current/Non-current, Monetary/Non-monetary, Temporal, Current Rate
10. Current/Non-current: Current items at current rate; non-current at historical rate
11. Monetary/Non-monetary: Monetary items at current rate; non-monetary at historical
12. Temporal: Same as monetary/non-monetary; inventory at historical unless at market
13. Current Rate: All assets and liabilities at current rate; equity at historical
14. Balance sheet hedge: Match exposed assets and liabilities in same currency
15. Hard currency: Likely to appreciate; Soft currency: Likely to depreciate
16. Increase hard-currency assets; decrease soft-currency assets
17. Indirect methods: Exposure netting, Leading/Lagging, Transfer pricing
18. Operating exposure = Strategic exposure; affects future revenues and costs
19. Economic exposure = Operating exposure + Transaction exposure
20. Management of operating exposure: Diversification, Currency zones, Sourcing flexibility, Flexible manufacturing, R&D, Financial hedges
21. Transfer pricing: Higher prices to soft-currency subsidiaries; lower to hard-currency
22. Translation exposure is notional; no real cash flow

Comprehensive Formula Handbook – Module 16

Transaction Exposure	Effect of exchange rate movement between transaction and settlement dates
Translation Exposure	Need to translate foreign currency values of assets and liabilities
Operating Exposure	Impact on future revenues and costs due to exchange rate changes
Economic Exposure	Operating Exposure + Transaction Exposure
Forward Hedge	Sell forward for receivable; Buy forward for payable

Money Market Hedge

Borrow, Convert, Invest, Repay

Options Hedge

Buy Put for receivable; Buy Call for payable

Futures Hedge

Sell futures if long; Buy futures if short

Balance Sheet Hedge

Match exposed assets and liabilities in same currency

One-Night Revision Notes – Module 16

Last Night Before Exam – Module 16

- **Transaction Exposure:** Effect of exchange rate movement between transaction and settlement dates
- **Internal Techniques:** Invoicing, Leading/Lagging, Netting, Back-to-back, Sharing risk
- **External Techniques:** Forwards, Money Market, Options, Futures
- **Forward Hedge:** Sell forward for receivable; Buy forward for payable
- **Money Market Hedge:** Borrow, Convert, Invest, Repay
- **Options Hedge:** Buy Put for receivable; Buy Call for payable
- **Futures Hedge:** Sell futures if long; Buy futures if short
- **Translation Exposure:** Consolidation exposure; balance sheet exposure
- **Translation Methods:** Current/Non-current, Monetary/Non-monetary, Temporal, Current Rate
- **Balance Sheet Hedge:** Match exposed assets and liabilities in same currency
- **Operating Exposure:** Strategic exposure; affects future revenues and costs
- **Economic Exposure:** Operating + Transaction
- **Management of Operating Exposure:** Diversification, Currency zones, Sourcing flexibility, Flexible manufacturing, R&D, Financial hedges

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Transaction exposure – internal and external techniques – 10 marks
- Forward market hedge – 5–10 marks
- Money market hedge – 5–10 marks
- Options hedge – 5–10 marks
- Futures hedge – 5 marks
- Translation exposure – methods and management – 5–10 marks
- Operating exposure – management techniques – 5 marks
- Balance sheet hedge – 5 marks
- Transfer pricing – 5 marks

Final Checklist – Module 16

✔ Section D Completed!

- Can I explain the meaning of transaction exposure?
- Can I list and explain internal techniques for managing transaction exposure?
- Can I list and explain external techniques for managing transaction exposure?
- Can I apply forward market hedge?
- Can I apply money market hedge?
- Can I apply options hedge?
- Can I apply futures hedge?
- Can I explain the meaning of translation exposure?
- Can I apply the four translation methods?
- Can I explain balance sheet hedge?
- Can I explain transfer pricing as a management tool?
- Can I explain the meaning of operating exposure?
- Can I list and explain strategies for managing operating exposure?
- Can I differentiate between transaction, translation, and operating exposure?
- Have I memorised all key concepts from this module?

END OF MODULES 14, 15 & 16

Section D – International Financial Management Completed

Next: Section E – Digital Finance (Module 17)

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17

Digital Finance

Master Revision Handbook · December 2026 Edition

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Module 17 – Digital Finance

Module Objective

Primary Objective

To obtain an overview of various components of digital finance to better understand the interrelationship among them. To understand the meaning of digital finance, understand the difference between traditional and digital finance, appreciate in detail various components of digital finance, and appreciate the regulatory framework and governance issues in a digital finance environment.

Mapped CMLO: 1a, 1b, 1c

Learning Outcomes

Students will be able to...	Application Skill
Understand the meaning of digital finance and the difference between traditional and digital finance.	Compare and contrast traditional and digital financial services; identify benefits and challenges.
Appreciate, in detail, various components of digital finance.	Identify and explain digital infrastructure, digital money, digital assets, and digital financial services.
Appreciate the regulatory framework and governance issues in a digital finance environment.	Analyse Fintech laws and regulations in India; understand regulatory sandbox and RegTech.

Coverage Matrix

Ch.	Topic	Weightage	Exam Relevance
17.1	Meaning, Traditional Finance vs. Digital Finance	HIGH 2%	Theory
17.2	Digital Finance Ecosystem	HIGH 2%	Theory
17.3	Regulation and Governance in a Digital Finance Environment	HIGH 1%	Theory

Expected Examination Areas – Dec 2026

DEC 2026 LIKELY AREAS

- Meaning and benefits of Digital Finance – **5 marks**
- Traditional vs Digital Finance – **5 marks**
- Digital Finance Ecosystem components – **5–10 marks**
- Digital Infrastructure – **5 marks**
- Digital Money – CBDC – **5 marks**
- Digital Assets – NFTs, Cryptocurrencies, Stablecoins – **5–10 marks**
- Digital Financial Services – Wallets, UPI, Neo-Banks, FinTech – **5–10 marks**
- Regulation and Governance – **5 marks**
- Digital Finance Cube – **5 marks**

Frequently Tested Concepts

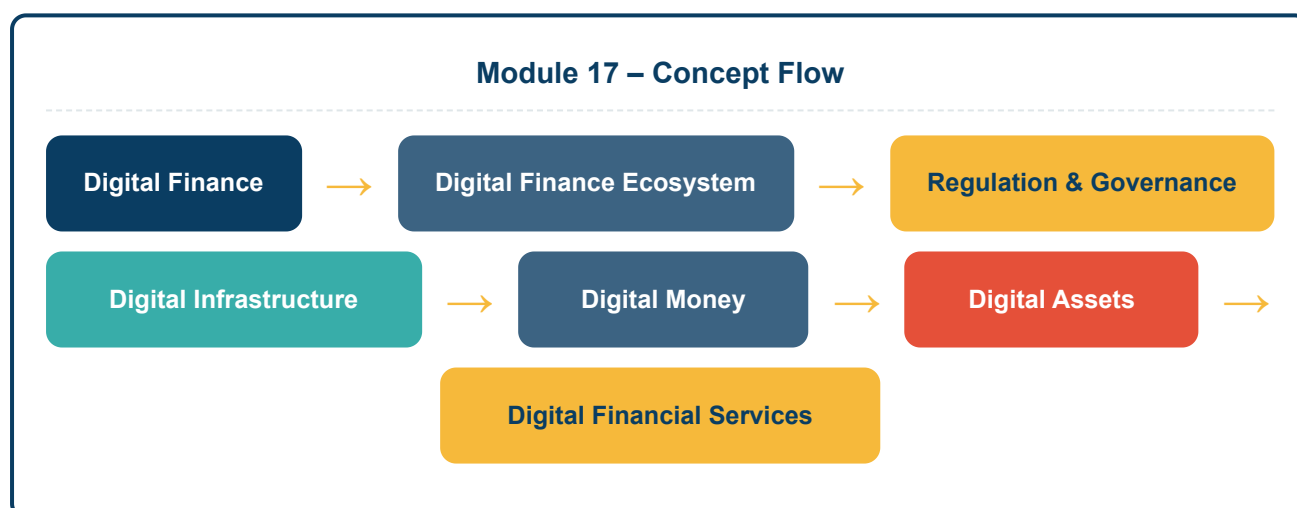


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★ FREQUENTLY ASKED – MODULE 17

- **Digital Finance benefits** – theory
- **Traditional vs Digital** – comparison
- **Digital Finance Ecosystem** – four components
- **Cryptocurrencies** – features, advantages, disadvantages
- **Stablecoins** – variants and limitations
- **UPI** – features and benefits
- **Neo-Banks** – features and benefits
- **Regulation** – PSS Act, RBI Master Directions

17.1 Meaning, Traditional Finance vs. Digital Finance

Chapter Overview

This chapter introduces the concept of digital finance, compares it with traditional finance, and discusses the benefits of digital finance.

Learning Objectives

- Understand the meaning and concept of digital finance
- Differentiate between traditional and digital finance
- Appreciate the benefits of digital finance
- Understand the role of technology in transforming financial services

17.1.1 Meaning of Digital Finance

Introduction

Financial services are the lifeblood of an economy, enabling households and businesses alike to buy, save, invest, and protect themselves against risk. Yet in many emerging economies today, larger section of individuals and small businesses lack the access to basic financial services. Around two billion people in the developing world lack access to a bank, and 200 million small businesses cannot get the credit they need to grow, a gap estimated at \$2.2 trillion.

The solution for the above problem can be summed up in two words: **Digital Finance**.

Definition

Digital finance is the delivery of traditional financial services digitally, through devices such as computers, tablets and smartphones. In other words, digital finance is the term used to describe the impact of new technologies on the financial services industry.

According to Gomber, Koch, and Siering (2017), digital finance encompasses a magnitude of new financial products, financial businesses, finance-related software, and novel forms of customer communication and interaction - delivered by FinTech companies and innovative financial service providers.

While there is no standard definition of digital finance, there is some consensus that digital finance encompasses all products, services, technology and/or infrastructure that enable individuals and companies to have access to payments, savings, and credit facilities via the internet (online) without the need to visit a bank branch or without dealing directly with the financial service provider.

While technological innovation in finance is not new, investment in new technologies has substantially increased in recent years with the pace of innovation in technologies being exponential. Artificial intelligence, social networks, machine learning, mobile applications, distributed ledger technology, cloud computing and big data analytics have given rise to new services and business models to be used by established financial institutions and new market entrants. Accordingly, digital finance is increasingly becoming a new idea to be analyzed and experimented separately.

17.1.2 Traditional Finance vs. Digital Finance

Traditional Finance	Digital Finance
Banking at Branches	Online banking, mobile banking apps, telebanking
Payment in physical mode	Payment in cashless digital modes such as netbanking, debit/credit cards, wallets, UPI etc.
Investment in Real or Financial Assets	Investment in Digital Assets such as Cryptocurrencies
Availing insurance and other services through branch or agents	Availing insurance and other services through apps

💡 Key Differences in Customer Journey (Availing Credit)

Traditional Finance	Digital Finance
Travel to branch	Apply via mobile phone
Meet with representative	Get approved and receive funds instantly
Wait to receive decision	Minutes (entire process)
Travel back to branch	—
Receive funds	—

17.1.3 Benefits of Digital Finance



Boosts GDP

Digital finance promises to boost the gross domestic product (GDP) of digitalized economies by providing convenient access to diverse range of financial products and services including credit facilities for individuals as well as small, medium and large businesses.

This significantly increases aggregate expenditure thereby improving GDP figures. Digital finance can also lead to greater economic stability and increased financial intermediation, both for customers and for the economy.



Bank Profitability

Innovation in digital finance can have long-term positive effects for banking performance. In a study, Scott et al. (2017) have showed that adoption of SWIFT, a network-based technological infrastructure and set of standards for worldwide interbank telecommunication, has significant positive impact on bank's profitability in the long run in 29 countries across USA and Europe. They also have found that these profitability effects are greater for small banks than for large banks.



Higher Tax Revenue

Digital finance also benefits governments by providing a platform to facilitate increase in aggregate expenditure which subsequently generates higher tax revenue arising from increase in the volume of financial transactions.



Reduced Counterfeit and Money Laundering

Digital finance also benefits the money market regulators. This is because full-scale digital finance adoption can significantly reduce the circulation of counterfeit currency and instances of money laundering etc.



Financial Inclusion

Digital finance has the potential to provide affordable, convenient and secure banking services to poor individuals in developing countries. Recent improvement in the



Consumer Benefits

Through adoption of digital finance users enjoy benefits like greater control of personal finance, quick financial decision making, and the ability to make and receive payments within seconds.

accessibility and affordability of digital financial services around the world has helped millions of poor customers move from cash-based transactions to formal digital financial transactions on secured digital platforms. Digital finance can also lead to greater financial inclusion, expansion of financial services to non-financial sectors, and the expansion of basic services to individuals since nearly most of the people in the developing world already own a mobile phone.

5 5 MARKS AREA – Digital Finance

Define digital finance, compare traditional vs digital finance, and explain the benefits of digital finance. Frequently asked as a short theory question.

17.2 Digital Finance Ecosystem

Chapter Overview

This chapter covers the components of the Digital Finance Ecosystem – Digital Infrastructure, Digital Money, Digital Assets, and Digital Financial Services – and the Digital Finance Cube.

Learning Objectives

- Understand the concept of the Digital Finance Ecosystem
- Identify components of Digital Infrastructure
- Understand Digital Money including CBDC
- Understand Digital Assets including NFTs, Cryptocurrencies, and Stablecoins
- Understand Digital Financial Services including Wallets, UPI, Neo-Banks, and FinTech
- Understand the Digital Finance Cube

Concept of Ecosystem

The term 'ecosystem' is generally used in biological sciences. However, now-a-days it is being increasingly adopted in business literature as well. As per Collin's English Dictionary, 'ecosystem' is defined as 'all the plants and animals that live in a particular area together with the complex relationship that exists between them and their environment.' When used in the context of digital finance, the term 'Digital Finance Ecosystem' may be defined as all the users or participants together their complex transactional relationship in a given digital environment.

The users or participants are the consumers of products or services or buyers of digital assets as well as the suppliers and sellers of the same while the environment, at large, comprises the infrastructure, the assets, the products or the services as well as money being the medium of exchange.

Components of Digital Finance Ecosystem



Digital Infrastructure

Digital technologies that bring together and interconnect physical and virtual technologies such as computer, storage, network, applications etc. to provide the foundation for an organisation's digital operations.



Digital Money

Digital or electronic representation of value; includes cards, e-money, and Central Bank Digital Currency (CBDC).



Digital Assets

Non-Fungible Tokens (NFTs), Private Cryptocurrency, Stablecoins; anything stored digitally that is uniquely identifiable and can be used to realize value.



Digital Financial Services

Financial services accessed and delivered through digital channels; includes Wallets, UPI, Neo-Banks, FinTech.

17.2.1 Digital Infrastructure

Concept

Digital infrastructure refers to the digital technologies that bring together and interconnect physical and virtual technologies such as computer, storage, network, applications etc. to provide the foundation for an organisation's digital operations. Businesses use this foundation to re-architect their services for global digital delivery and to access the ecosystems and capabilities they need to rapidly build products and services and deliver them at scale.

Components of Digital Infrastructure



Internet

The Internet is the global system of interconnected computer networks that uses the Internet protocol suite (TCP/IP) to communicate between networks and devices. It is a network of networks that consists of private, public, academic, business, and



Mobile Telecom & Digital Communication Suites



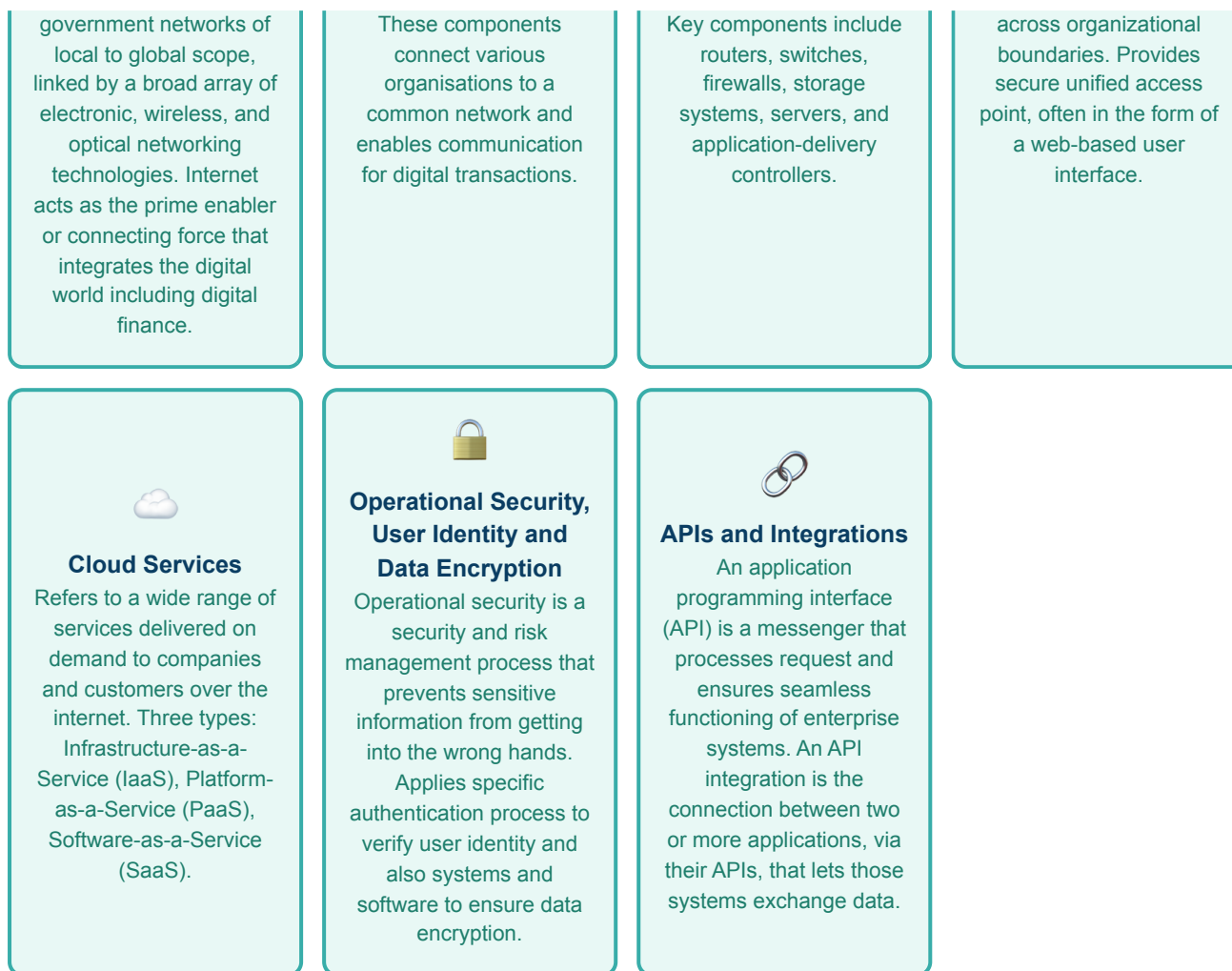
Data Centers and Networks

A data center is a physical facility that organisations use to house their critical applications and data.



Enterprise Portals, Platforms, Systems, and Software

An enterprise portal (EIP) is a framework for integrating information, people and processes



17.2.2 Digital Money

Concept

Money has been the medium of exchange in commercial transactions since the primitive ages. Over the years, however, it took various forms such as metal coins, paper notes and the latest being digital money. Digital money or e-money is the digital or electronic representation of value. In a broader sense, it includes plastic money or debit and credit cards or stored value cards also which basically represent the amount stored in account or the credit granted by the banks. However, digital money is largely interpreted as digital currency issued by the central bank of a country and is essentially a digital version of cash that can be stored and transferred using an internet or mobile application. It may also include cryptocurrencies and stablecoins if they are accepted as the medium of exchange (though largely these are seen as digital assets as they are not everywhere accepted as the medium of exchange).

Central Bank Digital Currencies (CBDC)

Concept

Central Bank Digital Currencies (CBDC) are digital tokens, similar to cryptocurrency, issued by a central bank. It is the virtual money backed and issued by a central bank. They are pegged to the value of that country's fiat currency. A CBDC is a high-security digital instrument; like paper banknotes, it is a means of payment, a unit of account, and a store of value. Like paper currency, each unit is uniquely identifiable to prevent counterfeiting.

Potential Advantages of CBDC

- Technological efficiency in storing and transacting with reduced cost
- Keeping track of transactions, exact location of money
- Preventing illegal activities like money laundering, tax evasion, terror financing
- Providing a digital record of every transaction
- More secure payment system
- Introducing competition and resilience in the domestic payments market
- Promoting financial inclusion

The present concept of "central bank digital currency" may have been partially inspired by Bitcoin and similar blockchain-based cryptocurrencies. However, a central bank digital currency would likely be implemented using a database run by the central bank, government, or approved private-sector entities. The database would keep a record (with appropriate privacy and cryptographic protections) of the amount of money held by every entity, such as people and corporations. In contrast to cryptocurrencies, a central bank digital currency would be centrally controlled (even if it was on a distributed database), and so a blockchain or other distributed ledger would likely not be required. This will make CBDCs more secure.

17.2.3 Digital Assets

Concept

A digital asset is anything that is stored digitally and is uniquely identifiable that the owner can use to realize value. In other words, a digital asset is anything that exists only in digital form and comes with a distinct usage right. Data that do not possess that right are not considered.

Types of digital assets include, but are not exclusive to: photography, logos, illustrations, animations, audio-visual media, presentations, spreadsheets, digital paintings, word documents, electronic mails, websites, and a multitude of other digital formats and their respective metadata.

In addition to above, digital assets may also include Non-Fungible Tokens, Private Cryptocurrency, Stablecoins which are immensely popular in today's digital age.

A. Non-Fungible Tokens (NFTs)

Concept

Non-fungible tokens (NFTs) are cryptographic assets on a blockchain with unique identification codes and metadata that distinguish them from each other. Unlike cryptocurrencies (which are fungible as each unit of cryptocurrency represent same value and characteristics), these are non-fungible as each NFT is unique. Non-fungible tokens can digitally represent any asset, including online-only assets like digital artwork and real assets such as real estate. Today, however, much of the current market for NFTs is centered around collectibles, such as digital artwork, sports cards, and rarities. Perhaps the most hyped space is NBA Top Shot, a place to collect non-fungible tokenized NBA moments in digital card form. Some of these cards have sold for millions of dollars.

NFTs are created through a process called 'asset tokenization'. Asset tokenization is the process by which an issuer creates digital tokens on a distributed ledger or blockchain (Ethereum being most popular), which represent either digital or physical assets. Blockchain guarantees that once you buy tokens representing an asset, no single authority can erase or change your ownership — your ownership of that asset remains entirely immutable.

NFTs can be bought and sold in NFT marketplace such as Rarible, OpenSea, Foundation. However, to buy NFTs from this marketplace, one will require a wallet and need to fund it. In most of the platforms wallets are required to be funded by cryptocurrencies and the widely accepted cryptocurrency in this context is the Ethereum.

B. Private Cryptocurrencies

Concept

Cryptocurrency, sometimes called crypto-currency or crypto, is any form of currency that exists digitally or virtually and uses cryptography to secure transactions. It's a peer-to-peer system that can enable anyone anywhere to send and receive payments. Instead of being physical money carried around and exchanged in the real world, cryptocurrency payments exist purely as digital entries to an online database describing specific transactions. When you transfer cryptocurrency funds, the transactions are recorded in a public ledger.

Working: Cryptocurrencies run on a distributed public ledger called blockchain, a record of all transactions updated and held by currency holders. Units of cryptocurrency are created through a process called mining, which involves using computer power to solve complicated mathematical problems that generate coins. Users can also buy the currencies from brokers, then store and spend them using cryptographic wallets.

💡 Examples of Cryptocurrencies

- **Bitcoin:** Founded in 2009, Bitcoin (BTC) was the first cryptocurrency and is still the most commonly traded. The currency was developed by Satoshi Nakamoto – widely believed to be a pseudonym for an individual or group of people whose precise identity remains unknown.
- **Ethereum:** Developed in 2015, Ethereum (ETH) is a blockchain platform with its own cryptocurrency, called Ether (ETH) or Ethereum. It is the most popular cryptocurrency after Bitcoin.
- **Litecoin:** This currency is most similar to bitcoin but has moved more quickly to develop new innovations, including faster payments and processes to allow more transactions.
- **Dogecoin:** Originally created as a joke after the run-up in Bitcoin, Dogecoin (DOGE) takes its name from an internet meme featuring a Shiba Inu dog. Unlike many digital currencies limiting the number of coins in existence, Dogecoin has unlimited issuance. It can be used for payments or sending money.



Advantages of Cryptocurrency

- Cryptocurrencies represent a new, decentralized paradigm for money
- Ensures easy and faster transfer of funds directly between two parties, without need for trusted third party
- Cryptocurrency investments can generate profits; easily traded on crypto exchanges; high liquidity and diversification



Disadvantages of Cryptocurrency

- Though they claim to be anonymous, cryptocurrencies are actually pseudonymous; leave a digital trail
- May facilitate money laundering; popular tool with criminals
- Ownership is highly concentrated (MIT study: 11,000 investors held 45% of Bitcoin's value)
 - Mining requires considerable energy
 - Extreme price volatility
- Crypto repositories (exchanges and wallets) can be hacked

C. Stablecoins

📌 Concept

A Stablecoin is a cryptocurrency which is pegged to any reserve asset like a fiat currency, commodity, or other cryptocurrencies. It is a tokenized version of the asset and can be introduced subtly into a blockchain ecosystem to facilitate seamless pass transactions, improved arbitrage, and exchange of value.

Many a times it is referred to as a utility token because it allows you to quickly buy and sell on decentralized exchanges that do not accept fiat currencies. However, these can also be used in centralized exchanges and reduce the processing time.

Uses of Stablecoin



Everyday Currency

Stablecoin can be used as an everyday currency. Unlike traditional crypto coins, which are subject to high degree of price fluctuations and volatility, stablecoins do not fluctuate



Smart Contracts

Stablecoins also have a great potential for smart contracts. Smart contracts are frequently based on other cryptocurrencies, such as Ethereum. Frequent price changes of cryptocurrencies can have an unpredictable

rapidly because they are backed by national currencies, commodities etc.

impact on the contract's terms. Therefore, the use of stablecoins like Tether can provide contract stability to both parties, by reducing market volatility and ensuring more secure contracts enforced by the blockchain.

Variants of Stablecoin

Variant	Description
Fiat-collateralized Stablecoins	Linked to the sovereign legal tenders of countries. Well-known examples include Tether and TUSD (True USD). However, these stablecoins are not created by the central authority. The issuer issues these tokens by depositing an equal amount of fiat in its reserves.
Commodity-backed Stablecoins	Backed by reserved assets other than fiat currencies—by commodities. Real estate, gold, silver, and various other precious metals are examples. Kitco Gold, for example, is backed by the company's gold reserves, and the token itself is based on the Ethereum-backed ERC-20 blockchain ecosystem.
Crypto-backed Stablecoins	Backed by any other cryptocurrency. Due to the volatile nature of cryptocurrencies, these stablecoins must be overcompensated in order to be collateralized. For example, to buy \$500 worth of the crypto-backed stablecoin, Maker DAO's Dai, one needs to deposit \$1,000 in ETH.
Algorithmic Stablecoins	Primarily non-backed stablecoins in which prices, token numbers, and other variables are manipulated with the help of special algorithms, software, and code in order to better manage supply and demand. This strategy allows the company to maintain the reserve peg in the event of price fluctuations.

Limitations of Stablecoins

- The value of stablecoins is based on people's trust in the company holding the collateralized reserve asset, and that trust may waver on occasion.
- Stablecoins may lose value if the company goes bankrupt.
- It is critical for the holders to declare solvency to maintain trust in the coin and its value.
- Unless there is a sense of unrest in the fiat or commodity markets, stablecoins aren't meant for trading gains.

17.2.4 Digital Financial Services

Concept

Digital Financial Services (DFS) are financial services (e.g., payments, remittances, and credit) accessed and delivered through digital channels, including via mobile devices. These encompass established instruments (e.g., debit and credit cards) offered primarily by banks, as well as new solutions built on cloud computing, digital platforms, and distributed ledger technologies (DLT), spanning mobile payments, and peer-to-peer (P2P) applications.

Advantages of Digital Financial Services



Improved Customer Experience

Digital technologies have changed the way financial services were provided. Now, customers enjoy a whole lot of information before the services can be availed.



Ease of Access

Because of the intervention of digital technology services can be accessed very easily. The customers need not visit the branches of the service providers anymore. Everything is possible a click of a mouse.



Streamlined Operations

Financial services in this digital era is much more streamlined. For example, in case of insurance services, from enquiry to customer on boarding, claim management to settlement – everything is now being done online and with minimum requirement of submission of physical documents. Even KYC (Know Your Customer) is also being done electronically.



Reduction in Cost of Delivery

Due to enhanced use of digital technology, companies are operating with minimum physical facilities and manpower. This has contributed heavily towards the profitability of the organisations. This savings is being shared with the customers in form of reduction in fees.

A. Payment System – Digital Wallets

Concept

These are basically a type of prepaid payment instruments. A prepaid payment instrument refers to certain instruments that facilitate purchase of goods and services against the value stored in them. Wallets are closed or semi-open system payment instruments which are reloadable and accepted by specified service providers or merchants with which the wallet license holder has the contract. A customer may open a digital wallet with valid credentials (email and password). While a basic wallet may not ask for KYC, the customer may need to comply with the same for an increased wallet limit. The wallets can be loaded by transferring money from bank account directly. Often the wallet service providers offer cashback for using the wallet services. Some examples of popular digital wallets are Amazon Pay, Paytm, Mobikwik, Freecharge etc.

B. Unified Payment Interface (UPI)

Concept

Another immensely popular digital payment instrument is Unified Payment Instrument or UPI. Unified Payments Interface (UPI) is a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing & merchant payments into one hood.

Unique Features of UPI

- Immediate money transfer through mobile device round the clock
- Single mobile application for accessing multiple bank accounts
- Single Click 2 Factor Authentication aligned with the Regulatory guidelines
- Virtual address of the customer for Pull & Push provides for incremental security with the customer not required to enter the details such as Card no, Account number, IFSC etc.
- QR Code enabled
- Best answer to Cash on Delivery hassle, running to an ATM or rendering exact amount
- Merchant Payment with Single Application or In-App Payments
- Utility Bill Payments, Over the Counter Payments, QR Code (Scan and Pay) based payments
- Raising Complaint from Mobile App directly



Benefits to Banks

- Single click Two Factor authentication
- Universal Application for transaction
- Leveraging existing infrastructure
- Safer, Secured and Innovative
- Payment basis Single/ Unique Identifier
- Enable seamless merchant transactions



Benefits to Customers

- Round the clock availability
- Single Application for accessing different bank accounts
- Use of Virtual ID is more secure, no credential sharing
 - Single click authentication
- Raise Complaint from Mobile App directly



Benefits to Merchants

- Seamless fund collection from customers - single identifiers
- No risk of storing customer's virtual address like in Cards
 - Tap customers not having credit/debit cards
- Suitable for e-Com & m-Com transaction
- Resolves the COD collection problem
- Single click 2FA facility to the customer - seamless Pull
 - In-App Payments (IAP)

Some Examples of UPI Service Providers

In India, some popular UPI services are BHIM UPI, AXIS Bank UPI, PhonePe, Paytm, Google Pay etc.

C. Neo-Banks

Concept

A neobank (also known as an online bank, internet-only bank, virtual bank or digital bank) is a type of direct bank that operates exclusively online without traditional physical branch networks. They leverage technologies such as artificial intelligence and machine learning to offer personalised and customised financial services to end-users and minimise the overall operating cost.

Benefits of Neo-Banks

- Highly convenient and user-friendly banking services
- Built for a niche audience
- Cost-effective alternative to challenger and traditional banks
- Offers digital banking services, such as, savings accounts, prepaid cards, bill payments, and money transfers
- Provide financial management services
- 24×7 customer support
- High-security features
- Simple and user-friendly mobile app interface
- Transparent structure with real-time notification feature

Top Neo-Banks in India: Jupiter, InstantPay, PayZollo, Freo, Chqbook, Neo-bank, Fi Money, Niyo, Finin, FamPay, North Loop, Fold, Tide, Mahila Money, Mool, OCareNeo.

D. Fintech

Concept

The technological revolution has led to the evolution of a new breed of tech-enabled firms that are constantly putting their efforts to redefine the financial solutions. These firms are collectively called Fintech firms.

According to the Financial Stability Board (FSB), 'Fintech' may be defined as 'technologically enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services'. In other words, it is the umbrella term which refers to all tech-enabled financial innovations targeted at improving the accessibility and quality of financial services. In that sense, all digital applications in the sphere of financial services may be included in fintech, but, to be specific, by 'fintech' we shall mean the tech-enabled start-ups.

Types of Fintech Services

- **Alternative Lending** (e.g., retail lending, aggregators)
- **Insurtech** (e.g., digital insurers, insurance aggregators)
- **Payments** (e.g., Prepaid payment instruments)
- **Wealthtech** (e.g., Investment portfolio management services)
- **Regtech** (e.g., Accounting, taxation etc.)

Fintech in India

In India, the fintech movement, in its popular sense, started in the second half of 1990s. PineLabs, a digital payment solution provider, was founded in 1998 followed by BillDesk in 2000. Policybazar, the online insurance aggregator came in 2008. Thereafter India saw a huge growth in fintech firms in the next 20 years. As of June 2020, India has around 2174 fintech start-ups. Bengaluru and Mumbai contribute to most of these companies. According to Hurun Global Unicorn List 2020, India was the home to 21 unicorns with a collective valuation of \$73.2 Bn as on 31.03.2020.

17.2.5 Digital Finance Cube

Concept

In the light of the discussion on Digital Finance Ecosystem, the digital finance landscape may be described in form of a Digital Finance Cube (Concept Source: CPA Digital Finance Program, Australia).

A digital finance cube has three dimensions: (I) Digital Finance business functions, (II) Digital Finance Technologies and Technological Concepts, and (III) Digital Finance Institutions. Each dimension is further classified into a number of constituents.

Digital Finance Cube – Three Dimensions

Dimension I – Business Functions	Dimension II – Technologies & Concepts	Dimension III – Institutions
• Digital Financing • Digital Investments • Digital Money • Digital Payments • Digital Insurance • Digital Finance Advice	• Blockchain • Social Networks • Near Field Communication • Peer to Peer Technology • Big Data Analytics • Enablers (Mobile, Cloud, AI)	• FinTech Companies • Traditional Service Providers

Detailed Description – Dimension I: Digital Finance Business Functions

- **Digital Financing:** Includes invoice financing and invoice factoring, electronic invoicing, lease financing, crowdfunding.
- **Digital Investments:** Includes investment advisory services including arrangement of transactions, online brokerage, mobile and social trading, high frequency and algorithmic B2B trading.
- **Digital Money:** Includes all digital innovations in how money and currency are created, stored, valued, regulated or exchanged.
- **Digital Payments:** Refers to electronic payments through wallets or UPIs.
- **Digital Insurance:** In B2B space, digital insurance platforms provide value-added services including data analytics. In B2C space, provides innovative services to customers.
- **Digital Finance Advice:** Includes aggregators who provide comparative quotes of financial services.

17.3 Regulation and Governance in a Digital Finance Environment

Chapter Overview

This chapter covers the regulatory framework and governance issues in a digital finance environment, including the role of regulators, Fintech laws and regulations in India, and governance initiatives.

Learning Objectives

- Understand the role of regulators in digital finance
- Identify the key regulatory frameworks governing FinTech in India
- Understand the concept of Regulatory Sandbox and RegTech
- Appreciate the governance initiatives in digital finance

17.3.1 Role of Regulators

Concept

Enabling regulation is critical for the success of digital finance. While the shift to a digital ecosystem brings new entrants, technologies, and innovative business models, it also brings with it new challenges to policymakers and regulators who want to manage the risks to stability and integrity without stifling innovation.

Two aspects are likely to be most important in defining the role of regulators in the context of digital finance - **consumer protection** and the **relationship between competition and innovation**.

With the rise of innovative technologies and new services, regulators will continue to be responsible for ensuring that the issue of consumer protection and digital finance is increasingly on their radar. Additionally, without appropriate treatment of consumers and their trust in digital finance, the digital ecosystem is unlikely to thrive. As business models transform and the complexity of offerings increases, it will be harder to regulate and ensure consumer protection. This puts regulators in a difficult position: they must weigh social inclusion and commercial benefit against protecting citizen privacy, choice, and control.

There are three goals when it comes to consumer protection regulation:

- Ensure consumers are informed,
- Prevent unfair practices by providers, and
- Ensure consumers have access to dispute and complaint mechanisms (while balancing onerous provider restrictions).

Regulators have a role to play in addressing digital finance competition bottlenecks, which can include: 1) connectivity and channel issues, particularly for USSD; 2) agent network issues, such as exclusivity; 3) account-level barriers, such as interoperability; and 4) application level issues, such as APIs. More recently, CGAP also identified data sharing as a key competition issue, explaining that improving standards for permitted and non-permitted uses of consumer data should be a priority, adding that authorities will likely need to coordinate how data is owned, accessed, and shared.

To avoid stifling innovation and to encourage safe and responsible development, a growing number of regulators are turning to a 'sandbox' approach. Initially launched by the FCA in the UK in 2014, a sandbox allows businesses to test out new services, business models, and delivery channels in a live environment where consumers are protected. Sandboxes are an important complement to policymakers' existing approaches to dealing with innovation.

Also, RegTech is gaining momentum as new solutions are developed and tested. A portmanteau of 'regulatory technology,' RegTech was first established as a subset of FinTech in 2015 by the UK's FCA and has since gained momentum for financial policymaking and supervision. RegTech is centered around technology that allows financial service providers to meet regulatory requirements in a more effective and efficient way—this includes risk identification, management tools, and quantitative- and information-based obligations. Generally, four key characteristics are attributed to RegTech: it is agile, fast, integrative, and it relies on analytics. RegTech has the potential to change the financial supervisory landscape.

17.3.2 Fintech Laws and Regulations in India

Regulatory Landscape

The regulatory landscape governing FinTech in India is largely fragmented. There is hardly a single set of regulations or guidelines which uniformly govern various FinTech products available in India. The following sources are important in this respect.

Regulation / Act	Key Provisions
Payment and Settlement Systems Act, 2007	The principal legislation governing payments regulation in India. It prohibits the commencement and operation of a "payment system" without prior authorisation of the RBI. The Act defines a "payment system" as "a system that enables payment to be effected between a payer and a beneficiary, involving clearing, payment or settlement service of all of them, but does not include a stock exchange". Accordingly, payment systems include the systems enabling credit card operations, debit card operations, smart card operations, money transfer operations, PPIs, etc.
Master Direction on Issuance and Operation of Prepaid Payment Instruments	Issued by the RBI on October 11, 2017 and amended from time to time ("PPI Master Direction") prescribes the eligibility criteria for PPI issuers, permissible debits and credits from PPIs and other operational guidelines to be followed by PPI issuers while issuing PPIs to their customers in India. PPIs fall within the definition of a "payment system" under the PSS Act and are therefore required to comply with the PSS Act and the PPI Master Direction.
NPCI Guidelines governing UPI Payments	UPI Payments in India are primarily governed by the DPI Procedural Guidelines issued by the NPCI. Under the current framework, only banks can directly integrate with the UPI platform to provide money transfer services to their customers. Banks are, however, permitted to engage technology providers for the design and operation of mobile applications for the purpose of UPI Payments, subject to compliance with certain eligibility and prudential norms prescribed by the NPCI.
Reserve Bank of India Act, 1934 allowing NBFCs in this space	NBFCs are primarily governed by the Reserve Bank of India Act, 1934 and a series of master directions and circulars regulating the licensing and operation of NBFCs in India. Most digital lenders operating in India are licensed as NBFCs. Key regulations include: Master Direction - NBFC - Systemically Important Non-Deposit taking Company and Deposit taking Company (Reserve Bank) Directions dated September 1, 2016; Master Direction - NBFC - Non-Systemically Important Non-Deposit taking Company (Reserve Bank) Directions dated September 1, 2016; and Master Direction - NBFC - Acceptance of Public Deposits (Reserve Bank) Directions dated August 25, 2016, each as amended from time to time.
Guidelines regulating P2P lending platforms	P2P lending platforms are primarily governed by the Master Directions - NBFC - Peer to Peer Lending Platform Directions 2017, which prescribe lender exposure norms and aggregate borrowing limits in relation to the operation of P2P lending platforms in the country.

Regulation / Act	Key Provisions
Guidelines governing payment aggregators/gateways	The Circular on Guidelines on Regulation of Payment Aggregators and Payment Gateways dated March 17, 2020 ("Payment Intermediary Guidelines"), recently updated on March 31, 2021, sets out the legal framework applicable to payment intermediaries (such as payment aggregators and payment gateways) operating in India. While the RBI has sought to directly regulate payment aggregators, it has stipulated only baseline technology-related recommendations for payment gateways, given that payment gateways do not handle funds.
Anti-money laundering laws	The regulator primarily responsible for overseeing and enforcing anti-money laundering regulations and measures is the RBI. Regulations governing entities offering financial products in India are the Prevention of Money Laundering Act, 2002, the Prevention of Money Laundering (Maintenance of Records) Rules, 2005 and the RBI's Master Directions on KYC dated February 25, 2016 (as amended from time to time).
Acts protecting data privacy and protection	Access to customer data, data privacy and protection have each become an increasingly important issue with FinTech platforms collecting and storing various forms of customers' personal, financial, and behavioural data. India does not today have a comprehensive data privacy framework. The Information Technology Act, 2000 and the IT (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules, 2011 are the two key regulations governing protection of personal data.

17.3.3 Governance in Digital Finance – Initiatives

Concept

Digital innovation in finance is happening at a tremendous pace and often regulators' efforts to keep up with it fall short by a mile.

The key governance issues that pose challenge for the regulators include:

- Governance of the internet economy and the global internet
- Management of intellectual property rights with innovation drive competition
- Taxation
- Customer Privacy
- Owning and sharing data

Traditionally, financial services are highly regulated, but increasingly, legacy models of regulation and supervision, where a static set of rules is set for industry to comply with, are no longer sufficient, thus requiring a broader view of governance that goes beyond just governments: looking at collaborative, principle-based ways of ensuring positive outcomes for consumers and society.

Recognizing such a need, the UN Secretary General's Task Force on Digital Financing of the SDGs (DFTF) established the Dialogue on Global Digital Finance Governance to explore the nexus of Big Fintechs (the dominant Fintechs) and sustainable development. Through its findings, the Dialogue aims to catalyze governance innovations that take greater account of the SDG impacts of Big Fintechs and are more inclusive of the voices of developing nations.

The Dialogue on Global Digital Finance Governance is hosted by the Swiss and Kenyan Governments and stewarded jointly by the United Nations Development Programme (UNDP) and United Nations Capital Development Fund (UNCDF).

The Dialogue bridges gaps in awareness of Big Fintechs' SDG-impacts by providing an overview of the pertinent issues that regulators and policymakers should consider at the nexus of sustainable development and Big Fintech governance.

Beyond embedding awareness, the Dialogue has developed a set of principles to guide policy makers, regulators and BigFintechs in the design of Big Fintech governance frameworks that support sustainable development. The toolkit also includes a series of recommendations for potential future regulatory pathways. The principles include:

- Ensuring foundational financial regulatory objectives
- Developing reflexive and iterative regulation
- Fostering responsible actors
- Ensuring oversight and enforcement
- Instilling a commitment to sustainable development

The above principles have been further detailed keeping in mind the role of Big Fintechs. In addition, the Dialogue provides a number of recommendations to support implementation of the principles.

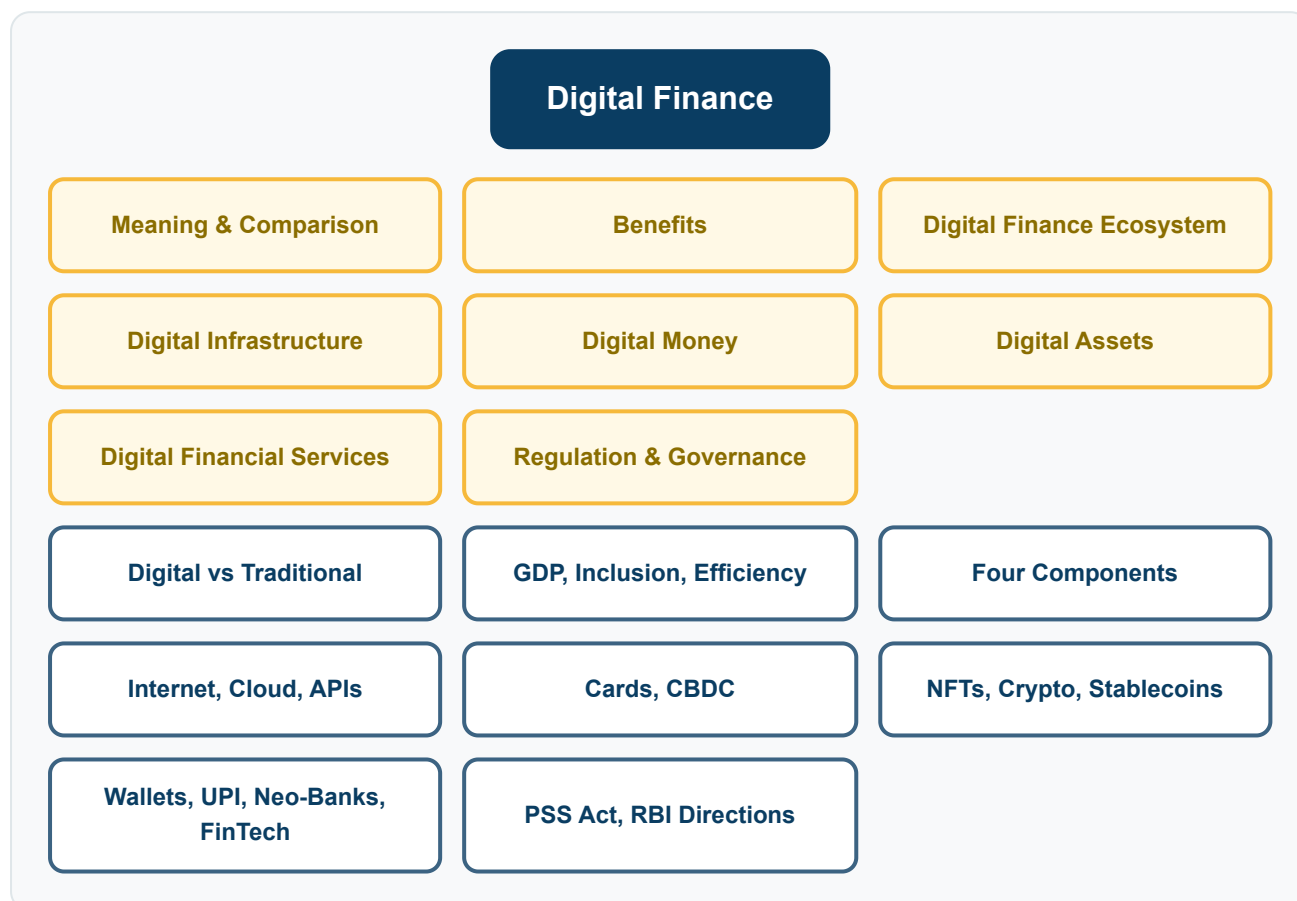
In India, governance norms specific to digital finance is still not existing. Regulators are addressing various issues through different acts and regulations. However, considering the nature of complexities involved, a comprehensive governance framework may be necessitated very soon.

10 10 MARKS AREA – Digital Finance

Comprehensive question on Digital Finance Ecosystem, Digital Assets, Digital Financial Services, and Regulation & Governance. Frequently asked for 10 marks.

Module 17 – Comprehensive Revision

Module Summary – Mind Map



Top Examination Points – Module 17



Key Points for Revision

1. Digital finance = Delivery of traditional financial services digitally through computers, tablets and smartphones
2. Digital finance encompasses all products, services, technology and/or infrastructure enabling access to payments, savings, and credit via internet
3. Traditional finance = Banking at branches, physical payment, real assets, branch/agent insurance
4. Digital finance = Online/mobile banking, cashless digital payments, digital assets, app-based insurance
5. Benefits of digital finance: Boosts GDP, bank profitability, higher tax revenue, reduced counterfeit, consumer benefits, financial inclusion
6. Digital Finance Ecosystem = Users + Complex transactional relationship + Environment
7. Four components: Digital Infrastructure, Digital Money, Digital Assets, Digital Financial Services
8. Digital Infrastructure: Internet, Mobile telecom, Data centers, Enterprise portals, Cloud services, Operational security, APIs
9. Cloud Services: IaaS, PaaS, SaaS
10. Digital Money = Digital or electronic representation of value
11. CBDC = Digital tokens issued by central bank; pegged to fiat currency; high-security digital instrument
12. Advantages of CBDC: Technological efficiency, tracking, preventing illegal activities, digital record, more secure, competition, financial inclusion
13. Digital Assets: NFTs, Private Cryptocurrency, Stablecoins
14. NFTs = Cryptographic assets on blockchain with unique identification codes and metadata
15. NFTs created through asset tokenization; Ethereum most popular blockchain
16. Cryptocurrency = Digital/virtual currency using cryptography; peer-to-peer system
17. Cryptocurrency runs on blockchain; units created through mining; stored in crypto wallets
18. Examples: Bitcoin (2009, Satoshi Nakamoto), Ethereum (2015), Litecoin, Dogecoin
19. Advantages of Cryptocurrency: Decentralized, faster transfer, investment profits
20. Disadvantages: Pseudonymous, money laundering, concentrated ownership, energy intensive, volatile, hackable
21. Stablecoin = Cryptocurrency pegged to reserve asset (fiat, commodity, crypto)
22. Stablecoin variants: Fiat-collateralized, Commodity-backed, Crypto-backed, Algorithmic
23. Uses of Stablecoin: Everyday currency, smart contracts
24. Limitations of Stablecoins: Trust dependent, bankruptcy risk, solvency declaration, not for trading gains
25. Digital Financial Services = Financial services accessed and delivered through digital channels
26. Advantages of DFS: Improved customer experience, ease of access, streamlined operations, reduced cost
27. Digital Wallets = Prepaid payment instruments; reloadable; accepted by specified merchants
28. UPI = System that powers multiple bank accounts into single mobile application
29. UPI features: Immediate transfer, single app, 2FA, virtual address, QR code
30. UPI benefits to Banks, Customers, and Merchants

31. Neo-Banks = Direct bank operating exclusively online without physical branches
32. Neo-Banks benefits: Convenient, niche, cost-effective, digital services, 24×7 support, high security
33. Fintech = Technologically enabled innovation in financial services
34. Fintech types: Alternative Lending, Insurtech, Payments, Wealthtech, Regtech
35. Digital Finance Cube = Three dimensions: Business Functions, Technologies & Concepts, Institutions
36. Dimension I Business Functions: Digital Financing, Investments, Money, Payments, Insurance, Finance Advice
37. Dimension II Technologies: Blockchain, Social Networks, NFC, P2P, Big Data, Enablers
38. Dimension III Institutions: FinTech Companies, Traditional Service Providers
39. Role of Regulators: Consumer protection and competition vs innovation
40. Three goals of consumer protection: Informed consumers, prevent unfair practices, dispute mechanisms
41. Regulatory Sandbox = Allows businesses to test new services in live environment
42. RegTech = Regulatory technology; agile, fast, integrative, analytics
43. Fintech Laws in India: PSS Act 2007, PPI Master Direction, NPCI UPI Guidelines, RBI Act 1934, P2P Lending Directions, Payment Intermediary Guidelines, AML laws, IT Act 2000
44. Governance issues: Internet economy, IPR, taxation, privacy, data sharing
45. Dialogue on Global Digital Finance Governance principles: Foundational objectives, reflexive regulation, responsible actors, oversight, sustainable development

Comprehensive Concept Handbook – Module 17

Digital Finance	Delivery of traditional financial services digitally
Digital Finance Ecosystem	Users + Relationship + Environment
Ecosystem Components	Infrastructure, Money, Assets, Services
CBDC	Digital tokens issued by central bank
NFT	Non-Fungible Token
Stablecoin	Cryptocurrency pegged to reserve asset
UPI	Unified Payments Interface
Neo-Bank	Online-only bank without physical branches
FinTech	Technologically enabled innovation in financial services
RegTech	Regulatory technology for compliance

One-Night Revision Notes – Module 17

Last Night Before Exam – Module 17

- **Digital Finance:** Delivery of traditional financial services digitally through computers, tablets, smartphones
- **Benefits:** GDP boost, bank profitability, higher tax revenue, reduced counterfeit, consumer benefits, financial inclusion
- **Ecosystem Components:** Digital Infrastructure, Digital Money, Digital Assets, Digital Financial Services
- **Digital Infrastructure:** Internet, Mobile telecom, Data centers, Cloud, APIs, Security
- **CBDC:** Central Bank Digital Currency; digital tokens issued by central bank; pegged to fiat
- **NFTs:** Cryptographic assets on blockchain with unique identification; asset tokenization
- **Cryptocurrency:** Digital/virtual currency using cryptography; blockchain; mining
- **Stablecoins:** Pegged to reserve asset; fiat-collateralized, commodity-backed, crypto-backed, algorithmic
- **Digital Wallets:** Prepaid payment instruments; reloadable
- **UPI:** Unified Payments Interface; multiple bank accounts in one app; 2FA; QR code
- **Neo-Banks:** Online-only banks; no physical branches; AI/ML; 24×7 support
- **FinTech:** Technologically enabled innovation; Alternative Lending, Insurtech, Payments, Wealthtech, Regtech
- **Digital Finance Cube:** Three dimensions – Business Functions, Technologies, Institutions
- **Regulation:** PSS Act 2007, PPI Master Direction, NPCI UPI Guidelines, RBI Act 1934, P2P Directions
- **Regulatory Sandbox:** Testing new services in live environment
- **RegTech:** Regulatory technology; agile, fast, integrative, analytics

Most Probable Examination Areas – Dec 2026

DEC 2026 – MOST PROBABLE AREAS

- Meaning and benefits of Digital Finance – 5 marks
- Traditional vs Digital Finance – 5 marks
- Digital Finance Ecosystem components – 5–10 marks
- Digital Infrastructure – 5 marks
- Digital Money – CBDC – 5 marks
- Digital Assets – NFTs, Cryptocurrencies, Stablecoins – 5–10 marks
- Digital Financial Services – Wallets, UPI, Neo-Banks, FinTech – 5–10 marks
- Regulation and Governance – 5 marks
- Digital Finance Cube – 5 marks

Final Checklist – Module 17

Course Completed!

- Can I define digital finance and compare with traditional finance?
- Can I list and explain the benefits of digital finance?
- Can I explain the Digital Finance Ecosystem and its four components?
- Can I describe the components of Digital Infrastructure?
- Can I explain CBDC and its advantages?
- Can I explain NFTs and asset tokenization?
- Can I explain Cryptocurrency, its working, advantages and disadvantages?
- Can I explain Stablecoins, their variants, uses and limitations?
- Can I explain Digital Wallets and UPI?
- Can I explain Neo-Banks and their benefits?
- Can I explain FinTech and its types?
- Can I describe the Digital Finance Cube and its three dimensions?
- Can I explain the role of regulators in digital finance?
- Can I list the key FinTech laws and regulations in India?
- Can I explain Regulatory Sandbox and RegTech?
- Can I explain the governance initiatives in digital finance?
- Have I memorised all key concepts from this module?



CONGRATULATIONS!



ALL 17 MODULES COMPLETED

CMA Final Paper 14 – Strategic Financial Management

Master Revision Handbook – December 2026 Edition



Complete Coverage:

- | | |
|------------------|--|
| Section A | Modules 1–4: Investment Decisions |
| Section B | Modules 5–11: Security Analysis & Portfolio Management |
| Section C | Modules 12–13: Financial Risk Management |
| Section D | Modules 14–16: International Financial Management |
| Section E | Module 17: Digital Finance |

Best Wishes for Your December 2026 Examination!

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