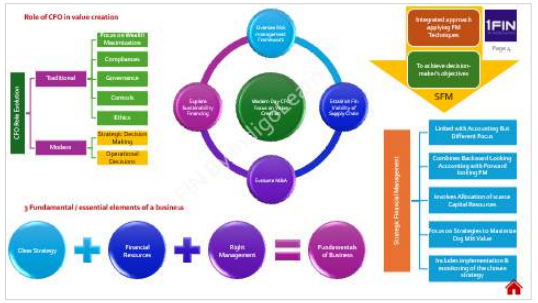

FINANCIAL POLICY &
CORPORATE STRATEGY


Role of CFO in value creation
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3 Fundamental / essential elements of a business
SFM


RISK
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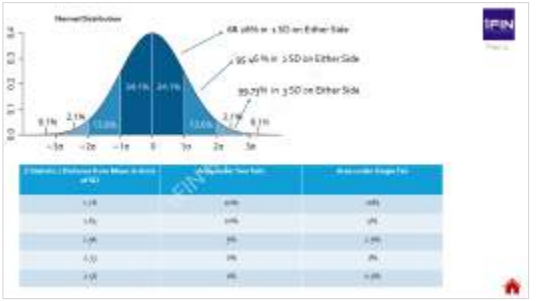
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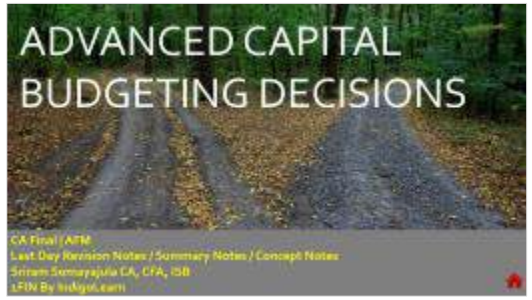
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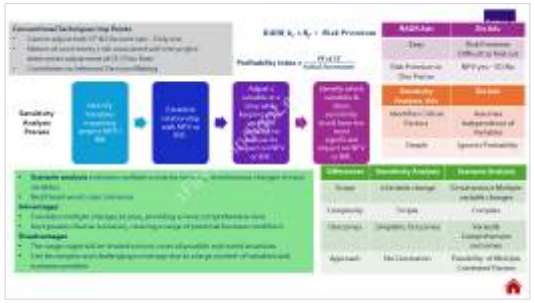
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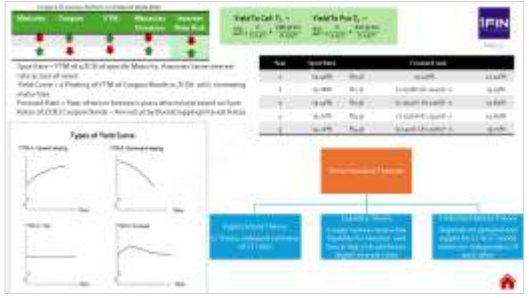
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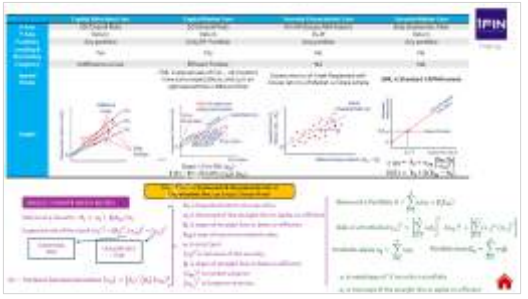
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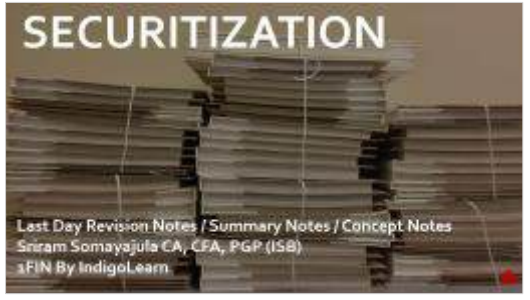
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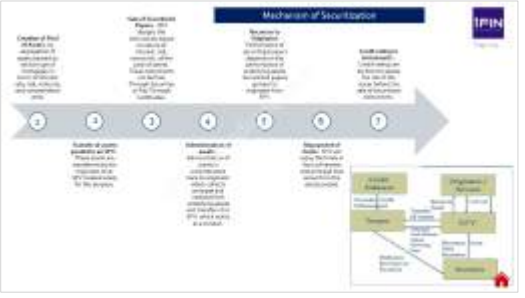
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Binomial Model
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FOREX EXPOSURE & RISK MANAGEMENT
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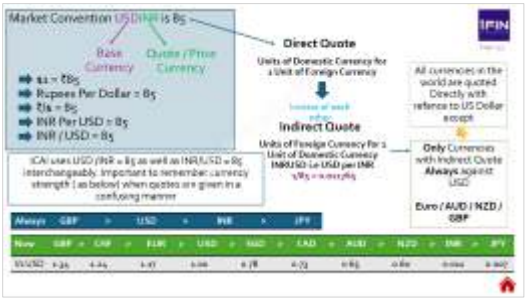
Market Convention USD/INR is 85
Direct Quote
Indirect Quote
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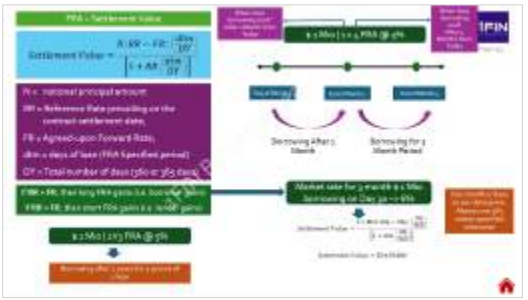
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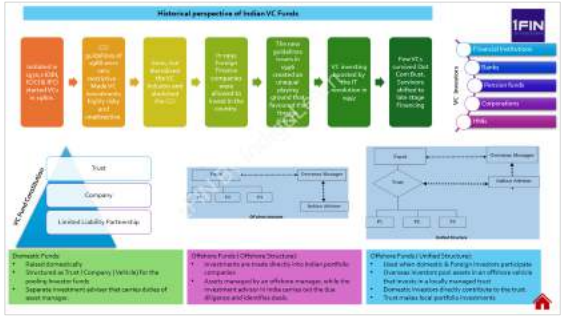
Historical perspective of Indian VC Funds
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Sriram Somayajula CA, CFA, ISB
Co-Founder & CEO, IndigoLearn
Faculty | CA Final, AFM & CFA
Practical Experience of 10+ years
Teaching Experience of 7+ Years
Deeply Passionate about Financial Markets & Economics
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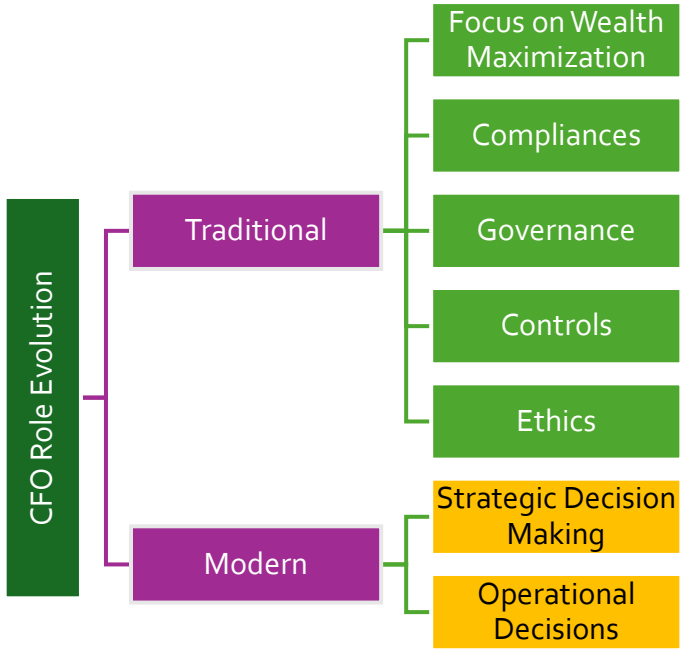
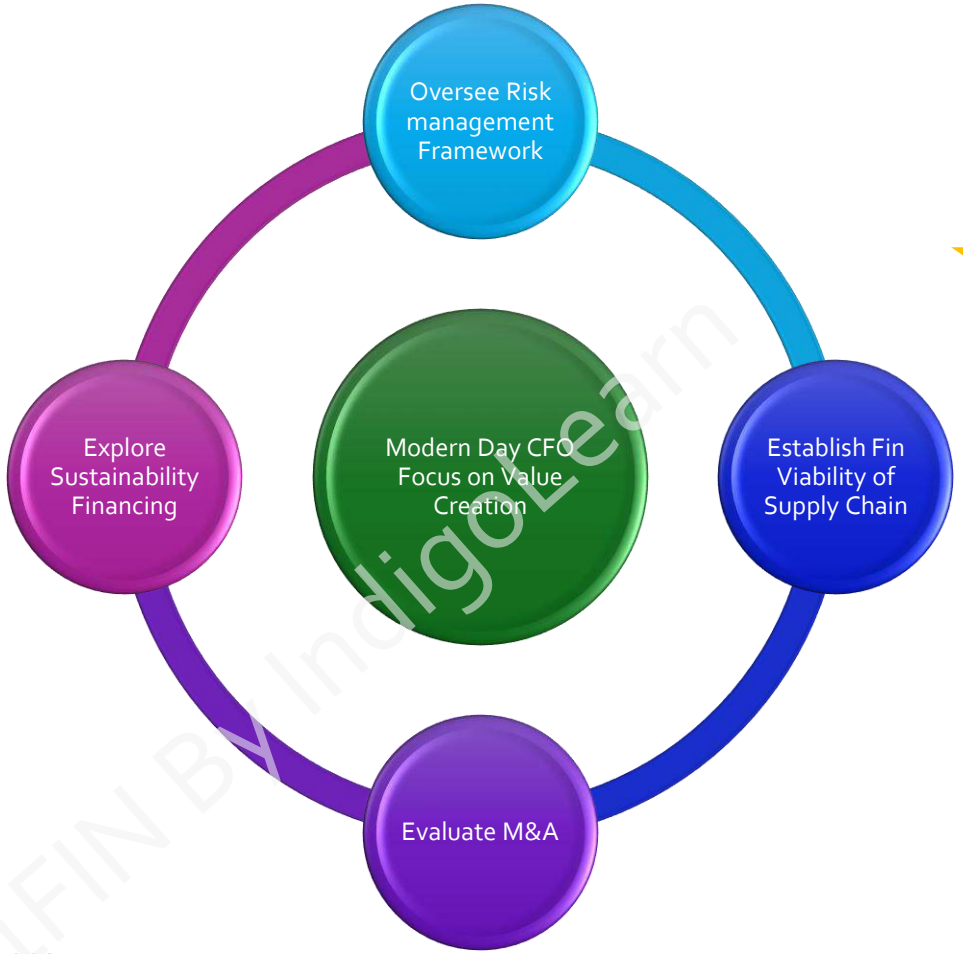
Role of CFO in value creation



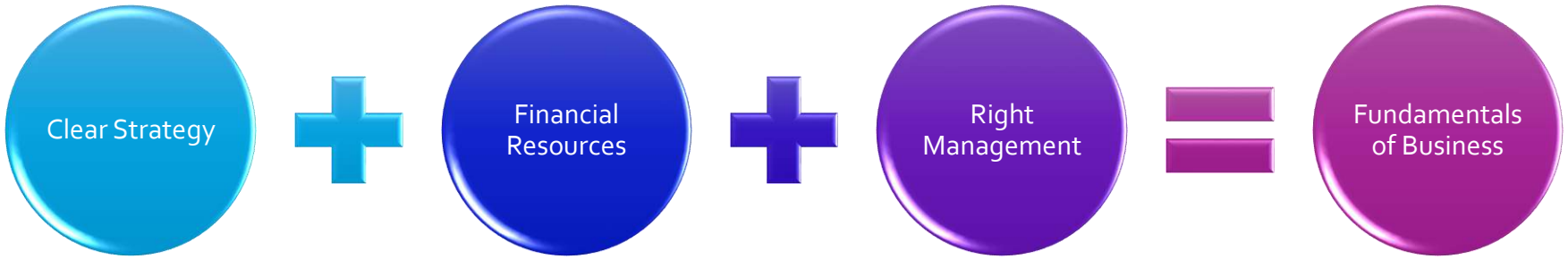


Integrated approach applying FM Techniques

To achieve decision-maker's objectives

SFM

3 Fundamental / essential elements of a business

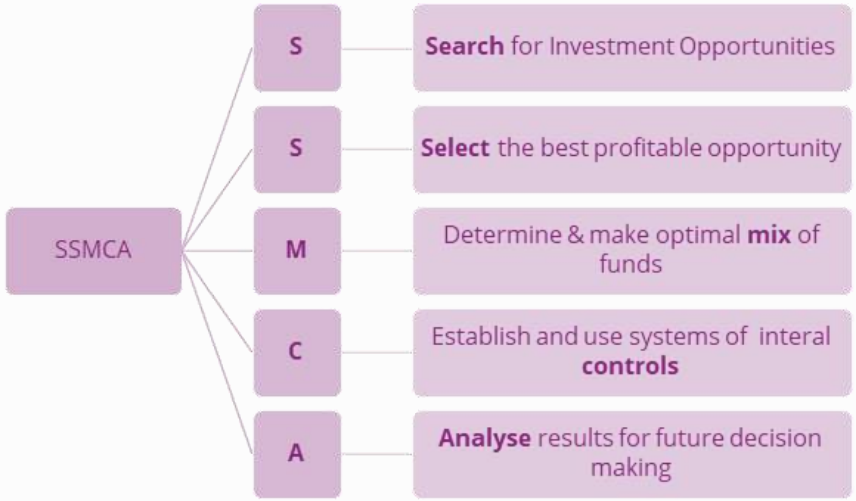


Strategic Financial Management

- Linked with Accounting But Different Focus
- Combines Backward Looking Accounting with Forward looking FM
- Involves Allocation of scarce Capital Resources
- Focus on Strategies to Maximize Org Mkt Value
- Includes implementation & monitoring of the chosen strategy

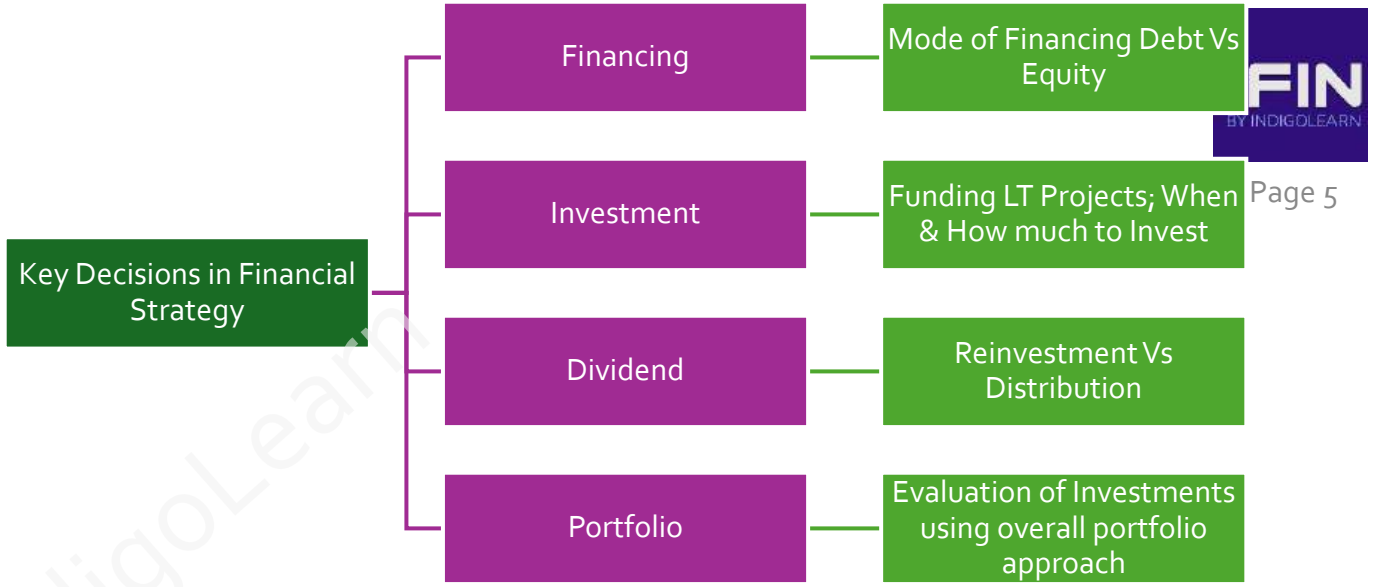
Functions of SFM (Investment & Financing Decisions)

SFM part of the corporate strategic plan – Combines investing & financing decisions for attaining overall objectives.



Focus on Allocating limited funds between alternative uses

Corporate level strategy Answers 3 Questions	
Suitability	Whether the strategy would work for the accomplishment of common objective of the company.
Feasibility	Determines the kind and number of resources required to formulate and implement the strategy.
Acceptability	It is concerned with the stakeholders' satisfaction and can be financial and non-financial.



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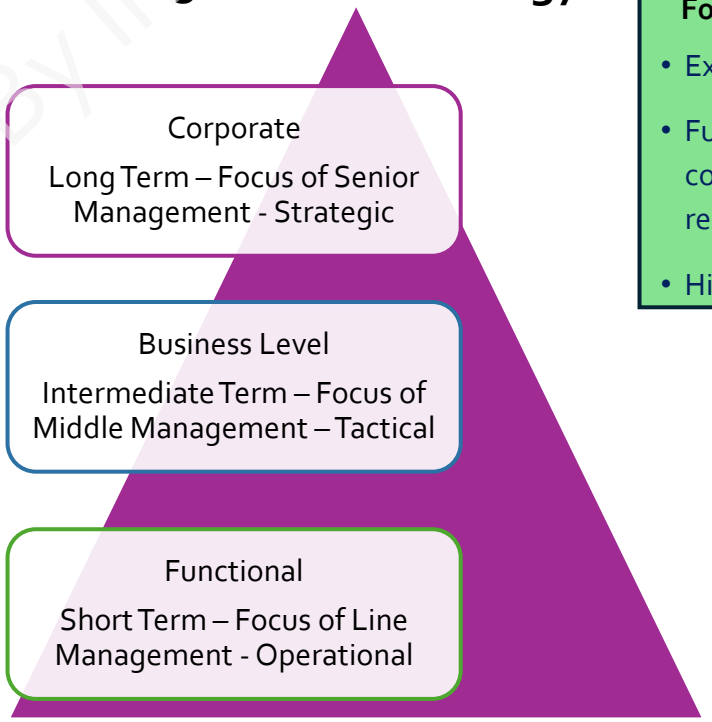
3 Levels of Strategy



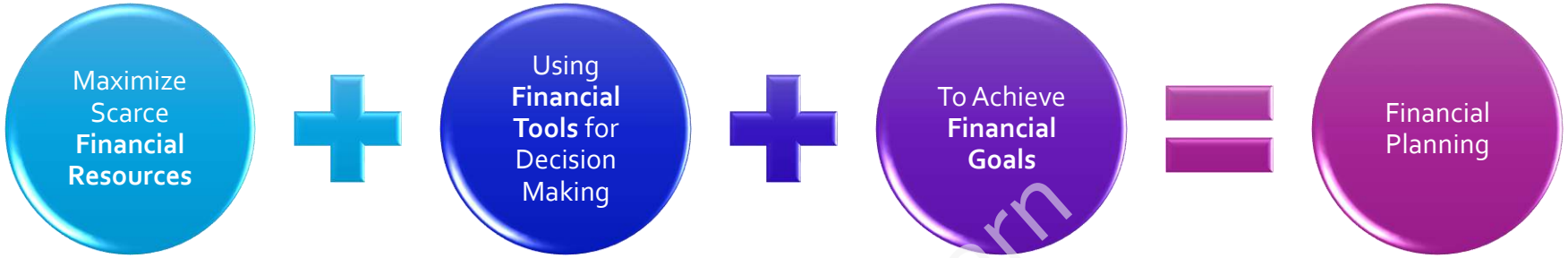
Focus of Functional Level Strategy

- Execution of BU Level strategies at floor or on site.
- Functional units provide input to the business unit level and corporate level strategy, on customer responses or on resources and capabilities
- Higher-level strategies can be based on these inputs.

Focus of BU Level Strategy

- practical coordination of operational units
- supervision of operations in the unit
- meet deadlines and targets set by Corporate Level in developing and sustaining products and services

Financial Planning & its 3 Major Components



Outcomes of the Financial Planning

Financial objectives:

- To be decided at the very outset so that rest of the decisions can be taken accordingly.
- They need to be consistent with the corporate mission and corporate objectives.

Financial decision making

- Helps in analysing financial problems that are being faced by the corporate and accordingly deciding the course of action to be taken by it.

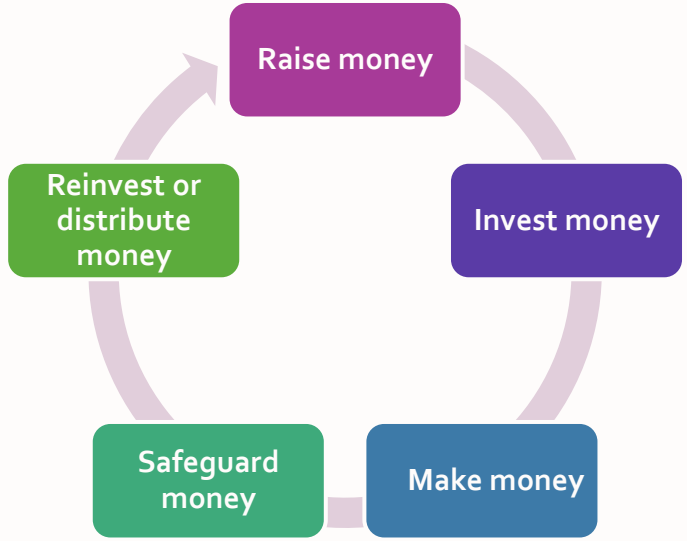
Financial measures

- Ratio analysis, analysis of cash flow statement are used to evaluate the performance of the Company.
- Selection of measures again depends upon the corporate objectives.

Interface of Financial Policy and Strategic Management

Fund mobilization essential to support expansion activity of firm - very vital for any organization.

- Financial Policy mainly deals with sourcing funds and
- Corporate Strategy mainly deals with deployment of funds.
- Financial policies should be framed at corporate planning stage itself and not later



Investment Decisions, Financing Decisions & Dividend Decisions are key elements of interface between Financial Policy & Strategic Management

Financing Decisions

Focussed on Sources of Funds & Capital Structure

- Cost of raising capital
- Risk associated with sources of funds.
- Cash Flow condition
- Control Considerations

Focus on investment of a Firm's Funds into different assets to earn highest possible returns & fulfil Stakeholder expectations

Investments Decisions

- New Project
- Expand Capacity
- Cost Reduction

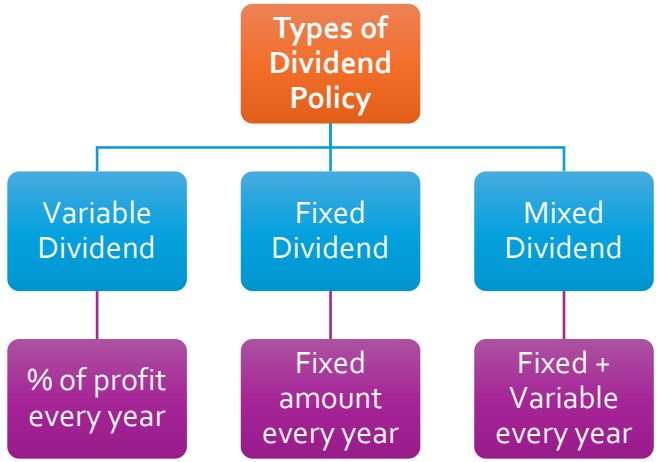
Allocation of Firm's Scarce resources to one of these based on Capital budgeting exercise.
Project Evaluation & Project Selection, 2 most important aspects in fund allocation

Elements determining the capital structure

Region	• Geographical position , Developed or underdeveloped
Industry	• Capital Intensive (high debt equity) or labour intensive
Sector	• Public (ideal is 1:1) or Private (ideal is 2:1)
Maturity	• Stage in the business life cycle

Dividend Decisions

Firms' decide how much they will pay-out to shareholders in the form of dividends



Involves deciding between investment in Business Vs payout to Shareholders; Companies explore cash / Stock Dividends too

All functional policies are interlinked with financial policy and they should be designed along with corporate strategy and not in in isolation. Financial Policy & Corporate Strategy are interdependent and affect each other and are affected by each other

Balancing Financial Goals vis-a-vis Sustainable Growth

Sustainable Growth Rate (SGR)

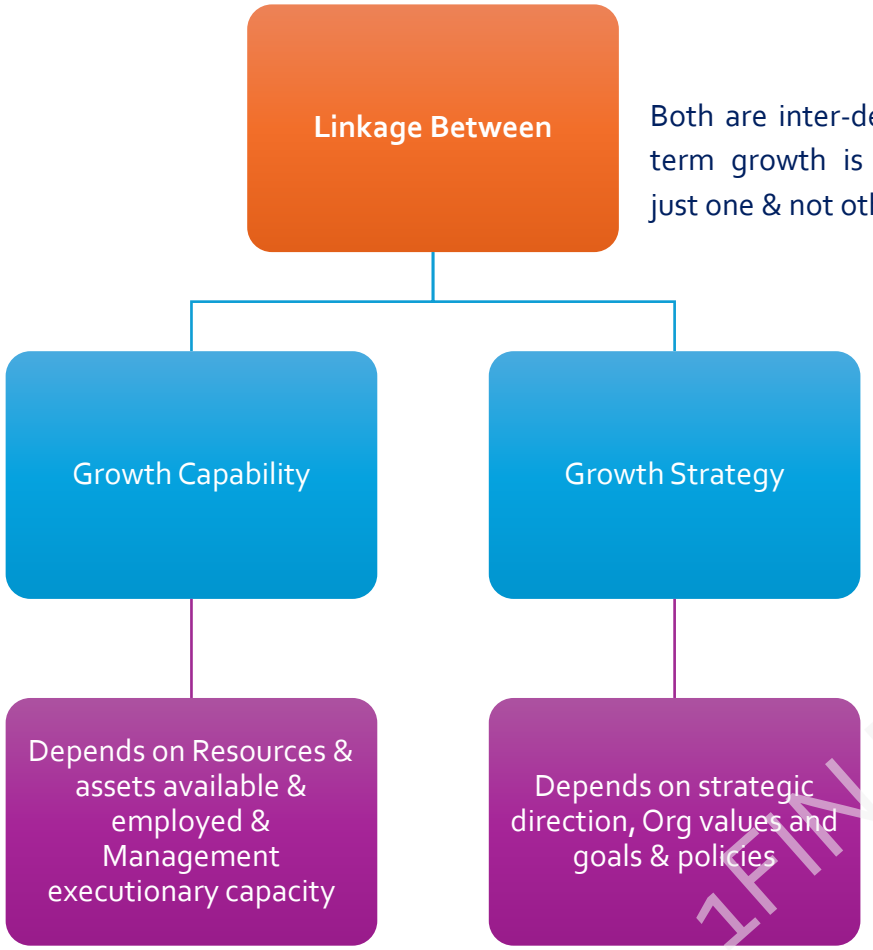
Return On Equity × Retention Ratio

SGR is the Maximum Sales Growth achievable by a Company given its Profitability, Asset Utilization & Dividend Payout & No Additional Borrowings

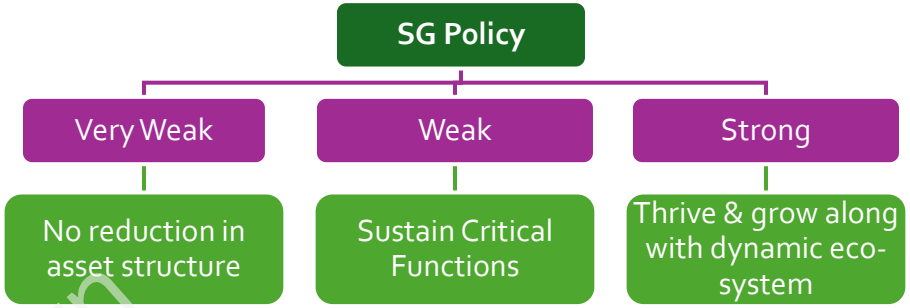
Assumptions underlying SGR

- Targeted capital structure maintained.
- Defined dividend payout policy i.e dividend payment ratio fixed and maintained; and
- No fresh equity raised

Sales can grow Faster if a firm issues additional debt or equity else SGR is the Maximum



Both are inter-dependent - long-term growth is impossible with just one & not other



- If an Org is Growing < SGR, better to return money through Dividends or Buy Back => lower SGR or Acquire Companies to Grow
- High Inflation => Higher external financing => Higher DE Ratio.
- If creditors require that a firm's historical cost Constant DE ratio, inflation lowers SGR
- Inflation > SGR (in a Mature Industry) => funds will be blocked in WC => Lower Reinvestment => Lower SGR

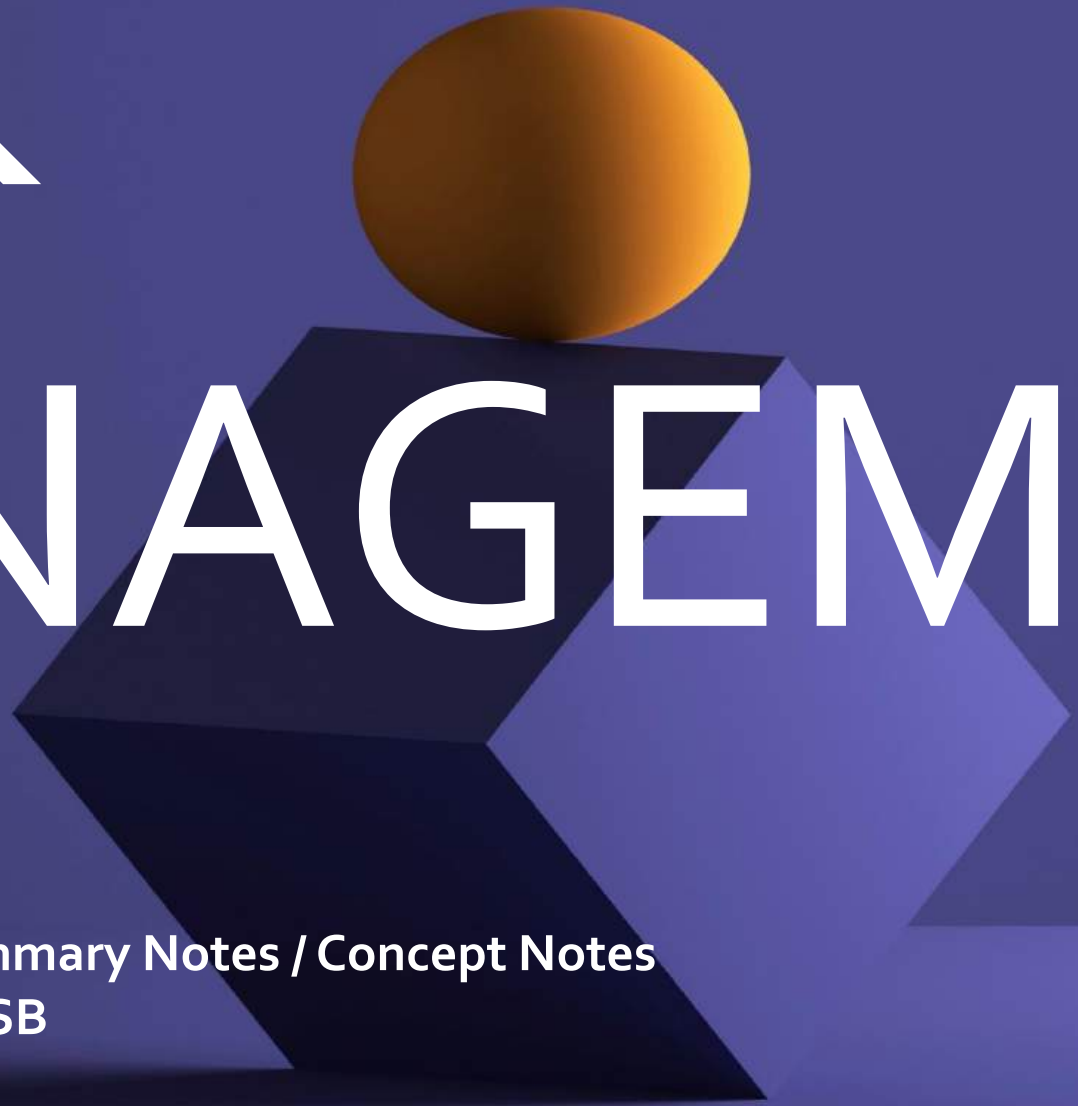
To Maintain a Growth rate with constraints over DE ratio and / or Current Ratio, an Org may raise External Financing, Debt or Equity

$$EFR = \frac{TA}{Sales} \times \Delta S - \frac{Payable\ and\ Liabilities}{Sales} \times \Delta S - mS_1(1-d)$$

m = PAT%

What Makes an Organization Sustainable?

RISK MANAGEMENT



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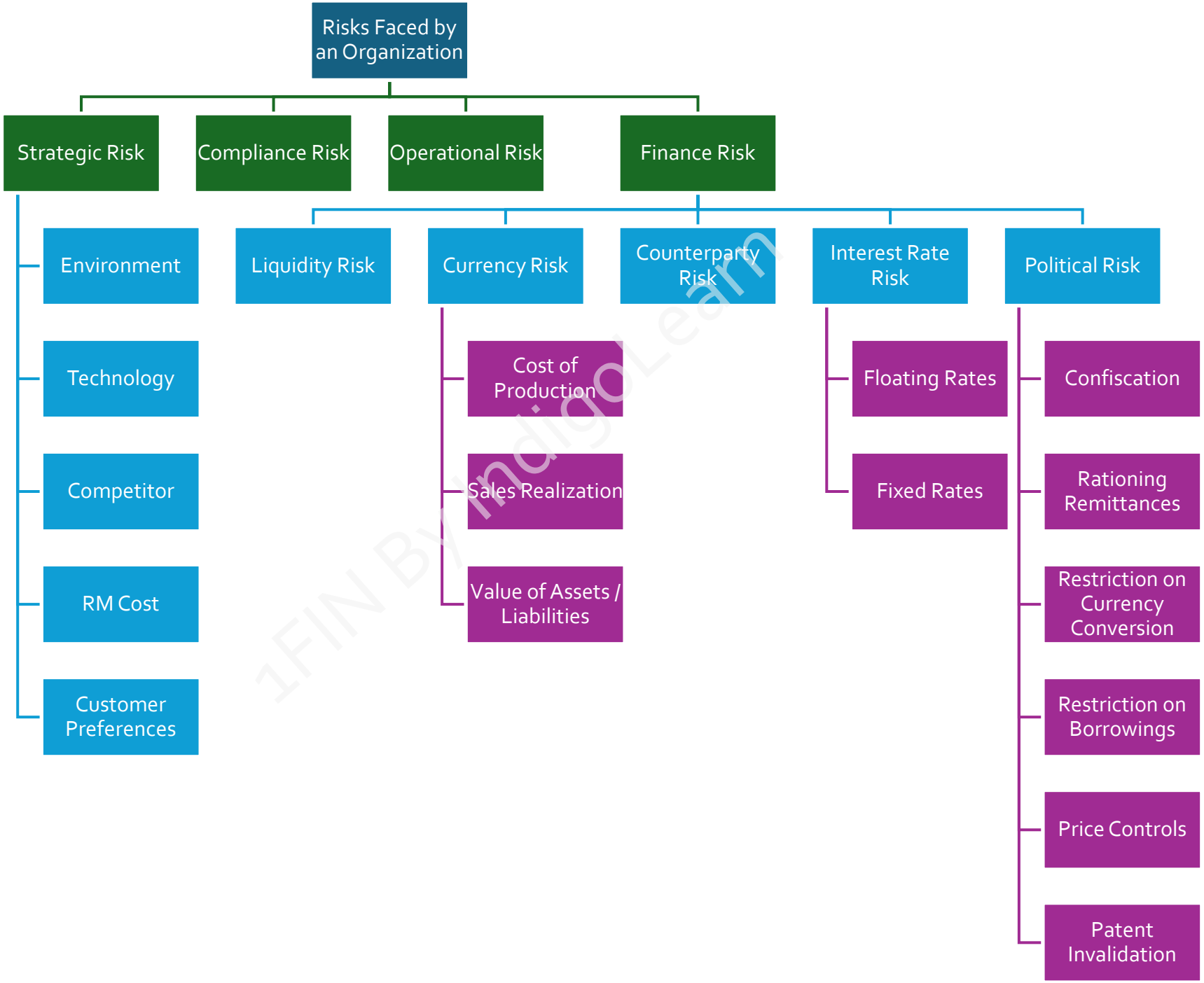


Stakeholder View of Risk Management

Equity holders/ Lenders (Financiers)

- High Leverage= High Risk
- Equity Shareholders: Uncomfortable with High Debt
- Debt holders: Uncomfortable with High Debt

Company

Excessive Borrowing / Lending leads to High Liquidation Risk. Mitigate Risk by

- Evaluating Financial Structure
- Evaluating Risks
- Set up robust risk management system.
- Measure the risk
- Quantify the risk

Government

- Risks have economy wide macro-economic financial implications, e.g.: failure of any bank (like Lehman Brothers) or down grading of any financial institution leading to spread of distrust among society at large. Potential Labour disturbances affect
- The Company
- Its production , &
- Overall macro-economic environment

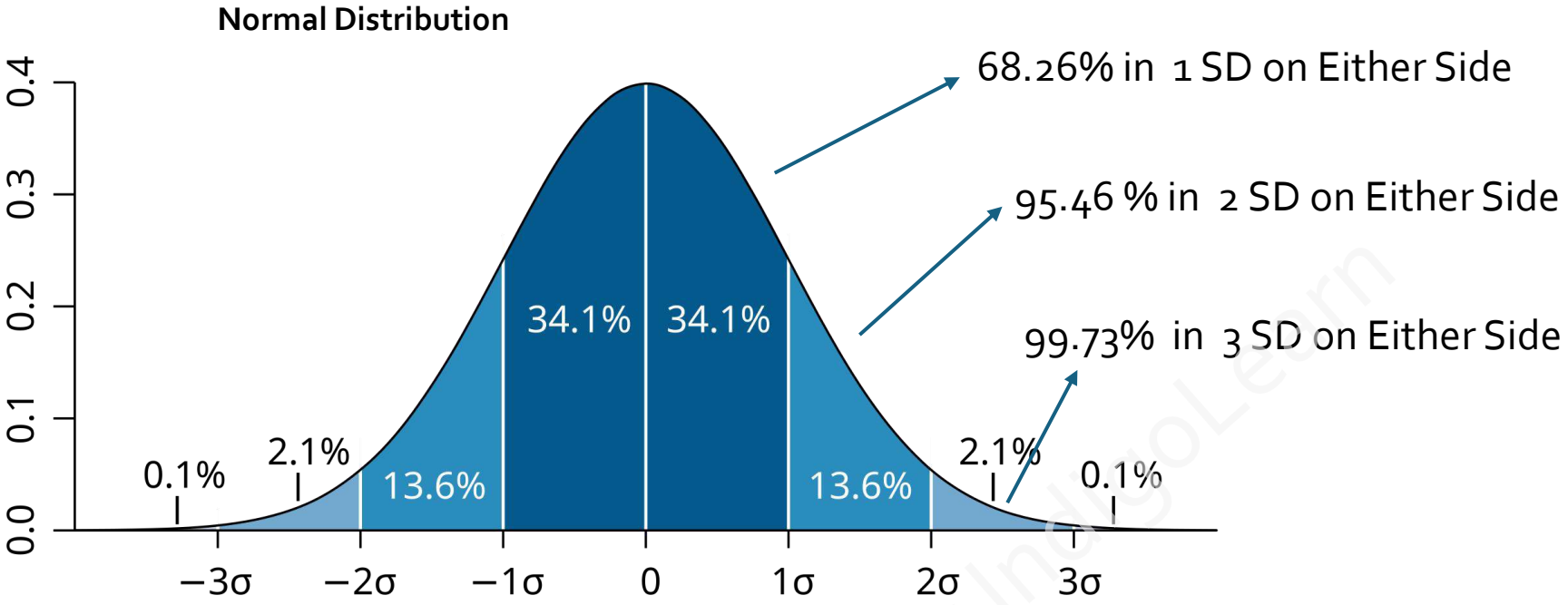
What is VAR? – Value at Risk & Its Features

- Uses Time, Confidence Level & Loss in % or Amt
- A Statistical Tool based on SD & Normal Distribution
- Can be applied for different time horizons , Day / Week / Month
- Determines maximum possible loss at a specific probability.
- Used for Setting Risk Limits

Z Score Indicates data is how Many SD away from Mean
VAR = Z Score x SD

Applications of VAR

- Measure the maximum possible loss on any portfolio or a trading position.
- Benchmark for performance measurement of any operation or trading.
- Fix limits for individuals dealing in front office of a treasury department.
- Decide the trading strategies.
- Tool for Asset and Liability Management especially in banks.



Z Statistic / Distance from Mean in Units of SD	Area under Two Tails	Area under Single Tail
1.28	20%	10%
1.65	10%	5%
1.96	5%	2.5%
2.33	2%	1%
2.58	1%	0.5%

Variance : $\frac{\sum(x-\bar{x})^2}{n}$

where x is observation, n is number of observations and $\bar{x}$ is the mean of observations.

Standard Deviation : $\sigma = \sqrt{\text{Variance}}$

Covariance:$\sum\frac{(x-\bar{x})(y-\bar{y})}{n}$

Correlation : $\rho = \frac{Cov(X,Y)}{\sigma_x\,\sigma_y}$

Where, Cov (X,Y) is covariance

σ is Standard Deviation

Standard Deviation of portfolio:

$$\sigma_p = \sqrt{\sigma_1^2 + \sigma_2^2 + \left(2(\sigma_1\sigma_2\,\rho)\right)}$$

Where σ_1 is standard deviation of 1st security and σ_2 is standard deviation of 2nd security in Rupee terms

Or,

$$\sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + \left(2(w_1w_2\sigma_1\sigma_2\,\rho)\right)}$$

Where w_1 & w_2 are the weights of respective securities & SDs are in %

Value at Risk (VAR) :

σ_px Portfolio Value x Cumulative Z score x $\sqrt{\text{N Days}}$

Where, Z score indicates how many standard deviation away from mean the value is

Determine the 10 days 99% Value at Risk (VAR) for Mr. J's portfolio. Given: The Z score from the normal table at 99% confidence level is 2.33 (Show your calculations upto four decimal points)

Particulars	Prices
Investment in shares of ABC Ltd.	200 Lakhs
Investment in shares of XYZ Ltd.	200 Lakhs
Daily standard deviation of both shares	1%
Co-efficient of correlation between both shares	0.3

Solution

Details	INR Lakhs	%	SD	SD in INR Lakhs
ABC Ltd	200	50%	1%	2
XYZ Ltd	200	50%	1%	2
Total Portfolio	400			
Correlation			0.3	

Portfolio Variance (σ_P) = $\sqrt{W1^2\sigma1^2 + W2^2\sigma^2 + 2W1W2\sigma1\sigma2\rho}$

Portfolio Variance	$= 2^2 + 2^2 + 2 \times 2 \times 2 \times 0.3 = 10.40$
Portfolio Standard Deviation in INR Lakhs	$=\sqrt{10.40} = 3.2249$
Z Value at 99% Confidence Level	2.33
Number of Days	10
Value at Risk in INR Lakhs	$= 3.2249 \times 2.33 \times \sqrt{10} = 23.7614$

Portfolio Variance	$=(1\% \times 50\%)^2 + (1\% \times 50\%)^2 + 2 \times 50\% \times 1\% \times 50\% \times 1\% \times 0.3$ $= 0.000065$
Portfolio Standard Deviation	$=\sqrt{0.000065} = 0.0081$
Portfolio Standard Deviation in INR Lakhs	$= 0.0081 \times 400 = 3.2249$
Z Value at 99% Confidence Level	2.33
Number of Days	10
Value at Risk in INR Lakhs	$= 3.2249 \times 2.33 \times \sqrt{10} = 23.7614$

On Tuesday morning (before opening of the capital market) an investor, while going through his bank statement, has observed that an amount of ₹ 7 lakhs is lying in his bank account. This amount is available for use from Tuesday till Friday. The Bank requires a minimum balance of ₹1000 all the time. The investor desires to make a maximum possible investment where Value at Risk (VaR) should not exceed the balance lying in his bank account. The standard deviation of market price of the security is 1.5 per cent per day. The required confidence level is 99 per cent. Given, Standard Normal Probabilities in table below, determine the maximum possible investment.

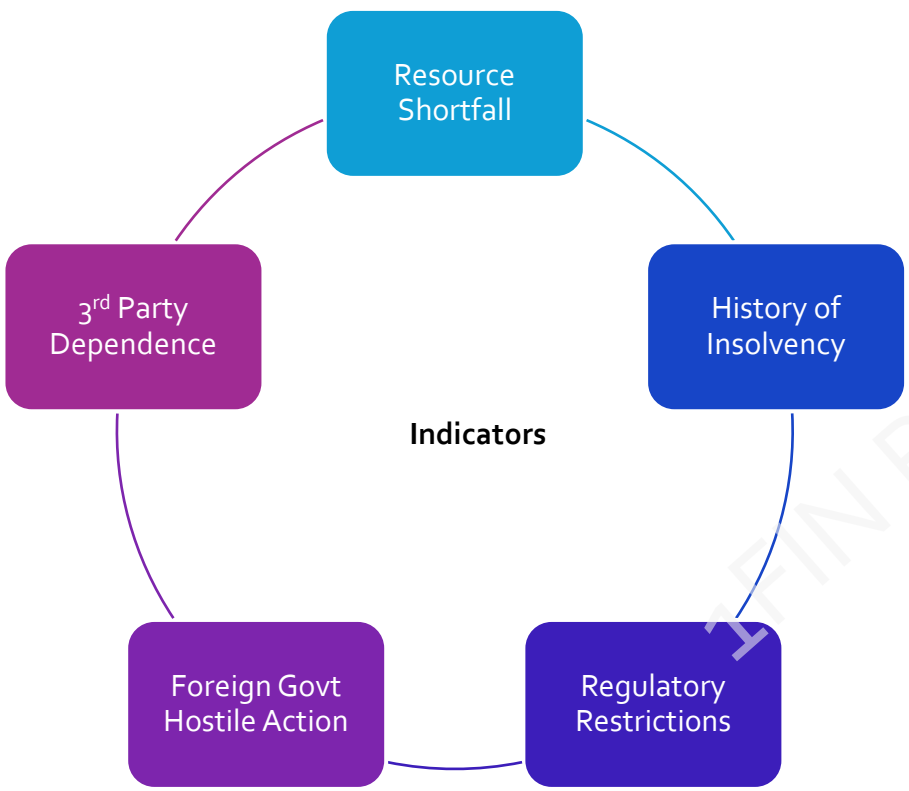
Standard Normal Probabilities

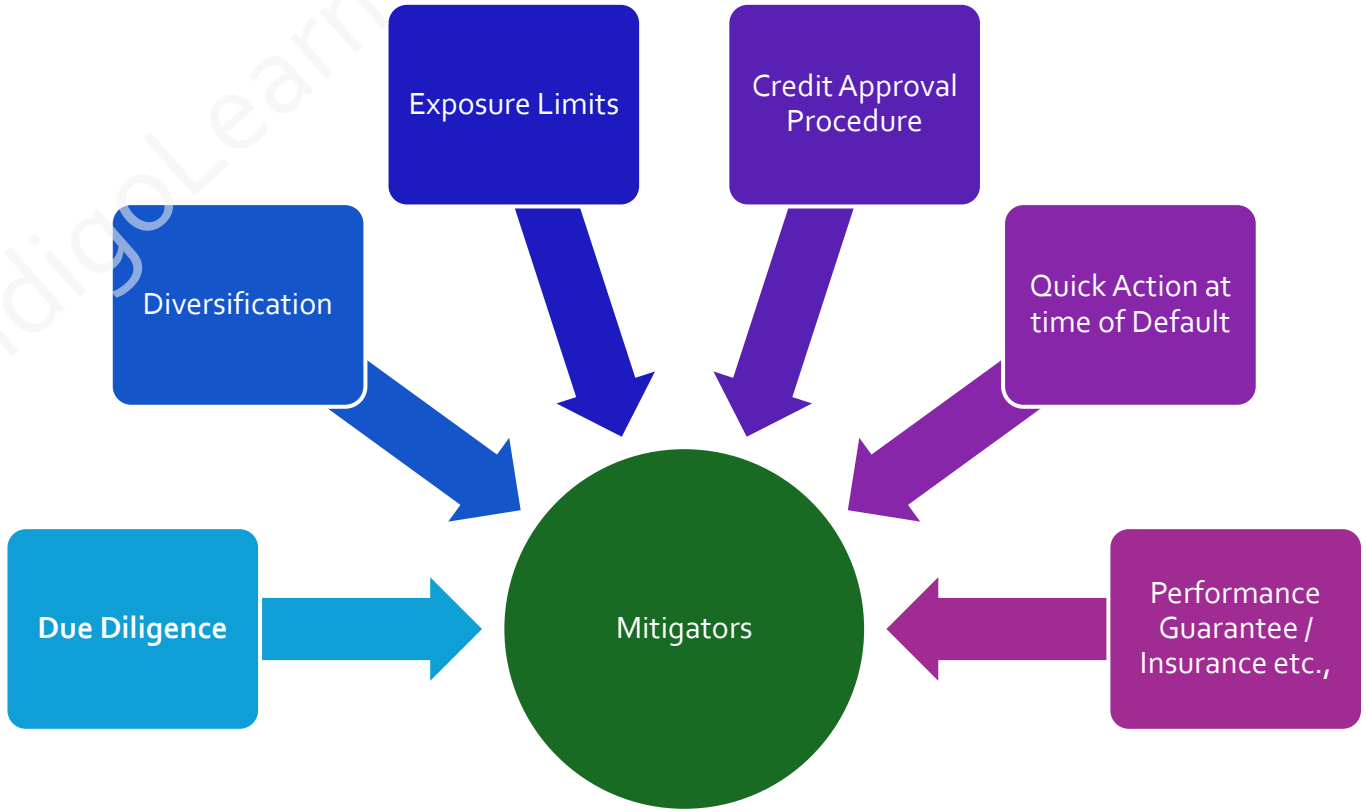
Z	0.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9998	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9923	.9925	.9929	.9931	.9932	.9934	.9936

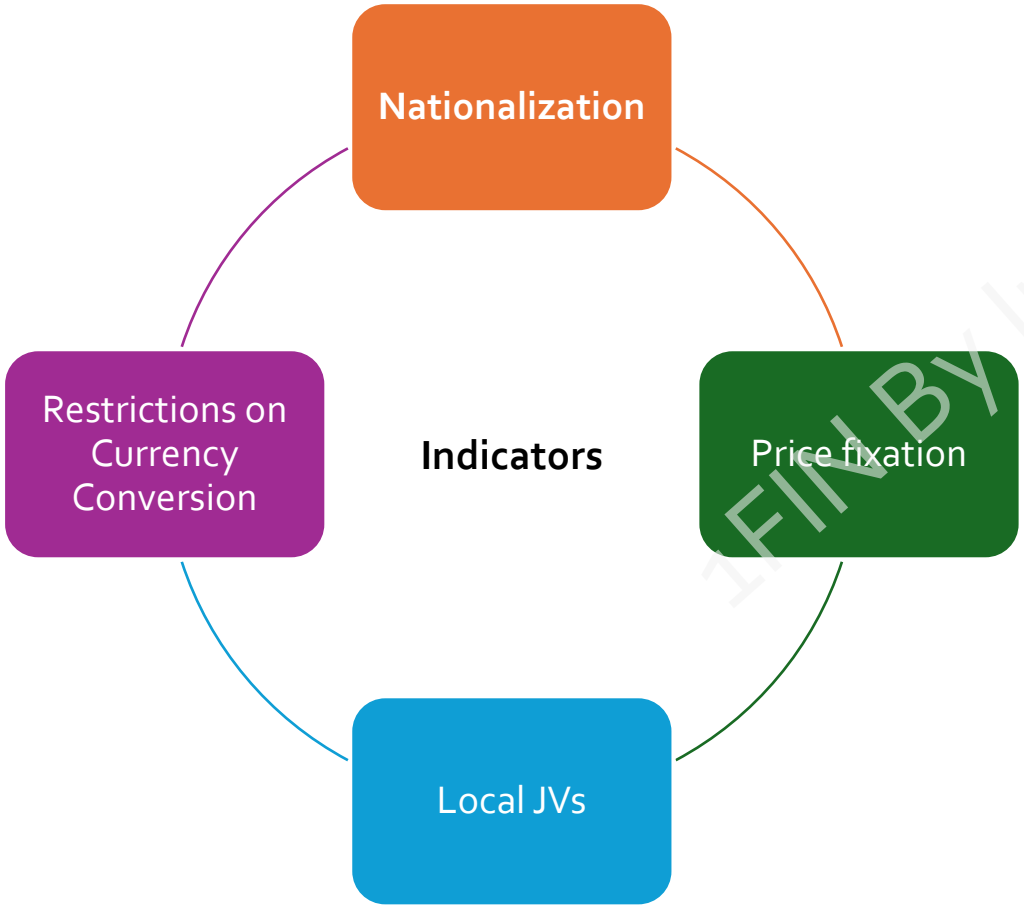
Solution

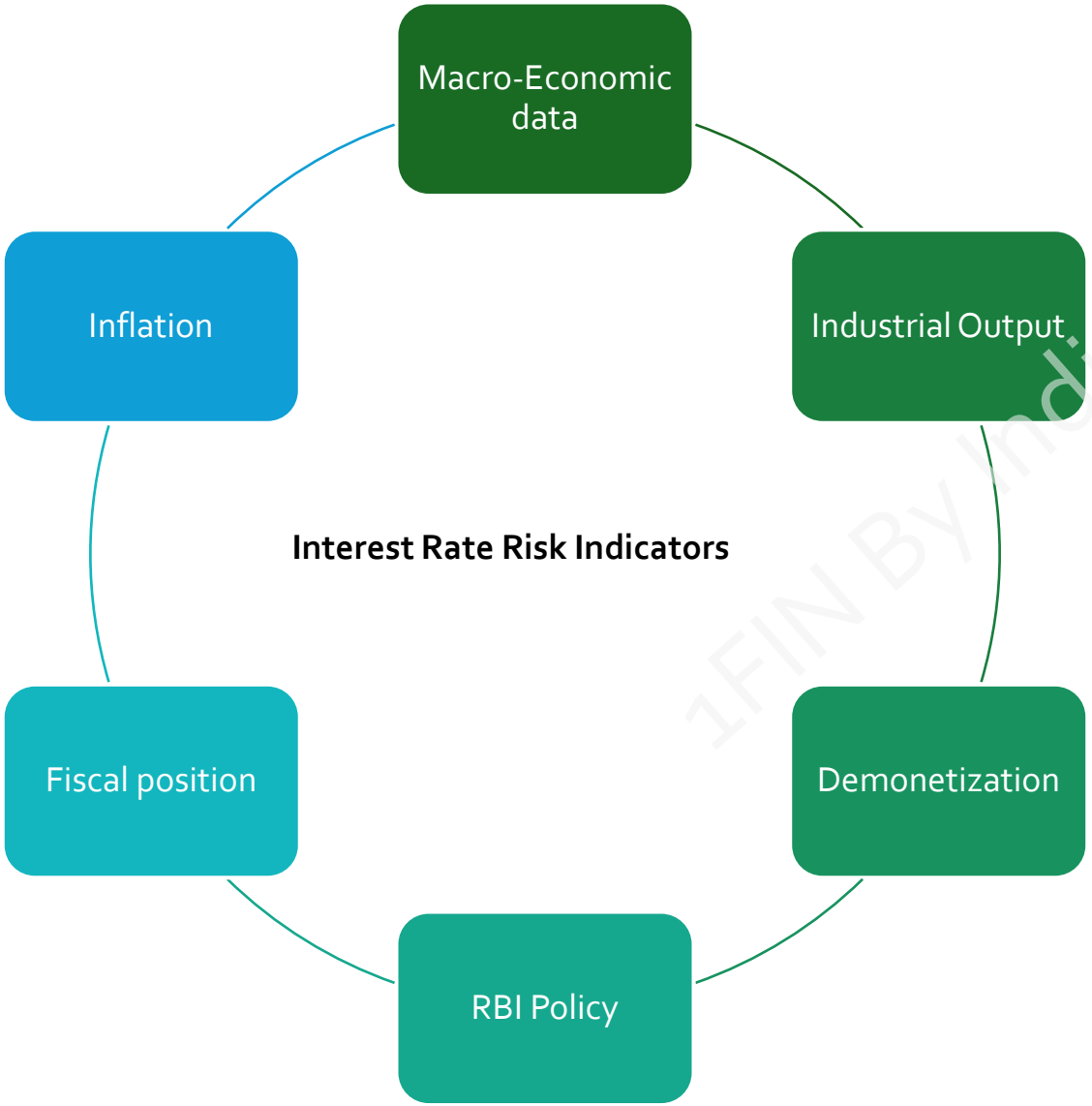
Particulars	Amount
Current Balance	7,00,000
Minimum Balance	1,000
Utilizable Balance	= 7,00,000 – 1,000 = 6,99,000
Standard Deviation (SD)	1.5%
Confidence Level	99%
Z Score at 99%	2.3300
Assuming 1 Day VAR is INR 6,99,000	VAR = SD × Portfolio × Z Score
	6,99,000 = 1.5% × Portfolio × 2.33 Portfolio = 6,99,000/(2.33 × 1.5%) Portfolio = 2,00,00,000
Assuming 4 Day VAR is INR 6,99,000	VAR = SD × Portfolio × Z Score × $\sqrt{4}$
	6,99,000 = 1.5% × Portfolio × 2.33 × $\sqrt{4}$ Portfolio = 6,99,000/(2.33 × 1.5% × 2) Portfolio = 1,00,00,000
Maximum Investment for a Day is	INR 2 Crores
Maximum Investment for 4 Days is	INR 1 Crores

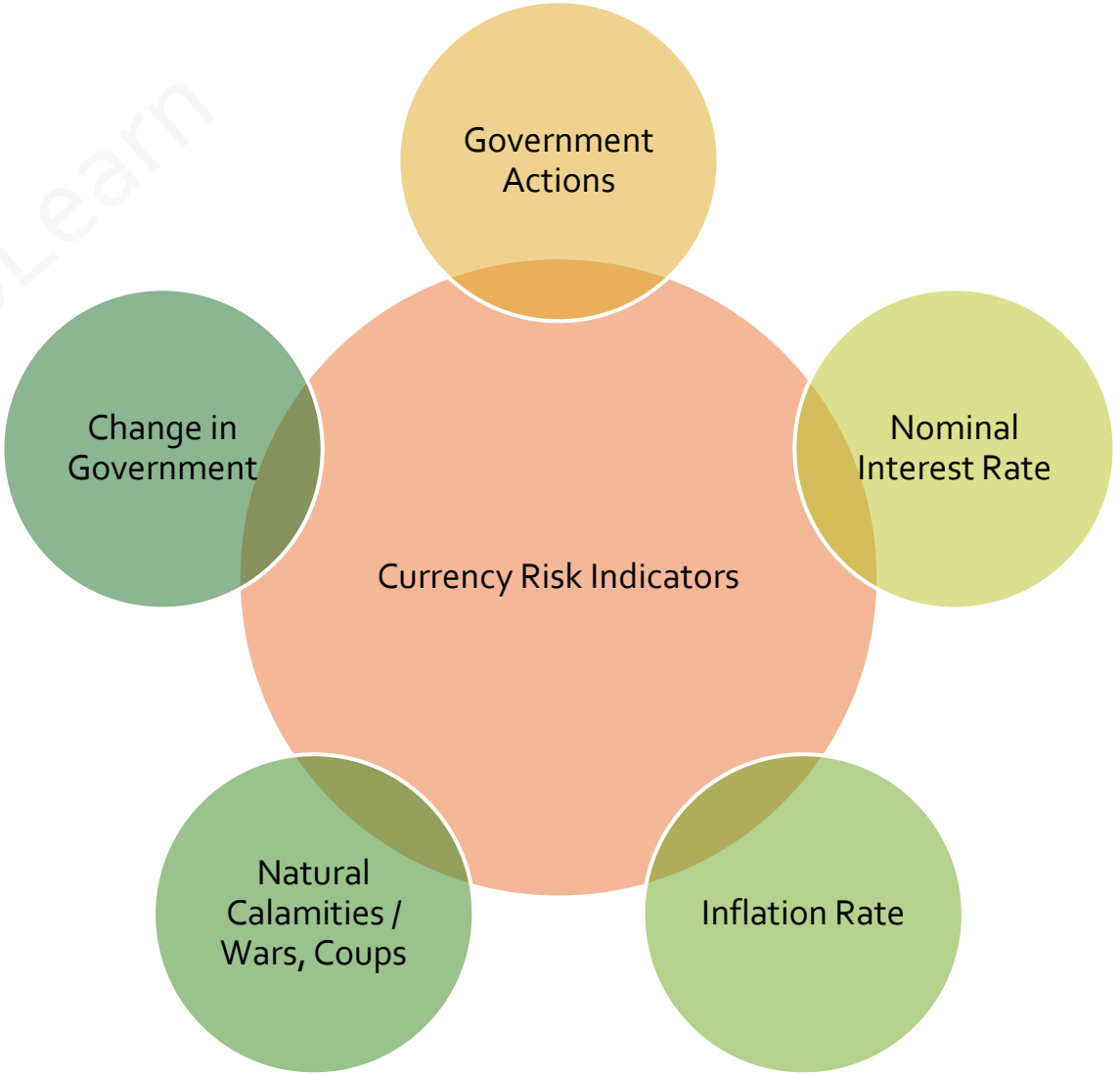
Counter-Party Risk

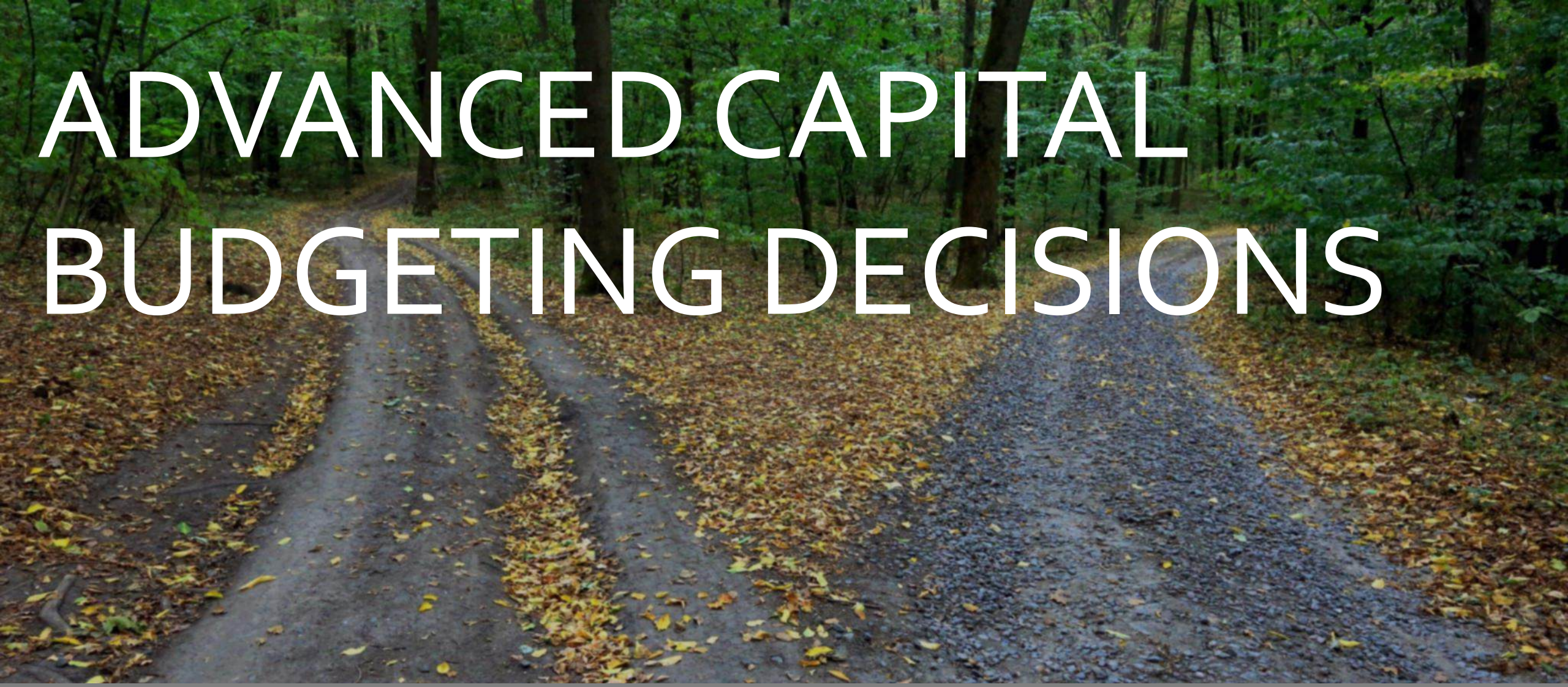












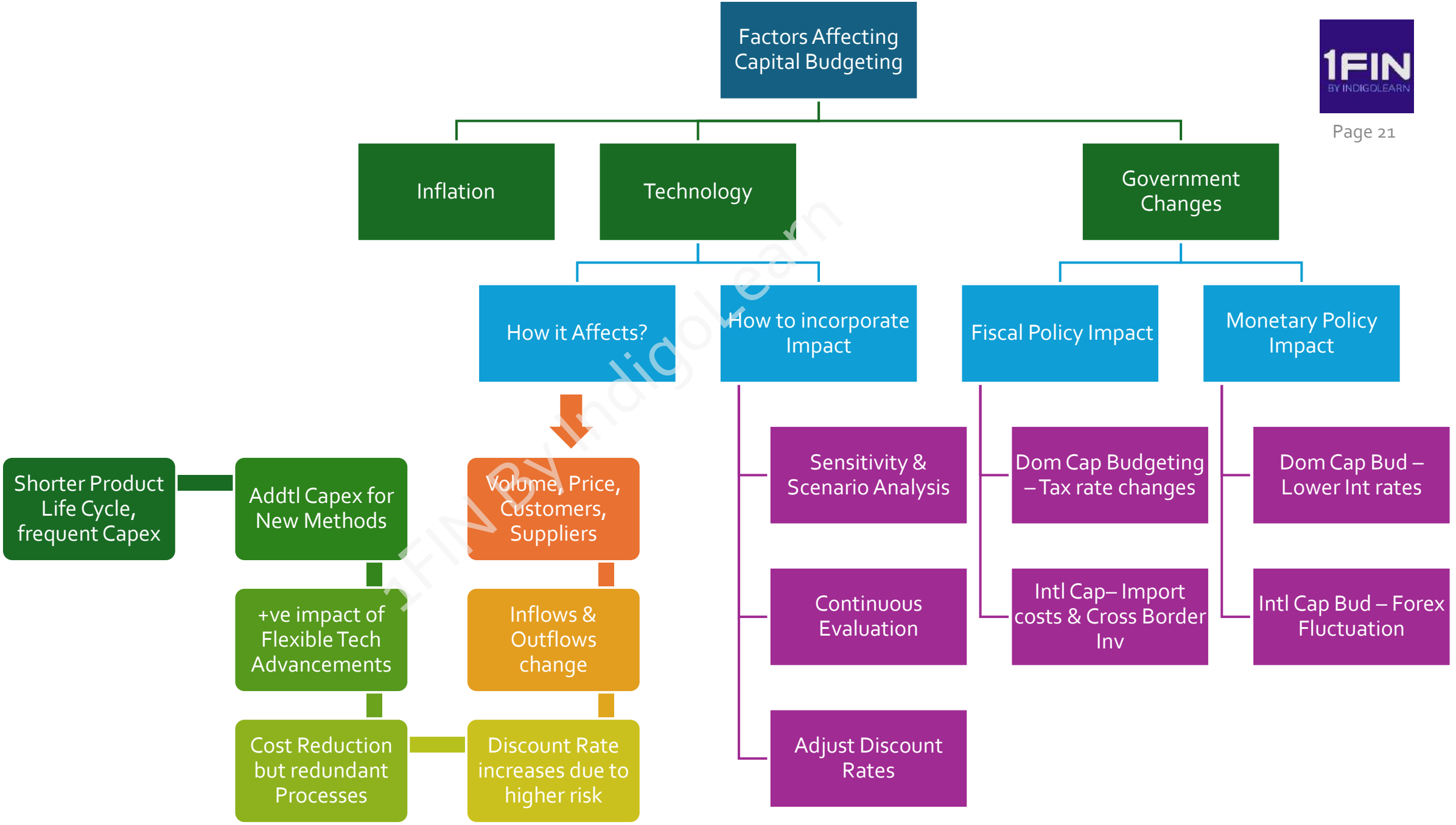
ADVANCED CAPITAL BUDGETING DECISIONS

CA Final | AFM

Last Day Revision Notes / Summary Notes / Concept Notes

Sriram Somayajula CA, CFA, ISB

1FIN By IndigoLearn


Factors Affecting Capital Budgeting
Inflation
Technology
Government Changes
How it Affects?
How to incorporate Impact
Fiscal Policy Impact
Monetary Policy Impact
Shorter Product Life Cycle, frequent Capex
Addtl Capex for New Methods
+ve impact of Flexible Tech Advancements
Cost Reduction but redundant Processes
Volume, Price, Customers, Suppliers
Inflows & Outflows change
Discount Rate increases due to higher risk
Sensitivity & Scenario Analysis
Continuous Evaluation
Adjust Discount Rates
Dom Cap Budgeting – Tax rate changes
Intl Cap– Import costs & Cross Border Inv
Dom Cap Bud – Lower Int rates
Intl Cap Bud – Forex Fluctuation

CFAT = (R – C – D) (1 – T) + D = (R – C) (1 – T) + DT

R – Project Revenue | C - Costs Excluding depreciation | D - Depreciation | T - Tax Rate

Nominal Return = Real Return + Inflation

(1+N) = (1+R) (1+ i)

Nominal CF = Real CF x (1+i)

Dealing with Risk & Uncertainty in Investment Decisions

Certain CF	CF Involving Risk	CF Uncertain
• No Need for Risk Assessment • No Probability Involved	• Use Probability Adjusted CF • Req Evaluating potential outcomes & Likelihood	• No Probability can be assigned • Challenging to assess potential outcomes

Why Risk is Adjusted in Cap Bud Decisions?

- Opportunity Cost Considering foregone opportunities
- Risk Premium: IS Return commensurate with Risk

Risk ≠ Uncertainty

Risk : Probabilities can be assigned | Uncertainty : Probabilities cannot be assigned

Factors Affecting Cap Bud Decisions

Internal

- Project-Specific Risks – Location / Environment
- Company-Specific Risks Credit / Management

External

- Industry-Specific Risks: Regulatory / tax / subsidies
- Market-Specific Risks: Supply chain RM shortages
- Competition Risks: New competitors / Tech
- Economic Condition Risks: Inflation, / Interest rate / Forex
- International Risks: Geopolitical Risks / Trade sanctions

Risk Analysis

- **Statistical Techniques**
  - Probability
  - Variance / SD
  - Co-efficient of Variation
- **Conventional techniques**
  - RADR
  - Certainty Equivalent
- **Other Techniques**
  - Sensitivity Analysis
  - Scenario Analysis
  - Simulation Analysis
  - Decision Tree

Expected NCF for a period $= \sum Pi\ NCFi$

For Single Period ENPV $= \sum_{t=1}^{n} \frac{ENCF}{(1+k)^t}$

For Multi-Period ENPV $= \frac{ENCF}{(1+k)^1} + \frac{ENCF}{(1+k)^2} + \cdots \frac{ENCF}{(1+k)^t}$

Variance $\sigma^2 = \sum_{j=1}^{n} Pi\ x\ (NCF - ENCF)^2$

Multi-Period $\sigma^2 = \frac{\sum(x-\bar{x})^2}{n}$

With Probability $\sigma^2 = \sum Pi(x - \bar{x})^2$

Hiller's Method:

Mean $M = \sum_{i=0}^{n}(1+r)^{-1}Mi$

$\sigma^2 = \sum_{i=0}^{n}(1+r)^{-2i}\sigma_i^2$

When Following Text is Used "SD of the PV distribution" or SD about Expected Value"

Co-efficient of Variation:

$= \frac{Standard\ Deviation}{Expected\ Cash\ Flow}$

= Risk Per unit of CF

Lower CV = Lower Risk

SD Vs. Variance

- Variance – Portrays range / spread of cash flow values, emphasizing how far each value deviates from the mean
- SD - quantifies variability or risk associated with the cash flow values

Certainty Equivalent Method

$NPV = \sum \frac{\alpha * NCF}{(1+Rf)^n} - Initial\ Investment$

$\alpha = \frac{Certain\ CF}{Expected\ CF\ from\ Risky\ Projects}$

Advantages

- Simple & Easy
- Allows adjustments for higher risk in specific years& Easy computation for diff risk levels

Disadvantages

- No objective or mathematical technique for estimating CE.
- CEs subjectively estimated by Mgmt & Ignores Shareholders Risk Perception

Determine NPV of the project with the following information: 1

Initial Outlay of project	₹ 40,000
Annual CFAT - Real	₹ 15,000
Useful life	4 years
Salvage value	Nil
Cost of Capital (Including inflation premium of 10%)	12%

Solution:

Method 1: Discounting Nominal Cash Flows

Year	Real CF	Inflation	Nominal CF	Disc Rate @12%	PV
1	15,000	=(1+10%)^1= 1.1	16,500	0.892	14,718.000
2	15,000	=(1+10%)^2= 1.21	18,150	0.797	14,465.550
3	15,000	=(1+10%)^3= 1.331	19,965	0.712	14,210.693
4	15,000	=(1+10%)^4= 1.4641	21,961.5	0.636	13,967.514
			76,576.5		57,361.76

PVCIF = ₹ 57,362
Initial Investment = ₹ 40,000
NPV = **₹ 17,362**

Method 2: Discounting Real Cash Flows with Real Rate

1+ Nominal Rate = (1+ Real Rate) * (1+ Inflation Rate)
(1+ Real Rate) = *(1+Nominal Rate)/(1+Inflation Rate)*
Real Rate = *(1+Nominal Rate)/(1+Inflation Rate)* -1
= *(1+12%)/(1+10%)* -1
= 1.82%

Year	Real CF	PVF @ 1.82%
1	15,000	0.982
2	15,000	0.965
3	15,000	0.947
4	15,000	0.930
		3.824

PVCIF (real) = 15,000* 3.824
= ₹ 57,366
PVCOF (real) = ₹ 40,000
NPV = **₹ 17,366**

Calculate Coefficient of Variation of Project A and Project B based on the following information: 2

Possible Event	Project A		Project B	
	CF(₹)	Prob	CF(₹)	Prob
A	10000	0.10	26,000	0.10
B	12,000	0.20	22,000	0.15
C	14,000	0.40	18,000	0.50
D	16,000	0.20	14,000	0.15
E	18,000	0.10	10,000	0.10

Solution:

Expected Cash Flows of the project A

Pi	CF	Pi * CF	$\sigma^2 = \sum Pi\,(x-\bar{x})^2$
0.1	10,000	1,000	0.1 (10,000 – 14,000)²
0.2	12,000	2,400	0.2 (12,000 – 14,000)²
0.4	14,000	5,600	0.4 (14,000 – 14,000)²
0.2	16,000	3,200	0.2 (16,000 – 14,000)²
0.1	18,000	1,800	0.1 (18,000 – 14,000)²
Total		14,000	48,00,000

σ^2 = **48,00,000** | σ = **2,190.89** | **CV = 2190/14000 = 0.1565**

Expected Cash Flows of the project B

Pi	CF	Pi * CF	$\sigma^2 = \sum Pi\,(x-\bar{x})^2$
0.10	26,000	2,600	0.1 (26,000 – 18,000)²
0.15	22,000	3,300	0.15 (22,000 – 18,000)²
0.50	18,000	9,000	0.5 (18,000 – 18,000)²
0.15	14,000	2,100	0.15 (14,000 – 18,000)²
0.10	10,000	1,000	0.1 (10,000 – 18,000)²
Total		18,000	1,76,00,000

σ^2 = **1,76,00,000** | σ = **4,195.235** | **CV = 0.2331**

3 Skylark Airways is planning to acquire a light commercial aircraft for flying class clients at an investment of ₹ 50,00,000. The expected cash flow after tax for the next three years is as follows:

Year 1		Year 2		Year 3	
CFAT	Probability	CFAT	Probability	CFAT	Probability
14,00,000	0.1	15,00,000	0.1	18,00,000	0.2
18,00,000	0.2	20,00,000	0.3	25,00,000	0.5
25,00,000	0.4	32,00,000	0.4	35,00,000	0.2
40,00,000	0.3	45,00,000	0.2	48,00,000	0.1

The Company wishes to take into consideration all possible risk factors relating to airline operations. The company wants to know:

(i) The expected NPV of this venture assuming independent probability distribution with 6 per cent risk free rate of interest.

(ii) The possible deviation in the expected value.

(iii) How would standard deviation of the present value distribution help in Capital Budgeting decisions?

Solution:

Expected NPV @ 6%

Year	0	1	2	3
Cash Flow (WN1)	(50)	27	29.3	27.9
PVF @6%	1	0.943	0.890	0.840
	(50)			74.97
NPV				24.974

Variance and SD of Cash Flow

Year	1	2	3
σ^2	85.4	98.61	74.29
σ	9.2412	9.9302	8.619

Expected Value of the Deviation – Hiller's Method

$$= = \sqrt{\frac{85.4}{(1.06)^2} + \frac{98.61}{(1.06)^4} + \frac{74.29}{(1.06)^6}}$$

$$= \sqrt{206.4855}$$

$$= ₹\ 14.3696 \text{ lakhs}$$

Standard Deviation identifies risk in cash flows. Using this, coefficient of variation can be computed and per unit of cashflows, how much risk is taken can be measured and decision on capital budgeting can be taken.

Standard Deviation and Variance

$\sigma^2 = \sum P_i(x - \bar{x})^2$

Year 1

$0.1 * (14-27)^2 = 16.9$

$0.2 * (18-27)^2 = 16.2$

$0.4 * (25-27)^2 = 1.6$

$0.3 * (40-27)^2 = 50.7$

$\sigma^2 = 85.4$

$\sigma = 9.2412$

Year 2

$0.1 * (15-29.3)^2 = 20.449$

$0.3 * (20-29.3)^2 = 25.947$

$0.4 * (32-29.3)^2 = 2.916$

$0.2 * (45-29.3)^2 = 49.298$

$\sigma^2 = 98.61$

$\sigma = 9.9302$

Year 3

$0.2 * (18-27.9)^2 = 19.602$

$0.5 * (25-27.9)^2 = 4.205$

$0.2 * (35-27.9)^2 = 10.082$

$0.1 * (48-27.9)^2 = 40.401$

$\sigma^2 = 74.29$

$\sigma = 8.619$

4 Shivam Ltd. is considering two mutually exclusive projects, A and B. Project A costs ₹ 36,000 and project B ₹30,000. You have been given below the net present value probability distribution for each project.

Project A		Project B	
NPV estimates (₹)	Probability	NPV estimates (₹)	Probability
15,000	0.2	15,000	0.1
12,000	0.3	12,000	0.4
6,000	0.3	6,000	0.4
3,000	0.2	3,000	0.1

(i) Compute the expected net present values of projects A and B.
(ii) Compute the risk attached to each project i.e. SD of each Prob distribution.
(iii) Compute the profitability index of each project.
(iv) Which project do you recommend? State with reasons

Solution:

A			B		
P_i	CF	P_i *CF	P_i	CF	P_i *CF
0.2	15,000	3,000	0.1	15,000	1,500
0.3	12,000	3,600	0.4	12,000	4,800
0.3	6,000	1,800	0.4	6,000	2,400
0.2	3,000	600	0.1	3,000	300
1.0		9,000			9,000

Expected NPV of Project A and B are ₹ 9,000 each.

σ_A^2 = 0.2(15,000-9,000)² + 0.3(12,000-9,000)² +0.3(6,000-9,000)² +0.2(3,000-9,000)² = 1,98,00,000

σ = **4,449.72**

σ_B^2 = 0.1(15,000-9,000)² + 0.4(12,000-9,000)² +0.4(6,000-9,000)² +0.1(3,000-9,000)² = 1,44,00,000

σ = **3,794.73**

Profitability Index of each project

	A	B
NPV	9,000	9,000
Add: Outflow	36,000	30,000
Inflow	45,000	39,000

Profitability Index $= \frac{Discounted\ Cash\ Inflow}{Intial\ Outflow}$

A $= \frac{45,000}{36,000} =$ **1.25**

B $= \frac{39,000}{30,000} =$ **1.30**

Project B has lower standard Deviation of Cash Flow at ₹ 3,794.73 for the same NPV of ₹ 9,000 and for a lower investment of ₹ 30,000 implying a higher Profitability Index of 1.3, hence **project B should be chosen**.

Conventional Techniques Imp Points

- Cannot adjust both CF & Discount rate - Only one
- Nature of uncertainty / risk associated with the project determines adjustment of CF / Disc Rate
- Contributes to Informed Decision Making

$$RADR, k_c = R_f + Risk\ Premium$$

$$\text{Profitability Index} = \frac{PV\ of\ CF}{Initial\ Investment}$$

RADR Adv	Dis Adv
Easy	Risk Premium Difficult to find out
Risk Premium in Disc Factor	NPV yes – SD No

Senstivity Analysis. Adv	Dis Adv
Identifies Critical Factors	Assumes Independence of Variables
Simple	Ignores Probability

Sensitivity Analysis Process

Identify Variables impacting project NPV / IRR → Establish relationship with NPV or IRR. → Adjust 1 variable at a time while keeping other variables constant to analyse its impact on NPV or IRR. → Identify which variables & (their sensitivity level) have the most significant impact on NPV or IRR.

- **Scenario analysis** evaluates multiple scenarios involving simultaneous changes in input variables.
- Best/ base/ worst-case Scenarios

Advantages:

- Considers multiple changes at once, providing a more comprehensive view
- Incorporates diverse scenarios, covering a range of potential business conditions

Disadvantages

- The range might still be limited and not cover all possible real-world situations
- Can be complex and challenging to manage due to a large number of variables and scenarios possible.

Differences	Sensitivity Analysis	Scenario Analysis
Scope	1 Variable change	Simultaneous Multiple variable changes
Complexity	Simple	Complex
Outcomes	Simplistic Outcomes	Varied & Comprehensive outcomes
Approach	No Correlation	Possibility of Multiple Correlated Factors

5 If Investment proposal costs ₹ 45,00,000 and risk-free rate is 5%, calculate net present value under certainty equivalent technique:

Year	Expected cash flow (₹)	Certainty Equivalent coefficient
1	10,00,000	0.90
2	15,00,000	0.85
3	20,00,000	0.82
4	25,00,000	0.78

Solution:

Cash outflow for Year 0 is ₹ 45 Lakhs

Year	0	1	2	3	4
CF in ₹ Lakhs	(45)	10	15	20	25
PVF @5%	1	0.952	0.907	0.864	0.823
DCF		9.524	13.605	17.277	20.568
∝		0.90	0.85	0.82	0.78
DCF * ∝		8.5716	11.56425	14.16714	16.04304

PVCIF = 50.34603 Lakhs
Less: COF = 45 Lakhs
NPV = **₹ 5.34603 Lakhs**

6 Estimates of the net cash flows and probability of a new project of M/s X Ltd.:

	Year	P = 0.3	P = 0.5	P = 0.2
Initial investment	0	4,00,000	4,00,000	4,00,000
Estimated net after tax cash inflows per year	1 to 5	1,00,000	1,10,000	1,20,000
Estimated salvage value (after tax)	5	20,000	50,000	60,000

Required rate of return from the project is 10%. Find:

(i) The expected NPV of the project.

(ii) The best case and the worst case NPVs.

(iii) The probability of occurrence of the worst case if the cash flows are perfectly dependent overtime and independent overtime.

(iv) Standard deviation and coefficient of variation, assuming that there are only three streams of cash flow, which are represented by each column of the table with the given probabilities.

(v) Coefficient of variation of X Ltd. on its average project which is in the range of 0.95 to 1.0. If the coefficient of variation of the project is found to be less risky than average, 100 basis points are deducted from the Company's cost of Capital

Should the project be accepted by X Ltd?

Solution:

Initial Investment = ₹ 4,00,000

Cash Flows (Year 1–5) (Expected) = 0.3* 1,00,000 + 0.5* 1,10,000 + 0.2* 1,20,000 **= ₹ 1,09,000**

Salvage Value = 0.3* 20,000 + 0.5* 50,000 + 0.2* 60,000 = ₹ **43,000**

Present Value Factor @ 10% Cost of Capital

PVF_A (5,10%) = 3.7908* 1,09,000 = ₹ 4,13,195.76
PVF (5,10%) = 0.6209* 43,000 = ₹ 26,699.61
Total = ₹ 4,39,895.37

i) Net Present Value = PV of Cash Inflows – PV of Cash Outflows

= 4,39,895.37– 4,00,000

= ₹ **39,895.37**

NPV in best and worst cases

	Best Case	Worst Case
Per year Cash flow (a)	1,20,000	1,00,000
PVF_A (b)	3.7908	3.7908
A= (a)* (b)	4,54,896	3,79,080
Salvage Value (c)	60,000	20,000
PVF (Year 5) (d)	0.6209	0.6209
B= (c)* (d)	37,254	12,418
A+B	4,92,150	3,91,498
Less: Investment	4,00,000	4,00,000
NPV	92,150	(8,502)

Cash flows perfectly Dependent Overtime

First year cash flows determine cash flow of all subsequent years, of which probability is provided 0.3.

Cash flows are Independent Overtime. Probability of worst case in all 5 years,

= 0.3*0.3*0.3*0.3*0.3 = 0.00243

Most Likely NPV = -4,00,000+1,10,000*3.7908 + 50,000*0.620 = 48,033

σ^2 = 0.3(-8,502-39,895)^2 + 0.5(48,033-39,895)^2 + 0.2(92,150-39,895)^2

= 1,28,19,11,409.4

σ = 35,803.79

Coefficient of Variation = $\frac{\sigma}{ENPV} = \frac{35803.79}{39895} = 0.897$

Because Coefficient of Variation is 0.897, which is less than 0.95, the cost of capital will be 100 bps lower than 10% i.e it will 9%. 9% is RADR. ENPV of project at 9% Cost of Capital:

Year	PVF@ 9%	
Year 0	1	4,00,000 Investment
Year 1-5	3.889	1,09,000 Inflow
Year 5	0.6499	43,000 Salvage
	NPV	₹ 51,919.03

7

XYZ Ltd. is considering a project for which the following estimates are available:

	₹
Initial Cost of the project	10,00,000
Sales price/unit	60
Cost/unit	40
Sales volumes	
Year 1	20000 units
Year 2	30000 units
Year 3	30000 units

Discount rate is 10% p.a.

You are required to measure the sensitivity of the project in relation to each of the following parameters:

(a) Sales Price/unit (b) Unit cost (c) Sales volume (d) Initial outlay and (e) Project lifetime . Taxation may be ignored.

Solution:

Project NPV for the given data

Year	0	1	2	3
Cash Flow (WN1)	– 10,00,000	4,00,000	6,00,000	6,00,000
PVF @10%	1	0.909	0.8264	0.7513
PVCIF	-10,00,000	3,63,636.36	4,95,867.76	4,50,788.8
NPV	-10,00,000			13,10,293
NPV	3,10,293			

Method 1: Sensitivity, when Selling Price reduces by 10%

Year	0	1	2	3
Cash Flow (WN1)	– 10,00,000	2,80,000	4,20,000	4,20,000
PVF @10%	1	0.909	0.8264	0.7513
PVCIF	-10,00,000	2,54,545.45	3,47,107.44	3,15,552.22
NPV	-10,00,000			9,17,205.11
NPV	-82,794.89			

From a 10% reduction in selling price, the NPV fell by ₹ 3,93,087.89 to ₹ –82,794 from 3,10,293 i.e., a reduction of **126.68%**

Method 2: At what Selling Price will NPV be zero.

Let S be the sale price,

$$\left\{\frac{(S-40)*20,000}{1.1}+\frac{(S-40)*30,000}{1.1^2}+\frac{(S-40)*30,000}{1.1^3}\right\}-10,00,000=0$$

-36,20,586 +65,514.65 S= 0 => **S = 55.26**

At price of ₹ 55.26, i.e., a reduction in Selling Price by ₹ 4.74, i.e., a **reduction of 7.89%** the NPV reduces by 100% to zero.

Change in Unit Cost: **Method 1:** Unit Cost Increases by 10% from 40 to 44

Year	0	1	2	3
Cash Flow (WN 3)	-10,00,000	3,20,000	4,80,000	4,80,000
PV @10%	-10,00,000			10,48,234.41
NPV				₹ 48,234.41

Reduction in NPV = 3,10,293 – 48,234

= ₹ 2,62,058 = 84.45%

For 10% increase in cost, the NPV reduces by 84.45%

Method 2: At what cost, NPV will be zero

Year	0	1	2	3
Cash Flow (WN 3)	-10,00,000	(60-c)*20,000	(60-c)*30,000	(60-c)*20,000
		1.1	1.21	1.31

29,30,879 – 65,514.6 C = 0

C = 44.736

If Cost increases by **11.84%** i.e., ₹ 4.736 from ₹ 40 to ₹ 44.736, the NPV will reduce by 100% to zero.

Method 1: Reduction in Sales Volume by 10%

Year	0	1	2	3
C.F (WN 4)	= (10,00,000)	= 20* 18,000 = 3,60,000	=20* 27,000 = 5,40,000	=20*27,000 = 5,40,000

PV @ 10% = ₹ 1,79,263

Reduction from original NPV ₹ 3,10,293 = ₹ 1,31,029 **= 42.22%**

10% reduction in volume, reduces NPV by 42.22%

Method 2: At what volume will NPV be zero.

Since volume reduction is common across all 3 yrs, the reduced NPV equation for NPV @ 0

- Outflow+ current Inflow (1-x) = D
- 10,00,000+ 13,10,293(1-x) = 3,10,293- 3,10,293

3,10,293 = 13,10,293 x

x = $\frac{310293}{1310293}$

x = **23.68%**

Method 1: 10% increase in Outlay (₹ 1,00,000)

₹ 1,00,000 increase in outlay, reduces NPV by ₹ 1,00,000 i.e., 10% for ₹ 3,10,293 to ₹ 2,10,293 i.e., a reduction of **32.2276%**

Method 2: Increase in Outflow to be zero

Current Outflow = ₹ 10,00,000

Current Inflow = ₹ 13,10,293

Increase in outflow for NPV to be zero, is increase of ₹ 3,10,293 i.e., **31.03%** for NPV to reduce by 100%.

Method 1: If project life time reduces by 10%, i.e., from 3years to 2.7 years, last year reduction from 1 year to 0.7 years

Year	0	1	2	3
CF	(10,00,000)	4,00,000	6,00,000	6,00,000
Period	1	1	1	0.7
PV @ 10%	(10,00,000)	11,75,056		
NPV	1,75,056			

Reduction for 3,10,293 to 1,75,056 = **43.58%**

Method 2: At what period will NPV be zero.

Amount received in years 1 and 2

= 4,00,000/1.1 + 6,00,000/1.21 = ₹ 8,59,504

Balance to be recovered in PV terms = 10,00,000 – 8,59,504 = 1,40,496

Amount to be recovered in FV terms = 1,40,496 X 1.331 = 1,87,000

Total units manf per day = 30000 / 365 = 82.19 units

Profit per unit = ₹20

Per day profit = 82.19 x 20 = ₹1643.84

No of days of profit required = ₹1,87,000 / ₹1643.84 = 113.76 days.

Unit has to operate for 114 days in Year 3. i.e a reduction of 251 days in Yr 3.

So total period reduction = 251/1095 x 100 = 22.92 %

	Impact on NPV of a 10% Reduction	Change required for NPV= 0
Selling Price	126.68	7.89
Cost	84.45	11.84
Volume	42.22	23.68
Outlay	32.23	31.03
Time	43.58	22.92

Involves depicting decision-making processes via a branching tree-like structure, where choices and potential outcomes are evaluated sequentially.

Decision trees assist in assessing multiple scenarios, weighing outcomes, and making rational investment decisions.

Probabilities associated with chance nodes indicate the likelihood of specific outcomes, providing a nuanced understanding of potential scenarios.

The evaluation starts from the right (decision nodes) and progresses leftwards, assessing alternatives logically based on monetary implications.

Key Nodes and Components:

- Decision nodes: Points where choices are made regarding various alternatives.
- Events/ Chance nodes: Represent outcomes or events with associated probabilities.
- Outcomes: Depicted as circles, representing potential results of decisions and events.

Steps in Decision Tree Analysis

1. Define the investment problem.
2. Identify alternatives for evaluation.
3. Draw a decision tree.
4. Evaluate alternatives using the decision tree structure.
5. Make a rational decision based on maximizing profits or minimizing costs.

Structure of a Decision Tree:

- Outcomes, such as good, bad, best case, worst case, or proceed / don't proceed, reflect potential scenarios branching from decision points.
- Tree structure denotes a hierarchy where outcomes are evaluated systematically, leading from right to left.
- The analysis begins by computing NPV at end nodes, moving backward to determine the most rational path.
- Rational decisions are made by choosing paths that maximize profits or minimize costs, not driven by personal preferences.

Working Notes

Selling Price = ₹ 60/ Unit |Cost = ₹ 40/ unit =>Contribution = ₹ 20/ unit

Year 1	= 20,000 units,	Cash flow = ₹ 4,00,000
Year 2	= 30,000 units,	Cash flow = ₹ 6,00,000
Year 3	= 30,000 units,	Cash flow = ₹ 6,00,000

Selling Price reduces by 10%

Selling Price = ₹ 54/ unit |Cost = ₹ 40/ unit=> Contribution = ₹ 14/ unit

Year 1	= 20,000 units,	Cash flow = ₹ 2,80,000
Year 2	= 30,000 units,	Cash flow = ₹ 4,20,000
Year 3	= 30,000 units,	Cash flow = ₹ 4,20,000

Unit Cost increase by 10%

Selling Price = ₹ 60 / unit |Cost = ₹ 40+ 10% = ₹ 44=> Profit = ₹ 16

Year 1	= 20,000 units*16	Cash flow = ₹ 3,20,000
Year 2	= 30,000 units*16	Cash flow = ₹ 4,80,000
Year 3	= 30,000 units*16	Cash flow = ₹ 4,80,000

Reduction in Sales Volume

Year	Volume	%	Revised Volume
Year 1	20,000 units	10%	18,000
Year 2	30,000 units	10%	27,000
Year 3	30,000 units	10%	27,000

8 A firm has an investment proposal, requiring an outlay of ₹ 80,000. The investment proposal is expected to have two years economic life with no salvage value. In year 1, there is a 0.4 probability that cash inflow after tax will be ₹ 50,000 and 0.6 probability that cash inflow after tax will be ₹ 60,000. The probability assigned to cash inflow after tax for the year 2 is as follows:

The cash inflow year 1	₹ 50,000		₹ 60,000	
The cash inflow year 2	Probability		Probability	
	₹ 24,000	0.2	₹ 40,000	0.4
	₹ 32,000	0.3	₹ 50,000	0.5
	₹ 44,000	0.5	₹ 60,000	0.1

The firm uses a 10% discount rate for this type of investment. Required:

(i) Construct a decision tree for the proposed investment project and calculate the expected net present value (NPV).

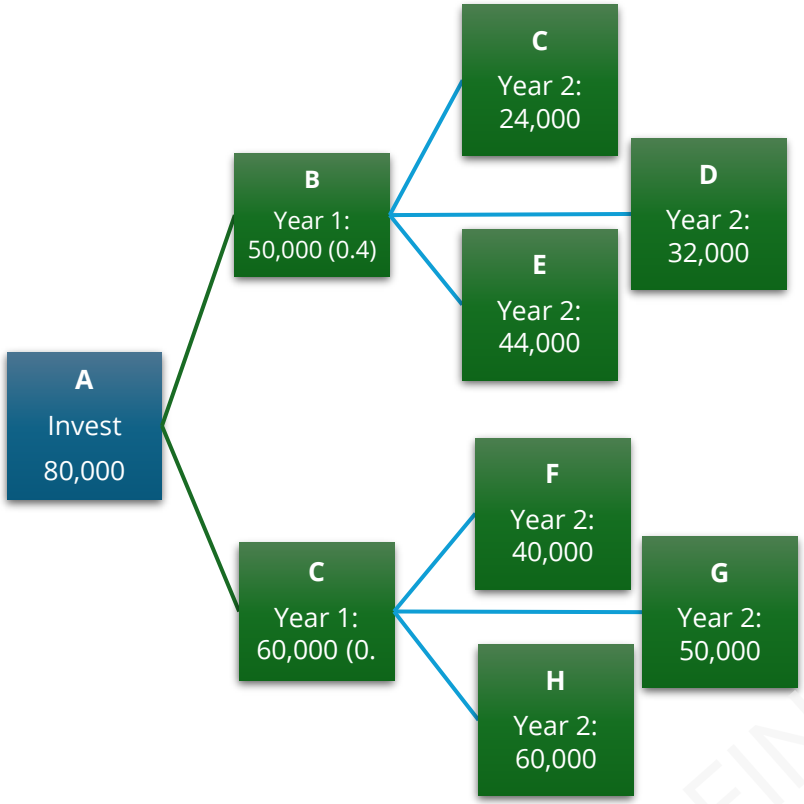
(ii) What net present value will the project yield, if worst outcome is realized? What is the probability of occurrence of this NPV?

(iii) What will be the best outcome and the probability of that occurrence?

(iv) Will the project be accepted?

(Note: 10% discount factor 1 year 0.909; 2 year 0.826)

Solution:



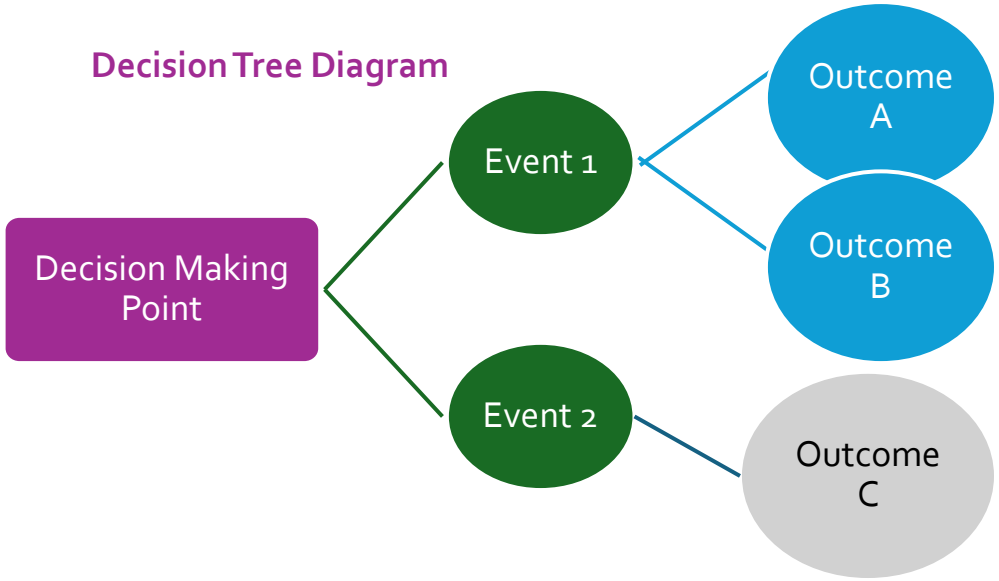
Expected Value

Part	Year 1 Cf* PV	Year 2 Cf*PV	– Invest	NPV (1)	Joint Probability (2)	(1)* (2)
1	= 50,000*0.909 = 45,450	= 24,000*0.826 = 19,824	– 80,000	–14,726	= 0.4*0.2 = 0.08	–1,178.08
2	45,450	= 32,000*0.826 = 26,432	– 80,000	–8,118	= 0.4*0.3 = 0.12	–974.16
3	45,450	= 44,000*0.826 = 36,344	– 80,000	1,794	= 0.4*0.5 = 0.2	358.8
4	= 60,000*0.909 = 54,540	= 40,000*0.826 = 33,040	– 80,000	7,580	= 0.6*0.4 =0.24	1,819.2
5	54,540	= 50,000*0.826 = 41,300	– 80,000	15,840	= 0.6*0.5 = 0.3	4,752
6	54,540	= 60,000*0.826 = 49,560	– 80,000	24,100	= 0.6*0.1 = 0.06	1,446
						6,223.76

Expected Value = **₹ 6,223.76**

- If worst outcome is realised, the NPV will be **–₹ 14,726** and probability will be 0.08
- If best outcome is realised, the NPV will be **–₹ 24,100** and probability will be 0.06
- Yes, the project is accepted as the expected value of NPV is positive at **₹ 6,223.76.**

Decision Tree Diagram



Monte Carlo Simulation involves choosing random paths using a random number generator and analysing multiple outcomes to create a distribution curve, showcasing a range of potential results.

Parameters
- Input variables controlled by the investor in a simulation model, representing factors within their control, such as investment costs or interest rates.

Exogenous Variables
- Uncontrollable inputs with stochastic nature, such as market prices, which exhibit probability distributions without precise predictability.

Stochastic Variables:
- These variables cannot be precisely determined but possess probability distributions, contributing to the uncertainty within the simulation model.

Steps in Monte Carlo Simulation

Model Creation
- Identify Exogenous (Stochastic / random) Variables
- Determine Input Parameters
- Develop a Model Eg: NPV

Parameter Specification
- Assign Parameter Values
- Define Probability Distribution

Random Value Selection
- Generate Random Numbers
- Map to Probability Distribution

Iterative Process
- Choose Exogenous Variables
- Repeat Iteratively:

NPV Computation
- Calculate NPV

Analysis and Visualization
- Plot NPV Probability Distribution
- Compute Mean and Standard Deviation

With i = 10%, I = ₹ 1,30,000, CF t & n stochastic exogenous variables with the following distribution will be as under:

Annual Cash Flow		Project Life	
₹	Probability	Year	Probability
10,000	0.02	3	0.05
15,000	0.03	4	0.10
20,000	0.15	5	0.30
25,000	0.15	6	0.25
30,000	0.30	7	0.15
35,000	0.20	8	0.10
40,000	0.15	9	0.03
Total	**1.00**	**10**	**0.02**

Random Numbers

53479	81115	98036	12217	59526
97344	70328	58116	91964	26240
66023	38277	74523	71118	84892
99776	75723	03172	43112	83086
30176	48979	92153	38416	42436
81874	83339	14988	99937	13213
19839	90630	71863	95053	55532
09337	33435	53869	52769	18801
31151	58295	40823	41330	21093
67619	52515	03037	81699	17106

Correspondence between Values of Exogenous Variables and Two Digit Random Numbers:

Annual Cash Flow				Project Life			
Value (₹)	Prob	Cumu. Pro	2 Digit Random No.	Year	Prob	Cumu. Pro	2 Digit Random No.
10,000	0.02	0.02	00 – 01	3	0.05	0.05	00 – 04
15,000	0.03	0.05	02 – 04	4	0.10	0.15	05 – 14
20,000	0.15	0.20	05 – 19	5	0.30	0.45	15 – 44
25,000	0.15	0.35	20 – 34	6	0.25	0.70	45 – 69
30,000	0.30	0.65	35 – 64	7	0.15	0.85	70 – 84
35,000	0.20	0.85	65 – 84	8	0.10	0.95	85 – 94
40,000	0.15	1.00	85 – 99	9	0.03	0.98	95 – 97
				10	0.02	1.00	98 – 99

Run	Random No. (Annual Cash Flow)	Corresponding Value of Annual Cash Flow (1)	Random No. (Project Life)	Corresponding Value of Project Life	PVAF @ 10% (2)	NPV (1) × (2) – 1,30,000
1	53	30,000	97	9	5.759	42,770
2	66	35,000	99	10	6.145	85,075
3	19	25,000	81	7	4.868	(8,300)
4	31	20,000	09	4	3.170	(66,600)
5	31	25,000	67	6	4.355	(21,125)
6	81	35,000	70	7	4.868	40,380
7	48	30,000	75	7	4.868	16,040
8	30	40,000	33	5	3.791	21,640
9	90	40,000	33	5	3.791	21,640
10	58	30,000	52	6	4.355	650

Monte Carlo Simulation Adv & Dis Adv

Advantages

- Provides a range of potential bad outcomes beforehand
- Capable of managing and incorporating exogenous variables
- Considers complex interdependencies between variables
- Compels Decision Makers to consider interdependencies & uncertainties

Disadvantages

- Difficulty to model & Specify Probability Distribution
- Lack of Precision
- Complex Modelling by Experts
- Risk Assessment and NPV Impact

Steps in Replacement Decision

Step 1: Net Cash flow = Cost of new Machine – (Tax saving + market value of old machine) **[NCOF is** *negative value]*

Tax Savings of Old Machine = (BV - MV)*Tax Rate

Step 2: Cash Flow per Year = (Change in Sales +/- Change in Operating Cost – Change in Depreciation) × (1- Tax) + Change in Depreciation

Or

(Change in Sales +/- Change in Operating Cost) ×(1- Tax) + (Change in Depreciation × Tax)

Step 3: Present Value of Cashflows = Present Value of Yearly Cash Flows (Step 2) + Present Value of Salvage value of New Machine

Step 4: NPV = Step 1 [cash outflow i.e -ve value] + Step 3 [cash inflow i.e +ve value]

9 A Company named Roby's cube decided to replace the existing Computer system of their organization. The original cost of the old system was ₹ 25,000 and it was installed 5 years ago. Current market value of old system is ₹ 5,000. Depreciation of the old system was charged with life of 10 years with Estimated Salvage value as Nil. Depreciation of the new system will be charged with life over 5 years. Present cost of the new system is ₹ 50,000. Estimated Salvage value of the new system is ₹ 1,000. Estimated cost savings with the new system is ₹ 5,000 per year. Increase in sales with new system is assumed at 10% per year based on original total sales of ₹ 1,00,000. Company follows straight line method of depreciation. The cost of capital of the company is 10% whereas tax rate is 30%. Evaluate the replacement decision

Solution:

	Old System	New System
Original Cost	25,000	50,000
Original Life	10 years	5 years
Life Expected	5 years	0
Market Value (Today)	5,000	
Salvage Value (10 yrs)	0	1,000
Savings		5,000
Sales	1,00,000	
Increase In Sales		10,000 p.a
Depreciation	SLM	SLM
Kc	10%	10%
Tax	30%	30%

STEP 1:

Cash Outflow of New System + Cash Inflow of Old System

= –50,000 + 7,250 = **–42,750**

Calculation:

Book Value of Old System

Depreciation = $\frac{25,000-0}{10}$ = ₹ 2,500

Life Exhausted = 5 years

Depreciation for 5 years = 5* 2500 = 12,500

Current Book Value = 25,000– 12,500 = ₹ 12,500

Cash Inflow from Old System

i) Market Value = ₹ 5,000

ii) Tax Benefit on Loss = (Book Value – Market Value) * Tax Rate

= (12,500–5,000)*30% = ₹ 2,250

Cash Inflow = 5,000+ 2,250 = 7,250

Cash Outflow from New System = – 50,000

STEP 2: Changes in Annual Cash Flows

= (Change in Sales+ Change in Savings) (1–t) + (Change in Depreciation)*t

= (15,000) *(1-30%) + 7,300*30%

= 10,500+ 2,190 = **₹ 12,690**

Calculation:

i) Increase in Sales = ₹ 1,00,000* 10% = ₹ 10,000

ii) Savings = ₹ 5,000

iii) Change in Depreciation

= New depreciation – Old Depreciation

= 9,800 – 2,500 = 7,300

New depreciation = (Original cost – Salvage Value)/Life

= 50000-1000/5 = 9,800

STEP 3: PV of Annual Cash Flow @10% for 5 Years

= (12,690* 3.790786) + (1000*0.62092)

= 48,105.08 + 620.92 = **₹ 48,726**

STEP 4: PV of Cash Inflow+ PV of Cash Outflow

= 48,726– 42,750 = **₹ 5,976**

STEP 5: Since NPV>0, the replacement **decision is correct**.

Optimum Replacement Cycle

$$\text{Equivalent Annual Cost (EAC)} = \frac{\text{Present Value of Cash Outflow (PVCF)}}{\text{Present Value Annuity Factor (PVAF)}}$$

Lower EAC values indicate lower annual costs associated with replacements over the project's life.

Adjusted Present Value

Base Case NPV (on unlevered cost of capital) + PV of tax benefits on interest

10

A machine used on a production line must be replaced at least every four years. Costs incurred to run the machine according to its age are:

Machine Age (years)	0	1	2	3	4
Purchase price (in ₹)	60,000				
Maintenance (in ₹)		16,000	18,000	20,000	20,000
Repair (in ₹)		0	4,000	8,000	16,000
Scrap Value (in ₹)		32,000	24,000	16,000	8,000

Future replacement will be with identical machine with same cost. Revenue is unaffected by the age of the machine. Ignoring inflation and tax, determine the optimum replacement cycle. PV factors of the cost of capital of 15% for the respective four years are 0.8696, 0.7561, 0.6575 and 0.5718.

Solution:

Replacement Cycle:

Repl. Cycle Years		1		2	
Year	PVF 15%	CF	PVCF	CF	PVCF
0	1	-60,000	-60,000	-60,000	-60,000
1	0.896	16,000	13,913.6	-16,000	-13,913.6
2	0.7561			2,000	1,512.2
3	0.6575				
4	0.5718				
		-46,086.4		-72,401	

Repl. Cycle Years		3		4	
Year	PVF 15%	CF	PVCF	CF	PVCF
0	1	-60,000	-60,000	-60,000	-60,000
1	0.896	-16,000	-13,913.6	-16,000	-13,913.6
2	0.7561	-22,000	-16,634.2	-22,000	-16,634.2
3	0.6575	-12,000	-7,890	-28,000	-18,410
4	0.5718			-28,000	-16,010.4
		-98,437.8		-1,24,968.2	

Optimum Replacement Cycle:

$$EAC = \frac{CumCF}{PVAF}$$

Replacement Period	Cum. PV of CF (1)	PVAF (2)	(1)/ (2)
1	-46,086.4	0.896	52,997
2	-72,401	1.6257	44,535
3	-98,437.8	2.2832	43,113.96
4	-1,24,968.2	2.855	43,771.7

The optimum replacement cycle is **after 3 years.** When EAC is lowest at ₹ 43,113.96.

Working Notes: Replacement at the end of Year 1:

Year	0	1
Cash Flows:		
Purchase	-60,000	
Maintenance		-16,000
Repairs		0
Scrap		32,000
	-60,000	**16,000**

Replacement at the end of Year 2:

Year	0	1	2
Cash Flows:			
Purchase	-60,000		
Maintenance		-16,000	-18,000
Repairs			-4,000
Scrap			24,000
	-60,000	**-16,000**	**2,000**

Replacement at the end of Year 3:

Year	0	1	2	3
Cash Flows:				
Purchase	-60,000			
Maintenance		-16,000	-18,000	-20,000
Repairs			-4,000	-8,000
Scrap				16,000
	-60,000	**16,000**	**-22,000**	**-12,000**

Replacement at the end of Year 4:

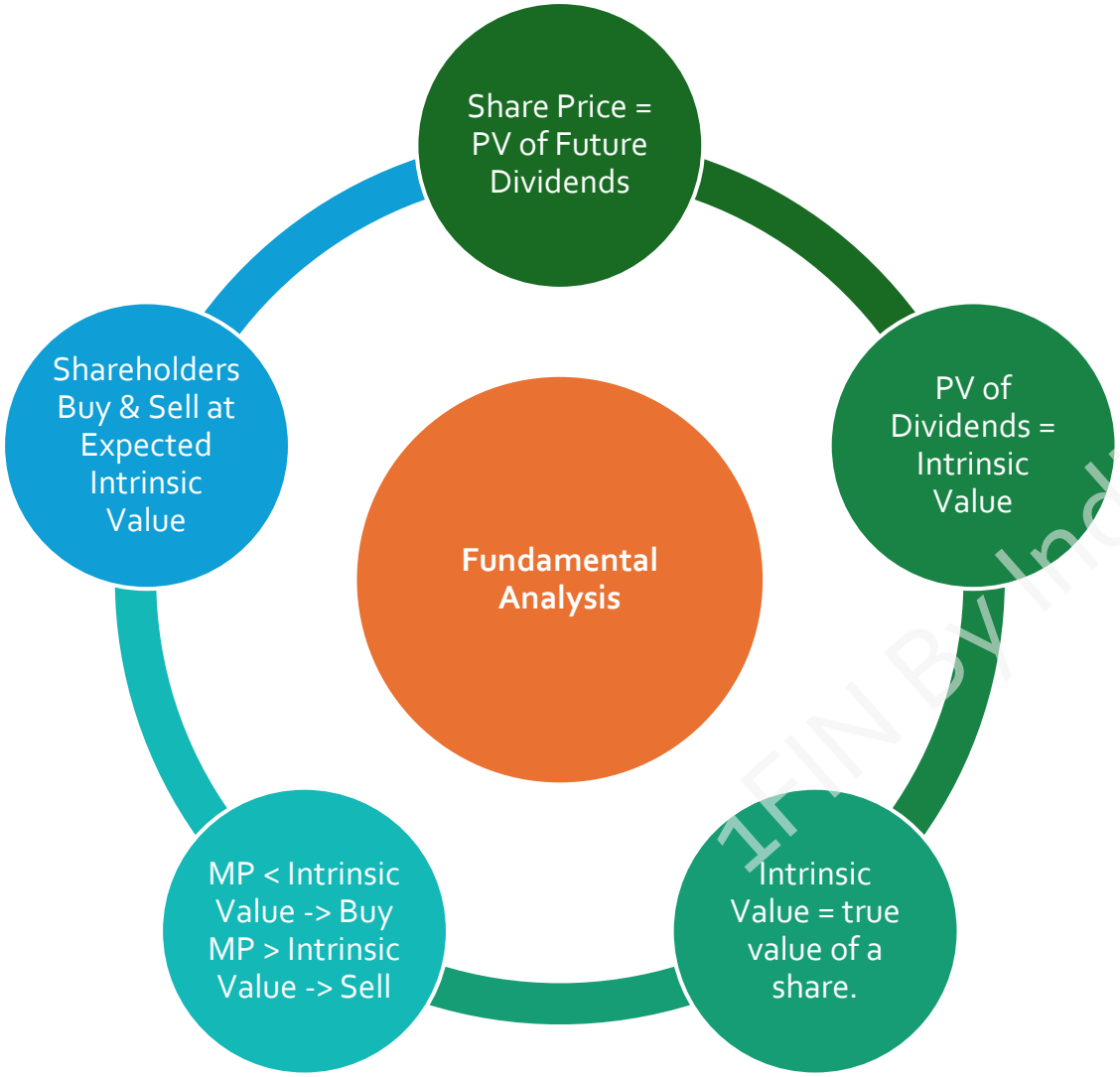
Year	0	1	2	3	4
Cash Flows:					
Purchase	-60,000				
Maintenance		-16,000	-18,000	-20,000	-20,000
Repairs			-4,000	-8,000	-16,000
Scrap					8,000
	-60,000	**16,000**	**-22,000**	**-28,000**	**-28,000**

SECURITY ANALYSIS

Last Day Revision Notes | Summary Notes | Concept Notes

Sriram Somayajula CA | CFA | ISB

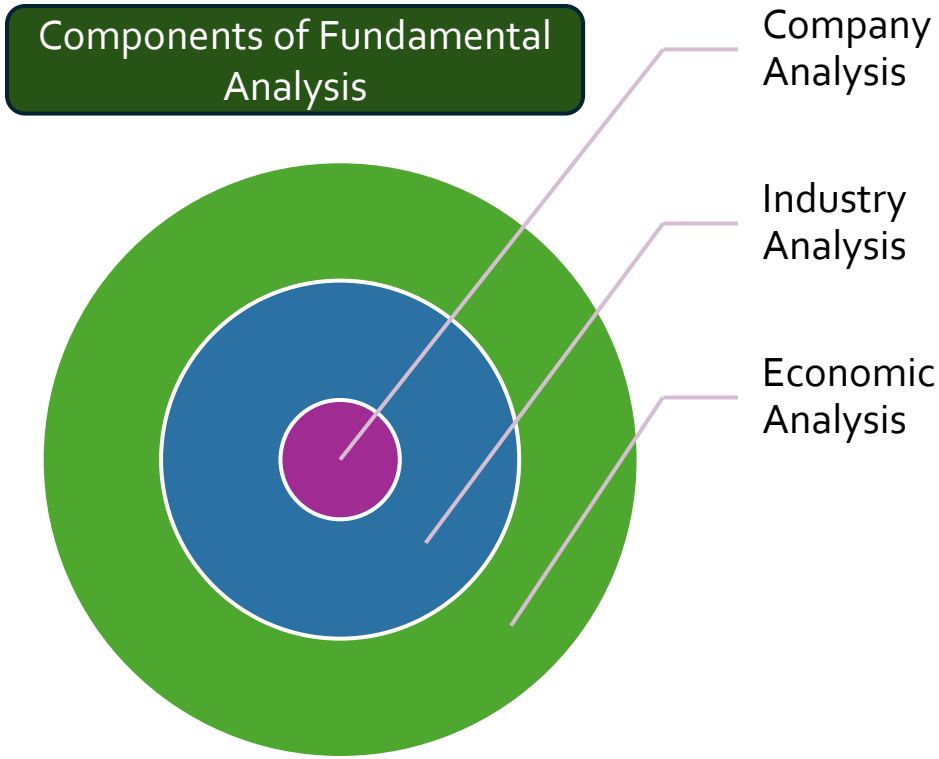
1FIN By IndigoLearn



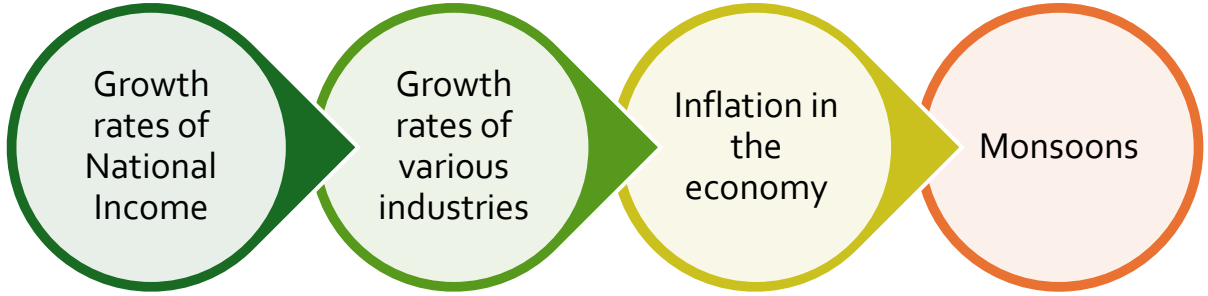
Gordon's Dividend Growth Model :

$$\text{Current Stock Price(Po)} = \frac{D_1}{k-g} = \frac{b \times E_1}{k-b \times r}$$

PE Multiple : $\frac{\text{Current Market Price}}{\text{Earnings per share}}$



Factors Affecting Economic Analysis



Factors affecting Industry analysis

Product Life Cycle	• High Profitability in initial & growth stages • Medium profitability in maturity stage • Sharp decline in last stage of growth
Demand Supply Gap	• Excess supply reduces the profitability • Insufficient supply improves the profitability
Barriers to Entry Industry with high profitability attracts new investments	• Barriers are innate to the product, technology etc. • Barriers may be created by existing firms in the industry.
Government Attitude	• Government attitude is crucial in determining prospects of the industry.
Competition in the Industry	• Market leadership. • Competition in domestic and foreign markets • Product differentiation
Cost Conditions and Profitability	• Cost control measures adopted by the units. • Product price • Production Cap – installed , idle & operating. • Level of CAPEX required for productive efficiency.
Technology and Research	• Industries which update themselves have a competitive advantage over others in terms of quality, price etc

Techniques used in Economic analysis

Anticipatory Surveys

- Expert Opinion on Economic Activities and consumer preferences
- But no guarantee of intentions materializing and not regarded as forecasts

Barometer/ Indicator Approach

- Leading Indicators
- Coincidental Indicators
- Lagging Indicators

Economic Model Building Approach

- Measure GNP
- Estimate components of GNP
- Compare with GNP forecast with that of an independent agency

Techniques used in Industry Analysis

Regression Analysis

- Product demand analysis by regressing Output against GNP, disposable income, per capita consumption / income, price elasticity of demand.
- Statistical techniques like regression analysis and correlation are used.

Input Output Analysis

- Reflects, flow of goods and services through the economy
- Identify changes in patterns using flow of goods from RM – WIP - FG

Factors affecting Company Analysis

Net worth & Book Value
- Book value per share represents intrinsic.
- Market price of the share reflects the future earnings potential which may have no relationship with the value of its assets.

Sources & Uses of Funds
- Use fund flow analysis to identify if short term sources of financing have been used for long term asset creation, if so it is a matter of concern

Cross Sectional & Time Series data
- Compare Common size statements & ratios with peers and industry benchmarks over time

Size & Ranking
- Rank Company based on Sales, ROE, ROCE, CE amongst industry peers
- Also rank on tech, R&D & Price leadership

Growth Record
- PE Ratio, EPS growth & NFA growth in the past can provide an idea of growth opportunities for the firm
- Identify reasons why the above metrics for a Company are different compared to peers
- Sources to identify plans are AR, Directors reports etc

Financial Analysis
- Use Financial Ratios to evaluate Financial position of the Company
- EPS, PE, Yield, BV & Intrinsic Value are primary aspects to be considered
- Also compare & contrast with past & peers, efficiency & liquidity ratios

Competitive Advantage
- A company's long-term success is driven largely by its ability to maintain its competitive advantage.
- Competitive advantage creates a shield around a business that allows competitors at a distance.

Management Quality
- Quality of management must be seen with reference to the experience, skills, and integrity of the Top Management. Investor's confidence on the management determined by Relationship with the investors /Dividend policy / Financial performance record etc.

Corporate Governance
- Compliance with SEBI (LODR) Regulations 2015
- Quality and timeliness of company financial disclosures
- Quality of independent directors

Regulation
- Compliance with various acts like Companies Act, FEMA, RBI, SEBI etc very important

Location & Labour Relations

(a)Location of the company's manufacturing facilities determines its economic viability such as
- ➢Availability of raw materials & skilled labour
- ➢Nearness to markets.

State of Labour relations also important

Stockholding Pattern

An analysis of the pattern of existing stock holdings of the company would also be relevant. This would show the stake of various parties in the company.

Marketability of Shares
- Trading Volumes, overall activity & speculative interest should be evaluated

Correlation & Regression Analysis:

- Relationship between variables belonging to economy, industry and company are found out.
- Adv: One can test the reliability of such estimates.

Trend Analysis

- Gives an insight into the historical behaviour of the variable

Decision Tree Analysis

- A range of values of the variable with probabilities of occurrence of each value is taken up.
- The limitations are reduced through decision tree analysis and use of simulation techniques.
- Decision is taken sequentially with probabilities attached to each sequence.

Group Analysis

- RBI & SEBI focus on Group Company related Disclosures & Exposures

Technical Analysis visualizes the actions of market participants in the form of stock charts. Patterns are formed within the charts, and these patterns help a trader identify investor psychology & hence provide trading opportunities. Technical analysis is used best to identify short term trades. Attempts to Answer 2 basic questions

- Is the pattern identifiable?
- If yes, then when will the pattern reverse?

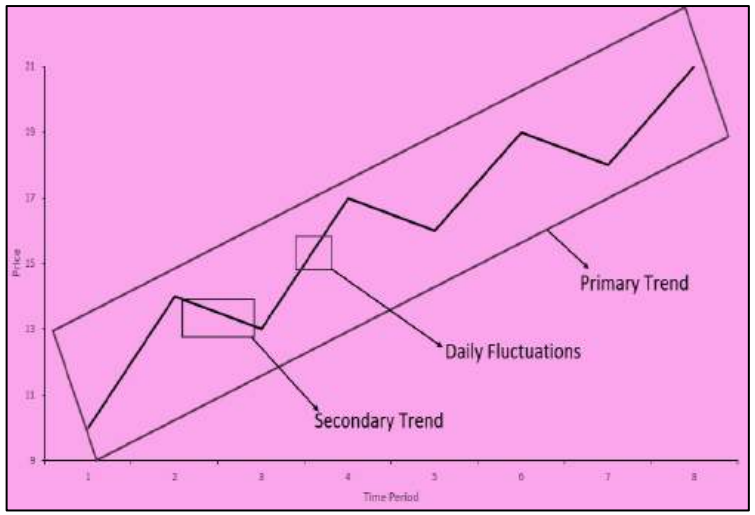
3 Key Assumptions of Technical Analysis

- Market Discounts everything: All known and unknown information in the public domain is reflected in the latest stock price
- Price moves in trends: All major moves in the market are an outcome of a trend. The concept of trend is the foundation of technical analysis. Once the trend is established, the price moves as per the trend.
- History tends to repeat itself: The price trend tends to repeat itself. The market participants consistently react to price movements in a similar way, every time the price moves in a certain direction.

Theories of Technical Analysis

Dow Jones Theory

- This theory propounded by Charles Dow, founder of WSJ is based on two indices, The Dow Jones Industrial Average (DJIA – 30 stocks)) & The Dow Jones Transportation Average (DJTA – 20 stocks)
- Per this theory - market is in an upward trend if one of the indices (i.e., DJIA or DJTA) advances above a previous important high and is accompanied or followed by a similar advance in the other index.
- 3 Trends exist in markets:
  - Primary – 12- 36 months, Low volume signals a weakness in the trend.
- Secondary 2- weeks to month & opposite of primary
  - Daily Fluctuations - narrow movements & they build up to long movements



Elliot Wave Theory

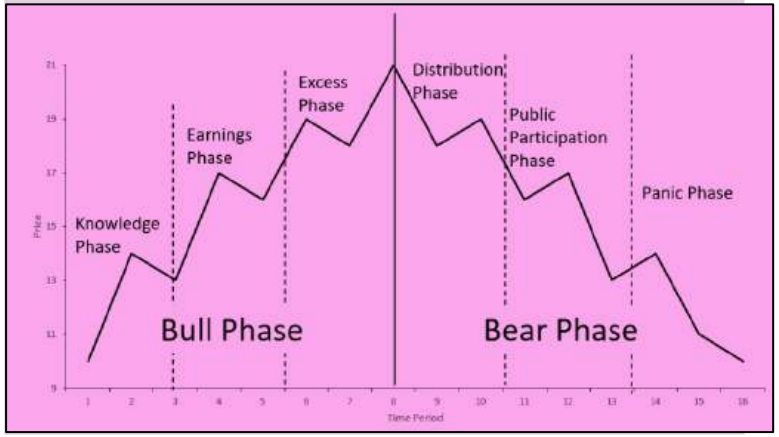
- Ralph Elliot formulated Elliot Wave Theory in 1934 based on analysis of 75 years stock price movements and charts.
- Markets exhibited certain repeated patterns or waves.
- A wave is a movement of the market price from one change in the direction to the next change in the same direction.
- Impulsive patterns (Basic waves)
  - These waves shall move in the direction of the basic movement.
  - Can indicate bull phase or bear phase
- Corrective patterns (Reaction waves)

  These waves are against the basic direction of the basic movement.

  Correction involves correcting the earlier rise in case of bull market and an up move in case of bear market.

Random Walk Theory

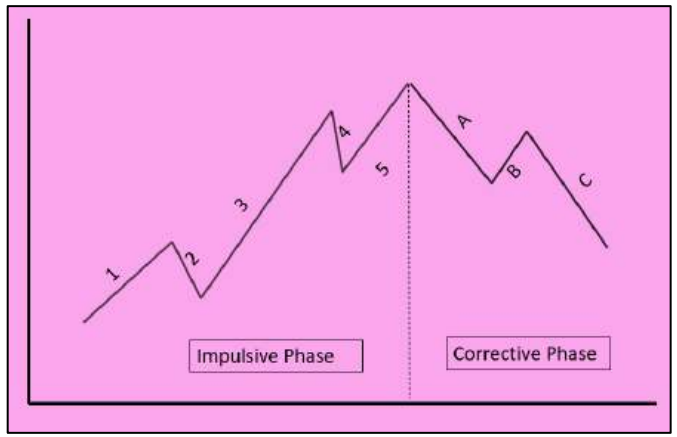
- Prices of shares in stock market can never be predicted.
- Prices area statistical expression of past data.
- No connection can be established between two successive peaks and troughs



Bull Phase (Upward Trend)	
Knowledge Phase / Accumulation Phase	Far sighted investors such as FIIs, DIIs, Mutual funds invests in this phase
Earnings Phase	Earnings goes up. Public starts making investments
Excess Phase	Speculation is high in the market. Knowledge investors exit.
Bear Phase (Downward Trend)	
Distribution Phase	Exit of big investors
Public participation Phase	Sell off by public
Panic Phase	Exit by all traders and investors & Knowledge investors start getting interested in making investments

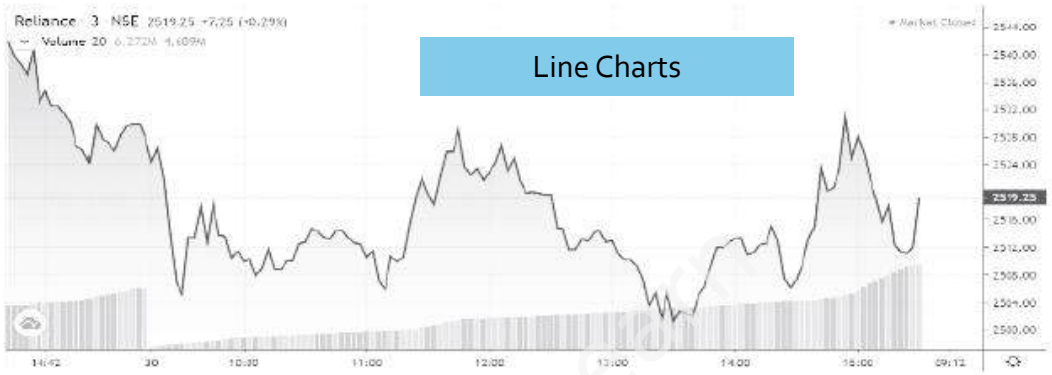
Moves in Primary Trend Per Dow Jones Theory

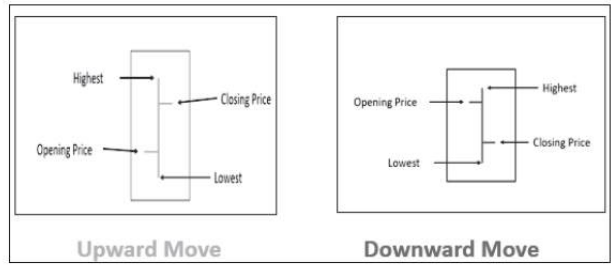
Elliot Wave

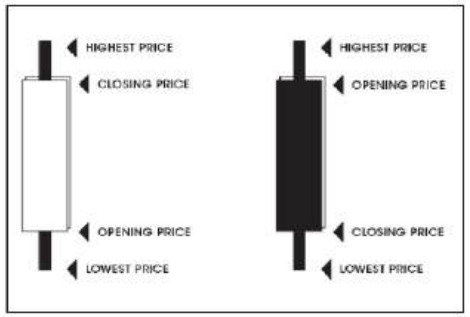


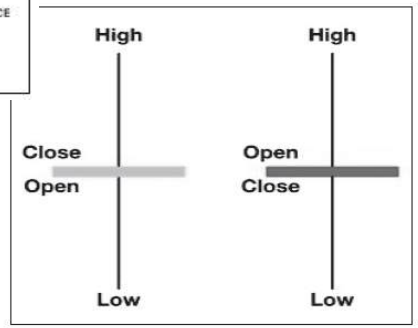
1 to 5	Upward Trend
A to C	Downward Trend
Wave 3	Greater than Wave 1 and Wave 2
Wave 2	Less than Wave 1
Wave 4	Less than Wave 3

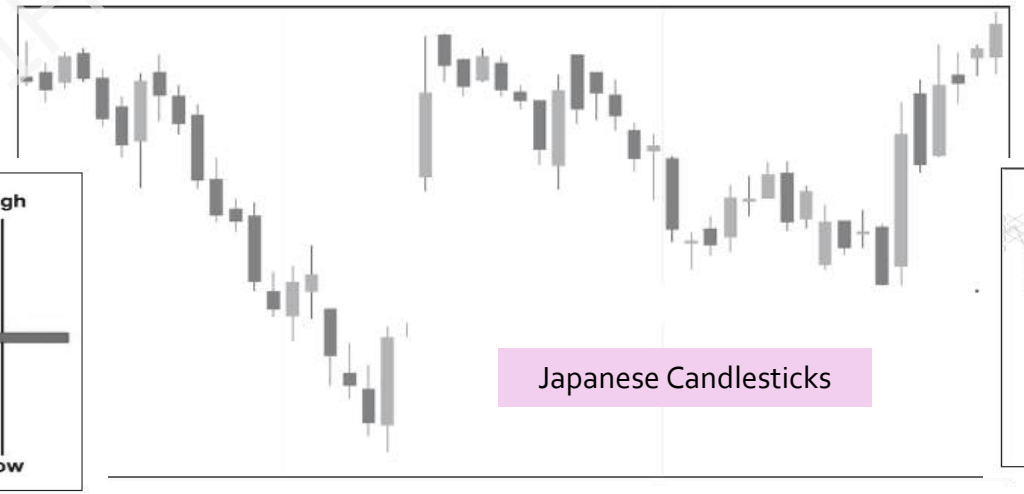
Charting Techniques

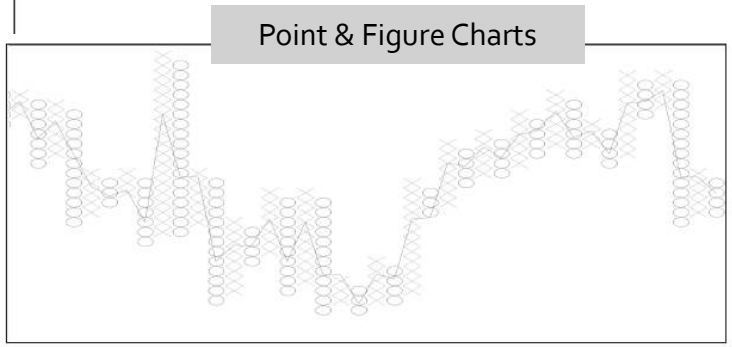












Market Breadth

- Measures Market Strength – Net Advances Divided by Total Securities
- If this supports Dow Jones Averages indicates Technical Strength else Technical weakness
- Changes Breadth Indicate potential change in the index direction

Volume of Transactions

- Rising markets on increasing volume are typically viewed as strong and healthy.

Index Value	Volume	Scenario
↑	↑	
↓	↑	
↑	↓	
↓	↓	

Confidence Index

- Avg yields of high-grade bonds / Avg Yields lower grade bonds.
- Index always < 1
- Leading indicator of Stock Market

Rising Confidence Index	(i)	High confidence level
	(ii)	Low Risk
	(iii)	Lead indicator to rise in market.
Fall in Confidence Index	(i)	Low confidence levels
	(ii)	High Risk
	(iii)	Lead indicator to fall in market.

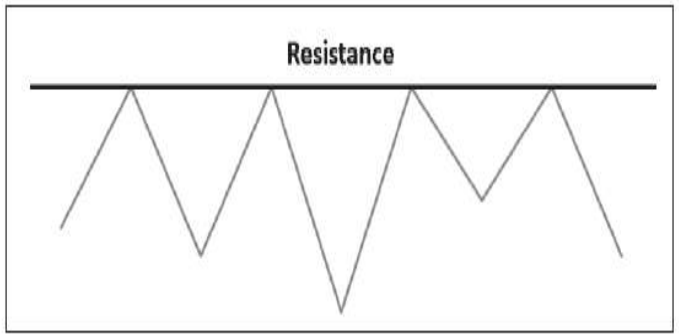
Relative Strength Analysis

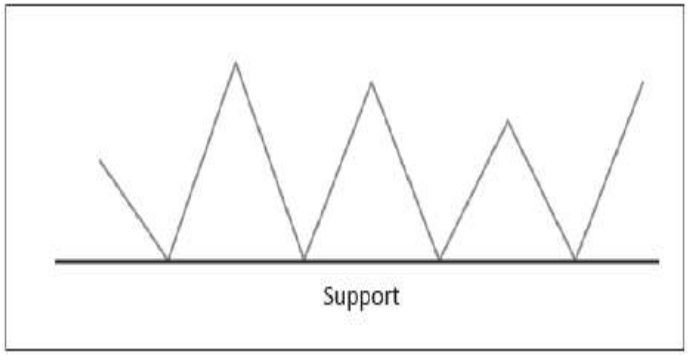
- Measures the speed and change of price movements.
- Range 0 -100 | >70 overbought | <30 oversold
- Stocks with high RSI Higher Returns
- RSI does not dimmish with time

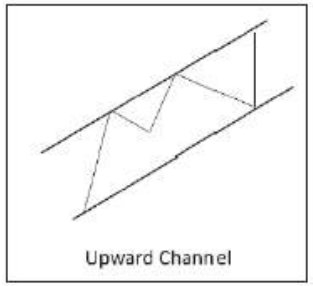
Odd Lot Theory

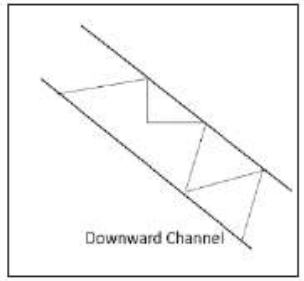
- Contra- opinion theory.
- Assumes Average person is usually wrong
- Used primarily to predict tops in bull markets& reversals in individual securities

Price Patterns

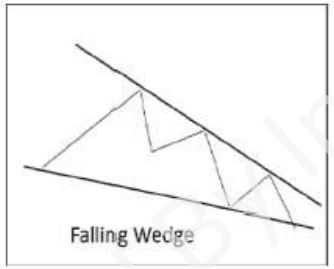


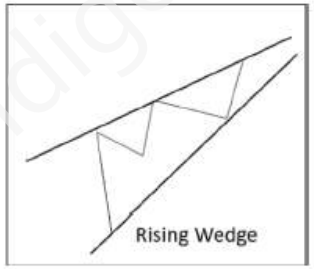






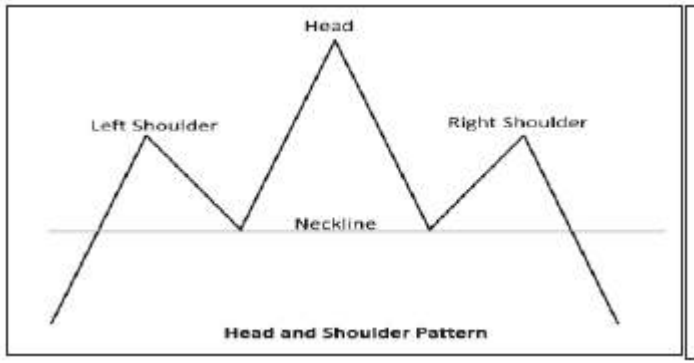
Ascending Channel	Upward Trend
Descending Channel	Downward Trend

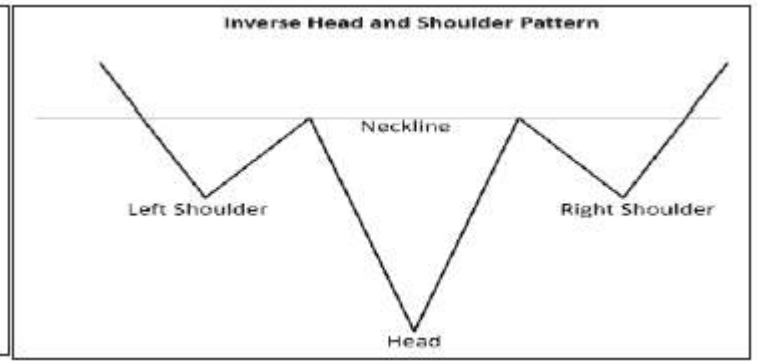


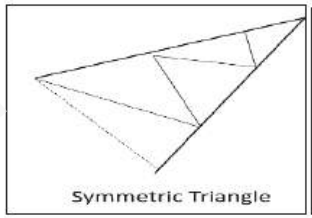


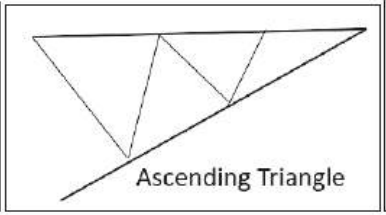
Decreasing Volumes	
Falling Wedge	Bullish indicator
Rising Wedge	Bearish Indicator

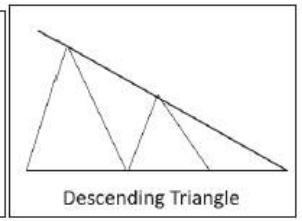
Head and Shoulders	Decline in prices
Inverse Head and Shoulders	Increase in prices



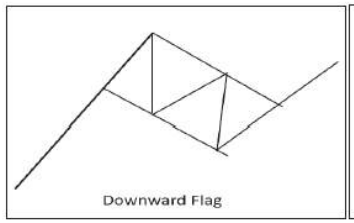


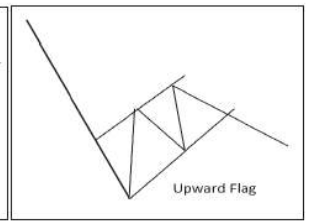






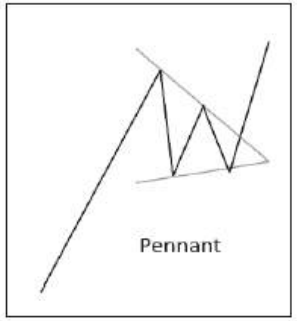
Ascending Triangle	Flat resistance level	Bullish Trend
Descending Triangle	Flat support level	Bearish Trend
Symmetric Triangle	Support and resistance level in opposite direction	Not clear





Upward Flag	Temporary	Bearish trend
Downward Flag	Temporary	Bullish trend

Pattern	Shape	Trend
Double Top	'M' Shape	Bearish
Double bottom	'W' Shape	Bullish



Arithmetic Moving Average

$AMA_{n,t} = 1/n [P_t + P_{t-1} + \ldots + P_{t-(n-1)}]$

Where N is number of total periods and t is period.

200 day DMA – used for identifying LT trends

60 day DMA for Intermediate Trends

10 day DMA for Short Term trends

Bullish Trends (Buy Signal)	Bearish Trends (Sell Signal)
Stock price line rise through the moving average line when graph of the moving average line is flattering out.	Stock price line falls through moving average line when graph of the moving average line is flattering out.
Stock price line falls below moving average line which is rising	Stock price line rises above moving average line which is falling.
Stock price line which is above moving average line falls but begins to rise again before reaching the moving average line.	Stock price line which is below the moving average line rises but begins to fall again before reaching the moving average line.

Exponential Moving Average

$EMA\ t = aP_t + (1-a)(EMA_{t-1})$

Where, a(exponent) =2/(n+1)

N Is number of days, P_t is price of today and EMA_{t-1} is previous day EMA.

Illustration 1: Closing values of BSE Sensex from 6th to 17th day of the month of January of the year 2020 were as follows. Calculate EMA of SENSEX during the above period. The previous day EMA of Sensex can be assumed as 15,000. The Value of exponent for 31 days EMA is 0.062

(ICAI SM, May'24 QP, Nov '19 QP, May'18 QP, MTP March 18,4 Old PM)

Solution:1

Days	Date	Day	Sensex
1	6	Thursday	14522
2	7	Friday	14925
3	8	Saturday	No trading
4	9	Sunday	No Trading
5	10	Monday	15222
6	11	Tuesday	16000
7	12	Wednesday	16400
8	13	Thursday	17000
9	14	Friday	No Trading
10	15	Saturday	No Trading
11	16	Sunday	No Trading
12	17	Monday	18000

Day	Sensex	Pt	EMA of Previous Day	Exponent (2/n+1)	EMA for the Day
6	14522	14522	15000	0.062	(14522*0.062) + (1- 0.062) × 15000 = 14,970
7	14925	14925	14970	0.062	(14925*0.062) + (1- 0.062) × 14970 = 14,968
10	15222	15222	14968	0.062	(15222*0.062) + (1- 0.062) × 14968 = 14,983
11	16000	16000	14983	0.062	(16000*0.062) + (1- 0.062) × 14,983 = 15,046
12	16400	16400	15046	0.062	(16,400*0.062) + (1- 0.062) × 15,046 = 15,130
13	17000	17000	15130	0.062	(17000*0.062) + (1- 0.062) × 15,130 = 15,246
17	18000	18000	15246	0.062	(18000*0.062) + (1- 0.062) × 15,246 = 15,417

Pros & Cons of Technical Analysis

For

(a) Under influence of crowd psychology trend persist for some time - Technical analysis help in identifying these trends early

(b) Shift in demand and supply are gradual rather then instantaneous. Technical analysis helps in detecting this shift rather early

(c) Fundamental information about a company is observed and assimilated by the market over a period of time. Hence price movement tends to continue more or less in same direction till the information is fully assimilated in the stock price.

Against

(a) Most technical analysts are not able to offer a convincing explanation for the tools employed by them.

(b) Empirical evidence in support of random walk hypothesis cast its shadow over the usefulness of technical analysis.

(c) By the time an uptrend and down trend may have been signaled by technical analysis it may already have taken place.

(d) Ultimately technical analysis must be a self-defeating proposition. With more and more people employing it, the value of such analysis tends to decline.

Efficient Market Hypothesis - EMH

An efficient market is one in which the market prices of a security are an unbiased estimate of its intrinsic value. This means that market efficiency does not imply that the market price equals intrinsic value.

The price can deviate from the intrinsic value, but the deviations are random and uncorrelated with any observable variable

Basis	Fundamental Analysis	Technical Analysis
Method	Prospects are measured by ➢ Economic analysis ➢ Industry analysis ➢ Company analysis	Predicts future prices and their direction using, ➢ Historical market data ➢ Price movements ➢ Volume ➢ Open Interest etc.
Rule	Prices of a share discounts everything.	Price captures everything
Usefulness	Long term investment	Short term investment

EMH Misconception	Reality
The market has perfect forecasting abilities	This hypothesis merely implies that prices reflect all available information. It does not mean that the market possesses perfect forecasting abilities
As price tends to fluctuate, it does not reflect fair value.	Unless prices fluctuate, they would not reflect fair value. Future is uncertain and the market is continually surprised.
Lack of competence of FIIs, DIIs, portfolio managers.	Market efficiency exists because portfolio managers are doing their job well in a competitive setting
Stock market is irrational due to random movement in the prices	If investors are rational and competitive, price changes are bound to be random.

EMH Why Stock Prices are Random?

- Information is freely and instantaneously available to all market participants
- Keen competition among the market participants ensures that market will reflect intrinsic values
- Price change only response to new information that is unrelated to previous information and therefore unpredictable

Per Eugene Fama 3 forms of market efficiency

Weak: Prices reflect all past price & Volume =>No relationship between past & future prices	Semi strong: Price reflects past information & all other public information. Prices adjust to new public info	Strong Form: Price reflects all public and private information
Serial Correlation Test: No Such Correlation Discovered	Event Studies: Pre Stock Split returns > post split returns. Implying that the moment news became public, prices adjusted	Corporate insiders with Inside Info earned higher Risk Adj returns
Run Tests: Statistically independent Runs => Random Walk Model	+ve A/C Earnings Cos. Stock returns higher than –ve A/C earnings Cos => moment news became public, prices adjusted	Stock Exchange Specialists with monopolistic exposure earner higher Risk Adj returns
Filter Rule Test: If prices are random Filter rules underperform Buy & Hold then mkt is ateast weakly efficient	Price adj gradual & not rapid Small Firm return > Large Firm Returns Low PE Stock Returns > High PE stocks Monday Returns < Other days	MF did not earn any superior returns than random portfolios

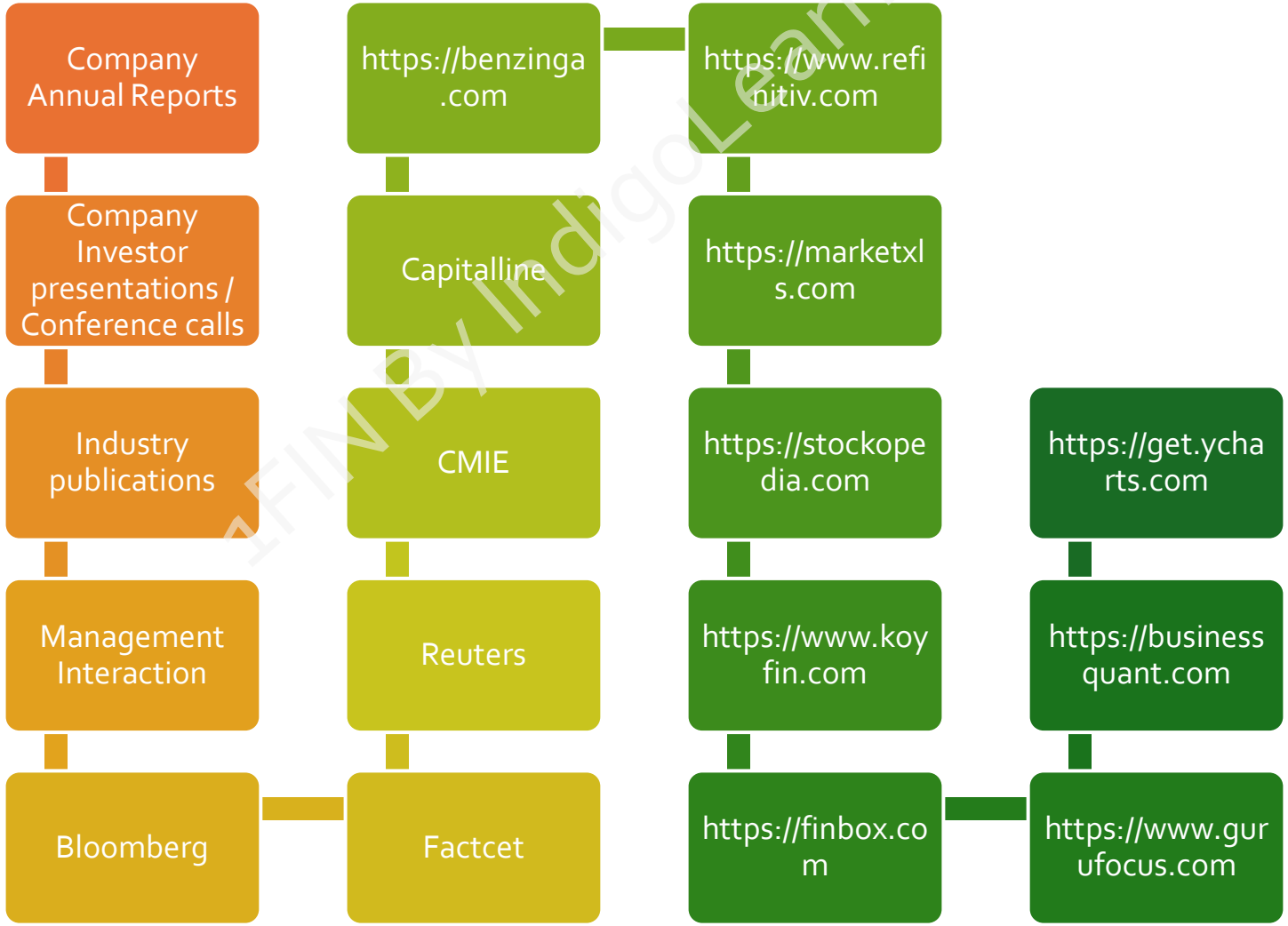
Challenges to EMH

- Information is neither freely available nor rapidly transmitted to all participants in the stock market.
- Human information processing capabilities are sharply limited.
- It is generally believed that investors' rationality will ensure a close correspondence between market prices and intrinsic values. But in practice this is not true.
- Powerful institutions and big operators wield high influence over the market& diminish the competitiveness of the market.

Equity Research involves the analysis of company's financial performance and other factors to determine whether the equity share of the same company should be bought, sold, or continued to be hold. This research can also be applied in M&A

Equity Research analysts are employed by Investment Banks, Mutual Funds, Hedge Funds, Wealth management firms, stockbrokers etc.

Tools / Sources for Equity Research



Question 2: (Auto Correlation) Mr. X is of the opinion that market has recently shown the Weak Form of Market Efficiency. In order to test the validity of his impression he has collected the following data relating to the movement of the SENSEX for the last 20 days. You are required to test the Weak Form of Market Efficiency using Auto-Correlation test, taking time lag of 10 days ***(Jan 21 QP)***

Days	Open	High	Low	Close
1	33470.94	33513.79	33438.03	33453.99
2	33453.64	33478.11	33427.82	33434.83
3	33414.06	33440.29	33397.65	33431.99
4	33434.94	33446.18	33377.78	33383.41
5	33372.92	33380.27	33352.12	33370.93
6	33375.85	33389.49	33331.42	33340.75
7	33340.89	33340.89	33310.95	33330.93
8	33326.84	33340.91	33306.17	33335.08
9	33307.16	33328.22	33296.43	33301.97
10	33298.64	33318.60	33254.28	33259.03
11	33260.04	33228.85	33241.66	33251.53
12	33255.92	33289.46	33249.46	33285.89
13	33288.86	33535.67	33255.98	33329.28
14	33335.00	33346.21	33276.72	33284.17
15	33293.83	33310.86	33278.54	33298.78
16	33300.02	33337.79	33300.02	33325.38
17	33323.36	33356.34	33322.44	33329.95
18	33322.81	33345.98	33317.44	33319.67
19	33317.51	33321.18	33294.19	33302.32
20	33290.86	33324.96	33279.62	33319.61

Solution:2

Day	Sensex	Price change (X)	Day	Sensex	Price change (Y)	x - x mean	x - x mean	y - y mean	y - y mean	$(X - X\ mean)^2$	$(Y - Y\ Mean)^2$	(X – X Mean) (Y – Y Mean)
1	33,453.99		11	33251.53								
2	33,434.83	-19.16	12	33285.89	34.36	-19.16--21.66	2.5	34.36-7.56	26.8	6.26	718	67.05
3	33,431.99	-2.84	13	33329.28	43.39	-2.84--21.66	18.82	43.39-7.56	35.83	354.28	1283.47	674.32
4	33,383.41	-48.58	14	33284.17	-45.11	-48.58--21.66	-26.92	-45.11-7.56	-52.67	724.57	2774.6	1417.88
5	33,370.93	-12.48	15	33298.78	14.61	-12.48--21.66	9.18	14.61-7.56	7.05	84.31	49.64	64.69
6	33,340.75	-30.18	16	33325.38	26.6	-30.18--21.66	-8.52	26.6-7.56	19.04	72.55	362.35	-162.14
7	33,330.93	-9.82	17	33329.95	4.57	-9.82--21.66	11.84	4.57-7.56	-2.99	140.24	8.97	-35.46
8	33,335.08	4.15	18	33319.67	-10.28	4.15--21.66	25.81	-10.28-7.56	-17.84	666.27	318.42	-460.6
9	33,301.97	-33.11	19	33302.32	-17.35	-33.11--21.66	-11.45	-17.35-7.56	-24.91	131.05	620.73	285.22
10	33,259.03	-42.94	20	33319.61	17.29	-42.94--21.66	-21.28	17.29-7.56	9.73	452.74	94.59	-206.94
	Average	**-21.66**			**7.56**							
	Sum									**2,632.27**	**6,230.77**	**1644.01**
	Variance									**292.47**	**692.31**	
	SD									**17.1**	**26.31**	

Co- Variance = Sum of (X – X Mean) × (Y – Y Mean)/n

= 1,644.01/9

= **182.67**

Correlation = Cov (X,Y)/ $SD_X \times SD_Y$

=182.67/(17.10 × 26.31)

= **40.59%**

Given that correlation is 40.59%, the market does not exhibit even weak form of efficiency, it is not all efficient.

If correlation % is

0 -> Strong form of efficiency

0-10 –> Semi Strong

10-20 –> Weak

> 30 -> Inefficient

Illustration 3: The closing value of a Stock Market Index for the month of October 2007 is given below. You are required to test the weak form of efficient market hypothesis by applying the run test at 5% and 10% level of significance.

Value of t at 5% is 2.101 at 18 degrees of freedom

Value of t at 10% is 1.734 at 18 degrees of freedom.

(ICAI SM, RTP Nov '23, MTP April '21, MTP Oct'18, Old PM)

Solution:3

Date	Index Value		Run
1-Oct-07	2800		
03-Oct-07	2780	-	1
04-Oct-07	2795	+	2
05-Oct-07	2830	+	
08-Oct-07	2760	-	3
09-Oct-07	2790	+	4
10-Oct-07	2880	+	
11-Oct-07	2960	+	
12-Oct-07	2990	+	
15-Oct-07	3200	+	
16-Oct-07	3300	+	
17-Oct-07	3450	+	
19-Oct-07	3360	-	5
22-Oct-07	3290	-	
23-Oct-07	3360	+	6
24-Oct-07	3340	-	7
25-Oct-07	3290	-	
29-Oct-07	3240	-	
30-Oct-07	3140	-	
31-Oct-07	3260	+	8

As the number of runs lies between the 1 SD Value from mean at t Levels of 5% & 10% , the market exhibits atleast weak form of efficiency.

Number of Sign Changes (A)	19
+	11
-	8
Runs	8

	t	DoF (A – 1)
5%	2.101	18
10%	1.734	18

Mean = $2n1n2/(n1+n2) + 1$

= $(2 \times 11 \times 8)/(11+8) + 1$

= 10.2632

Standard Deviation $= \frac{\sqrt{2n1n2(2n1n2 - n1 - n2)}}{\sqrt{n1 + n2)\text{^}2(n1 + n2 - 1)}}$

$= \frac{\sqrt{2 \times 11 \times 8\,(2 \times 11 \times 8 - 11 - 8)}}{\sqrt{11 + 8)\text{^}2(11 + 8 - 1)}}$

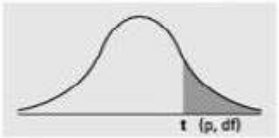
$= \frac{\sqrt{176\,(157)}}{\sqrt{361)(18)}}$

= 2.06213

Particulars	5%	10%
t	2.101	1.734
Mean	10.26	10.26
SD	2.06	2.06
R (Number of runs)	8	8
Mean + t × SD	=10.26+ (2.10 × 2.06) = 14.60	=10.26+ (1.734 × 2.06) = 13.84
Mean – t × SD	= 5.93	= 6.69
R	8	8

T - DISTRIBUTION TABLE

Numbers in each row of the table are values on a *t*-distribution with (*df*) degrees of freedom for selected right-tail (greater-than) probabilities (*p*).



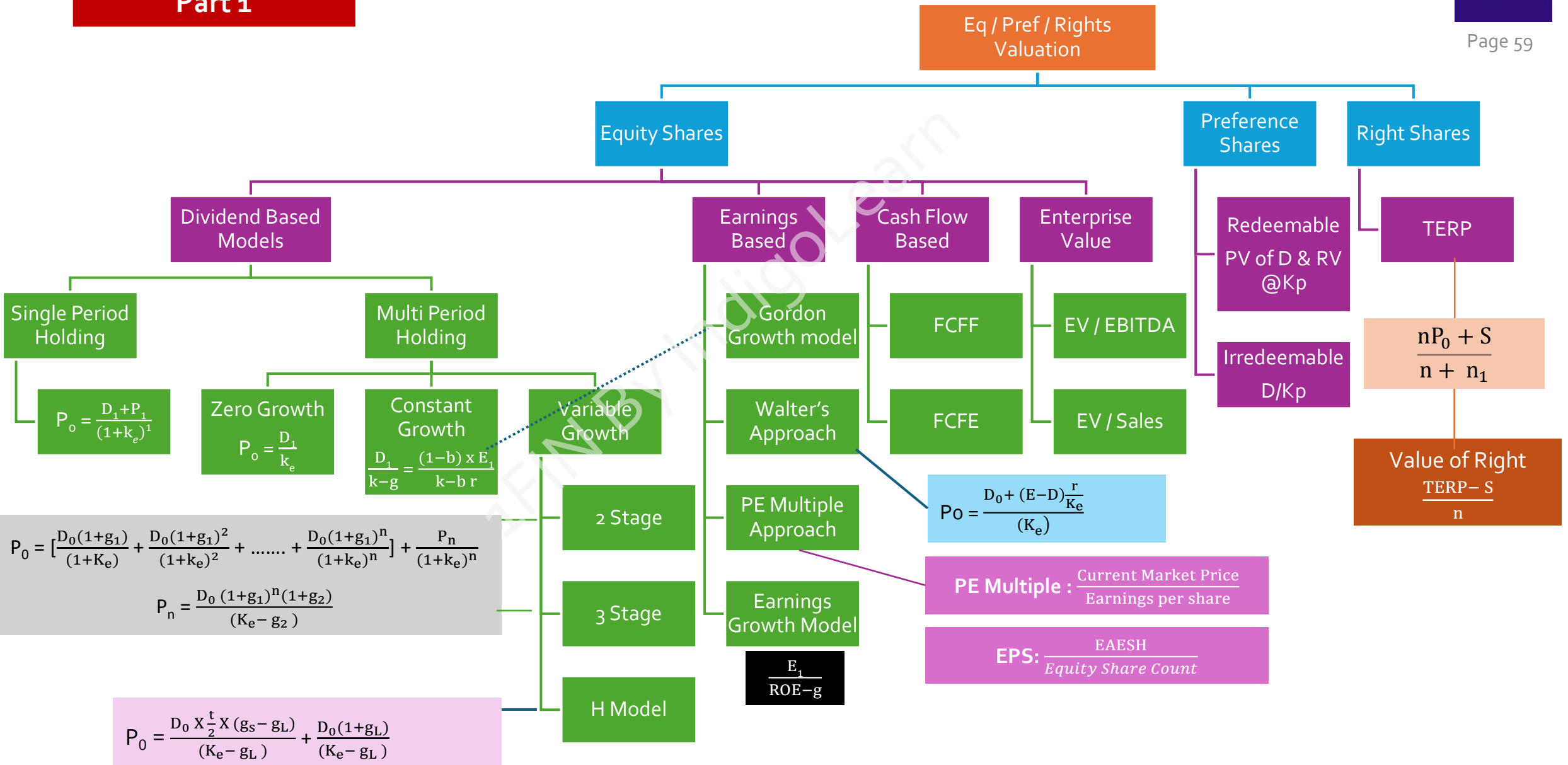
df/p	0.40	0.25	0.10	0.05	0.025	0.01	0.005	0.0005
1	0.324920	1.000000	3.077684	6.313752	12.70620	31.82052	63.65674	636.6192
2	0.288675	0.816497	1.885618	2.919986	4.30265	6.96456	9.92484	31.5991
3	0.276671	0.764892	1.637744	2.353363	3.18245	4.54070	5.84091	12.9240
4	0.270722	0.740697	1.533206	2.131847	2.77645	3.74695	4.60409	8.6103
5	0.267181	0.726687	1.475884	2.015048	2.57058	3.36493	4.03214	6.8688
6	0.264835	0.717558	1.439756	1.943180	2.44691	3.14267	3.70743	5.9588
7	0.263167	0.711142	1.414924	1.894579	2.36462	2.99795	3.49948	5.4079
8	0.261921	0.706387	1.396815	1.859548	2.30600	2.89646	3.35539	5.0413
9	0.260955	0.702722	1.383029	1.833113	2.26216	2.82144	3.24984	4.7809
10	0.260185	0.699812	1.372184	1.812461	2.22814	2.76377	3.16927	4.5869
11	0.259556	0.697445	1.363430	1.795885	2.20099	2.71808	3.10581	4.4370
12	0.259033	0.695483	1.356217	1.782288	2.17881	2.68100	3.05454	43178
13	0.258591	0.693829	1.350171	1.770933	2.16037	2.65031	3.01228	4.2208
14	0.258213	0.692417	1.345030	1.761310	2.14479	2.62449	2.97684	4.1405
15	0.257885	0.691197	1.340606	1.753050	2.13145	2.60248	2.94671	4.0728
16	0.257599	0.690132	1.336757	1.745884	2.11991	2.58349	2.92078	4.0150
17	0.257347	0.689195	1.333379	1.739607	2.10982	2.56693	2.89823	3.9651
18	0.257123	0.688364	1.330391	1.734064	2.10092	2.55238	2.87844	3.9216
19	0.256923	0.687621	1.327728	1.729133	2.09302	2.53948	2.86093	3.8834
20	0.256743	0.686954	1.325341	1.724718	2.08596	2.52798	2.84534	3.8495
21	0.256580	0.686352	1.323188	1.720743	2.07961	2.51765	2.83136	3.8193
22	0.256432	0.685805	1.321237	1.717144	2.07387	2.50832	2.81876	3.7921
23	0.256297	0.685306	1.319460	1.713872	2.06866	2.49987	2.80734	3.7676
24	0.256173	0.684850	1.317836	1.710882	2.06390	2.49216	2.79694	3.7454
25	0.256060	0.684430	1.316345	1.708141	2.05954	2.48511	2.78744	3.7251
26	0.255955	0.684043	1.314972	1.705618	2.05553	2.47863	2.77871	3.7066
27	0.255858	0.683685	1.313703	1.703288	2.05183	2.47266	2.77068	3.6896
28	0.255768	0.683353	1.312527	1.701131	2.04841	2.46714	2.76326	3.6739
29	0.255684	0.683044	1.311434	1.699127	2.04523	2.46202	2.75639	3.6594
30	0.255605	0.682756	1.310415	1.697261	2.04227	2.45726	2.75000	3.6460
z	0.253347	0.674490	1.281552	1.644854	1.95996	2.32635	2.57583	3.2905
CI	———	———	80%	90%	95%	98%	99%	99.9%

SECURITY VALUATION

Last Day Revision Notes | Summary Notes | Concept Notes

Sriram Somayajula CA | CFA | ISB
1FIN By IndigoLearn

Part 1



Basic Concepts

Required Rate of Return = Opportunity cost = Return Expected by Investor

Discount Rate = Rate at which CF are discounted

IRR is the rate of return at which **PV Of Inflows = PV Outflows**

Assumes CF are reinvested at same rate thought the life of security / project

Equity Risk Premium= $E(R) - R_f = \beta\,(R_m - R_f)$ **= β x MRP**

Market Risk Premium = $(R_m - R_f)$

Per CAPM Expected Return of Security $\mathbf{E(R) = R_f + \beta\,(R_m - R_f)}$ **= K_e**

Nominal Discount Rate is used to Discount Nominal CF

$$IRR = LR + \frac{NPV\ at\ LR}{NPV\ at\ LR - NPV\ at\ HR} \times (HR - LR)$$

Cash Flow Based Valuation more appropriate than DDM as Dividends may not always be paid

PAT	EBIT x (1-T)	EBITDA x (1-T)	CFO	FCFE
+ Depreciation	+ Depreciation	+ Depreciation x (T)	- Capex	+ Interest (1-t)
- Increase in Non Cash WC	- Increase in Non Cash WC	- Increase in Non Cash WC		-Debt Raised
- Capex	- Capex	- Capex		+ Dept Repaid
+ Interest (1-t)				+Preferred Dividend
FCFF	**FCFF**	**FCFF**	**FCFF**	**FCFF**

Net profit
+ Depreciation
+Debt Raised
-Dept Repaid
-Preferred Dividend
+Pref issue
-Capex
-Increase in NWC
FCFE

One Can Apply Gordon Growth Model Formula to the FCFE to arrive at **Equity Value**

One Can Apply Gordon Growth Model Formula to the FCFF to arrive at **Enterprise Value of the Firm**

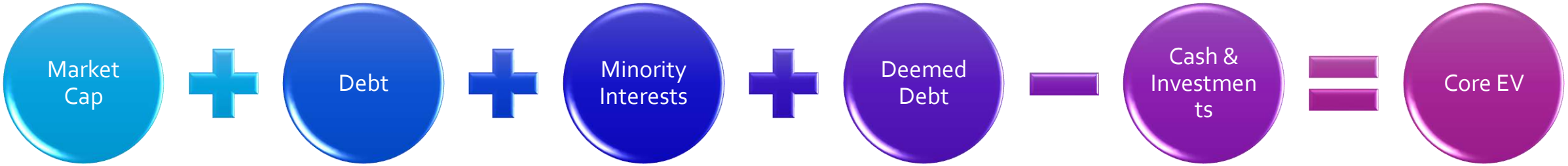


Illustration 1:

Piyush Loonker and Associates presently pay a dividend of Rs. 1.00 per share and has a share price of Rs. 20.00.

i. If this dividend were expected to grow at a rate of 12% per annum forever, what is the firm's expected or required return on equity using a dividend-discount model approach?

ii. Instead of this situation in part (i), suppose that the dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter. Now what is the firm's expected, or required, return on equity? ***(ICAI SM, RTP Nov'18, Old PM)***

Solution 1

(i) Firm's Expected or Required Return on Equity (Using a dividend discount model approach

$P_0 = \frac{D_1}{K_e - g}$ *or* $K_e = \frac{D_1}{P_0} + g$

Now, $D_1 = D_0$ (1 + g) or 1 (1 + 0.12) or 1.12, Po = 20 and g = 12% per annum

Therefore, $K_e = \frac{₹1.12}{₹20}$ + 12% = 17.6%

(ii) Firm's Expected or Required Return on Equity

(If dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter) i.e. $P_0 = 20\ \ g_1 = 20\%\ \ g_2 = 10\%\ D_0 = 1\ \ K_e = ?$

Assume $K_e = 18\%$ and see if it leads us to $P_0 = 20$

Year	Growth	Dividend	Dividend(₹)	PVF@18%	PV
0	-	1			
1	20%	(1.2)	1.2	0.847	1.0164
2	20%	$(1.2)^2$	1.44	0.718	1.03392
3	20%	$(1.2)^3$	1.728	0.609	1.0505
4	20%	$(1.2)^4$	2.074	0.516	1.0701
5	20%	$(1.2)^5$	2.488	0.437	1.087256
6	10%	$(1.2^5)(1.1)$	2.737		**∑= 5.258**

$P_0 = \frac{D_1}{1+K_e} + \frac{D_2}{(1+K_e)^2} + \frac{D_3}{(1+K_e)^3} + \frac{D_4}{(1+K_e)^4} + \frac{D_5}{(1+K_e)^5} + \frac{P_5}{(1+K_e)^5}$

$P_5 = \frac{D_6}{K_e - g} = \frac{2.737}{18\% - 10\%} = ₹34.2125$

$P_0 = 5.258 + \text{PV of } 34.2125$ = 5.258 + 0.437(34.2125) = **₹20.209**

Computation using $K_e = 19\%$, g = 10%

Year	Dividend(₹)	PVF@19%	PV
1	1.2	0.840	1.008
2	1.44	0.706	1.01664
3	1.728	0.593	1.0247
4	2.074	0.499	1.0349
5	2.488	0.419	1.0424
6	2.737		∑= 5.127

P_0 = 5.127 + $\frac{P_5}{(1+K_e)^5}$

$P_5 = \frac{D_6}{K_e - g} = \frac{2.737}{19\% - 10\%} = ₹30.411$

$P_0 = 5.127 + PV\ of\ 30.411$ = 5.127 + 0.419(30.411) = **₹17.869**

Since the present value of dividend stream is more than required it indicates that K_e is greater than 18%.

$K_e = LR + \frac{NPV\ at\ LR - NPV\ Required}{NPV\ at\ LR - NPV\ at\ HR} \times \Delta r$

K_e = 18% + $\frac{(₹20.209 - ₹20)}{₹20.209 - ₹17.869}$ × 1% = **18.089%**

Illustration 2:

Capital structure of Sun Ltd., as at 31.3.2003 was as under:

	(Rs. In Lakhs)
Equity share capital (FV ₹100)	80
8% Preference share capital	40
12% Debentures	64
Reserves	32

Sun Ltd. earns a profit of Rs. 32 lakhs annually on an average before deduction of income-tax, which works out to 35%, and interest on debentures.

Normal return on equity shares of companies similarly placed is 9.6% provided:

- Profit after tax covers fixed interest and fixed dividends at least 3 times.
- Capital gearing ratio is 0.75
- Yield on share is calculated at 50% of profits distributed and at 5% on undistributed profits

Sun Ltd. has been regularly paying equity dividend of 8%.

Compute the value per equity share of the company assuming:

- 1% for every one time of difference for Interest and Fixed Dividend Coverage.
- 2% for every one time of difference for Capital Gearing Ratio.

(ICAI SM, MTP Oct'18, Old PM)

Solution 2

Working note 1: Calculation of Profit after tax (PAT)

Profit before interest and tax (PBIT)	**32,00,000**
Less: Debenture interest (64,00,000 × 12/100)	7,68,000
Profit before tax (PBT)	24,32,000
Less: Tax @ 35%	8,51,200
PAT Profit after tax (PAT)	**15,80,800**
Less: Preference Dividend(40,00,000 × 8/100)	3,20,000
Equity Dividend (80,00,000 × 8/100)	6,40,000
Retained Earnings (Undistributed Profit)	**6,20,800**

(i) Calculation of Interest and Fixed Dividend Coverage

$$\frac{\text{PAT+ Debenture interest}}{\text{Debenture interest+ Preference dividend}} = \frac{15,80,800+ 7,68,000}{7,68,000 + 3,20,000} = \mathbf{2.16}$$

(ii) Capital Gearing Ratio = $\frac{Fixed\ interest\ bearing\ funds}{Equity\ shareholders\ funds} = \frac{Preference\ Share\ Capital + Debentures}{Equity\ Share\ Capital + Reserves} =$

$\frac{40,00,000+64,00,000}{80,00,000 + 32,00,000} = \mathbf{0.93}$

Calculation of Yield on Equity Shares: Yield on equity shares is calculated at 50% of profits distributed and 5% on undistributed profits:

Particulars	Amount(₹)
50% on distributed profits (6,40,000 × 50/100)	3,20,000
5% on undistributed profits (6,20,800 × 5/100)	(+)31,040
Yield on equity shares	3,51,040

Yield on equity shares % = $\frac{\text{Yield on shares}}{\text{Equity share capital}} *100 = \frac{3,51.040}{80,00,000} *100 = \mathbf{4.388\%\ or\ 4.39\%}$

(iv) Calculation of Expected Yield on Equity shares (a) Interest and fixed dividend coverage of Sun Ltd. is 2.16 times but the industry average is 3times s. Therefore, risk premium is added to Sun Ltd. Shares @ 1% for every 1 time of difference.

Risk Premium = 3.00 – 2.16 (1%) = (1%) = **0.84%**

Capital Gearing ratio of Sun Ltd. is 0.93 but the industry average is 0.75 times. Therefore, risk premium is added to Sun Ltd. shares @ 2% for every 1 time of difference.

Risk Premium = (0.75 – 0.93) (2%) = 0.18 (2%) = **0.36%**

Particulars	%
Normal return expected	9.60
Add: Risk premium for low interest and fixed dividend coverage	0.84
Add: Risk premium for high interest gearing ratio	0.36
	10.80%

Value of Equity Share Actual yield / Expected yield × Paid-up value of share = 4.39/10.80 × 100 = **₹40.65**

Illustration 3: Rahul Ltd. has surplus cash of Rs. 100 lakhs and wants to distribute 27% of it to the shareholders. The company decides to buy back shares. The Finance Manager of the company estimates that its share price after re-purchase is likely to be 10% above the buyback price-if the buyback route is taken. The number of shares outstanding at present is 10 lakhs and the current EPS is Rs. 3. Determine,

- The price at which the shares can be re-purchased if the market capitalization of the company should be Rs. 210 lakhs after buyback,
- The number of shares that can be re-purchased, and
- The impact of share re-purchase on the EPS, assuming that net income is the same. ***(ICAI SM, RTP Nov'22, MTP Sept'22, Old PM)***

Given,

Surplus Cash = 100 lakhs

Buy back value ₹27 lakhs

Let Buy back price = P

Post buy back price = 1.1P

Current shares = 10 lakhs

Shares re-purchased = $\frac{₹27 lakhs}{P}$

Outstanding shares post buy back = 10 lakhs - $\frac{₹27 lakhs}{P}$

Market capitalisation = 210 lakhs

Market capitalisation = O/S share x price per share

₹210 lakhs = (10 lakhs - $\frac{₹27 lakhs}{P}$) x 1.1P

₹210 lakhs = $\frac{(₹10 \text{ lakhsP} - ₹27 \text{ lakhs})}{P}$ x 1.1P

On solving the above equation we get,

P = ₹21.79

(ii) No. of shares re-purchased = $\frac{₹27 \ lakhs}{₹21.79}$ = 123910 shares

Current EPS = ₹3

Current shares 10 lakhs ∴ Net profit = ₹3 x 10 lakhs = ₹30 lakhs

Share count after buy back = 10,00,000 - 1,23,910 = **8,76,090**

Revised EPS = ₹30,00,000/8,76,090 = **₹3.424**

If Net Income is same EPS will go up from ₹3 to ₹3.424

EPS increased by 14.13%

Illustration 4: Goldi locks Ltd was started a year back with equity capital of Rs. 40 lakhs. The other details are as under:

Earnings of the company	Rs. 4,00,000
Price Earnings ratio	12.5
Dividend paid	Rs. 3,20,000
Number of Shares	40,000

Find the current market price of the share. Use Walter's Model. Find whether the company's D/ P ratio is optimal, use Walter's formula ***(MTP Nov'21 Old, Old PM)***

Solution 4:

PAT = ₹4,00,000 | PE Ratio = 12.5 | Dividend = ₹3,20,000

No. Of shares = 40,000 | Equity Capital = ₹40,00,000

Walter's model $P_0 = \frac{D+(E-D)*\frac{r}{K_e}}{K_e}$

DPS = Dividend/Shares = ₹3,20,000/40,000 = ₹8

EPS = PAT/No. of shares = ₹4,00,000/40,000 = ₹10 per share

For investment of ₹40,00,000 PAT = ₹4,00,000. ∴ Return(r) = 10%

PE = $\frac{MPS}{EPS}$ or $\frac{EPS}{MPS} = \frac{1}{PE}$ i.e $K_e = \frac{1}{PE} = \frac{1}{12.5} = 8\%$

Price as per Walter's model = $\frac{₹8+(10-8)*\frac{10\%}{8\%}}{8\%}$ = **₹131.5**

	Dividend for Maximizing Share price	Company Stage
R >Ke	Pay 0% Dividend	Growing
R<Ke	Pay 100% Dividend	Decline
R= Ke	Pay any amount of Dividend	Mature

Illustration 5: An investor is considering purchasing the equity shares of LX Ltd., whose current market price is Rs. 150. The company is proposing a dividend of Rs. 6 for the next year. LX is expected to grow at 18% per annum for the next four years. The growth will decline linearly to 14% per annum after first four years. Thereafter, it will stabilize at 14% per annum infinitely. The required rate of return is 18% per annum.

You are required to determine:

i. The intrinsic value of one share

ii. Whether it is worth to purchase the share at this price *[MTP Oct'21 New & Old, May'19 QP (Old)]*

Solution 5:

t	1	2	3	4	5	6	7	8
PVIF (18,t)	0.847	0.718	0.609	0.516	0.437	0.370	0.314	0.266

MPS =₹150	D_1 = ₹6	$g_1 - g_4$ = 18%	$g_5 - g_8$ =17%/16%/15%/14%	g_9 - g_∞= 14%	K_e = 18%

Year	Growth rate	Computation	Dividend	PVIF @ 18%	PV
1	18%	-	6	0.847	5.082
2	18%	6(1.18)	7.08	0.718	5.084
3	18%	$6(1.8)^2$	8.35	0.609	5.085
4	18%	$6(1.8)^3$	9.86	0.516	5.088
5	17%	9.86(1.17)	11.53	0.437	5.005
6	16%	11.53(1.16)	13.38	0.370	4.95
7	15%	13.38(1.15)	15.39	0.314	4.83
8	14%	15.39(1.14)	17.54	0.266	4.66
		Present value of explicit factor			∑ = 39.79
9	14%	17.54(1.14)	20		

$P_8 = \frac{D_9}{K_e - g} = \frac{20}{18\% - 14\%} = ₹500$

PV of P_8 = ₹500 x 0.266 = ₹133

So, the total value of cash inflow = ₹39.79 + ₹133 = ₹172.79

Intrinsic Value = 172.79 and investor should buy shares of LX Ltd as MPS (₹150) is less than the intrinsic value.

Alternatively,

Explicit factor (discounting for 7 years) = 35.13 (5.082 + 5.084 + 5.085 + 5.088 + 5.005 + 4.95 + 4.83)

Terminal value of $P_7 = \frac{D_8}{K_e - g} = \frac{17.54}{18\% - 14\%} = ₹438.5$

PV(7^{th} yr @18%) of ₹438.5 is 0.314 x 438.5 = ₹137.69

So, the total value of cash inflow = Explicit factor + Terminal value of P_7

= ₹35.13 + ₹137.69 = ₹172.81

Intrinsic Value = 172.81 and investor should buy shares of LX Ltd as MPS (₹150) is less than the intrinsic value.

Illustration 6: The management of T Ltd, an internationally diversified conglomerate, believes that the recent strong performance of its wholly owned medical supply subsidiary, S Ltd, has gone unnoticed. To realize S Ltd' s full value, T Ltd has announced that it will List S Ltd.

Data for 2021 & 2022 is given below

Income Statement Rs.cr	2021	2022
Revenue	474	598
Depreciation	20	23
Other Operating costs	368	460
Income before taxes	86	115
Taxes	26	35
Net Income	60	80
Dividends	18	24
EPS	Rs. 0.714	Rs. 0.952
Dividends per share	Rs. 0.214	Rs. 0.286
Common Shares Outstanding	84	84

Balance Sheet – Rs. Cr	2021	2022
Current Assets (Includes Rs. 5 Cr. cash in 2021 and 2022)	201	326
Net property, plant, and equipment	474	489
Total Assets	**675**	**815**
Current Liabilities (all non-interest-bearing)	57	141
Long Term Debt	0	0
Shareholder's Equity	618	674
Total Liabilities and equity	**675**	**815**
Capital Expenditures	34	38

A. Calculate the amount of FCFE per share for 2022 by using the data from Exhibit.

B. Calculate the current value of a share of S Ltd. based on the two - stage FCFE model.

For the next three years, growth rate is 10% and after 3 years at 5% in perpetuity.

Cost of Equity is 11%.

FCFF = EBIT (1 – Tax) + Depreciation -/+ Capital Expenditure / Assets Disposed off +/- Change in Working capital

FCFE = FCFF - Interest (1 – Tax rate) - Debt / Preference Shares repaid / redeemed + New Debt / Preference shares Issued - Preference Dividend

	2021	2022
PBIT	86	115
Int	-	-
PBT	86	115
Tax	26	35
PAT	60	80

EBIT(1 – t) = PAT

Int = 0 & Not accrued taxes & No adj.

*WN :1 Increase in working capital

	2021	2022
PAT	60	80
(+) DEP	20	23
(-) CAPEX (given)	(34)	(38)
(-) Inc in WC*	-	(41)
FCFF	6	24

	2021	2022
Assets excluding cash	201	326
(-) Cash	(5)	(5)
CA	**196**	**321**
Current Liabilities	57	141
WC	**139**	**180**
Increase in WC		**41 (180-139)**

FCFE = FCFF - Interest (1 – Tax rate) - Debt /Preference Shares repaid / redeemed + New Debt / Preference shares Issued - Preference Dividend

FCFE = FCFF – 0

FCFE = 24Cr – 0 = 24Cr

O/S shares = 84Cr

FCFE/Share = 0.2857/share

$g_1 - g_3$ = 10%	$g_4 - g_\infty$ = 5%	K_e = 11%

Two stage FCFE Model : Stage 1 : FCFE 0.2857

Year	Growth	Computation	FCFE Value
2022			0.2857
2023	10%	0.2857(1.10)	0.3143
2024	10%	0.3143(1.10)	0.3457
2025	10%	0.3457(1.10)	0.3803
2026	5%	0.3803 (1.05)	0.3993

P_0 = Explicit period value + perpetuity value

Year	Cashflow	PVF@11%	PVCF
1	0.3143	0.9009	0.2831
2	0.3457	0.8116	0.2806
3	0.3803	0.7312	0.2780
			∑ = 0.8417
4	0.3803(1.05) = 0.3993		

Stage 2

Perpetuity Value : $\frac{P_3}{(1+K_e)^3}$

$P_3 = \frac{FCFE_4}{K_e - g} = \frac{0.3993}{11\% - 5\%}$ = ₹6.6547

PV of P_3 = 6.6547 x 0.7312 = ₹4.8659

Now, $\boldsymbol{P_0}$ = Explicit period value + perpetuity value

P_0 = 0.8417 + 4.8659 = ₹5.7076 per share

Illustration 7: X is evaluating PQR Co., which has been growing at the annual rate of 15% for the last 5 years. Here is her forecast of the company's future dividend growth trend.

2022	13.5%
2023	12%
2024	10.5%
2025	9.0%
2026	7.5%
2027	6%
Till perpetuity	6%

After considerable study, she has decided to use the following information in her valuation (as of the end of 2021):

- Beta: 1.2.
- 2021 dividend: ₹5.
- The risk-free rate: 4%.
- Expected Market Risk Premium: 6%.

What is the value of the PQR stock?

Solution 7:

Beta: 1.2	D_0: ₹5	$R_f = 4\%$	$R_p = 6\%$

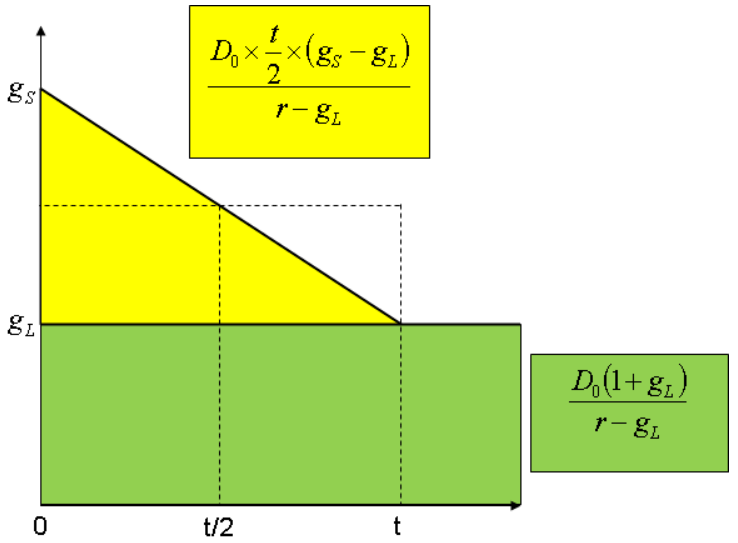
H Model formula

$\mathbf{P_0} = \frac{D_0(1+g_c)}{K_e - g_c} + \frac{D_0\left(\frac{1}{2}*2H\right)(g_h - g_c)}{K_e - g_c}$ where,

g_h = Highest growth g_c = constant growth 2H = 6yrs (2021 to 2027)

$K_e = R_f + \beta\,(R_m - R_f) = 4\% + 1.2(6\%) = 11.2\%$

So, $P_0 = \frac{5(1+6\%)}{11.2\%-6\%} + \frac{5\left(\frac{1}{2}*6\right)(15\%-6\%)}{11.2\%-6\%} = \frac{5.3+1.35}{5.2\%} =$ **₹127.88**



H Model assumes that before extraordinary growth rate reaches normal growth, it declines linearly for period 2H or t.

Illustration 8: ABC Limited, just declared a dividend of ₹28.00 per share. Mr. A is planning to purchase the share of ABC Limited, anticipating increase in growth rate from 8% to 9%, which will continue for three years. He also expects the market price of this share to be ₹720.00 after three years.

You are required to determine:

- the maximum amount Mr. A should pay for shares, if he requires a rate of return of 13% per annum.
- the maximum price Mr. A will be willing to pay for share, if he is of the opinion that the 9% growth can be maintained indefinitely and require 13% rate of return per annum.
- the price of share at the end of three years, if 9% growth rate is achieved and assuming other conditions remaining same as in (ii) above.

Note : Calculate rupee amount up to two decimal points and use PVF upto 3 decimal points. *(RTP May'21 New & Old)*

Solution 8: (i) Expected dividend for next 3 years

Year 1 (D_1) 28.00 (1.09) = ₹30.52
Year 2 (D_2) 28.00 $(1.09)^2$ = ₹ 33.27
Year 3 (D_3) 28.00 $(1.09)^3$ = ₹36.26

Required rate of return = 13% (Ke)

Market price of share after 3 years = (P_3) = ₹720

The present value of share

$$P_0 = \frac{D_1}{1+K_e} + \frac{D_2}{(1+K_e)^2} + \frac{D_3}{(1+K_e)^3} + \frac{P_3}{(1+K_e)^3} = \frac{30.52}{(1+0.13)} + \frac{33.27}{(1+0.13)^2} + \frac{36.26}{(1+0.13)^3} + \frac{720}{(1+0.13)^3}$$

P_0 = 30.52(0.885) + 33.27(0.783) +36.26(0.693) +720(0.693) = ₹577.15

(ii) If growth rate 9% is achieved for indefinite period, then maximum price of share should Mr. A willing be to pay is

$$P_0 = \frac{D_1}{K_e - g} = \frac{30.52}{0.13-0.09} = ₹763$$

(iii) Assuming that conditions mentioned above remain same, the price expected after 3 years will be:

$$P_3 = \frac{D_4}{K_e - g} = \frac{D_3(1+9\%)}{0.13-0.09} = \frac{36.26(1.09)}{0.13-0.09} = ₹988$$

Illustration 9: Mr. A is holding 1000 shares of face value of ₹ 100 each of M/s. ABC Ltd. He wants to hold these shares for long term and has no intention to sell.

On 1st January 2020, M/s XYZ Ltd. has made short sales of M/s. ABC Ltd.'s shares and approached Mr. A to lend his shares under Stock Lending Scheme with following terms:

i. Shares to be borrowed for 3 months from 01-01-2020 to 31-03-2020
ii. Lending Charges/Fees of 1% to be paid every month on the closing price of the stock quoted in Stock Exchange and
iii. Bank Guarantee will be provided as collateral for the value as on 01-01-2020.

Other Information:

a. Cost of Bank Guarantee is 8% per annum,
b. On 29-02-2020, M/s. ABC Ltd., declared dividend of 25%
c. M/s ABC Ltd.'s share quoted in Stock Exchange on various dates are as follows:

Date	Share Price in Scenario -1	Share Price in Scenario -2
01-01-2020	1000	1000
31-01-2020	1020	980
29-02-2020	1040	960
31-03-2020	1050	940

You are required to find out:

i. Earning of Mr. A through Stock Lending Scheme in both the scenarios

ii. Total Earnings of Mr. A during 01-01-2020 to 31-03-2020 in both the scenarios

iii. What is the Profit or loss to M/s. XYZ by shorting the shares using through Stock Lending Scheme in both the scenarios? ***[RTP May'22, RTP Nov'24, MTP Apr'23, Jan'21 QP (Old)]***

Solution 9:

		Scenario 1	Scenario 2
(i)	Lending fee		
	31-01-20 1020 x 1% and 980 x 1%	10.20	9.80
	29-02-20 1040 x 1% and 960 x 1%	10.40	9.60
	31-03-20 1050 x 1% and 940 x 1%	10.50	9.40
	Earnings from lending per Share (A)	31.10	28.80
	Total No. of Shares	1000	1000
	Total Earning from Lending	**31,100**	**28,800**
(ii)	Dividend income per Share (B)	25.00	25.00
	Total earnings per share (A) + (B)	56.10	53.80
	Total No. of Shares	1000	1000
	Total Earning	**56,100**	**53,800**
(iii)	Gain on shorting the shares (1,050 - 1,000) and (1,000 - 940)	(50.00)	60.00
	Lending fees paid	(31.10)	(28.80)
	Bank guarantee charges @ 8%	(20.00)	(20.00)
	Dividend Exp (If paid before March 31st)	(25.00)	(25.00)
	Gain Per Share	(126.10)	(13.80)
	Total No. of Shares	1000	1000
	Total Gain on shorting the shares	**(1,26,100)**	**(13,800)**

Illustration 10: ABC Limited's shares are currently selling at Rs. 13 per share. There are 10,00,000 shares outstanding. The firm is planning to raise Rs. 20 lakhs to Finance a new project. Required:

- What are the ex-right price of shares and the value of a right, if
  - The firm offers one right share for every two shares held.
  - The firm offers one right share for every four shares held.
- How does the shareholders' wealth (holding 100 shares) change from (i) to (ii)? How does right issue increase shareholders' wealth?

(ICAI SM, RTP Nov'18, Old PM)

Solution 10: Current Market price of equity Share is ₹13
Existing share count 10,00,000 & New Project = ₹20,00,000

1 Right share for 2 shares held

No. of rights shares issued = 10,00,000/2 = 5,00,000 shares
Hence, Project of ₹20,00,000 will be financed by issuing 5,00,000 shares
Price per right share = *Money raised / No.of shares issued*
= *₹20,00,000/5,00,000* = ₹4 per share
So,(TERP) Ex Right Price of share = *(NoPo+ S)/(No+ N1)*
= *(10,00,000*13+20,00,000)/(10,00,000+5,00,000)* = ₹10 per share
Value of Right = ₹10 per share - ₹4 per share = ₹6 per share
Value of Right on per share basis = *₹6/2* = ₹3

Shareholder Wealth in Scenario 1, 1for 2	
Shares held	100
New right shares	50
Total shares	**150**
Ex right price	₹10
Total Value of shareholding	**₹1500**
Less: Subscription amt paid	₹200 i.e (50*4)
(Price / share * No. of shares subscribed)	
Shareholder's wealth	**₹1300**

1 Right share for 4 shares held No. of rights shares issued = 10,00,000/4 = 2,50,000 shares
Price per right share = *Money raised / No. of shares issued* = *₹20,00,000/2,50,000* = ₹8 per share
Ex Right Price of share = *(NoPo+ S) /(No+ N1)* =
*(10,00,000*13+20,00,000)/(10,00,000+2,50,000)* = ₹12 per share
Value of Right = ₹12 per share - ₹8 per share = ₹4per share
Value of Right on per share basis = *₹4/4*= **₹1**

Shareholder Wealth in Scenario 2, 1 for 4	
Shares held	100
New right shares	25
Total shares	**125**
Ex right price	₹12
Total Value of shareholding	₹1500
Less: Subscription amt paid	₹200
(Price / share * No. of shares subscribed)	(25*8)
Shareholder's wealth	**₹1300**

Shares held	**100**
CMP	₹13
Total shareholder's wealth	₹1300

Conclusion: There is no change in shareholder's wealth due to rights issue in both the scenarios.

Part 2

Bond Value : Annual Coupon

$$P_0 = \sum_{t=1}^{n} \frac{C}{(1+y)^t} + \frac{M}{(1+y)^n} = C\,(PVIFA_{y,n}) + M\,(PVIF_{y,n})$$

$$= \frac{C}{y} x \left[1 - \frac{1}{(1+y)^n}\right] + \frac{M}{(1+y)^n}$$

P_0 = Bond price; n = Maturity period; C = Coupon; y = YTM; M = Maturity value

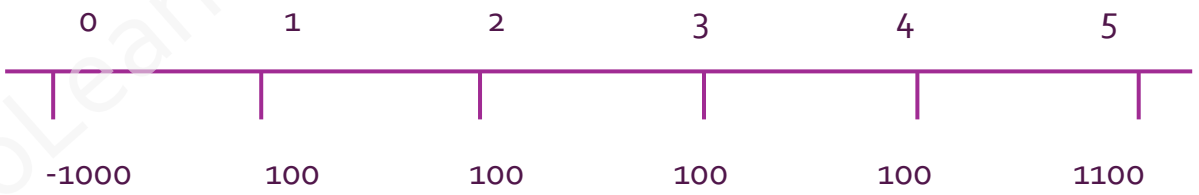
Bond Value : Semi Annual Coupon

$$P_0 = \sum_{t=1}^{2n} \frac{\frac{C}{2}}{(1+\frac{y}{2})^t} + \frac{M}{\left(1+\frac{y}{2}\right)^{2n}}$$

n = Maturity period expressed in terms of half-yearly periods; C/2 = Semi-annual coupon; y/2 = Discount rate applicable for half-year period

Yield	=	Coupon	Bond Price	=	PAR
Yield	>	Coupon	Bond Price	<	PAR
Yield	<	Coupon	Bond Price	>	PAR

Bond Maturity 5 Years
Coupon 10%
Bond FV ₹1000
Coupon Frequency Annual
Market Yield – 10%
Market Price of the Bond - ₹1000



Yield	Bond Price
↑	↓
↓	↑

Bond CMP	As Time Elapse	
Discount	Price	↑
Premium	Price	↓

Current Yield: $\frac{\text{Coupon}}{\text{Current market price}}$

$$YTM = LR + \frac{\text{NPV at LR} - NPV\ req}{\text{NPV at LR} - \text{NPV at HR}} x\ (HR - LR)$$

YTM (Approximate Formula) : $\frac{C \pm \frac{(F-P)}{n}}{\frac{F+P}{2}}$

C is coupon, F is face value, P is market price of bond/issue Price, n is years to maturity

Bond Basic Value (between 2 coupon dates) :

$$\text{Present Value of (A + Coupon)} - \text{Accrued Interest}$$

A = Bond price calculated as on next coupon date after payment of coupon

$$\text{Present value of (A + Coupon)} = \frac{\text{A + Coupon}}{(1 + \frac{\text{Req. YTM}}{\text{No. of periods}})^{\frac{\text{Time until next coupon}}{\text{Total coupon period}}}}$$

$$\text{Accrued Interest} = \text{Face Value x } \frac{\text{Coupon rate}}{\text{No. of periods}} \text{ x } \frac{\text{Time elapsed}}{\text{Total coupon period}}$$

Illustration 1:

MP Ltd. issued a new series of bonds on January 1, 2010. The bonds were sold at par (₹1,000), having a coupon rate 10% p.a. and mature on 31st December, 2025. Coupon payments are made semi-annually on June 30th and December 31st each year. Assume that you purchased an outstanding MP Ltd. bond on 1st March, 2018 when the going interest rate was 12%.

Required:

(i) What was the YTM of MP Ltd. bonds as on January 1, 2010?

(ii) What amount you should pay to complete the transaction? Of that amount how much should be accrued interest and how much would represent bonds basic value.

Solution 1:

(i) As the issue @ 10% coupon is at par the YTM is also 10% p.a

(ii) Date of purchase 1/3/2018

Semi-Annual Coupon dates = 30th June and 31st December

On 1/03/2018 Price includes 2 months accrued interest

$P_0 = 50.PVAF_{(6\%,15\ Periods)} + 1000.PVIF_{(6\%,15th\ Period)}$ = 50 x 9.7122 + 1000 x 0.41727 = **902.88**

Two Adjustments

(i) PV of Bond by 4 months @ 12% p.a

(ii) Adjust the interest for 4 months

Price on 30th June before coupon is 902.88 + 50 = ₹952.88

Now, if price on 30th June 2018 is 952.88 then, what is the price on 1/03/2018?

i.e. 952.88 x $PVAF_{(6\%,4months)}$

= 952.88 x $\frac{1}{(1.06)^{4/6}} = \frac{952.88}{(1.06)^{2/3}} = \frac{952.88}{1.0396}$ = **₹916.57 is dirty price as on 1/03/2018**

Clean Price = Dirty Price – Interest Accrued

Interest Accrued = 1000 x $\frac{10\%}{2}$ x $\frac{2}{6}$ = 50 x $\frac{1}{3}$ = ₹16.67 (2m = 31/12 to 1/3)

Clean Price = 916.57 – 16.67 = **₹899.90**

Steps to compute $(1.06)^{2/3}$

Type 1.06 on Calculator ->Press the square root button 12 times - >Subtract 1 ->multiply with 2/3 -> Add 1 -> Press "multiply button and then equal to button" 12 times Ans = 1.0396

Macaulay Duration : $\sum \frac{PVF \times t \times CF}{P} = \frac{1+y}{y} - \frac{(1+y)+t(c-y)}{C((1+y)^t-1)+y}$

It is Average Years taken to recover all CF from bonds in PV terms

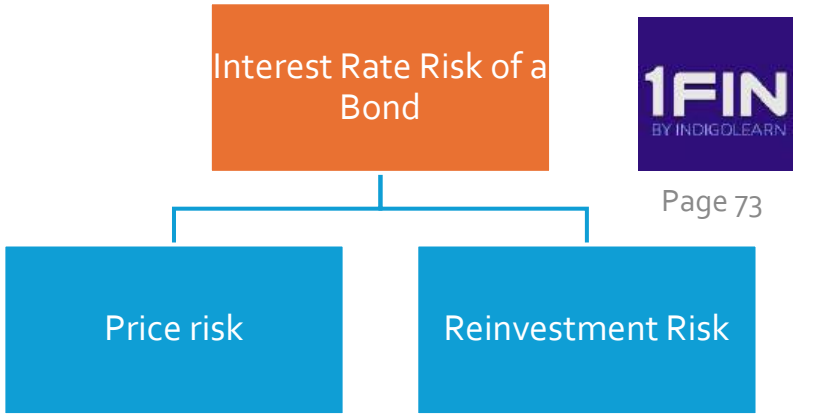
Illustration 2: Mac Duration of a bond with 5 yr bal maturity,12% annual coupon, FV 100 & Current YTM 10%

Year (A)	PVF @10% (B)	CF (C)= Coupon @12% + Principal	Price Computation B X C	A x B X C
0	1.0000	0	-	
1	0.9091	12	10.90	10.91
2	0.8264	12	9.91	19.83
3	0.7513	12	9.01	27.05
4	0.6830	12	8.19	32.78
5	0.6209	112	69.54	347.72
	Total		**107.58**	**438.29**

$Macaulay\ Duration = 438.29\ /107.58 = 4.07$ Years

Macaulay duration of a portfolio can be computed as weighted average Macaulay duration of its individual components

For a ZCB, Macaulay Duration = Maturity of the bond



Immunization is the process in which Interest Rate risk does not affect portfolio Value for one-time change in interest rate , i.e Price risk and reinvestment risk negate each other. This happens when a Bond Portfolio's (Macaulay) Duration = Holding period

Illustration 3:
Liability of ₹ 100,000 after 3 years

Immunize using a portfolio of 2 bonds of FV 100 each

Current YTM for bonds of Maturity 2 to 4 years = 9%

	Annual Coupon	Maturity
Bond 1 - X	8%	4 Years
Bond 2 -Y	9%	2 Years

PV of liability @ current YTM of 9% = 77,218.35

Face Value Bond 1	100					Mac
Annual Coupon	8%					Duration
Maturity period in years	4	Year	CF	PVF	PVCF	CF x PVF X t
Current market Yield	9%	1	8	0.917	7.339	7.339
		2	8	0.842	6.733	13.467
		3	8	0.772	6.177	18.532
		4	8	0.708	5.667	22.670
		4	100	0.708	70.843	283.370
				Price	96.760	345.378
				Mac Duration		**3.569**

Face Value Bond 1	100					
Annual Coupon	8%					Duration
Maturity period	4	Year	CF	PVF	PVCF	CF x PVF X t
Current market Yield	10%	1	8	0.909	7.273	7.273
		2	8	0.826	6.612	13.223
		3	8	0.751	6.011	18.032
		4	8	0.683	5.464	21.856
		4	100	0.683	68.301	273.205
				Price	93.660	333.589
				Mac Duration		**3.562**

Face Value Bond 2	100					Mac
Annual Coupon	9%					Duration
Maturity period	2	Year	CF	PVF	PVCF	CF x PVF X t
Current market Yield	9%	1	9	0.917	8.257	8.257
		2	9	0.842	7.575	15.150
		2	100	0.842	84.168	168.336
				Price	100.000	191.743
				Mac Duration		**1.917**

Face Value Bond 2	100					
Annual Coupon	9%					Duration
Maturity period	2	Year	CF	PVF	PVCF	CF x PVF X t
Current market Yield	10%	1	9	0.909	8.182	8.182
		2	9	0.826	7.438	14.876
		2	100	0.826	82.645	165.289
				Price	98.264	188.347
				Mac Duration		**1.917**

WA Duration Ratio 65.53 34.47 3.00

WA Duration Ratio 65.53 34.47 2.995

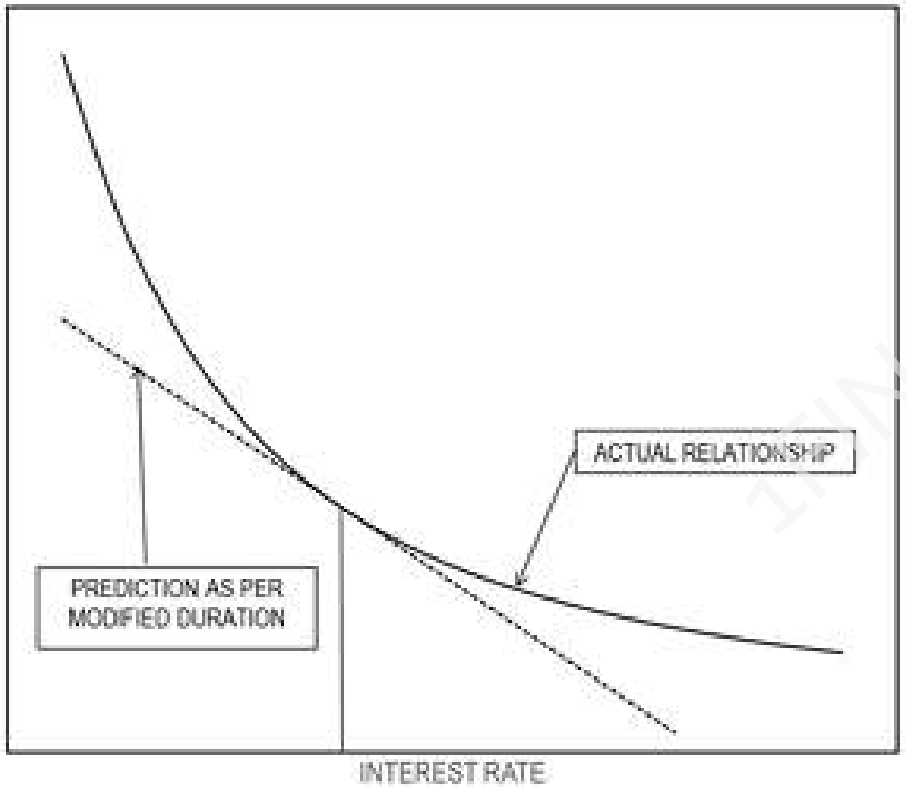
Share of bonds of	X	65.53	50,602.03
	Y	34.47	26,616.31
Price per bond	X		96.76
	Y		100.00
No of bonds	X		522.96
	Y		266.16

Bond 1	1	2	3	**Portf Value**
CF	5,062.281	4,602.073	4,183.703	13,848.057
Bond 1			51,345.446	51,345.446
Reinvst	1.210	1.100	1.000	
Total				65,193.503
Bond 2	1	2	2	
CF	2,898.517	2,635.015	29,277.945	34,811.477
Bond 2				-
Reinvst	1.210	1.100	1.100	
Total				34,811.477
Grand Total				**100,004.980**

$$\text{Modified Duration} = -\frac{\text{Macaulay Duration}}{\left(1+\frac{\text{YTM}}{n}\right)}$$

$$\frac{\frac{C}{y^2}\left(1-\frac{1}{(1+y)^n}\right)+\frac{n \times \left(M-\frac{C}{y}\right)}{(1+y)^{n+1}}}{P}$$

Modified Duration = Sensitivity or Volatility



Price Change = -MD x Δy x Bond Price + C* x Δy^2 x100 x Bond Price

Convexity adjustment:

C* x Δy^2 x 100

Where,

C* is Convexity formula; Δy is Change in yield for which calculation is done

Convexity Formula : $\frac{V_+ + V_- - 2V_0}{2\ V_0\ (\Delta y)^2}$

Where, V_+ is Price of Bond if yield increases by Δy

V_- = Price of Bond if yield decreases by Δy

V_0 = Initial Price of bond; Δy = Change in Yield

Convexity = Second Order change in price of Bond & More accurate

Illustration 4 : (Nov'20 QP 7 marks, RTP May'23)

The following data are available for a bond:
Face Value ₹10,000 to be redeemed at par on maturity / Coupon rate 8.5 % p.a. / Years to Maturity 5 years ? YTM 10%

Calculate

(i)Current market price of the Bond

(ii)Macaulay's Duration

(iii)Volatility of the Bond

(iv)Convexity of Bond

(v)Expected market price if there is decrease in YTM by 200 basis points

a.By Modified Duration based estimate

b. Using Convexity

c.By Intrinsic Value Method

Years	1	2	3	4	5
PVIF (10%, n)	0.909	0.826	0.751	0.683	0.621
PVIF (8%, n)	0.926	0.857	0.794	0.735	0.681

Solution 4

(a) (i) **Current Market Price of Bond**

$$P_0 = \sum_{t=1}^{n} \frac{C}{(1+y)^t} + \frac{M}{(1+y)^n}$$

= 850 (PVIAF 10%, 5) + 10,000 (PVIF 10%, 5)

= 850 (3.79) + 10,000 (0.621) = 3,221.50 + 6,210 = **₹9,431.5**

Year	Cash flow	PVF@ 8%	Present Value	PVF@ 12%	Present Value
1	850	0.926	787.10	0.082	758.20
2	850	0.857	728.45	0.074	677.45
3	850	0.794	674.90	0.068	605.20
4	850	0.735	624.75	0.062	540.60
5	10,000 + 850	0.681	7388.85	0.714	6151.95
			10204.05		**8733.40**

(ii) **Macaulay's Duration**

Year	Cash flow (b)	PVF@ 10% (c)	Present Value (b) * (c) = (d)	Proportion of bond value (e)	Proportion of bond value x time (years) (e) *(a) = f
1	850	0.909	772.65	0.082	0.082
2	850	0.826	702.10	0.074	0.148
3	850	0.751	638.35	0.068	0.204
4	850	0.683	580.55	0.062	0.248
5	10,000 + 850	0.621	6737.85	0.714	3.57
			9431.50	**1.000**	**4.252**

Duration of the bond = **4.252 years**

(iii) **Volatility of Bond**

Volatility of Bonds = Modified Duration = $\frac{\text{Duration}}{(1+y)} = \frac{4.252}{1.10} = 3.865$

(iv) Convexity of Bond

C*x $(\Delta y)^2$ x 100

$C^* = \frac{V_+ + V_- - 2V_0}{2V_0 (\Delta y)^2}$

$C^* = \frac{10,204.05 + 8,733.40 - 2 \times 9,431.50}{2 \times 9,431.50 \times (0.02)^2} = \frac{74.45}{7.5452} = 9.867$

So, Convexity Adjustment = C*x $(\Delta y)^2$ x 100 = 9.867 x $(0.02)^2$ x 100 = **0.395%**

(v) The expected market price if decrease in YTM by 200 basis points

(A) <u>By Macaulay's duration-based estimate</u>

9431.50 x 2 (3.865/100) = ₹729.05

Hence expected market price is 9431.50 + 729.05 = **10,160.55**

Hence, the market price will increase.

(B) <u>Using Convexity</u>

Approximate Revised Price = Price as per MD + Convexity Adjustment x Bond Price

= 10160.55 + 0.395% x 9431.50

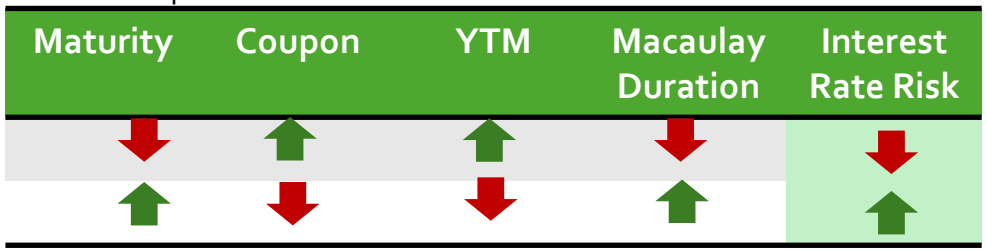
= 10,197.80

<u>(C)By Intrinsic Value method</u>

Intrinsic Value at YTM of 10%	₹9,431.50
Intrinsic Value at YTM of 8%	₹10,204.05
Price increased by	₹772.55

Hence, expected market price is ₹10,204.05

Impact of various factors on Interest Rate Risk



Yield To Call $P_o = \sum_{t=1}^{n} \frac{C}{(1+y)^t} + \frac{\text{Call price}}{(1+y)^n}$

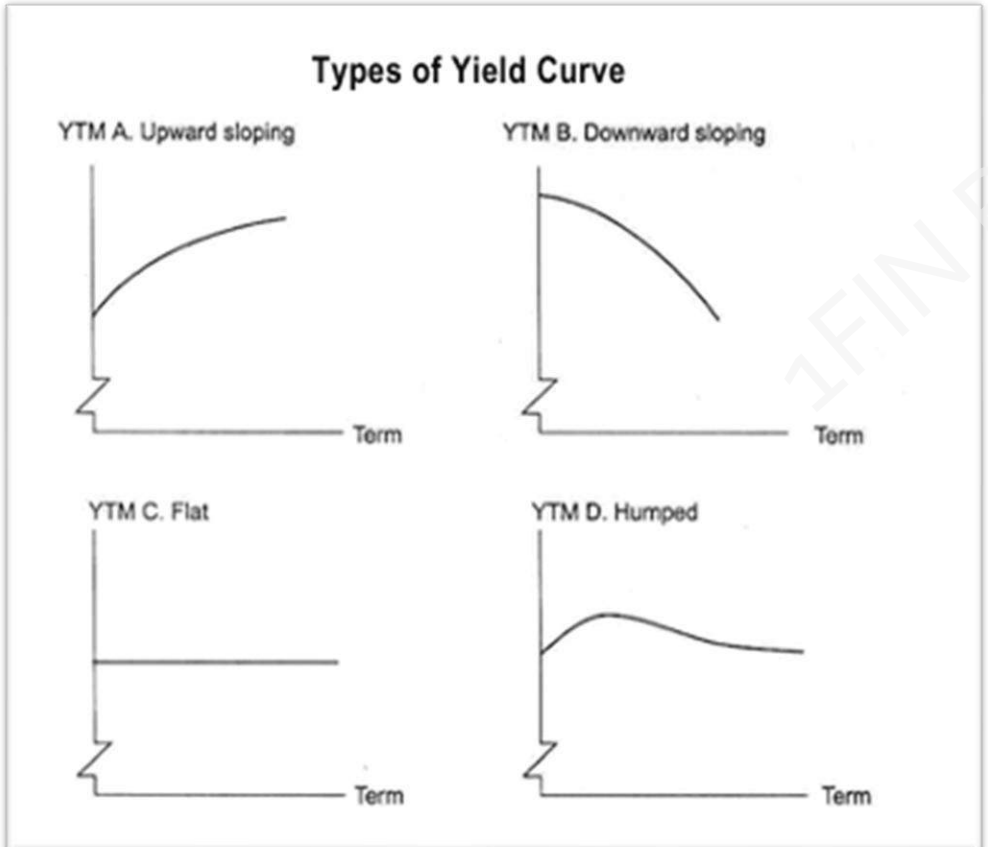
Yield To Put $P_o = \sum_{t=1}^{n} \frac{C}{(1+y)^t} + \frac{\text{Put price}}{(1+y)^n}$

Spot Rate = YTM of a ZCB of specific Maturity. Assumes Same interest rate across all years

Yield Curve = a Plotting of YTM of Coupon Bonds or ZCBs with increasing maturities

Forward Rate = Rate of two in between years determined based on Spot Rates of ZCB / Coupon Bonds – Arrived at by Bootstrapping Interest Rates

Year	Spot Rate	Forward rate		
1	12.40%	f(0,1)	12.40%	12.40%
2	13.18%	f(1,2)	$(1.1318)^2/(1.1240)^1 - 1$	13.97%
3	13.40%	f(2,3)	$(1.1340)^3/(1.1318)^2 - 1$	13.84%
4	13.70%	f(3,4)	$(1.1370)^4/(1.1340)^3 - 1$	14.60%
5	14.10%	f(4,5)	$(1.1410)^5/(1.1370)^4 - 1$	15.71%



Term Structure Theories

- **Expectations Theory**: LT Rates, unbiased estimate of ST rates
- **Liquidity Theory**: Longer tenure means low liquidity for investor and hence high risk and hence higher interest rates
- **Preferred Habitat Theory**: Depends on demand and supply for LT & ST bonds which are independent of each other

Illustration 5: Based on the credit rating of bonds, Mr. Z has decided to apply the following discount rates for valuing bonds:

Credit Rating	Discount Rate
AAA	364 day T bill rate + 3% spread
AA	AAA + 2% spread
A	AAA + 3% spread

He is considering to invest in AA rated, ₹1,000 face value bond currently selling at ₹1,025.86. The bond has five years to maturity and the coupon rate on the bond is 15% p.a. payable annually. The next interest payment is due one year from today and the bond is redeemable at par. (Assume the 364 day T-bill rate to be 9%). You are required to calculate the intrinsic value of the bond for Mr. Z. Should he invest in the bond? Also calculate the current yield and the Yield to Maturity (YTM) of the bond. *(RTP May'19, RTP Nov'11, Old PM)*

Solution 5:

The appropriate discount rate for valuing the bond for Mr. Z is:

R = 9% + 3% + 2% = 14%

Year	CF	PVIF 14% PV (CF)	PV (CF)
1	150	0.877	131.55
2	150	0.769	115.35
3	150	0.675	101.25
4	150	0.592	88.80
5	1150	0.519	596.85
			$P_0 = 1033.80$

Since, the current market value is less than the intrinsic value;

Mr. Z should buy the bond.

Current yield = Annual Interest / Price

= 150 / 1025.86 = **14.62%**

The YTM of the bond is calculated as follows:

@15%

$P = 150 \times PVIFA_{15\%,4} + 1150 \times PVIF_{15\%\ 5}$

$= 150 \times 2.855 + 1150 \times 0.497 = 428.25 + 571.55 = 999.80$

@14%

As found in sub part (a) Po = 1033.80

By interpolation we get,

$= 14\% + \frac{7\ 94}{7\ 94 - (-\ 26.06)} \times 15 \text{ -\% } 14\%) = 14\% + \frac{7.94}{34}\%$

YTM = 14.23%

Illustration 6 : (Old PM, MTP Aug'17, May'15)

On 31st March, 2013, the following information about Bonds is available:

Name of Security	Face Value ₹	Maturity Date	Coupon Rate	Coupon Date(s)
Zero coupon	10,000	31st March, 2023	N.A.	N.A.
T-Bill	1,00,000	20th June, 2013	N.A.	N.A.
10.71% GOI 2023	100	31st March, 2023	10.71	31st March
10% GOI 2018	100	31st March, 2018	10.00	31Mar/30 Sep

Calculate:

(i) If 10 years yield is 7.5% p.a. what price the ZCB would fetch on 31st March, 2013?

(ii) What will be the annualized yield if the T-Bill is traded @ 98500?

(iii) If 10.71% GOI 2023 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March)?

(iv) If 10% GOI 2018 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March)? [MTP Aug 17 (8 marks), May 15 (8 marks)]

Solution6:

(i) Rate used for discounting shall be yield. Accordingly, ZCB shall fetch:

$\frac{10000}{(1.075)^{10}}$ = 4852

(ii) The day count basis is actual number days / 365. Accordingly annualized yield shall be :

Yield = $\frac{\text{FV}-\text{Price}}{\text{Price}} * \frac{365}{\text{No.of days}} = \frac{100000-98500}{98500} * \frac{365}{81}$ = 6.86%

(iii) Price GOI 2023 would fetch

= ₹10.71 PVAF (8%, 10) + ₹100 PVF (8%, 10) = ₹10.71 x 6.71 + ₹100 x 0.4632

= ₹71.86 + ₹46.32 = ₹118.18

(iv) Price GOI 2018 Bond would fetch:

= ₹5 PVAF(4%, 10) + ₹100 PVF (4%, 10) = ₹5 x 8.11 + ₹100 x 0.6756 = 40.55 + 67.56 **= 108.11**

Illustration 7: (MTP Oct'17)

The HLL has Rs. 8.00 crore of 10% mortgage bonds outstanding under an indenture. The indenture allows additional bonds to be issued as long as all of the following conditions are met:

(1) Pre- tax interest coverage i.e., (Income before tax + Bond Interest) / Bond Interest remains greater than 4.

(2) Net depreciated value of mortgage assets remains twice the amount of the mortgage debt.

(3) Debt-to-equity ratio remains below 0.50.

The HLL has net income after taxes of Rs. 2 crores and a 40% tax-rate, Rs. 40 crores in equity and Rs. 30 crores in depreciated assets, covered by the mortgage.

Assuming that 50% of the proceeds of a new issue would be added to the base of mortgaged assets and that the company has no Sinking Fund payments until next year, how much more 10% debt could be sold under each of the three conditions? Which protective covenant is binding?

Solution 7: Let x be the crores of Rupees of new 10% debt which would be sold under each of the three given conditions.

Now, the value of x under each of the three conditions is as follows:

1. Pre-tax interest coverage $\frac{\text{Income before tax+bond interest}}{\text{Bond Interest}}$ remains > 4.

$\frac{\frac{₹2\text{crores}}{(1-0.4)} + 8\text{crores}*0.1+x*0.1}{(8\text{crores}*0.1)+(x*0.1)}$ = 4

Or $\frac{3\ 33\ .0\ \text{crores} + 0.80\ \text{crores} + 10x}{(0.80\ \text{crores} + 0.10x\ )}$ = 4

Or Rs. 4.13 crores + 0.10x = 4 (Rs. 0.80 crores + Rs. 0.10x)

Or Rs. 4.13 crores + 0.10x = Rs. 3.2 crores + Rs. 0.40x

Or Rs. 0.30 x = 0.93

Or x = Rs. 0.93/0.30 = Rs. 3.10 crores

Additional mortgage required shall be a maximum of Rs. 3.10 crores.

2. Net depreciated value of mortgage assets remains twice the amount of mortgage debt (Assuming that 50% of the proceeds of new issue would be added to the base of mortgaged assets)

i.e $\frac{₹30\ \text{crores}+0.5x}{₹8\text{crores}+x}$ = 2

or Rs. 30 crores + 0.5x = 2 (Rs. 8 crores + x) or Rs. 1.5x = Rs. 14 crores

or **x = 9.33 crores**

Additional mortgage required to satisfy condition No. 2 is Rs. 9.33 crores

3. Debt to equity ratio remains below 5

i.e $\frac{₹8\ \text{crores}+x}{₹40\ \text{crores}}$ = 0.5

or Rs. 8 crores + x = Rs. 20 crores

or x = Rs. 12 crores

Since all the conditions are to be met, the least i.e. Rs. 3.10 crores (as per condition – 1) can be borrowed by issuing additional bonds. Thus, binding conditions are met and it limits the amount of new debt to 3.10 crore.

Illustration 8: The following data is related to 8.5% Fully Convertible (into Equity shares) Debentures issued by JAC Ltd. at ₹1000. *[Similar May'18 QP (Old), RTP Nov'21, Similar MTP Apr'22, MTP Aug'18 Old, RTP Nov 16 & May 15, Old PM]*

Market Price of Debenture	₹900
Conversion Ratio	30
Straight Value of Debenture	₹700
Market Price of Equity share on the date of Conversion	₹25
Expected Dividend Per Share	1

You are required to calculate:

(a) Conversion Value of Debenture

(b) Market Conversion Price / Conversion Parity Price

(c) Conversion Premium per share

(d) Ratio of Conversion Premium

(e) Premium over Straight Value of Debenture

(f) Favourable income differential per share

(g) Premium pay back period

(h) Percentage of downside risk

Solution 8:

(a) Conversion Value of Debenture

= Market Price of one Equity Share X Conversion Ratio

= ₹30 X 25 = **₹750**

(b) Market Conversion Price / Conversion Parity price

$$\frac{\text{Market Price of Convertible Debenture}}{\text{Conversion Ratio}} = \frac{900}{30} = \mathbf{30}$$

(c) Conversion Premium per share

Market Conversion Price – Market Price of Equity Share

= ₹30 – ₹25 = **₹5**

(d) Ratio of Conversion Premium

$$\frac{\text{Conversion premium per share}}{\text{Market Price of Equity Share}} = \frac{5}{25} \text{ X } 100 = \mathbf{20\%}$$

(e) Premium over Straight Value of Debenture

$$\frac{\text{Market Price of Convertible Bond}}{\text{Straight Value of Bond}} - 1 = \frac{900}{700} - 1 = \mathbf{28.57\%}$$

(f) Favourable income differential per share

$$\frac{\text{Coupon Int from Debenture} - \text{Conversion Ratio Dividend Per Share}}{\text{Conversion Ratio}} = \frac{85-30}{30} = \mathbf{₹\ 1.833}$$

(g) Premium pay back period

$$\frac{\text{Conversion premium per share}}{\text{Favourable Income Differntial Per Share}} = \frac{5}{1.833} = \mathbf{2.73\ years}$$

(h) Percentage of Downside Risk

$$= \frac{\text{MP of Convert Bond} - \text{Straight Value}}{\text{MP of Convert}} \text{ X } 100 = \frac{\text{Rs.900} - \text{Rs.700}}{\text{Rs.900}} = 28.57\%$$

	Convertible Debenture	Warrant
Nature	To convert Existing Debt to Equity Shares at a predetermined price	To subscribe to New Equity shares at a predetermined price
Option	Yes	Yes
Option Detachable?	No	Yes
Cash Payment for Eq Share Subscription?	No	Yes
Valuation	**Conversion Premium per share** = Market Conversion Price – Market Price of Equity Share	Theoretical Value of a Warrant = (MP of share – Exercise Price of Warrant) x No of Eq shares per warrant

Illustration 9: Tangent Ltd. is considering calling ₹3 crores of 30 years, ₹1,000 bond issued 5 years ago with a coupon interest rate of 14 per cent. The bonds have a call price of ₹1,150 and had initially collected proceeds of ₹2.91 crores since a discount of ₹30 per bond was offered. The initial floating cost was ₹3,90,000. The Company intends to sell ₹3 crores of 12 per cent coupon rate, 25 years bonds to raise funds for retiring the old bonds. It proposes to sell the new bonds at their par value of ₹1,000. The estimated floatation cost is ₹4,25,000. The company is paying 40% tax and its after tax cost of debt is 8 per cent. As the new bonds must first be sold and then their proceeds to be used to retire the old bonds, the company expects a 2month period of overlapping interest during which interest must be paid on both the old and the new bonds. You are required to evaluate the bond retiring decision. [PVIFA 8%, 25 = 10.675] *(Nov'18 QP 8 marks, MTP Nov'21)*

Solution 9: (a) NPV for **bond refunding**

	₹
PV of annual cash flow savings (W.N. 2)	
(3,49,600 x PVIFA 8%,25) i.e. 10.675	37,31,980
Less: Initial investment (W.N. 1)	31,15,000
NPV	**6,16,980**

Recommendation: Refunding of bonds is recommended as NPV is positive.

WN 1 Initial investment:

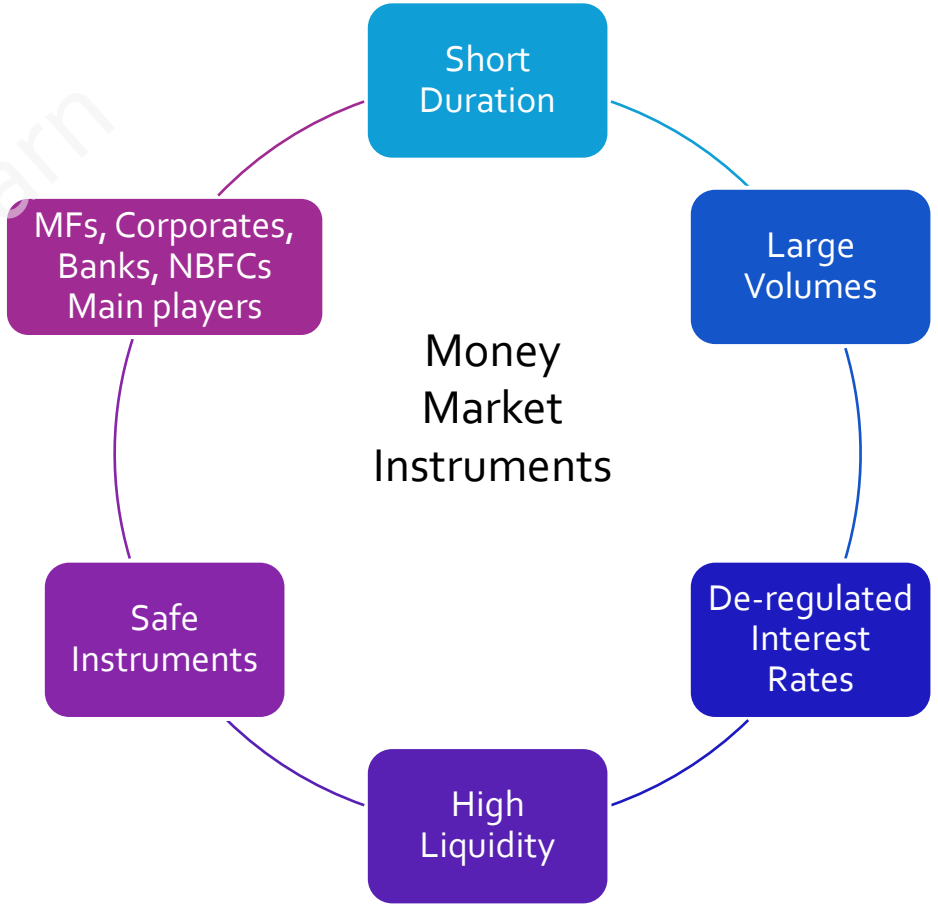
(a) Call premium Before tax (1,150 – 1,000) x 30,000	45,00,000
Less tax @ 40%	18,00,000
After tax cost of call premium	**27,00,000**
(b) Floatation cost	**4,25,000**
(c) Overlapping interest Before tax (0.14 × 3 crores)× 2/12	7,00,000
Less tax @ 40%	2,80,000
	4,20,000
(d) Tax saving on unamortized discount on old bond (25/30 × 9,00,000 x (0.4)	**(3,00,000)**
(e) Tax savings from unamortized floatation	
Cost of old bond (25/30 x 3,90,000 x 0.4)	**(1,30,000)**
	31,15,000

(2) Annual cash flow savings:	
(a) Old bond	
(i) Interest cost (0.14 x 3 crores)	42,00,000
Less tax @ 40%	16,80,000
	25,20,000
(ii) Tax savings from amortization of discount (9,00,000/30 × 0.4)	(12,000)
(iii) Tax savings from amortization of floatation cost (3,90,000/30 × 0.4)	(5,200)
Annual after tax cost payment under old Bond (A)	**25,02,800**

(b) New Bond	
(i) Interest cost before tax (0.12 × 3 crores)	36,00,000
Less tax @ 40%	14,40,000
After tax interest	**21,60,000**
(ii) Tax savings from amortization of floatation cost (0.4 x 4,25,000/25)	(6,800)
Annual after tax payment under new Bond (B)	21,53,200
Annual Cash Flow Saving (A) – (B)	**3,49,600**

Assumptions:

- Discount & Flotation cost can be amortized over Bond Life
- Amortization of Discount, Floatation Cost have tax benefit
- Old Bond unamortized flotation costs can be w/o in an year and with full tax deductibility
- Tax benefit is available on premium on redemption in the year of redemption



Call / Notice Money
- Call – Overnight
- Notice – Up to 14 days
- Interbank market used for ALM

T Bills
- GOI borrowings <365 day instruments, 14,28,91,182, 364
- Issued at discount

Commercial bills
- General Bills between companies
- Discounted with banks, encourage by RBI
- Upfront Discount

ertificates of Deposits
- Issued by Banks
- Upfront Discount
- Negotiable Term Deposits accepted from Bulk Depositors

CPs
- ST borrowings by companies - Unsecured
- Issued at Discount, replaces a Company's WC Limits
- Subscribed by Banks / NBFCs, MFs

REPOs
- REPO also known as Ready Forward Contract
- REPO Rate generally rate at which RBI lends to banks
- In a REPO transaction, a Bank borrows by selling a G sec and buying it back at higher rate
- Reverse repo is for lending the money
- Repo Rate > Reverse Repo Rate

Yield on Treasury Bills:

$$\frac{\text{FV} - \text{Issue Price}}{\text{Issue Price}} \times \frac{365}{\text{Maturity}}$$

Yield on Commercial Bills/ Certificate of Deposit/ CP:

$$\frac{\text{FV} - \text{Sale Value}}{\text{Sale Value}} \times \frac{365}{\text{Maturity}}$$

Start Proceeds in Repo

$$\text{Nominal Value} \times \frac{\text{Dirty Price}}{100} \times \frac{100 - \text{Initial Margin}}{100}$$

Repayment at Maturity in Repo

$$\text{Start Proceeds} \times \left(1 + \text{Repo Rate} \times \frac{\text{No, of days}}{360}\right)$$

Illustration 10 : Z Co. Ltd. issued commercial paper worth ₹10 crores as per following details:What was the net amount received by the company on issue of CP? (Charges of intermediary may be ignored)
(ICAI SM, MTP Nov'21 New & Old, Old PM)

Date of issue:	16th January, 2019
Date of maturity:	17th April, 2019
No. of days:	91
Interest rate:	12.04% p.a

Solution 10

The company had issued commercial paper worth ₹10 crores

No. of days Involves = 91 days

Interest rate applicable = 12.04 % p.a.

Interest for 91 days = $12.04\% \times \frac{91\text{Days}}{365\text{Days}} = 3.00175\%$

= or ₹10 cr x $\frac{3.00175}{100+3.00175}$ = ₹29, 14,274

= or ₹29.14274 Lakhs

∴ Net amount received at the time of issue:- ₹10.00 Crores – ₹0.2914274 Cr = **₹9.7085726 Cr**

Alternatively, it can also be computed as follows:

Price = $\frac{₹10\ crores}{\left(1+12.04\% \times \frac{91 days}{365 days}\right)}$ = **₹9.7085726 Cr**

Illustration 11: [RTP Nov'24, MTP Oct'22, Jul'21 QP (Old)] The Bank BK enters into a Repo for 9 days with Bank NE in 6% Government bonds 2022 for an amount of 2 crore. The other relevant details are as follows:
Assume 360 days in a year. You are required to calculate:
•Repo Rate
•Dirty Price and
•Clean Price

First Leg Payment (Start Proceeds)	2,00,06,750
Second Leg Payment (Repayment Proceeds)	2,00,31,759
Initial Margin	1.25%
Days of accrued interest	240

Solution 11: (i) Repo Rate :

Particulars	Amt(₹)
Loan	20006750
Repayment	20031759
Difference(Interest)	25009

Interest = Loan x Repo rate x $\frac{Days}{360}$

25009 = 20006750 x r% x $\frac{9}{360}$

25009 x 40 = 20006750 x r%

r% = 5.0001 = 5%

(ii) Dirty Price

Loan = Security given – Margin =– 1.25%

If Security is 100 then loan is 98.75% of security given.

20006750 = 98.75% of security

Security sold = 20006750/98.75% = ₹20260000

Face Value = ₹ 2,00,00,000

Market Value = ₹ 2,02,60,000

Dirty Price using Face Value of bond ₹100

If Face Value ₹100 is worth ₹20000000 Then, How much Dirty Price is worth ₹20260000?

So, $\frac{2,02,60,000}{2,00,00,000}$ x 100 = **₹101.3**

(iii) Clean Price = DP – Accrued Interest = $101.3 - \left(100 * 6\% * \frac{240}{360}\right) = 101.3 - 4 =$ **₹97.3**

Illustration 12: Mr. X wants to invest ₹ 1,00,000 in the 7 years 8% bonds in the market (Face Value ₹100) which were issued 2 years ago. (i) You are requested to advise him what is the maximum price for bonds to be paid in the following scenarios:
(1)If Mr. X is expecting minimum 9% / 7%return on the bonds
(2) If the present rate of similar bonds issued is 8.25% /7.75%
(ii) If the bonds are available at par and 1% is the transaction cost, what is the effective yield?
(iii) Find the number of days required to breakeven transaction cost if the bonds are available at par and 2% is the transaction cost. (Nov'22 QP 8 marks)

Solution 12: Assumption: Bonds are annual coupon only. Balance period = 5 years

(i) Maximum price for bonds to be paid

1) Price of Bond if Minimum return is 9%

Coupon Payment = 100* 8% = 8

Principal = 100

Discount = 9%

Bond Price $= \frac{8}{1.09^1} + \frac{8}{1.09^2} + \frac{8}{1.09^3} + \frac{8}{1.09^4} + \frac{108}{1.09^5}$

(Alternatively) =100* PVIF (9%,5th year) + 8* PVAF (9%, 5 years = **₹ 96.1072**

2) Price of Bond if Minimum return is 7%

Coupon Payment = 100* 8% = 8

Principal = 100

Discount = 7%

Bond Price $= \frac{8}{1.07^1} + \frac{8}{1.07^2} + \frac{8}{1.07^3} + \frac{8}{1.07^4} + \frac{108}{1.07^5}$

(Alternatively) = 100* PVIF (7%,5th year) + 8* PVAF (7%, 5 years)

= 100* 0.7129 + 8* 4.1002 = **₹ 104.09**

3) Price of Bond if present rate on similar Bonds is 8.25%

P_0 = 100* PVIF (8.25%,5th year) + 8* PVAF (8.25%, 5 years)

= 100* 0.6727 + 8* 3.9665 = **₹ 99.002**

4) Price of Bond if present rate on similar Bonds is 7.75%

P_0 = 100* PVIF (7.75%,5th year) + 8* PVAF (7.75%, 5 years) = 100* 0.6885 + 8* 4.0191

= **₹ 101.0032**

(ii) Effective Yield

P_0 = 100

Coupon = ₹ 8

Face Value = 100

Transaction Cost = 1%

Market Rate = 8%

Yield = 8%

Investment = 100 (1+ 1%) = ₹ 101

Of ₹ 101 invested, ₹ 1 goes to the transaction cost and the remaining to the Bond.

Effective Yield = $\frac{Coupon}{Investment}$ = $\frac{8}{101}$ = **7.92%**

(i)Number of days required to breakeven transaction cost

P_0 = 100

Coupon = ₹ 8

Face Value = 100

Transaction Cost = 2%

Transaction Cost = 2%* 100 = ₹ 2

No. of Days = $\frac{2*365}{8}$ = **91.25 days**

For a bond with annual coupon of ₹ 8, it will take 91.25 days to breakeven transaction cost, assuming 365 days in the year.

Illustration 13: (RTP Nov'17)Based on the following data, estimate the Net Asset Value (NAV) 1st July 2016 on per unit basis of a Debt Fund:

Name of Security	Face Value (₹)	Purchase Price (₹)	Maturity Date	No. of Securities	Coupon Date(s)	Duration of Bonds
10.71% GOI 2028	100	104.78	31st March, 2028	100000	31st March	7.3494
10% GOI 2023	100	100.00	31st March 2023	50000	31st March & 30th Sep	5.086
9.5% GOI 2021	100	97.93	31st Dec 2021	40000	30th June & 31st Dec	4.3949
8.5% SGL 2025	100	91.36	30th June 2025	20000	30th June	6.5205

Number of Units (₹ 10 face value each): 100000

All securities were purchased at a time when applicable Yield to Maturity (YTM) was 10%. On NAV date, the required yield increased by 75 basis point and Cash in hand and accrued expenses were ₹ 6,72,800 and ₹ 2,37,400 respectively.

Solution 13: Computation of Change in price of the bond

Name of Security	Purchase Price (₹) (A)	No. of Securities (B)	Value of the bond P = (A * B)	Duration of Bonds (C)	Modified Duration(M.D) = (C)/1.1 or 1.05	Δ Bond Δp = - Δy x M.D x P
10.71% GOI 2028 (Annual coupon)	104.78	100,000	1,04,78,000	7.3494	6.6813	- 5,25,048 (1,04,78,000 x 6.6813 x 0.75%) Or $\left(\frac{1,04,78,000 \text{ x } 7.3494}{1.1}\right) 0.75\%$
10% GOI 2023 (Semi-annual coupon)	100.00	50,000	50,00,000	5.086	4.8438	- 1,81,643 (50,00,000 x 4.8438 x 0.75%) Or $\left(\frac{50,00,000 \text{ x } 5.086}{1.05}\right) 0.75\%$
9.5% GOI 2021 (Semi-annual coupon)	97.93	40,000	39,17,200	4.3949	4.1856	- 1,22,969 (39,17,200 x 4.1856x 0.75%) Or $\left(\frac{39,17,200 \text{ x } 4.3949}{1.05}\right) 0.75\%$
8.5% SGL 2025 (Annual coupon)	91.36	20,000	18,27,200	6.5205	5.9277	- 81,234 (18,27,200 x 5.9277 x 0.75%) Or $\left(\frac{18,27,200 \text{ x } 6.5205}{1.1}\right) 0.75\%$
			2,12,22,400			

Computation of Expected Market Price

Name of Security	Value of the bond (P)	Δ in price	Expected Market Price P - Δp
10.71% GOI 2028 (Annual coupon)	1,04,78,000	- 5,25,048	99,52,952 (1,04,78,000 – 5,25,048)
10% GOI 2023 (Semi-annual coupon)	50,00,000	- 1,81,643	48,18,357 (50,00,000 – 1,81,643)
9.5% GOI 2021 (Semi-annual coupon)	39,17,200	- 1,22,969	37,94,231 (39,17,200 – 1,22,969)
8.5% SGL 2025 (Annual coupon)	18,27,200	- 81,234	17,45,966 (18,27,200 – 81,234)
	2,12,22,400	**- 9,10,894**	**20311506**

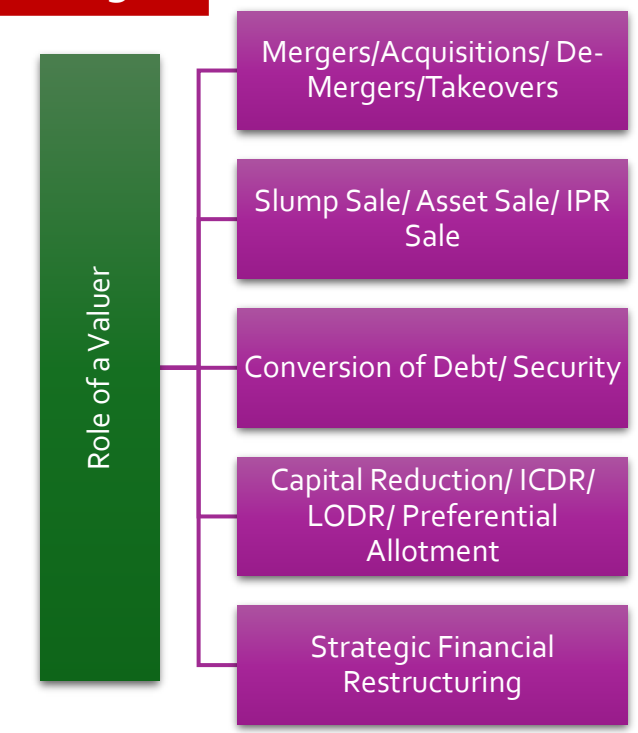
Computation of NAV per unit

Particulars	Amount(₹)
Closing Value of the bond	2,03,11,506
Add : Cash in hand	6,72,800
Less : Accrued Expenses	(2,37,400)
Add :Interest Accrued (WN : 1)	3,92,750
Value of net assets	2,11,39,656
Total units	100000
NAV/No. of units	**211.3965**

Working Note 1: Computation of Interest Accrued

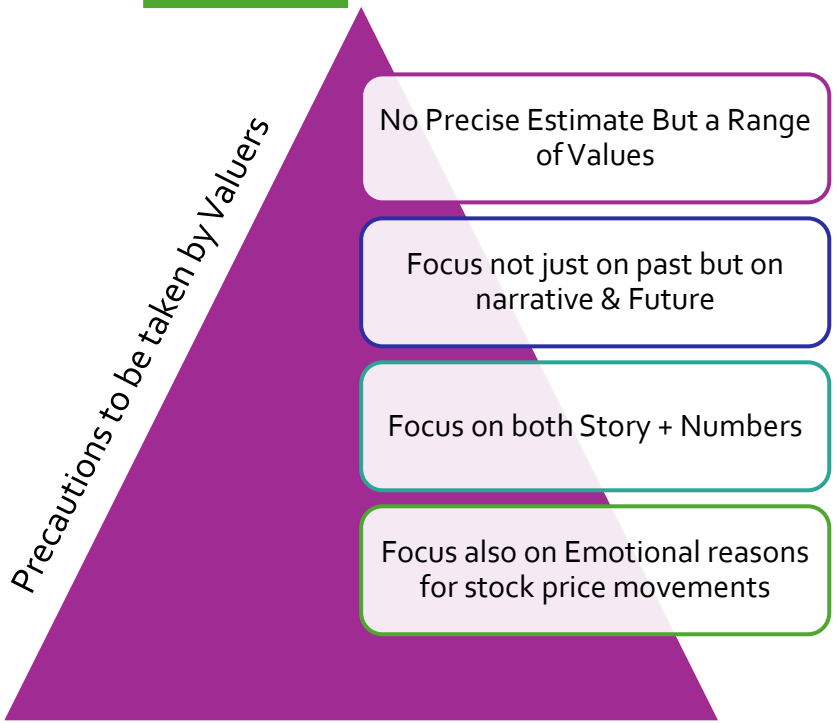
Name of Security	Computation	Interest Accrued(₹)
10.71% GOI 2028 (Annual coupon)	100 x 100000 x 10.71% x3/12	2,67,750
10% GOI 2023 (Semi-annual coupon)	100 x 50000 x 5% x 3/6	1,25,000
		Σ = 3,92,750

Part 3



Responsibilities of Valuers (IPICIGRO)

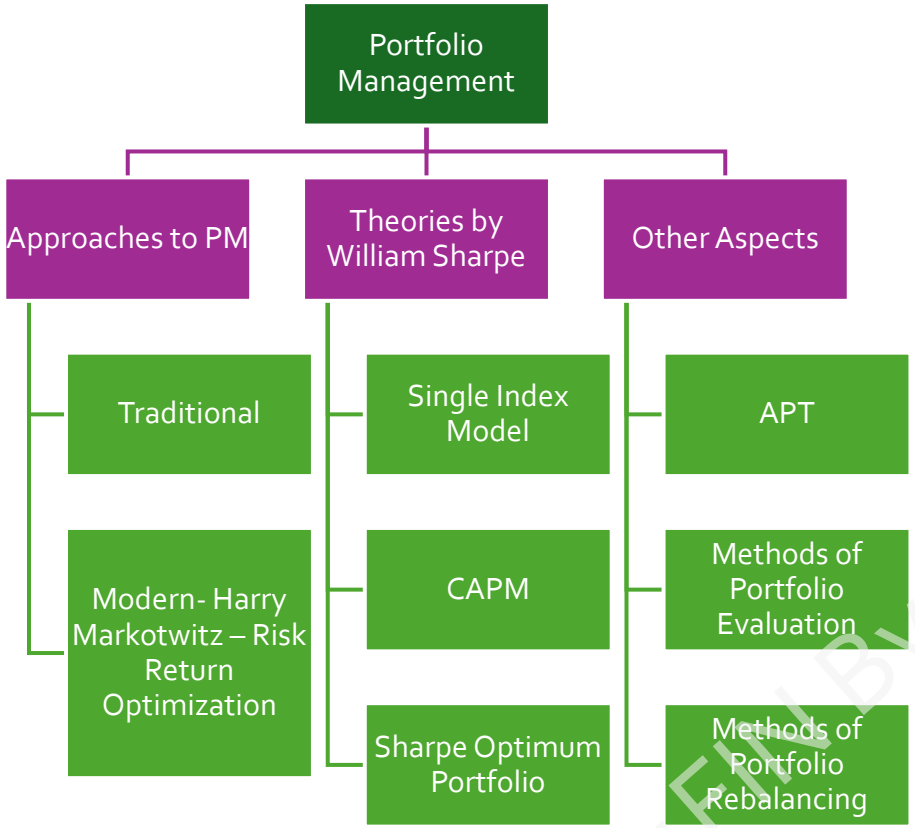
- **Integrity and Fairness**
  - With Clients & Other Valuers
  - In all professional relationships.
  - Not misrepresent any facts or situations.
  - No disrepute to the profession.
- **Professional Competence and Due Care**
  - Exercise Ind professional judgment.
  - Accordancwith the relevant Tech & Prof Standards
  - Maintain & Update Prof knowledge
  - Cannot disclaim liability for his/its expertise
  - Work care & skill, instructions of client
- **Independence and Disclosure of Interest**
  - Act with Objectivity
  - No Assignments with relatives
  - Maintain Independence.
  - Disclose Conflicts
  - No Insider Trading
  - No "mandate snatching" or "convenience valuation
  - No Success Fee
  - Declare Past Associations
- **Confidentiality**
  - Maintain Confidentiality
- **Information Management**
  - Maintain Documentation
  - Co Operate with investigations
  - Provide Info as sought by agencies
  - Maintain Records
- **Gifts and hospitality**
  - Not Accept Gifts
  - Not Offer gifts
- **Remuneration and Costs**
  - Transparent Fees
  - No Undisclosed Fees
- **Occupation, employability and restrictions**
  - No to too Many Assignments
  - No Employment with CoP
  - No Other Business

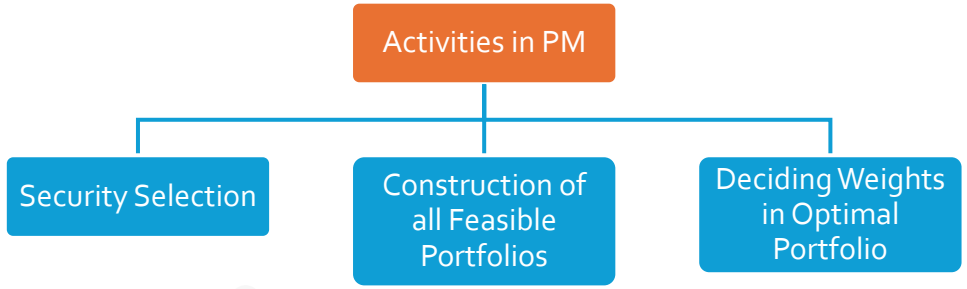


PORTFOLIO MANAGEMENT

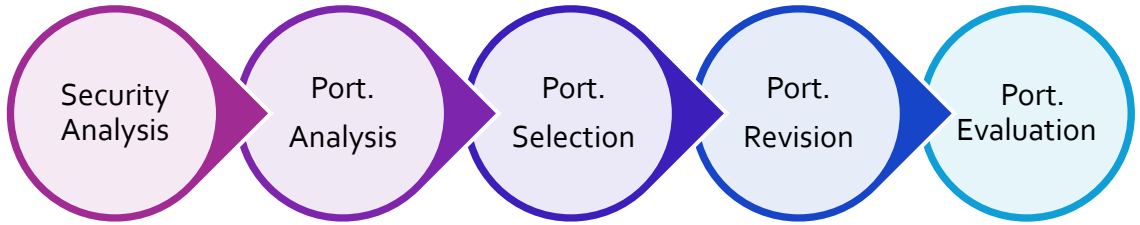
Last Day Revision Notes / Summary Notes / Concept Notes

Sriram Somayajula CFA, PGP (ISB)
1FIN By IndigoLearn





Phases in Portfolio Management



Investor Study → Define Risk & Return Objectives → Investment Strategy → Diversification → Security Selection → **Traditional Approach to PM**

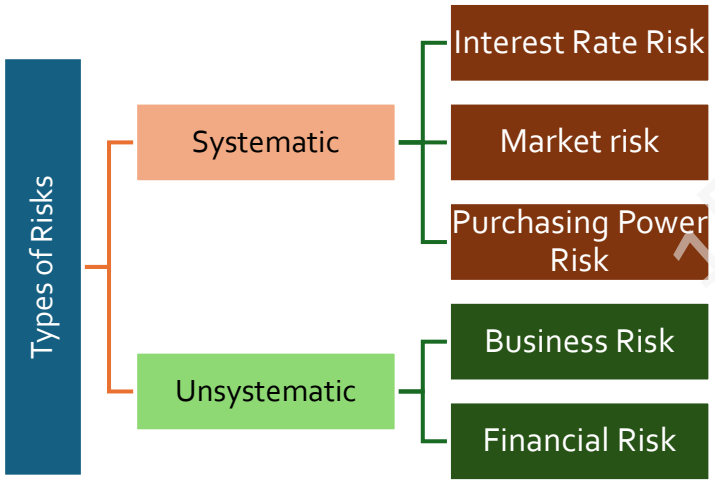
Focus on Risk Management

Finding Mean Variance Efficient portfolios

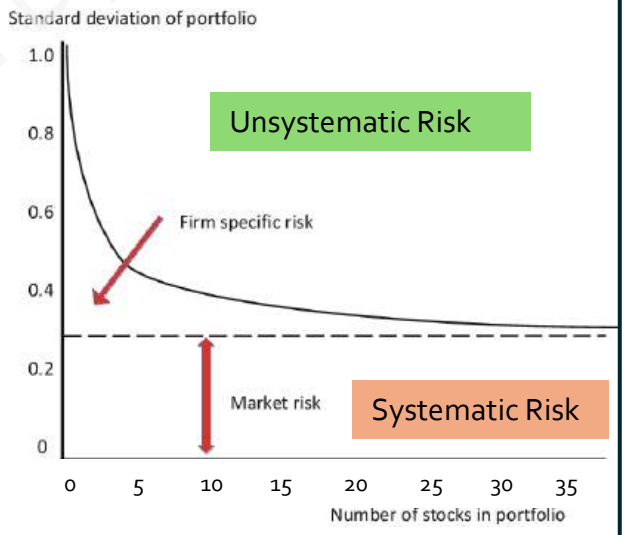
Risk - Return Optimization

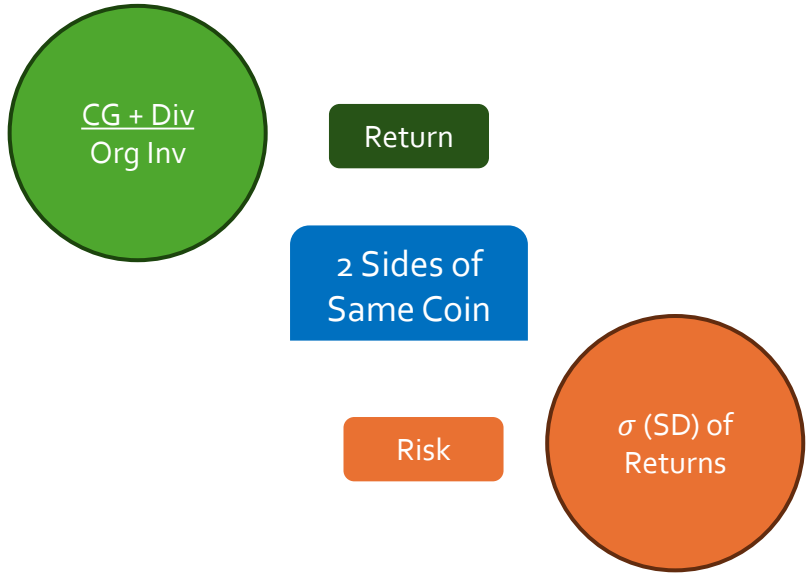
Identify the Best Portfolio

Modern Approach to PM Markowitz Risk Return Optimization



Unsystematic risk CAN BE diversified
Systematic Risk CANNOT BE Diversified





Key Formulae

Expected Return (Single Sec)

$$(\bar{X}) = \sum_{i=1}^{n} X_i p(X_i)$$

X_i is Possible Returns of a security,

P (X_i) is Related probability &

$\bar{X}$ is Expected Return

Expected Return (Portfolio)

$$E(R)_p = \sum R_i w_i$$

$E(R)_p$ is Portfolio Return

R_i is Return on Stock

w_i is Weightage of stock in the portfolio

Variance (Single Sec)

$$(\sigma^2) = \sum_{i=1}^{n} (X_i - \bar{X})^2 . p(X_i)$$

Standard Deviation (Single Sec)

$$SD = \sqrt{variance} = \sqrt{\sigma^2} = \sqrt{\frac{\sum_{i=1}^{n} (X_i - \bar{X})^2}{n}}$$

Portfolio Variance (2 Securities)

$$(\sigma p)^2 = w_i^2 . (\sigma_i)^2 + w_j^2 . (\sigma_j)^2 + 2\sigma_i \sigma_j r_{ij} w_i w_j$$

$$= w_i^2 . (\sigma_i)^2 + w_j^2 . (\sigma_j)^2 + 2Cov(i,j) w_i w_j$$

Correlation Coefficient

$$r_{XY} = \frac{Cov(X,Y)}{\sigma_X . \sigma_Y}$$

σ_X is standard deviation of X

σ_Y is standard deviation of Y

(r_{AB}) / (ρ) range (-1 to + 1)

$$\frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[\,n\sum x^2 - (\sum x)^2\,]\,[\,n\sum y^2 - (\sum y)^2\,]}}$$

$$\frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

Co-efficient of Determination = r^2

Covariance

$$Cov\,(X,Y) = \sum_{I=1}^{n} (X_i - \bar{X})\,(Y_i - \bar{Y})\,/n$$

$$\mathbf{Cov}(x,y) = r_{xy} . \sigma_x \sigma_y$$

Cov for set of prob = $\sum_{i=1}^{n} (x - \bar{x})(y - \bar{y}) P_i$

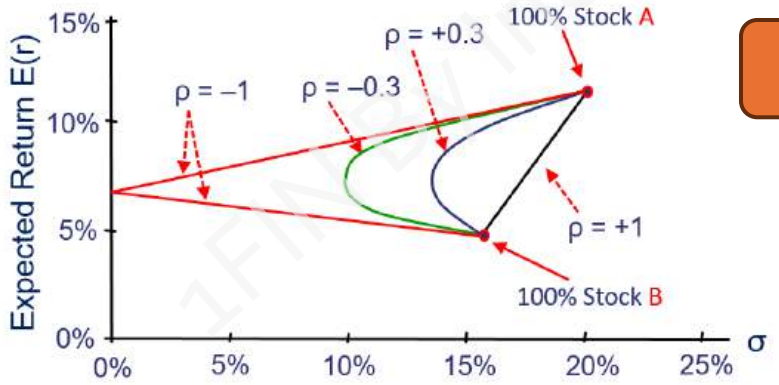
X is security 1 | $\bar{X}$ is Mean of security 1

Y is security 2 | $\bar{Y}$ is Mean of security 2

n is no. of observations

2 Asset Portfolio:

As Correlation reduces, Portfolio risk reduces



when r is 0, $(\sigma_p) = \sqrt{w_1^2 . (\sigma_1)^2 + w_2^2 (\sigma_2)^2}$

when r is + 1, $(\sigma_p) = (w_1\sigma_1 + w_2\sigma_2)$

when r is − 1, $(\sigma_p) = (w_1\sigma_1 - w_2\sigma_2)$

Co-efficient of Variation = S.D/ Mean = $\frac{\sigma}{E(R)}$

Measures Risk per unit of Return – Use this when you are asked to compared more than 1 investment with different SD & Mean Returns

Correlation is negative meaning r is between -1 & 0

Correlation is Positive meaning r is between 0 & +1

Portfolio Variance (3 securities)

Variance Co Variance Matrix - (a+b+c)²

$$\sigma^2 = [2\sigma_y \sigma_z w_y w_z r_{yz}] + [2\sigma_x \sigma_y w_x w_y r_{xy}] + [2\sigma_x \sigma_z w_x w_z r_{xz}] + [(\sigma_x)^2 (w_x)^2 + (\sigma_y)^2 (w_y)^2 + (\sigma_z)^2 (w_z)^2]$$

Portfolio Variance (> 2 securities)

Variance Co Variance Matrix (a+b+c)²

$$\sigma_p{}^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j . r_{ij} . \sigma_i . \sigma_j$$

Or,

$$\sigma_p{}^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j . \sigma_{ij}$$

Markowitz Modern Portfolio Theory

Find Mean Variance Efficient portfolios → Select a Suitable Portfolio

Assumptions

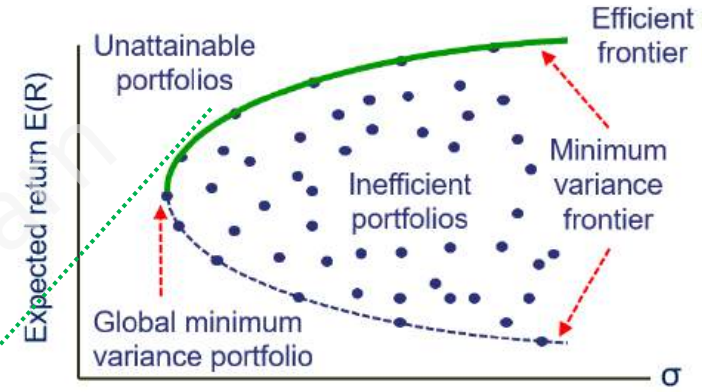
- Return Adequately Summarizes Investment Outcomes
- Investors can visualize a probability distribution of rates of return
- Risk estimates are proportional to variance of return
- Investors are risk averse. Expectations - High Risk High Return
- Investors are rational – Same Risk Prefer Investments with higher returns
- Yield Most Commonly used measure of Return
- SD Refers to SD of yield about its expected value

Weight Of Asset A in a portfolio of 2 assets to achieve Minimum Variance Portfolio

$$W_A = \frac{[\sigma_B^2 - r_{AB}\sigma_A\sigma_B]}{\sigma_A^2 + \sigma_B^2 - 2r_{AB}\sigma_A\sigma_B}$$

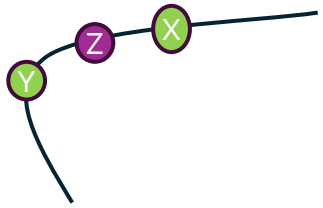
= Variance of B – Covariance / (Sum of Variances – 2 x Covariance)

In a Multi- Asset portfolio (>2) When all possible portfolio combinations are mapped with their risk, returns & correlations, the risk return profile looks as



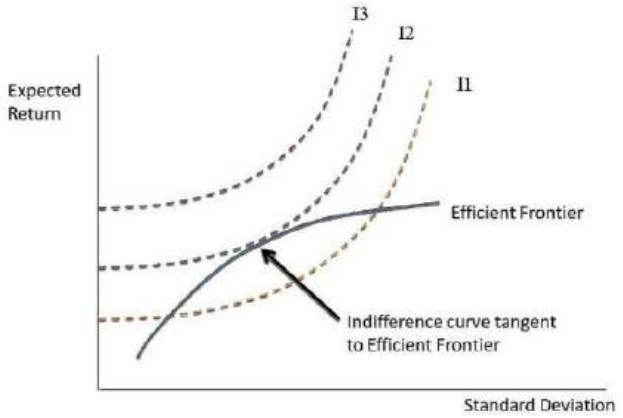
Portfolio at the Point where the Efficient frontier is tangential to an investors Indifference corves is the Optimal portfolio for an investor

Critical Line Theory



Amongst all Portfolios along the efficient frontier, Proportion of Increase in the ratio of a stock & Decrease in another stock will remain the same

Portfolio	X	Y	Z
A:B:C	10:30:60	20:50:30	If A Moves to 30 then B will Move to 70 & C will be 0



Beta Under Correlation Method

$\beta = \frac{r_{im}\sigma_i}{\sigma_m}$ Or $\frac{Cov(i,m)}{(\sigma_m)^2}$ = Or $\frac{CoVariance}{Market\ Variance}$

[i =Sec, m = Mkt]

β is Beta (degree of dependency of returns / ri)

Market Risk = SD of Market = σ_m

Beta using observations

$$\beta = \frac{(n\sum xy - \sum x \sum y)}{n\sum y^2 - (\sum y)^2}$$

$$\beta = \frac{\sum xy - n\bar{x}\bar{y}}{\sum y^2 - ny^2}$$

x – Security | y - Market

Security Beta based on probability

$(\beta) = \sum_{i=1}^{n} \beta_i p(\beta_i)$ = Sum of probability multiplied by Beta Value

Portfolio Beta

$\beta_p = \sum_{i=1}^{n} w_i\beta_i$ *i.e.* Weighted Average

Beta of NIFTY / Mkt Index = 1

Beta of GOI Bonds = Usually 0

Beta of Debt = Usually 0

↑ Inc Beta of Portfolio => Sell Rf to get cash or Bring in new cash & invest in Mkt

↓ Dec Beta of Portfolio => Sell Stock in Mkt or Bring in Addtl cash & Invest in R_f

In Exceptional Cases where No other information is available in the question

Beta = Change in security Return / Change in Mkt Return

Portfolio Beta Computation

Rf Assets have an impact in denominator but Zero impact on Numerator, as their Beta is Zero;

Eg: Beta of Eq Stock of ₹ 1 Lac = 1.2, Rf Assets = ₹ 1.4 Lac

Portfolio Beta = $\frac{1.2 \times 1,00,000 + 0 \times 1,40,000}{2,40,000}$ = 0.5

On the contrary, ***Futures contracts*** have impact on Numerator but Zero impact on Denominator

Eg: Beta of Eq Stock of ₹ 1 Lac = 1.2 & Nifty Future = 3 Lac

Portfolio Beta = $\frac{1.2 \times 1,00,000 + 1 \times 3,00,000}{1,00,000}$ = 4.2

Equity Risk Premium

$E(R) - R_f = \beta (R_m - R_f)$

Market Risk Premium

$(R_m - R_f)$

$E(R)$ of stock = $\frac{\text{dividend}}{\text{opening value}} + \frac{\text{capital gain}}{\text{opening value}}$

R_f = Risk free Rate = GOI Bonds Yield (If Not available then T Bills Yield)

R_m = Market Return = NIFTY Return

Return Due to Manager Skill = Actual Return – CAPM Return

Return due to higher risk = CAPM Return – Mkt (NIFTY) Return

Asset Beta

$$\beta_a = \beta_e \left[\frac{E}{E + D(1-t)}\right] + \beta_d \left[\frac{D(1-t)}{E + D(1-t)}\right]$$

Where,

β_a – Ungeared or Asset Beta

β_e – Geared or Equity Beta

β_d – Debt Beta (usually 'o')

E – Equity

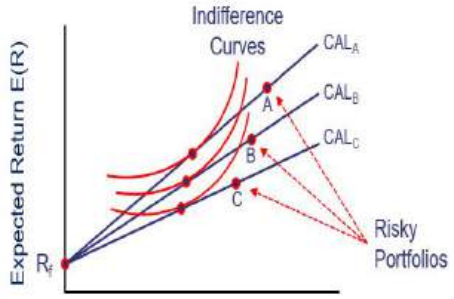
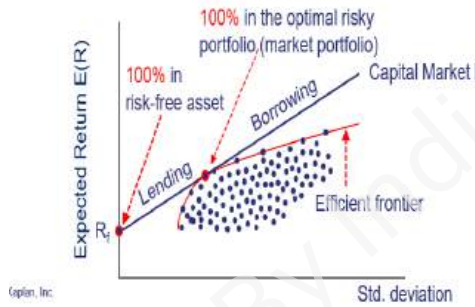
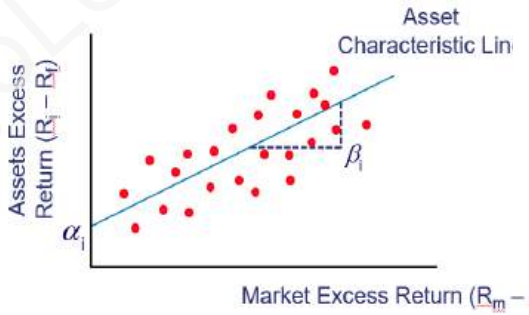
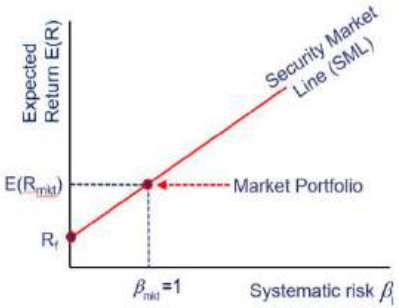
D is Debt

t is Tax rate (If not available ignore tax impact)

Beta (Slope of line) : $y = \alpha + \beta x + \epsilon_i$

α – alpha - intercept value

β –Beta, Slope of the line & ϵ = Error Term

	Capital Allocation Line	Capital Market Line	Security Characteristic Line	Security Market Line
X Axis	SD (Overall Risk)	SD (Overall Risk)	Rm-RF (Excess Mkt Return)	Beta (Systematic Risk)
Y Axis	Return	Return	Rs-Rf	Return
Portfolio	Any portfolio	Only Eff. Portfolio	Any portfolio	Any portfolio
Lending & Borrowing	Yes	Yes	No	No
Tangency	Indifference curves	Efficient Frontier	NA	NA
Special Points		CML is special case of CAL - all investors have same expectations, and such an optimal portfolio is Mkt portfolio	Excess returns of Asset Regressed with Excess returns of Market i.e Slope is Beta	**SML is Standard CAPM formula**
Graphs					

Slope = $(Rm\text{-}Rf)/(\sigma_m)$

$E(R) = Rf + (Rm\text{-}Rf) \times (\sigma_p)/(\sigma_m)$

$E(R) = R_f + \sigma_{im}\left[\frac{R_m - R_f}{(\sigma_m)^2}\right]$

$E(R) = R_f + \beta(R_m - R_f)$

When Q talks of **Systematic & Unsystematic risk or Characteristic line,** use Single / Sharpe Model

SINGLE / SHARPE INDEX MODEL

Return of a Security - $R_i = \alpha_i + \beta_i R_m + \epsilon_i$

Expected risk of the stock $(\sigma_i)^2 = (\beta_i)^2 . (\sigma_m)^2 + (\sigma_{\epsilon_i})^2$

- Systematic Risk
- Unsystematic Risk

$\text{Co} - \text{Variance between Securities } (\sigma_{ij}) = (\beta_i) . (\beta_j) (\sigma_m)^2$

R_i is Expected return on a security i

α_i is intercept of the straight line or alpha co-efficient

β_i is slope of straight line or beta co-efficient

R_m is rate of return on market index

ϵ_i is error term

$(\sigma_i)^2$ is variance of the security

β_i is slope of straight line or beta co-efficient

$(\sigma_m)^2$ is market variance

$(\sigma_{\epsilon_i})^2$ is Variance of errors

Return of a Portfolio $E = \sum_{i-1}^{n} x_i(\alpha_i + \beta_i R_m)$

Risk of a Portfolio $(\sigma_p)^2 = \left[\sum_{i-1}^{n} x_i \beta_i\right]^2 . (\sigma_m)^2 + \left[\sum_{i-1}^{n} (x_i)^2 (\sigma_{\epsilon_i})^2\right]$

Portfolio Alpha $\alpha_p = \sum_{i=1}^{n} x_i \alpha_i$ Portfolio beta $\beta_p = \sum_{i=1}^{n} w_i \beta_i$

x_i is weightage of 'x' security in portfolio

α_i is intercept of the straight line or alpha co-efficient

CAPM Assumptions

- Efficient Market & Capital Markets are in Equilibrium
- Rational Investment Goals
- All Assets are Divisible & Liquid
- Investors are Generally Risk Averse – Some time Risk Seeking
- Investors are rational – Same Risk Prefer Investments with higher returns
- Borrowing & Investing at Rf freely
- No Commission, Brokerage or Taxes & No Bankruptcy or Insolvency

CAPM $E(R) = R_f + \beta(R_m - R_f)$

Under/ Overvaluation Decisions

Required return as per CAPM < Expected Return	Actual Market Price < Estimated Market Price	Stock Undervalued	Buy
Required return as per CAPM > Expected Return	Actual Market Price > Estimated Market Price	Stock Overvalued	Sell
Required return as per CAPM = Expected Return	Actual Market Price = Estimated Market Price	Correctly valued	Hold

Advantages

- Risk Adjusted Return
- No Dividend Company

Limitations

- Reliability of Beta
- Other Risks
- Information Available

Arbitrage Pricing Theory

$$E_R = R_f + \lambda_1\beta_1 + \lambda_2\beta_2 \dots \lambda_n\beta_n$$

$$E_R = R_f + (AV_1 - EV_1)\beta_1 + (AV_2 - EV_2)\,\beta_2 \dots \dots (AV_n - EV_n)\beta_n$$

Were, λ *is* Risk premium for the factors like GDP, inflation, interest rate, etc & β is the sensitivity of that factor

$(AV_n - EV_n)$ – Surprise Factor due to change in Value of Factor

Sharpe 's Optimal Portfolio > Please Ignore the Concept – Too lengthy, Complicated & not worth spending time

Portfolio Evaluation

Sharpe Ratio: $S = \frac{R_p - R_f}{\sigma_i}$: **S: Standard Deviation**

Sortino Ratio: $S = \frac{R_p - R_f}{\sigma_d}$: **D: Downside Deviation (i.e SD is computed only for lower than mean values)**

Treynor Ratio: $T = \frac{R_p - R_f}{\beta_i}$:**T: Beta**

Jensen Alpha : $\text{Alpha}(\alpha) = A(R) - E(R) = R_p - (R_f + \beta(R_m - R_f))$

Where, Jensen's Alpha is α

A(R) is Actual return & E(R) is Expected Return as per CAPM

Higher the Ratio better the Portfolio / Stock / Asset

Portfolio Strategies

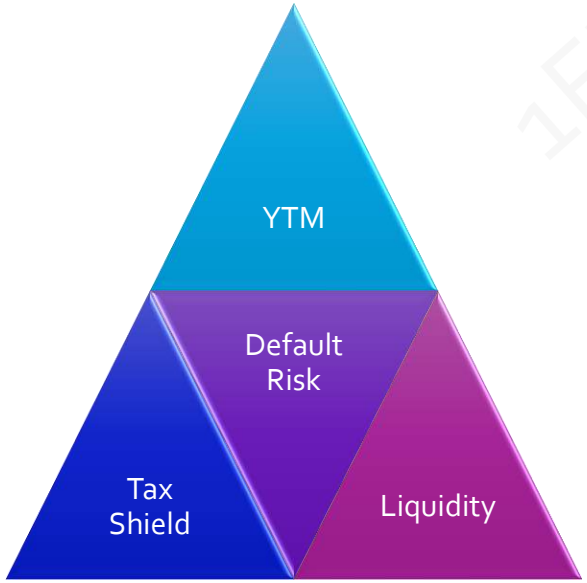
Active Portfolio Strategy

- Market Timing: Very Difficult – Use models to predict
- Sector Rotation: Buy In In Favor sectors
- Security Selection: Fundamental Analysis
- Use of Specialised Investment Concepts. Eg Growth, Contra, Cyclical

Passive Portfolio Strategy

- Create a well diversified portfolio at a predetermined level of risk
- Hold the portfolio relatively unchanged over time unless it became adequately diversified or inconsistent with the investor risk return preference

Bonds Factors to Consider



Equities – Types of Analysis

Mkt Efficiency / Analysis	Technical Analysis	Fundaments Analysis	Random Selection
Inefficient	Best	Poor	Poor
Weak	Poor	Best	Poor
Semi-strong	Poor	Good	Fair
Strong	Poor	Fair	Best

Portfolio Revision & Rebalancing

	Buy & Hold Policy	Constant Mix Policy	Constant Proportion Portfolio Insurance Policy (CPPI)
Action	Buy & Don't Sell	Buy on lows and Sell on Highs	Buy on Highs – Sell on Lows
Formula	NA	A	S = M x (PV-F) S- Equity Inv | M Multiplier PV – Port Val | F – Floor Val
Portfolio Value	Moves along an upwards Sloping Line	Concave	Convex
Graph			
Payoff in Various Mkts			
Flat	Between CM & CPPI	Excellent	Very bad
Up	Ok	Poor	Excellent
Down	Poor	Not so bad	Good

Asset Allocation Strategies

- Integrated – Mix of Strategic & Tactical Strategies
- Strategic – Based on Investor Risk & Return & Adj periodically
- Tactical – Risk Tolerance Assumed Constant & allocation Based on Mkt Conditions
- Insured – Risk Exposure increased as Portfolio Value increases as there is greater Risk-taking ability

Fixed Income Portfolio Returns

- Arithmetic Avg. Rate of Return
- Time Weighted Rate of return
- Rupee Weighted Rate of Return
- Annualised returns

Fixed Income Portfolio Process → Setting up objective → Drafting guideline for investment policy → Selection of Portfolio Strategy - Active and Passive → Selection of securities and other assets → Evaluation of performance with benchmark

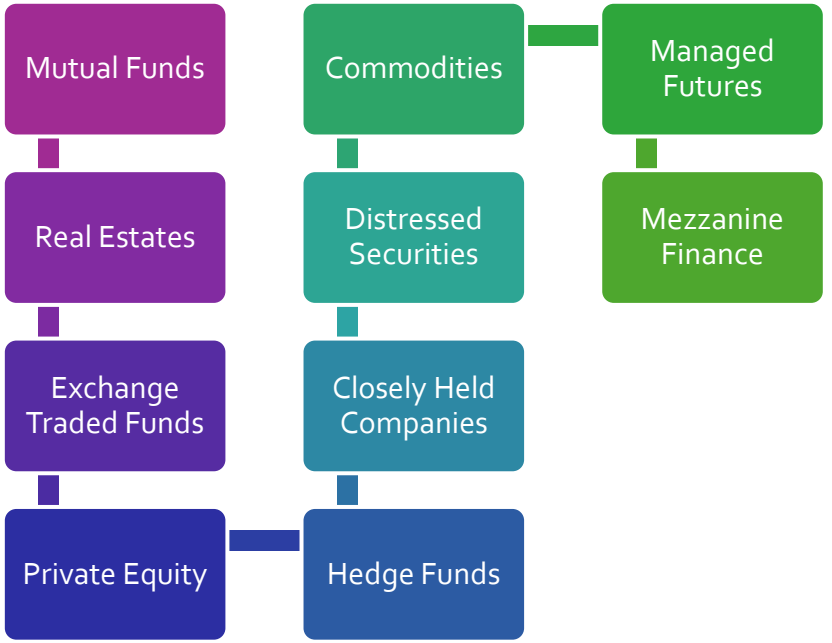
Fixed Income Active Mgmt Strategies

- Forecasting ST Interest Rates
  - Yield Movement Strategies
    - Barbell: Invst Equal Amt in LT & ST Bonds
    - Bullet: Invest in Bond with Liab Maturity
    - Ladder: Equal Invst in Multiple bonds
  - Int Rate estimation Models based on
    - Inflation
    - Past Trends
    - Multi Factor Analysis
    - Horizon Analysis
- Bond Swaps / Interest Rate Swaps
  - Pure Yield Swap – Sell Low Yld & Buy High Yld Bond
  - Substitution Swap: Swap Bonds with similar Features & Diff prices
  - International Spread Swap: Take Advantage of Differing spreads between sectors
  - Tax Swap: Harvest Tax losses & Buy similar Bonds

Alternative Investments Features

Fixed Income Passive Mgmt Strategies

Alternative Investments Types

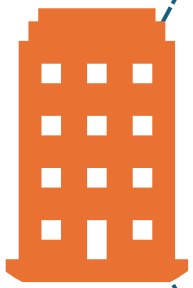


Issues in Real Estate Valuation

Inefficient market | Illiquidity | Comparison

High Transaction cost | No Organized market

Methods of Real Estate Valuation



- **Sales Comparison** - Like PE Multiple on Rental Income
- Income – Like Capitalisation value of Perp Debenture
- Cost – Land + Building Replacement Cost
- Post Tax DCF = NPV of Inflows - Investment

Risks with Distressed Securities

Securities of Companies near on in Bankruptcy

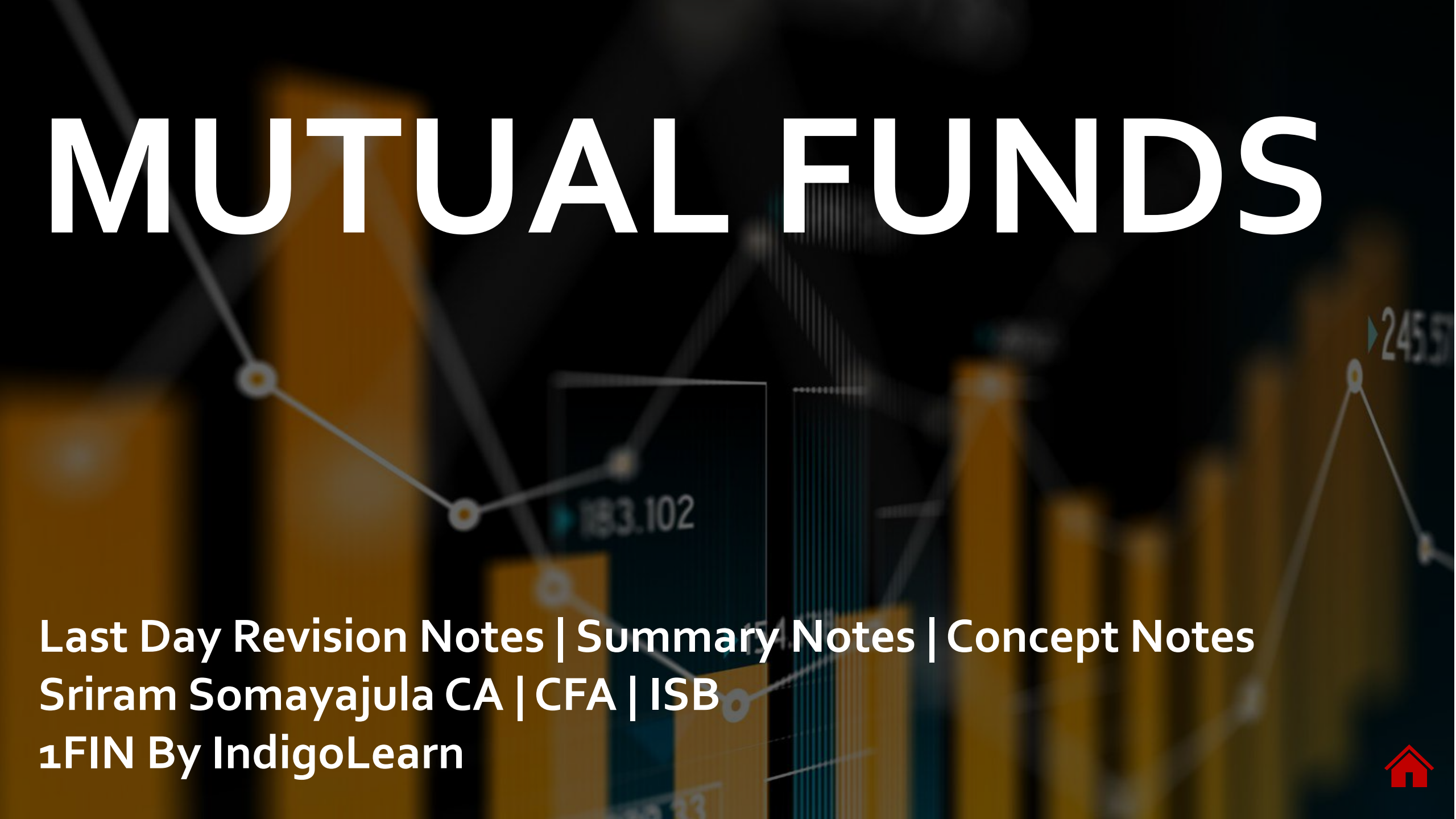
- **Liquidity** – May not be able to Dispose
- **Event** – Events may affect Co. only & not the entire Mkt
- **Market** – They also face Mkt risk in addition to Event Risk
- **Human** – Decision of Judge plays a big role

Distressed Security Arbitrage
Long Debt & Short Equity
If Co. Survives, Inflow on Debt >Outflow on Eq Short
If Co. Collapses Inflow on Eq short >Debt Loss

Modes of Investment in Gold

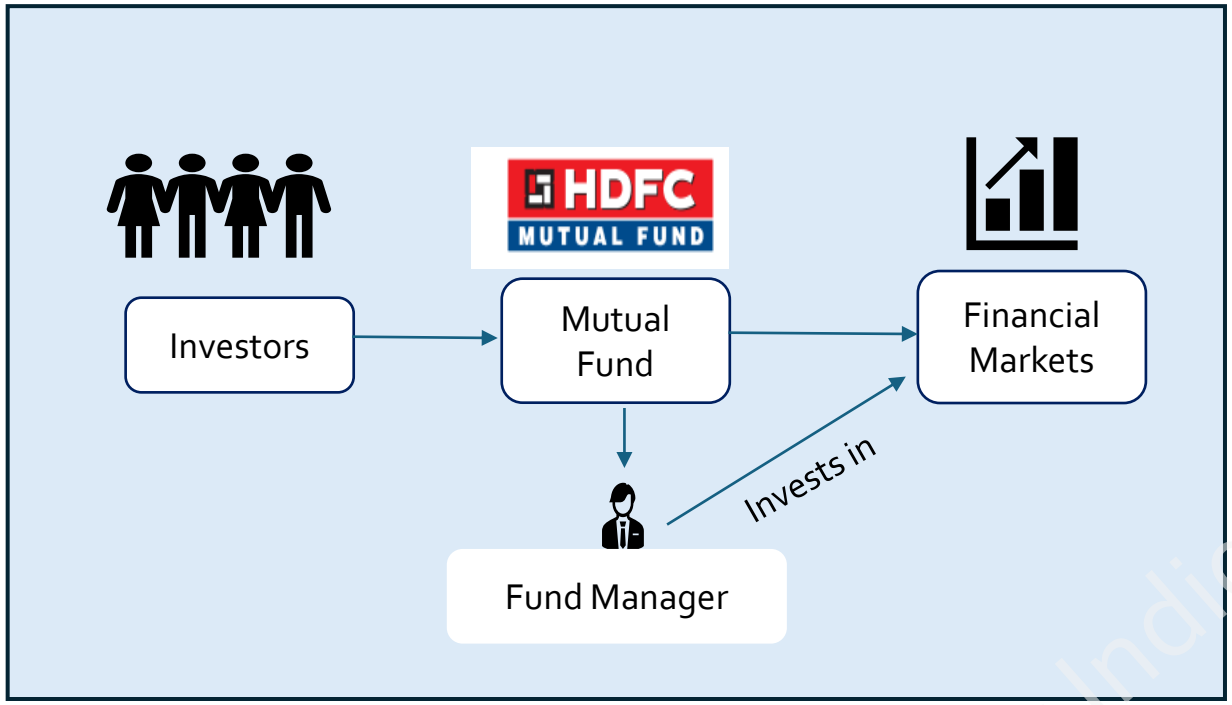
- **E Gold** – Electronic Gold Representing Physical Bullion – Offered by NSEL
- SGBs – Sovereign Gold Bonds – Offered by RBI in Demat, Int benefit, No CG
- Gold ETFs – Like MFs – Continuous trading in Mkt – Backed by Bullion
- Gold Bars – Physical gold, safety , storage issues arise

MUTUAL FUNDS



Last Day Revision Notes | Summary Notes | Concept Notes

Sriram Somayajula CA | CFA | ISB
1FIN By IndigoLearn



- The fund is managed by a professional investment manager – Fund Manager
- Fund Manager invests the money collected from different investors in various stocks, bonds or other securities according to specific investment objectives.
- The net income earned and capital appreciation on the investment, after charging initial and ongoing expenses is shared amongst the unit holders in proportion to the units owned by them

A Mutual Fund is a

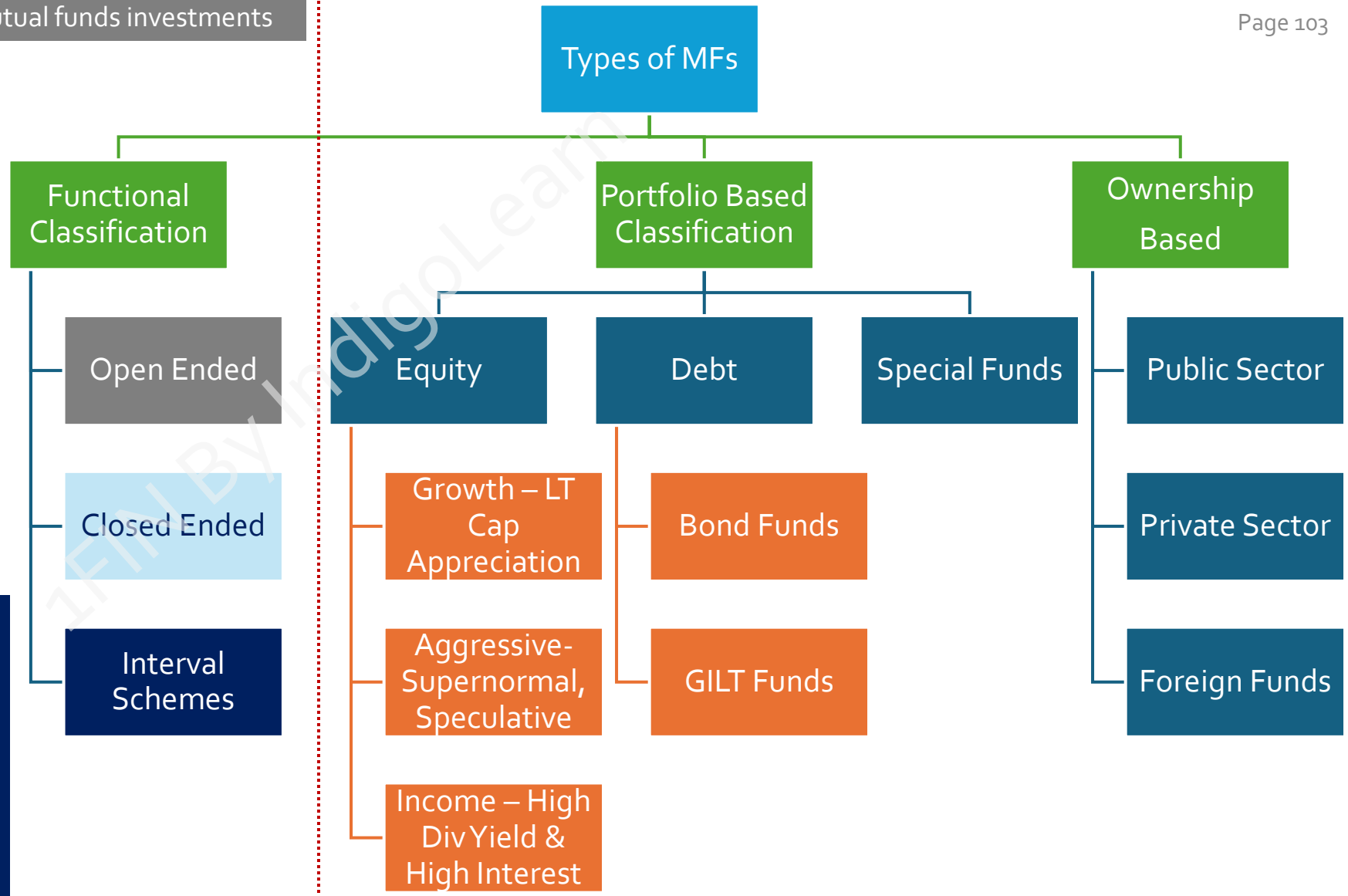
Trust → that pools money from investors → to collectively buy / own asset → for mutual benefit of investors → in proportion of their investment

- Investor can make or / and redeem investments anytime directly transacting with the fund house.
- Not listed on the stock exchange
- Investors Purchase money flows into mutual funds investments

- Investors cannot make or redeem their investments anytime.
- Fund Manager can keep the investments till the end of tenure.
- Mutual Fund scheme listed on the stock exchange.
- Price at which the scheme is listed on stock exchange may not be the underlying value of investment (NAV).
- If investors purchase units from exchanges, money flows to the selling investor and not the mutual fund.
- Fresh investments cannot be made into the fund

Mix between an Open-Ended and a Close-Ended structure.

- They are close ended schemes, having liquidity just like open ended scheme where investments and withdrawals are permitted at periodic intervals
- Not listed on Stock Exchange
- Do not have maturity period



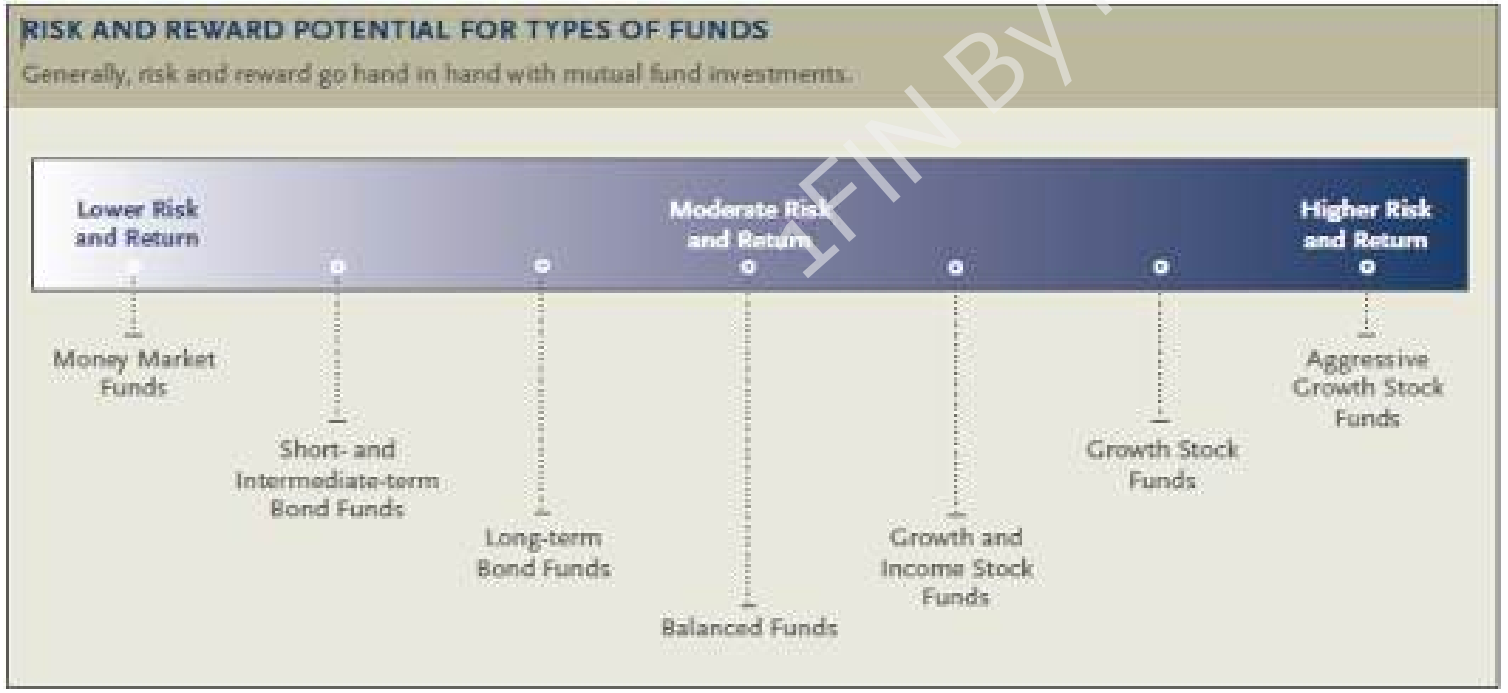
Debt Funds

Gilt Funds

- Invest only in government securities
- Highly secured
- Exposed only to interest rate risk

Bond Funds

- Invest in fixed income securities market like bonds (government and corporate) and other debt securities
- Less volatile and less risky than stock funds
- Provide regular income to the investors
- Investors use these to diversify portfolio



Risk associated with debt funds

- Interest Rate Risk: Higher the interest Rate, Lower the Price
- Credit Risk: Risk of Default – Lower the credit rating, higher the risk
- Pre Payment Risk: Callable bonds repaid by Company by refinancing at lower cost
- Reinvestment Risk: When Interest Rates fall,

Direct Vs. Regular Plans

- Direct Plans introduced from 1 Jan 2013
- No Distribution Expenses, Trail fees or Transaction Charges
- Direct Plan NAV higher than Regular Plan NAV
- Perform better than Regular plan due to lower fees

Special Funds

Offshore Funds: A mutual fund located in India to raise money globally for investing in India.

International Funds: A mutual fund located in India to raise money in India for investing globally.

Index Funds: Index Funds mirror the stocks comprising the index based on weight assigned in the index. For example, Nifty, Sensex, Nifty IT Index etc. These funds provide returns which are closer to market returns.

Liquid funds invest predominantly in safer ST instruments like CPs, CDs, TBills, G-Secs etc; objective - of preservation of capital, high liquidity, and moderate income. Used mainly by institutions and individuals to park their surplus funds for short periods of time.

Sector Funds invest their entire fund in a particular industry e.g. Banking fund invest in Banks, Real Estate funds in Real estate, Utility fund for utility industry like power, gas, public works etc.

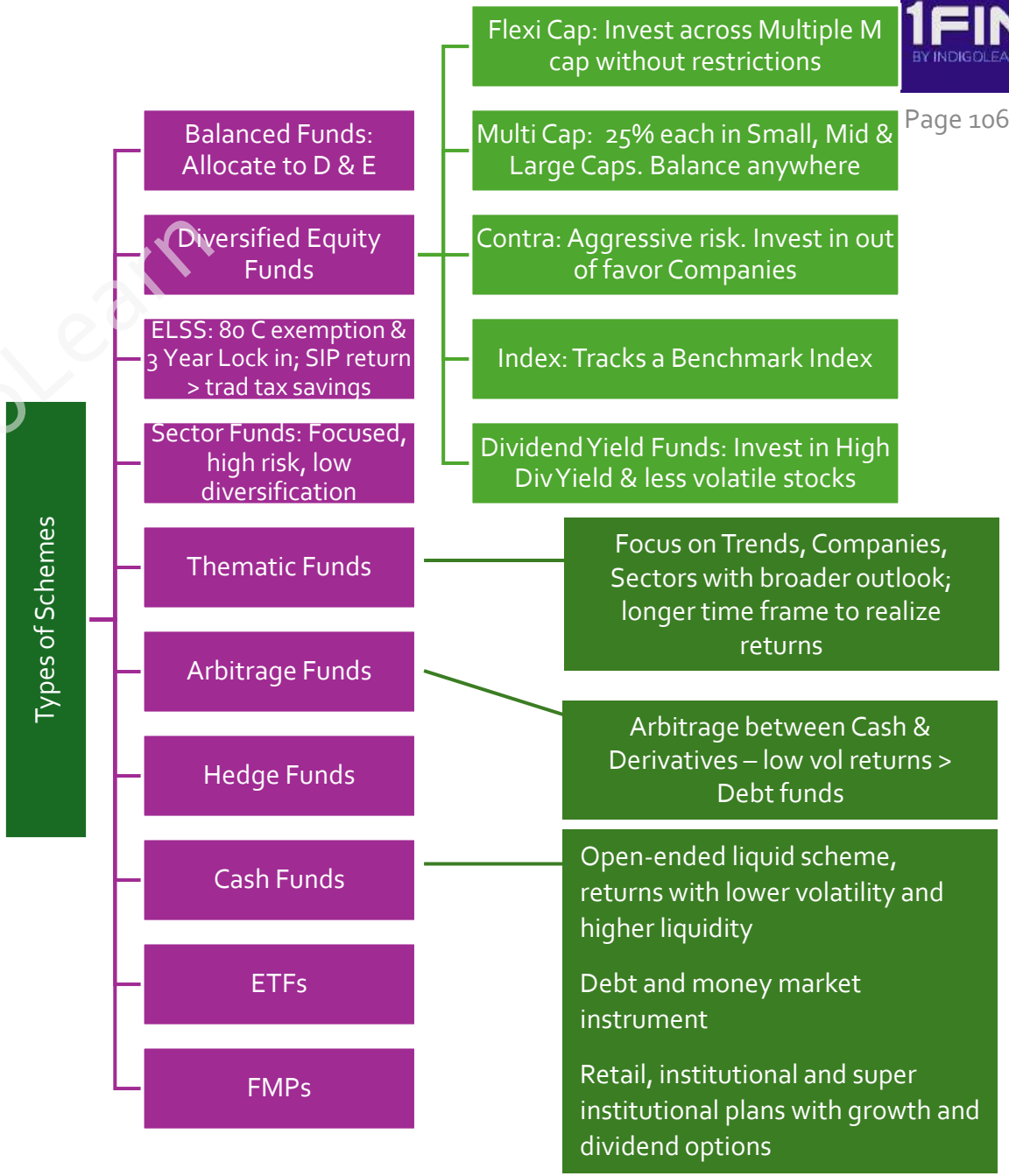
FoFs: invest in other mutual fund schemes. The concept is popular in markets where there are number of mutual fund offerings and choosing a suitable scheme according to one's objective is tough.

Gold funds invest in gold, either physical or digital. The units represent the value of gold or gold related instruments held in the scheme. Gold Funds are generally in the form of ETFs and are listed on the stock exchange. Investors can participate in the gold market (bullion market) without the need of physically buying gold.

Capital Protection Oriented Funds, aim to protect the capital invested. Close ended in nature, listed on the stock exchange and are rated. Major portion of fund is invested in highly rated debt instruments. The remaining portion is invested in equity or equity related instruments to provide capital appreciation.

Quant Funds

- Work on a data-driven approach for stock selection and investment decisions based on pre-determined rules or parameters using statistics or mathematics-based models.
- Rely on automated programs that help in taking decision for quantum of investment as well as its timings and action
- Very Different from active fund manager who selects the quantity, price of share and timing of investments (entry or exit) based on his/ her analysis and judgement.
- Fund Manager usually focuses on the robustness of the Models in use and monitors its performance on continuous basis
- Compared to Index Fund Manager entirely hands off the investment decision purely based on the concerned Index,
- Quant Fund Manager designs and monitors models and makes decisions based on the outcomes.
- It eliminates the human biasness and subjectivity and by using model-based approach also ensures consistency in strategy across the market conditions.
- Normally follows passive strategy their expense ratio generally tends to be lower than the actively managed Mutual Fund Schemes.
- Are tested based on historical data and past trends though cannot altogether be ignored but also cannot be used blindly as good indicators.



Hedge Funds

- Goal of most hedge funds is to maximize return on investment and not hedge.
- Hedge funds collect money from a number of people like MFs
- Are not subject to regulations like mutual funds.
- They are a private investment vehicle offered to selected clients
- Hedge funds cannot be started in India but foreign hedge funds can invest in India.
- Hedge funds invest aggressively across financial instruments – debt, derivatives, equity, commodities etc. in both domestic and international markets with the goal of generating high returns
- Hedge Funds do not reveal anything about operations publicly and charges a performance fee
- On outperformance vs a benchmark, takes a share in the profits

ETFs

- ETFs can be bought and sold like any other stock on an exchange. The quoted prices are expected to be closer to the NAV at the end of the day.

Types of ETFs

- Index ETFs - Most ETFs are index funds that hold securities and attempt to replicate the performance of a stock market index.
- Commodity ETFs - Commodity ETFs invest in commodities, such as precious metals and futures.
- Bond ETFs - Exchange-traded funds that invest in bonds are known as bond ETFs.
- Currency ETFs – Investments in currency

  Investors get total return = Fx spot change + Local Institutional Int rates + Collateral Yield

FMPs

Fixed Maturity Plans (FMPs) are close ended mutual funds in which an investor can invest during a New Fund Offer (NFO).

- FMPs have a fixed tenure or a maturity date.
- FMPs usually invest in CD's CPs, FDs, NCDs and Money Market Instruments over fixed investment period
- FMPs are traded on stock exchanges but not liquid
- The main advantage of Fixed Maturity Plans is that they are free from any interest rate risk because FMPs invest in debt instruments that have the same maturity as that of the fund.
- However, they carry credit risk, as there is a possibility of default by the debt issuing company. So, if the credit rating of an instrument is downgraded, the returns of FMP can come down.

Options for Income in MF Schemes

Growth / Cumulative option

1. No intermittent income.
2. Income only at the time of redemption
3. Return is accumulated & paid back on withdrawal
4. Return is in form of capital gain.

Dividend Option

- Dividend paid frequently
- Monthly/ Quarterly / Annually
- Further divided as
  - Dividend Payout: NAV falls to extent of Dividend paid in cash
  - Dividend Reinvestment: Dividend Reinvested at Ex Div NAV

  NAV falls but additional units received

Option	Dividend Reinvestment	Growth
Initial investment	Rs. 50,000	Rs. 50,000
NAV	Rs. 10	Rs. 10
Units received	5,000	5,000
NAV at the end of one year	Rs. 15	Rs. 15
Declaration of a dividend of Rs. 2 per unit		
Dividend received	Rs. 10,000	NIL
Dividend reinvestment	Rs. 10,000	NIL
NAV post dividend distribution	Rs. 13 (15-2)	Rs. 15
Units for dividend reinvestment	769.23 (Rs. 10,000/13)	NIL
Total units	5,769.23	5,000
Total value of investments	**Rs. 74,999.99**	**Rs. 75,000**

Advantages of MFs

- Professionally Skilled & Experienced Mgmt
- Diversification reduces Concentration risk
- Convenient Administration of Share Transfers etc
- Higher returns over medium to longer terms
- Low cost of Management: Max of 2.5% TER
- Liquidity: redemption / sale on exchange
- Transparency: Daily NAV disclosure
- Switching, SIP, SWP
- Regulation: SEBI has strict rules for MFs
- Economies of Scale: cheaper to invest thru MFs
- Flexibility: SIP / SWP & a wide range of plans
- Convenience: Invest & Redeem Online

Dis-advantages of MFs

No Guaranteed Returns:	•Despite best intent some underperform BM •Entry & Exit points determine investor return vis a vis Fund return •Short term events like 2008 & 2020 can have sever adverse impact but on LT returns are +ve and stable
Diversification	• Reduces risk but also reduces return
Fund Selection	•Difficult to select a Fund •Only criteria, past performance •But Past is not a great predictor of Future
Costs & Charges	• AMC fees are not linked to performance • Exit load may reduce return

- Net Asset Value (NAV) represents the market value of total assets of the Fund reduced by total liabilities attributable to those assets
- It is computed on per unit basis i.e. dividing the Net Asset Value by number of Outstanding Units.
- It is the amount which a unit holder would receive on redemption
- It changes daily based on market value of assets

Market value of investments
+ Receivables
+ Other accrued income
+ other assets
- Accrued Expenses
- Other Payables / Liabilities
= Net Assets of the scheme

NAV per Unit

$$= \frac{Net\ Assets\ of\ the\ scheme}{No.\ of\ units\ outstanding}$$

Entry / Exit Loads

- Charged by AMCs to compensate for distribution costs – almost done away as of now
- Entry Load: It charged at the time an investor purchases the units of a scheme and entry load percentage is added to the prevailing NAV at the time of allotment of units. No MFs have Entry loads as of now
- Exit Load: Exit load is charged at the time of redemption / transfer / switch & is deducted from the NAV if units not held for a period of time

Expense Ratio

- Also referred to as the Management Expense Ratio (MER) / TER.
- It is the percentage of the assets that are spent to run a mutual fund scheme. It includes expenses like management and advisory fees, travel costs and consultancy fees. T
- he expense ratio does not include brokerage costs for trading the portfolio.
- It can sometimes be as high as 2-3% undermining MF performance

Dividend Equivalisation

- New investors who buy Open Ended mutual fund units between any two distribution periods are not entitled to any share of the income of the scheme which accrued before they bought their units.
- To compensate old investors, an equalisation payment is added to the cost of new units at the time of purchase. It is the amount of income that has arisen up to the date of purchase of the unit.
- Similarly, at the time of exit, the amount of income that has arisen up to the date of repurchase of units, is added to the repurchase price to compensate the outgoing investor.

Trail Commission

- Amount an MF investor pays to his advisor each year. It is an incentive to the advisor to review their customer's holdings and to give advice from time to time.
- Distributors usually charge a trail commission of 0.30-0.75% on the value of the investment for each year that the investor's money remains invested with the fund company.
- This is separate from any upfront commission that is usually paid by the fund company to the distributor out of its own pocket.

Side Pocketing

- It leads to separation of risky assets from other good investments and cash holdings.
- This is done to make sure that money invested in a mutual fund, which is linked to stressed assets, gets locked, until the fund recovers the money from the company or could avoid distress selling of illiquid securities.
- Whenever, the rating of a mutual fund falls, the fund can shift illiquid assets into a side pocket with an independent NAV, so that there is no undue pressure on redemption of its better rated liquid assets of the scheme. NAV of the scheme will then reflect the actual value of the liquid assets.
- Side Pocketing is beneficial for those investors who wish to hold on to the units of the main funds for long term.
- Could have been used in IL&FS fiasco; but not used, leading to –Ve returns

Tracking Error

- Defined as deviation of a fund's return from the benchmarks return. Although fund managers design their investment strategy to generate returns of an index but often it may not exactly replicate the index return.
- The tracking error can be calculated based on corresponding benchmark return vis a vis quarterly or monthly average NAVs.
- Higher the tracking error higher is the risk profile of the fund.
- Whether the funds outperform or underperform their benchmark indices, it clearly indicates that of fund managers are not able to generate returns provided by index
- Other reasons for tracking errors are – Transaction cost, Fees charged by AMCs, Fund expense, Cash holdings etc. If a fund can replicate index returns, the tracking error would be 0.

The Tracking Error (TE) is calculated as

$$TE = \sqrt{\frac{\sum(d - \bar{d})^2}{n-1}}$$

d = Differential return

d' or $\bar{d}$ = Average differential return

n = No. of observations

$$\text{MF Holding Period Return} = \frac{(\text{Closing NAV} - \text{Opening NAV} + \text{CG} + \text{ID})}{\text{Opening NAV}}$$

$$\text{Fund return} = \frac{\text{Investor Return}}{1 - \text{Initial Expenses \%}} + \text{Recurring Expenses}$$

Mutual Fund Performance Evaluation

Selection of a Mutual Fund investment is as important as its performance evaluation. Fund continues to generate maximum profits with minimum risk.

- If performance is not up to the mark, then a replacement decision has to be taken.
- Past performance cannot guarantee the future performance.
- Since market is subject to fluctuations, evaluation of performance on daily basis is not advisable.
- A time of 3 to 5 year should be given to equity fund to assess its return.
- Performance should be evaluated at least every six/twelve month.

Illustration 1: Mr. X earns 10% on his investments in equity shares. He is considering a recently floated scheme of a Mutual Fund where the initial expenses are 6% and annual recurring expenses are expected to be 2%. How much should the Mutual Fund scheme earn to provide a return of 10% to Mr. X?

Solution:

Investor Return =[Fund Return - Recurring Expenses] x [1-initial expenses]

10% =[Fund Return -2%] x [1-6%]

10% / 0.94 = FR -2%

FR = (10% /0.94) + 2%

= 10.64% + 2% = 12.64%

$$\text{Entry or Front} - \text{End Load \%} = \frac{(\text{Purchase NAV} - \text{Allotment NAV})}{\text{Allottment NAV}}$$

$$\text{Exit or Back End Load \%} = \frac{(\text{Actual NAV} - \text{Redemption NAV})}{\text{Actual NAV}}$$

Annualized return / Yield = Holding period return x $\frac{\text{365 days or 12 months}}{\text{Holding period (Days or Months)}}$

Unless specifically mentioned IRR is not used for MF yield computation in ICAI Exams

Illustration 2: *[ICAI SM, MTP Oct'20, May'18 QP (Old), Old PM]*

Mr. Y has invested in the three mutual funds (MF) as per the following details:

Particulars	MF X	MF Y	MF Z
Amount of investment (₹)	2,00,000	4,00,000	2,00,000
Net Assets Value (NAV) at the time of purchase (₹)	10.30	10.10	10
Dividend received up to 31-3-2018 (₹)	6,000	0	5,000
NAV as on 31-3-2018 (₹)	10.25	10	10.20
Effective Yield per annum as on 31.03.2018 (%)	9.66	-11.66	24.15

Assume 1 Year = 365 days. Mr. Y has misplaced the documents of his investment. Help him in finding the date of his original investment after ascertaining the following:

- Number of units in each scheme
- Total NAV
- Total Yield; and
- Number of days investment held

Solution:2

Particulars	Scheme X	Scheme Y	Scheme Z
Amount of Investment (A)	2,00,000.00	4,00,000.00	2,00,000.00
Purchase NAV (B)	10.30	10.10	10.00
Dividend Received up to 31/3/2018 - P	6,000.00	-	5,000.00
Closing NAV as on 31/3/2018 (C)	10.25	10.00	10.20
Effective Yield PA - Y	**9.66%**	**-11.66%**	**24.15%**
Units in each scheme – invested D = (A/B)	19,417.48	39,603.96	20,000.00
Total Assets or Closing investment value - 31/3/18 (E = D x C)	1,99,029.13	3,96,039.60	2,04,000.00
Total closing Investment (X + Y + Z : values of E)	**7,99,068.73**		
Dividend – P	6,000.00	-	5,000.00
Total return in Rs. Terms (closing +div-opening) (F = E +P – A)	5,029.13	(3,960.40)	9,000.00
Total return from all 3 investments (X + Y + Z : values of F)	**10,068.73**		
Annual Return in ₹ on original investment assuming investment was for full year (R = Y x A)	19,320.00	(46,640.00)	48,300.00
Actual Return F	5,029.13	(3,960.40)	9,000.00
% of time (of a year) investments held (Actual return / Annual return) T = F/R	0.26	0.08	0.19
No of days in a year – Q	365	365.00	365.00
Period for which investment held S = T x Q	95.01	30.99	68.01
Reporting date - Z	31-Mar-18	31-Mar-18	31-Mar-18
Investment date I = Z - S	26-Dec-18	28-Feb-18	22-Jan-18

31 Mar 2018 less 95 days is computed as
31 days in Mar, 28 Days in Feb, 31 Days in Jan & 5 Days in Dec
Investment date would be 26th Dec as allotment NAV is as on date of investment

Illustration 3: *[May'19 QP (Old)]*

A mutual fund has two schemes i.e., Dividend plan (Plan-A) and Bonus plan (Plan-B). The face value of the unit is ₹10. On 01/04/2016 Mr. Anand invested ₹5,00,000 each in Plan-A and Plan-B when the NAV was ₹46 and ₹43.50 respectively, Both the Plans matured on 31/03/2019.

Particulars of dividend and bonus declared over the period are as follows:

Date	Dividend %	Bonus Ratio	Net Assets Value (₹)	
			Plan-A	Plan-B
30-06-2016	15%		46.80	44
31-08-2016		1:6	47.20	45.40
31-03-2017	10%		48	46.60
17-09-2017		1:8	48.40	47
21-11-2017	14%		49.60	47.20
25-02-2018	15%		50	47.80
31-03-2018		1:10	50.50	48.80
30-06-2018	12%		51.80	49
31-03-2019			52.40	50

You are required to calculate the Effective Yield Per annum in respect of the above two plans.

Solution:

Particulars	Units	Dividend	Reinv Units
Investment in Plan A - Dividend 1/4/16	10,869.57		
30 June 2016 15% NAV 46.80		16,304.35	348.38
Closing units	11,217.95		
31 Mar 2017 10% NAV48		11,217.95	233.71
Closing units	11,451.66		
21 Nov 2017 14% NAV 49.60		16,032.32	323.23
Closing units	11,774.89		
25 Feb 2018 15% NAV 50		17,662.33	353.25
Closing Units	12,128.13		
30 June 2018 15% NAV 51.80		14,553.76	280.96
Closing units	12,409.10		
Maturity 31 Mar 2019 - NAV	52.40		
Maturity Value	6,50,236.60		
Investment Value	5,00,000.00		
Absolute return	1,50,236.60		
Absolute Return %	30.05%		
Return per annum over 3 years	**10.02%**		

Investment in Plan B @NAV 43.5= $\frac{500000}{43.5}$	11,494.25
Add: 31 Aug 2016 Bonus 1:6 - NAV 45.4 = $\frac{11494.25}{6}$	1,915.71
=> Closing units =	**13,409.96**
Add: 17 Sep 2017 B: 1:8 - NAV 47 = $\frac{13,409.96}{8}$	1,676.25
=> Closing units =	**15,086.21**
Add: 31 Mar 2018 Bonus - 1:10 @ NAV 48.80 = $\frac{15,086.21}{10}$	1,508.62
=> Closing Units =	**16,594.83**
Maturity NAV	**50**
Maturity Value = $16,594.83 * 50$	8,29,741.38
Less: Investment Value	5,00,000.00
= Absolute Gain	**3,29,741.38**
Absolute Gain %	65.95%
Annual Return / gain % over 3 years	**21.98%**

** Assumption: Dividend is Reinvested in the Fund*

Illustration 4: [Nov'20 QP 10 marks, RTP May'23, Similar Dec'21 QP (Old)]

M/S. Corpus an AMC, on 1.04.2015 has floated two schemes viz. Dividend Plan and Bonus Plan. Mr. X, an investor has invested in both the schemes. The following details (except the issue price) are available:

Date	Dividend (%)	Bonus Ratio	NAV	
			Dividend Plan	Bonus Plan
1.04.2015			?	?
31.12.2016		1 :4 (One unit on 4 units held)	47	40
31.03.2017	12		48	42
31.03.2018	10		50	39
31.12.2018		1 :5 (One unit on 5 units held)	46	43
31.03.2019	15		45	42
31.03.2020	-	-	49	44

Investment (₹)	₹9,20,000	₹10,00,000
Average Profit (₹)	₹27, 748.60	
Average Yield (%)		6.40

You are required to calculate the issue price of both the schemes as on 1.04.2015.

Solution 4:

Particulars	Units	NAV	Value	% return
Investment - Dividend Plan			9,20,000	
Investment Bonus Plan			10,00,000	
Average Profit Dividend Plan - 5 years			27,748.60	
Total Profit over 5 years			1,38,743	
Closing Value of Investment - Dividend Plan	21,607	49	10,58,743	
Bonus Plan - Average Yield				6.40%
5 Year Yield				32%
Return over 5 years			3,20,000	
Closing Value of Investment on 31/3/2020	30,000	44	13,20,000	
Bonus Plan	20,000	50	10,00,000	
31 Dec 2016 Bonus 1:4	20,000	40	8,00,000	
31 Dec 2018 Bonus 1:5	25,000	43	10,75,000	
31 mar 2020 - Closing	30,000	44	13,20,000	
Dividend Plan	20,000	46	9,20,000	
Dividend 31 Mar 2017	20,000	48	9,60,000	12%
Dividend 31 Mar 2018	20,500	50	10,25,000	10%
Dividend 31 Mar 2019	20,910	45	9,40,950	15%
31 Mar 2020 - Closing	21,607	49	10,58,743	

WN 1- Dividend for 31 Mar 2019

Opening Units	$= Y$
$\frac{Y + (Y\ x\ 10\ x\ 15\%)}{45}$	$= 21607$
$45Y + 1.5Y$	$= 21607 * 45$
$46.5Y$	$= 21607 * 45$
Y	$= \frac{972315}{46.5}$
	$= 20,910$

Illustration 5: *[MTP Mar'21 New & Old, MTP May'20, Nov'18 QP (Old)]*

A mutual fund raised ₹150 lakhs on April 1, 2018 by issue of 15 lakh units at ₹10 per unit.
The fund invested in several capital market instruments to build a portfolio of ₹140 lakhs;
Initial expenses amounted to ₹8 lakhs.
During the month of April, the fund sold certain instruments costing ₹44.75 lakhs for ₹47 lakhs and used the proceeds to purchase certain other securities for ₹41.6 Lakhs. The fund management expenses for the month amounted to ₹6 lakhs of which ₹50,000 was in arrears The fund earned dividends amounting to ₹1.5 lakhs and it distributed 80% of the realized earnings. The market value of the portfolio on 30th April, 2018 was ₹147.85 Lakhs.
An investor subscribed to 1000 units on April 1 and disposed it off at closing NAV on 30th April. Determine his annual rate of earnings.

Solution 5:

Particulars	Units	NAV	Value
Investment Made @ 10 - 1000 units	1,000	10	10,000
Add: CG & Dividend			200
Redemption	1,000	9.85	9,850
Absolute Return			50
Absolute Return %			0.50%
Annualized Return %			**6%**

WN: 1 - Cash Balance

	Amount ₹ Lakh	Closing Cash ₹ Lakh
1 April 2018 NFO @ ₹10 / Unit - 15 Lac Units	150	150
Less: Initial Expenses	(8)	142
Less: Investment 1	(44.75)	97.25
Less: Investment 2	(95.25)	2
Add: Investment sold	47	49
Less: Investment 3	(41.60)	7.40
Less: Fund Management Exp	(5.50)	1.90
Add: Dividend Earned	1.50	3.40
Less: Realized Earning Distributed 1	(1.20)	2.20
Less: Realized Earning Distributed 2	(1.80)	0.40
Closing Cash Balance		**0.40**

WN 2: NAV Computation

Market value of Securities	147.85
Less: Payable	0.50
Add Cash Balance	0.40
Total NAV for 15 Lac Units	**147.75**
NAV Per unit	9.85

Illustration 6: *(ICAI SM, MTP Apr'24, RTP Nov'19 Old, Old PM)*

ANP Plan, a hedge fund currently has assets of ₹20 crore. CA. X, the manager of fund charges fee of 0.10% of portfolio asset. In addition to it the charges incentive fee of 2%. The incentive will be linked to gross return each year in excess of the portfolio maximum value since the inception of fund. The maximum value the fund achieved so far since inception of fund about one and half year ago was ₹21 crores. You are required to compute the fee payable to CA. X, if return on the fund this year turns out to be (a) 29%, (b) 4.5%, (c) -1.8%.

Solution 6:

Particulars	₹ Cr
Opening Fund value	20.00
Highest value since inception	21.00
Fund management charges	0.10%
Incentive	2.00%

Return in CY	29.00%	4.50%	-1.80%
Management fees	0.02	0.02	0.02
Incentive Computation			
Portfolio Return %	29.00%	4.50%	-1.80%
Portfolio Return absolute	5.80	0.90	(0.36)
Total Value of Portfolio	25.80	20.90	19.64
Less: Max value of portfolio	21.00	21.00	21.00
Return eligible for incentive	4.80	-	-
Incentive	0.10	-	-
Total Fee + Incentive - Cr	0.12	0.02	0.02
Total Fee + Incentive in ₹	**11,60,000.00**	**2,00,000.00**	**2,00,000.00**

Illustration 7: *(RTP May'22)*

On 1st April, an open-ended scheme of mutual fund had 400 lakh units outstanding with Net Assets Value (NAV) of ₹ 19. At the end of April, it issued 5 lakh units at an opening NAV plus 2% load, adjusted for dividend equalization. At the end of May, 4 Lakh units were repurchased at the opening NAV less 2% exit load adjusted for dividend equalization. At the end of June, 60% of its available income was distributed. In respect of April-June quarter, the following additional information is available:

Particulars	₹ in Lakhs
Portfolio value appreciation	515.67
Income of April	31.960
Income of May	46.125
Income for June	58.470

You are required to calculate:

(i) Income available for distribution
(ii) Issue price at the end of April
(iii) Repurchase price at the end of May; and
(iv) Net Asset Value (NAV) as on 30th June.

Solution 7:

Income Available for Distribution

Particulars	Units in Lakhs	Per Unit	₹ Lacs Income
Income for April	400	0.0799	31.96
Units Issued	5	0.0799	0.3995
End of April – A	**405**	**0.0799**	**32.3595**
Income for May – B	405	0.113888889	46.125
Closing Before Repurchase C = A + B	405	0.193788889	78.4845
Repurchase Units	-4	0.193788889	-0.775155556
End of May	**401**	**0.193788889**	**77.70934444**
Income for June D	401	0.145810474	58.47
End of June E = D + C	401	0.339599363	136.1793444
Distribution at 60%	401	-0.2038	-81.7076
Balance Available	**401**	**0.1358**	**54.4717**

Particulars	₹ per Unit
Opening NAV (5 lakh units)	₹ 19
Add: Entry Load at 2%	₹ 0.38
Add: Dividend Equalization	₹ 0.0799
Issue Price in April End	**₹ 19.4599**

Particulars	₹ per Unit
Opening NAV (4 lakh units)	₹ 19
Less: Exit Load at 2%	₹ -0.38
Add: Dividend Equalization	₹ 0.1938
Repurchase Price at May End	**₹ 18.8138**

Particulars		Amount
Opening NAV (400 lakh units)	₹ 19	₹ 7,600
Add: Incomes		
April	₹ 31.9600	
May	₹ 46.1250	
June	₹ 58.47	₹ 136.5550
Less: Dividend		₹ -81.7076
Add: Portfolio Appreciation		₹ 515.670
Add: Units Issued		
5* 19.4599		₹ 97.2995
Less: Units Repurchased		
4* 18.8138		₹ -75.2552
401 Lakh Units		₹ 8,192.5617
Closing NAV at June End	**8192.5617/ 401**	**₹ 20.4303**

Illustration 8: *(Nov'23 QP)*

Mr. S has invested in 3 different Mutual Fund Schemes. The following are the details of the same:

Particulars	Scheme A	Scheme B	Scheme C
Date of Investment	01-06-2022	01-07-2022	01-08-2022
Net Asset Value at Entry Date	₹ 11.00	₹ 10.50	₹ 12.00
Dividend received upto 31-03-23 (₹)	12,500.00	17,000.00	4,000.00
Unit NAV at 31-03-23 (₹)	11.25	11.48	10.80
Increase / (Decrease) in NAV (₹)	22,727.27	93,333.33	(50,000.00)
Effective Rate of Yield per annum	4.2296%	14.6978%	(-) 13.8190%

Ignore Entry/Exit load expenditure. Assume 365 days in a year. Round off the investment to nearest ₹100. You are required to calculate:

- The amount of investments made initially by Mr. S in these schemes.
- Number of units invested in the three schemes by Mr. S.

Advise also whether he can continue to hold this investment or can he redeem now.

Solution 8:

Method 1

Particulars	Scheme A	Scheme B	Scheme C
NAV Opening / Investment Date	11.00	10.50	12.00
NAV Closing	11.25	11.48	10.80
Increase / (Decrease) in NAV (₹ per unit	0.25	0.98	-1.20
Increase / (Decrease) in NAV (₹)	22,727.27	93,333.33	(50,000.00)
Units = Inc in Scheme Value / Inc in NAV	22,727.27 / 0.25	93,333.33/ 0.98	(50,000.00) / -1.20
Units	90909.08	95238.09	41666.67
= > Investment value = Units X NAV	11 x 90909.08	10.50 x 95238.09	12 x 41666.67
Investment Value	Rs.9,99,999.88	Rs.9,99,999.945	Rs.5,00,000.04
Investment value rounded off	Rs.10 lacs	Rs.10 Lacs	Rs.5 Lacs

Method 2

Particulars	Scheme A	Scheme B	Scheme C
Date of Investment	1st June 2022	1st July 2022	01 August 2022
Days of Investment till 31st March 2023	304	274	243
Dividend	12500	17000	4000
Increase / (Decrease) in NAV (₹)	22,727.27	93,333.33	(50,000.00)
Total Return Div + Inc in NAV - A	35227.27	110333.33	-46000
Yield Per Annum	4.2296%	14.6978%	-13.8190%
Yield of days of investment / HPR - B	4.2296% x 304 / 365 = 3.5227%	14.6978%x 274 / 365 = 11.0334%	-13.8190% X 243 /365 = -9.2000%
Investment Value C = A / B	Rs.10,00,007.66	Rs.10,00,000	Rs.5,00,000
Investment value rounded off	Rs.10 lacs	Rs.10 Lacs	Rs.5 Lacs
Units of Investment made = C / Opening NAV	Rs.10 Lacs / 11	Rs.10 Lacs / 10.5	Rs.5 Lacs / 12
Units of investment made	90909.08	95238.09	41666.67

The investor should redeem investments in Schemes A & C and invest the money in Scheme B as it has higher return

Illustration 9: *(Similar ICAI SM, Nov'24 QP)*

Mr. X invested ₹1,00,000 on face value of ₹10 per unit in a dividend reinvestment plan in a mutual fund during its initial offer on 1st July, 2022. On 31st March, 2023, the fund declared a dividend of 10%. At that time Mr. X calculated his holding period return to be in the range of 115%.
On 31st March, 2024, the mutual fund declared a dividend of 20% and Mr. X redeemed all his investment and calculated his holding period return to be 193.134%.

You are required to calculate:
(i) The NAVs as on 31.03.2023 and 31.03.2024.
(ii) Calculate the total units redeemed.

Solution 9:

Particulars	₹ Lacs
Amount Invested	100000
Face Value per Unit in ₹	10
Units Invested = 100000/10	10000
Holding period Return 1 July 2022 to 31st March 2023	115%
Holding period Return = (Closing Value – Opening Value) /Opening Value	115%
(Closing – ₹100000)/₹100000 =	115%
Closing	115% x ₹100000 + ₹100000
Closing value	₹ 2,15,000
Less: Dividend Declared per WN 1 Below	₹ 10,000
Closing Value of AUM	₹ 2,05,000
Closing NAV = ₹205000 / 10000 units	₹ 20.50
Dividend is reinvested in MF @NAV of ₹20.50	
Units Allotted ₹10000/₹20.50	487.8
Closing Units = Opening Units + Dividend Reinvested Units	10000 + 487.80
31/3/2023 - Closing Units	**10487.8**
Holding period Return 1 /07/22 to 31/03/2024	193.13%
(Closing – ₹100000)/₹100000 =	193.13%
Closing Value of Amount Invested	₹193134+₹100000
Closing Value of Amount Invested	**₹ 2,93,134**
Dividend Declared = 10487.80 x 2	₹ 20,976
Closing Value of investment without Dividend	₹293134- ₹20976= 272158
NAV per unit of investment value without Dividend	₹272158 / 10487.80 Units
NAV per unit of investment value without Dividend	**₹25.95 per Unit**
Dividend Amount Reinvested	₹ 20,976
Units allotted for Dividend Amount	₹20976 / ₹25.95 per Unit = 808.32 Units
Total Unit count	10487.80 + 808.32 = 11296.12 Units
NAV	**₹ 25.95**

(Cross Check 25.95 x 11296.12 = 293134)

Conclusion

	31 Mar 2023	**31 Mar 2024**
NAV	₹20.50	₹25.95
Units Held	10487.80	11296.12
Total Units Redeemed	**11296.12**	

WN 1
Dividend Declared = 10%
Dividend Declared in ₹ = ₹100000 x 10% = ₹10000
Assumption – Entire Dividend is Invested Back in Units at same NAV

- Performance Evaluation
  - Quantitative Factors
    - RADR
    - Bench Mark returns & Alpha
    - Peer Comparison
    - Comparison across market & Economic Cycles
    - Financial Measures
      - Expense Ratio
      - Sharpe Ratio — $\frac{R_p - R_f}{\sigma}$
      - Treynor Ratio — $\frac{R_p - R_f}{\beta}$
      - Sortino Ratio — $\frac{R_p - R_f}{\sigma d}$
    - Portfolio Quality
  - Qualitative Factors
    - Track Record & Competence of FM
    - Credibility of Fund House & team

- Quality of the portfolio plays a big role in achieving superior returns.
- Factors considered are allocation of funds in top Blue-chip companies, large companies and how diversified is the portfolio.
- Style - growth, value, or blend
- In Debt Funds, the quality of portfolio is measured based on credit quality, average maturity, and modified duration of the fixed asset securities.
- Investment should be as per the objective of the Fund. Under normal circumstances, a fund having lower Portfolio Turnover ratio is better.

Day	Return	σ Computation	σd Computation
1	5%	-2%	-2%
2	6%	-1%	-1%
3	8%	1%	-
4	9%	2%	-
	Avg 7%		
	Deviation	Sqrt (10/4) =1.58%	Sqrt (5/4) =1.12%

The competence of a Fund Manager is assessed from his/her knowledge and ability to manage in addition to past performance.

In addition to investment decisions, there are some other administrative tasks also such as redemption of units, crediting of dividend, providing adequate information etc. which play a crucial role in qualitative assessment of any mutual fund house

Role of Fund Managers in Mutual Funds

- **Actively Managed Funds:** Using extensive research, judgement and due diligence, he/she has to outperform the market and generate positive alpha. Right stock picking can outperform.
- **Passively Managed Funds:** Main Role - match the return of the underlying index with the Minimum Tracking Error.

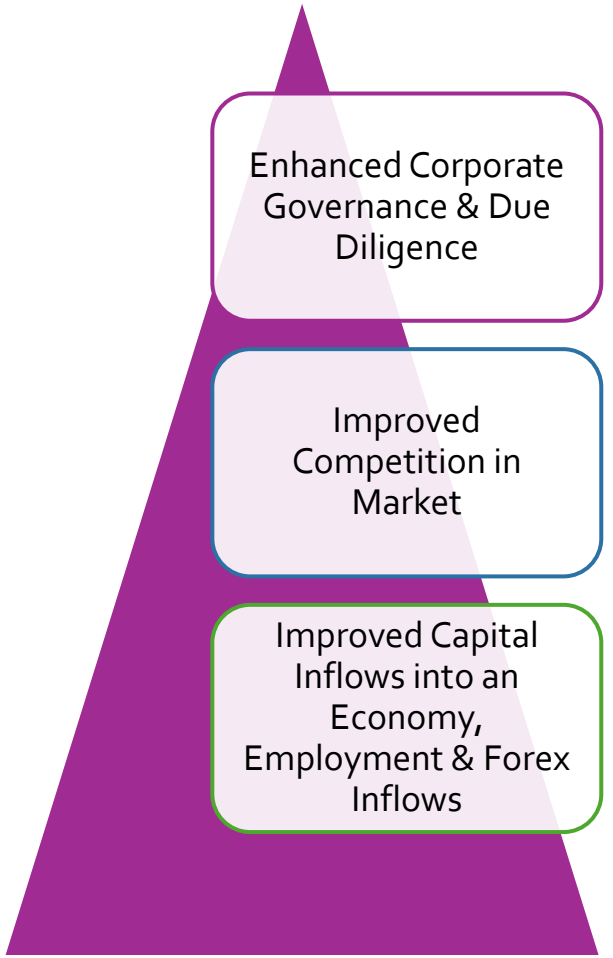
Other Functions

Compliances	• Compliance of various Guidelines as laid down by SEBI, AMFI etc. • Ensuring various reporting such as Expenses Ratio, redemption of funds etc. • Ensuring that investors are aware of various required details and rules. • Ensuring that all required documents are furnished on time.
Constant Monitoring	• Market Entry & Exit points maximizes the wealth of unit holders. • Return above inflation and interest rate is used to measure performance
Wealth Creation & Protection	• Use Fundamental & Technical Analysis • Reckless risk taking should be avoided
Control over work outsourced to 3rd Party	• Exercise Control to ensure error free operations

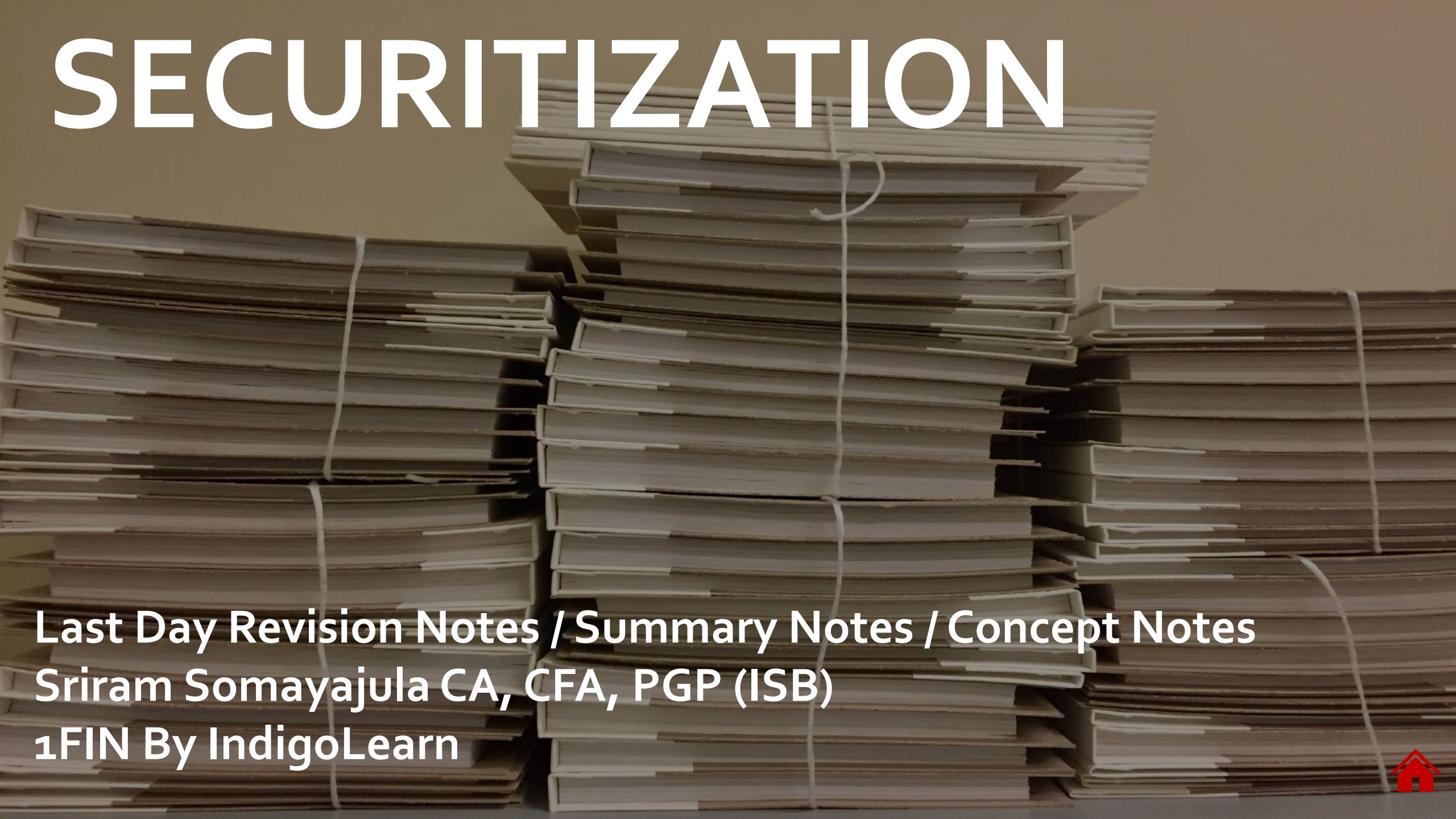
Role of FIIs in MFs

- FIIs are large foreign groups with substantial investible funds.
- FIIs are registered abroad with a view to investing in other nations to invest in equity market, hedge funds, pension funds and mutual funds.
- FIIs have strong research teams which guide them to invest in a country with a possibility of strong return in equity market.
- FIIs are an important source of capital in any economy especially in developing economies& fuel a bullish market for a short period of time and hence a nation experiences a strong inflow of foreign currency in its financial system at that time.
- FIIs can invest in stock directly or through Mutual Funds.
- They can buy units of domestic mutual funds either directly from the issuer of such securities or through a registered stockbroker on a recognized stock exchange in India.
- These investments are subject to limits notified by SEBI.

FIIs importance in Economy w.r.t MF Investments



SECURITIZATION



Last Day Revision Notes / Summary Notes / Concept Notes

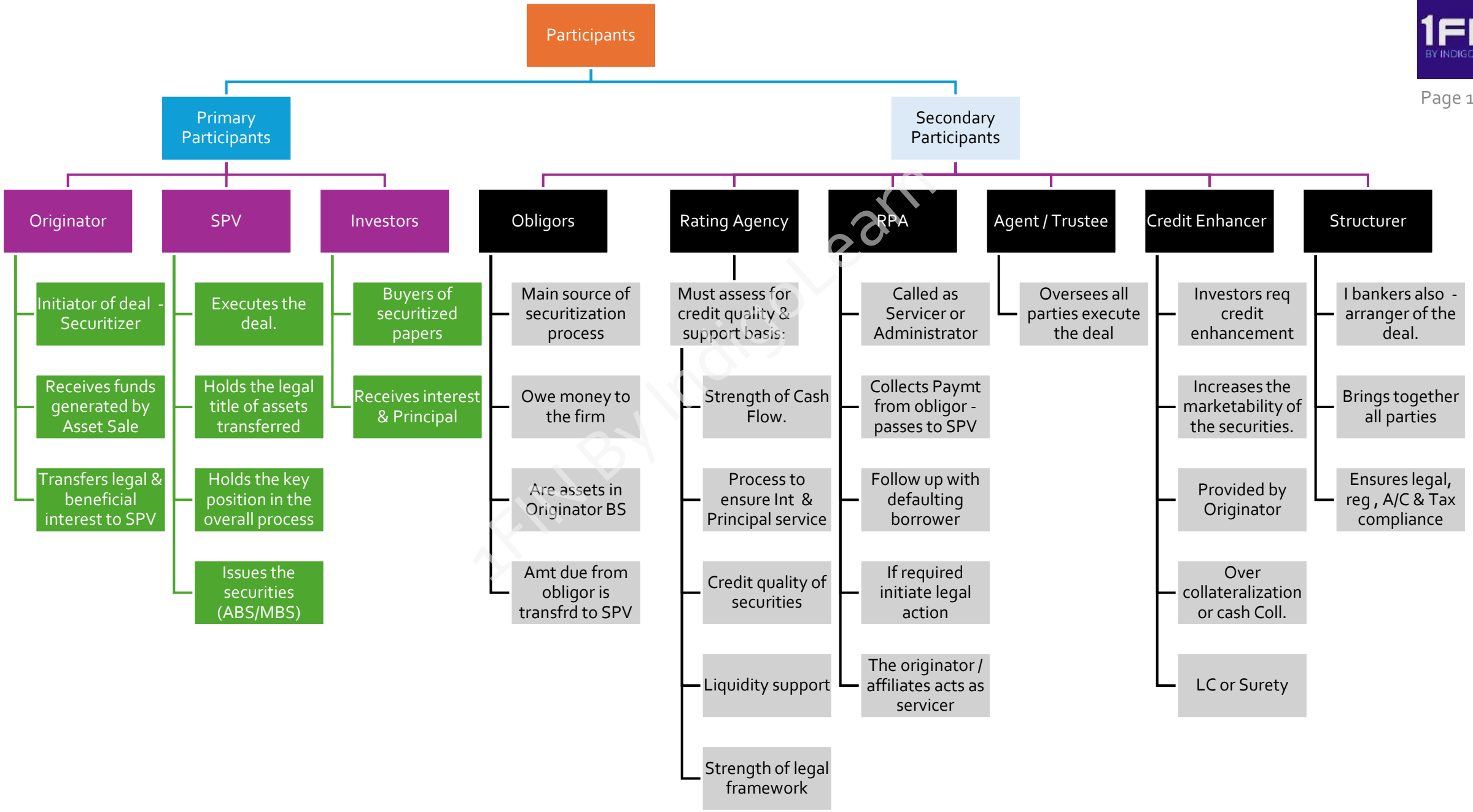
Sriram Somayajula CA, CFA, PGP (ISB)

1FIN By IndigoLearn

"The process of securitization typically involves the creation of pool of assets from the illiquid financial assets, such as receivables or loans which are marketable."

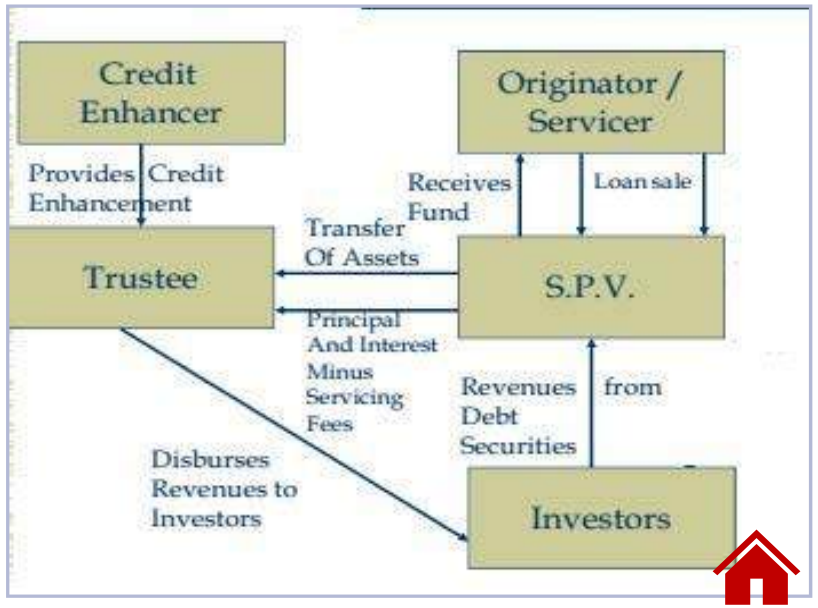
Benefits of Securitization

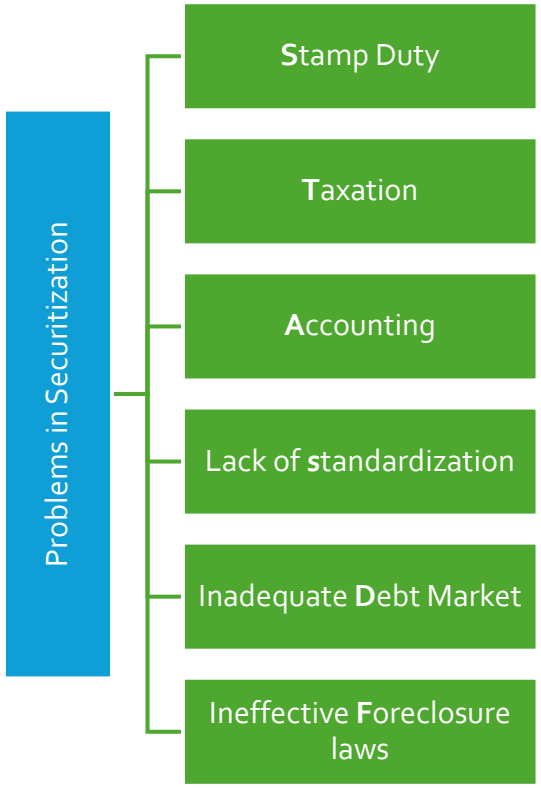
- Originator
  - Off Balance Sheet Financing
  - Focus on Core Business
  - Improve Financial Ratios
  - Reduce Cost of Borrowing
- Investor
  - Risk Diversification
  - Regulatory Requirement
  - Protection against Default


Participants
Primary Participants
Secondary Participants
Originator
SPV
Investors
Obligors
Rating Agency
RPA
Agent / Trustee
Credit Enhancer
Structurer
Initiator of deal - Securitizer
Receives funds generated by Asset Sale
Transfers legal & beneficial interest to SPV
Executes the deal.
Holds the legal title of assets transferred
Holds the key position in the overall process
Issues the securities (ABS/MBS)
Buyers of securitized papers
Receives interest & Principal
Main source of securitization process
Owe money to the firm
Are assets in Originator BS
Amt due from obligor is transfrd to SPV
Must assess for credit quality & support basis:
Strength of Cash Flow.
Process to ensure Int & Principal service
Credit quality of securities
Liquidity support
Strength of legal framework
Called as Servicer or Administrator
Collects Paymt from obligor - passes to SPV
Follow up with defaulting borrower
If required initiate legal action
The originator / affiliates acts as servicer
Oversees all parties execute the deal
Investors req credit enhancement
Increases the marketability of the securities.
Provided by Originator
Over collateralization or cash Coll.
LC or Surety
I bankers also - arranger of the deal.
Brings together all parties
Ensures legal, reg , A/C & Tax compliance

Mechanism of Securitization

1. **Creation of Pool of Assets** -by segregation of assets backed by similar type of mortgages in terms of interest rate, risk, maturity, and concentration units.
2. **Transfer of assets pooled to an SPV -** These assets are transferred by the originator to an SPV created solely for this purpose.
3. **Sale of Securitized Papers** - SPV designs the instruments based on nature of interest, risk, tenure etc. of the pool of assets. These instruments can be Pass Through Securities or Pay Through Certificates.
4. **Administration of assets** - Administration of assets is subcontracted back to originator which collects principal and interest from underlying assets and transfers it to SPV, which works as a conduit.
5. **Recourse to Originator-** Performance of securitized papers depends on the performance of underlying assets. Securitized papers go back to originator from SPV.
6. **Repayment of funds -** SPV will repay the funds in form of interest and principal that arises from the assets pooled.
7. **Credit rating to Instruments -** Credit rating can be done to assess the risk of the issuer before the sale of securitized instruments.





Pass Through Certificates (PTCs)

- Represent direct claim of the investors on Securitized assets
- Investors carry proportional beneficial interest in the asset held by SPV.
- Prepayment of principal is proportionately distributed among the securities holders.
- On completion of securitization by the final payment of assets, all the securities are terminated simultaneously.

Pay Through Securities (PTSs)

- Designed to overcome limitations of a)all cash flows being passed on & b) single maturity
- SPV issues PTS debt securities that are backed by the assets
- Creates desynchronization of servicing of securities issued from cash flows generated from the asset.
- This also permits the SPV to reinvest surplus funds for short term as per their requirement.
- Cash flows resulting from early retirement of receivables and cash can be used for short term yield.

Stripped Securities - highly volatile securities created by dividing the cash flows associated with underlying securities into two or more new securities.

- Interest Only (IO) Securities
- Principal Only (PO) Securities

The holder of IO securities receives only interest while PO security holder receives only principal.

Interest rate in market	Value of IO's securities	Value of PO's securities
Rises	Rises	Falls (Borrower prefers to postpone the payment on cheaper loans)
Falls	Falls	Rises (Borrower tends to repay the loans as they prefer to borrow fresh loan at lower rate of interest)

Pricing of Securitized Instruments

Originator Angle

- The instruments can be priced at a rate at which originator has to incur an outflow and if that outflow can be amortized over a period by investing the amount raised through securitization.

Investor Angle

- The price can be determined by discounting best estimate of expected future cash flows using YTM rate of a comparable security with respect to credit quality and average life of the securities.
- The yield can be estimated by referring the yield curve available for marketable securities, upon adjustments on account of spread points, because of credit quality of the securitized instruments.

Risks in Securitization

Credit risk / Counterparty risk

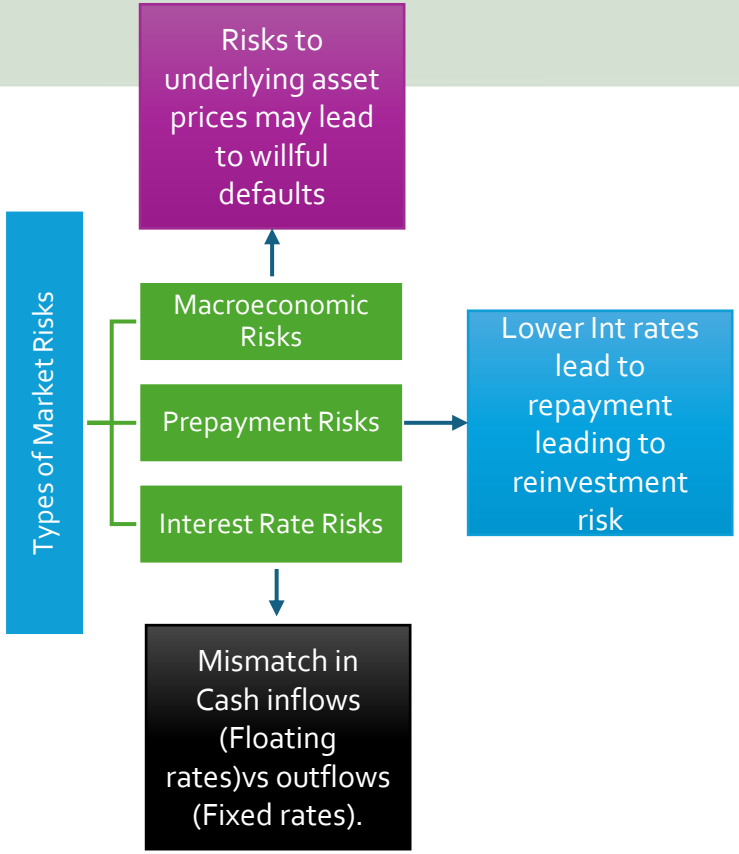
It is the prime risk wherein investors are prone to the risk of bankruptcy and non-performance of the servicer.

Legal risks

There is an absence of conclusive judicial precedent or explicit statutory provisions in India on securitization transactions and therefore dispute over the legal ownership of the assets is likely to result in uncertainty regarding investor pay-outs from the pool cash flow.

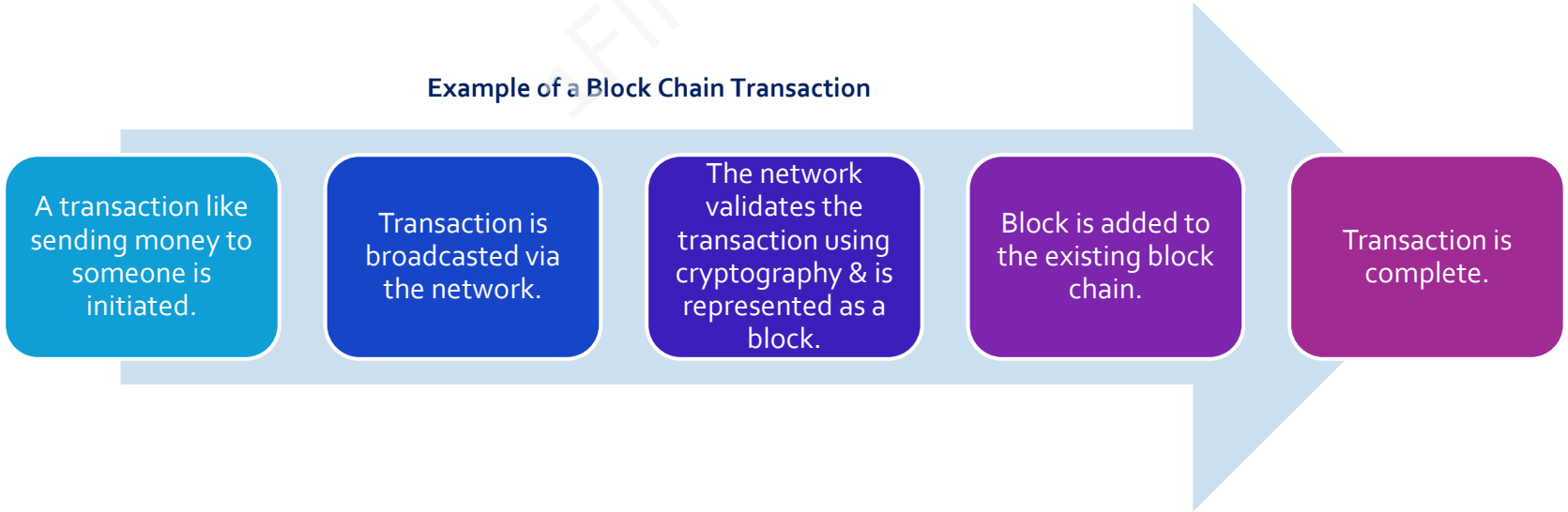
Market risks

Market risks represent risks external to the transaction and include market-related factors that impact the performance of the transaction.



- Blockchain, (DLT) is a shared, P2P, & decentralized open ledger of transactions system with no 3rd parties in between.
- This ledger database has every entry as permanent as it is an append-only database which cannot be changed or altered.
- All transactions are irreversible with any change in the transaction being recorded as a new transaction.
- The decentralised network refers to the network which is not controlled by any bank, corporation, or government.
- A block chain generally uses a chain of blocks, with each block representing the digital information stored in public database.
- Blockchain creates a decentralized distribution chain that gives everyone access to the ledger at the same time.
- No one is locked out awaiting changes from another party, while all modifications to the ledger are recorded in real-time, making changes completely transparent.

Example of a Block Chain Transaction



Applications of Block chain

Financial Services	Can be used to provide an automated trade lifecycle in terms of the transaction log of any transaction of asset or property - laptops, smartphones, automobiles, real estate, etc. from one person to another
Healthcare	Secure sharing of data by increasing the privacy, security, and interoperability of the data between doctors, patients & service providers by eliminating the interference of third party and avoiding the overhead costs.
Government	Blockchain improves the transparency and provides a better way to monitor and audit the transactions in land registration, vehicle registration and management, e-voting systems etc.
Travel Industry	Blockchain can be applied in money transactions and in storing important documents like passports/other identification cards, reservations and managing travel insurance, loyalty, and rewards.
Economic Forecasts	Blockchain makes possible the financial and economic forecasts based on decentralized prediction markets, decentralized voting, and stock trading, thus enabling the organizations to plan and shape their businesses.

Blockchain Risks

Differing Risk Appetite amongst members can lead to conflict. There may be questions about who is responsible for managing risks if no one party is in-charge, and how proper accountability is to be achieved in a blockchain.	The reliability of financial transactions is dependent on the underlying technology and if this underlying consensus mechanism has been tampered with, it could render the financial information stored in the ledger to be inaccurate and unreliable.	In the absence of any central authority to administer and enforce protocol amendments, there could be a challenge in the development and maintenance of process control activities and in such case, users of public blockchains find difficult to obtain an understanding of the general IT controls implemented and the effectiveness of these controls.	As blockchain involves humongous data getting updated frequently, risk related to information overload could potentially challenge the level of monitoring required. Furthermore, to find competent people to design and perform effective monitoring controls may again prove to be difficult.

Tokenization is a process of converting tangible and intangible assets into blockchain tokens. Digitally representing anything has recently acquired a lot of traction. It can be effective in conventional industries like real estate, artwork etc.

Since tokenization of illiquid assets attempts to convert illiquid assets into a product that is liquid and tradable, to some extent it resembles the process of Securitization.

Similarities between Tokenization & Securitization

Liquidity

Both Securitization and Tokenization inject liquidity in the market for the assets which are otherwise illiquid assets.

Diversification

Both help investors to diversify their portfolio thus managing risk and optimizing returns.

Trading

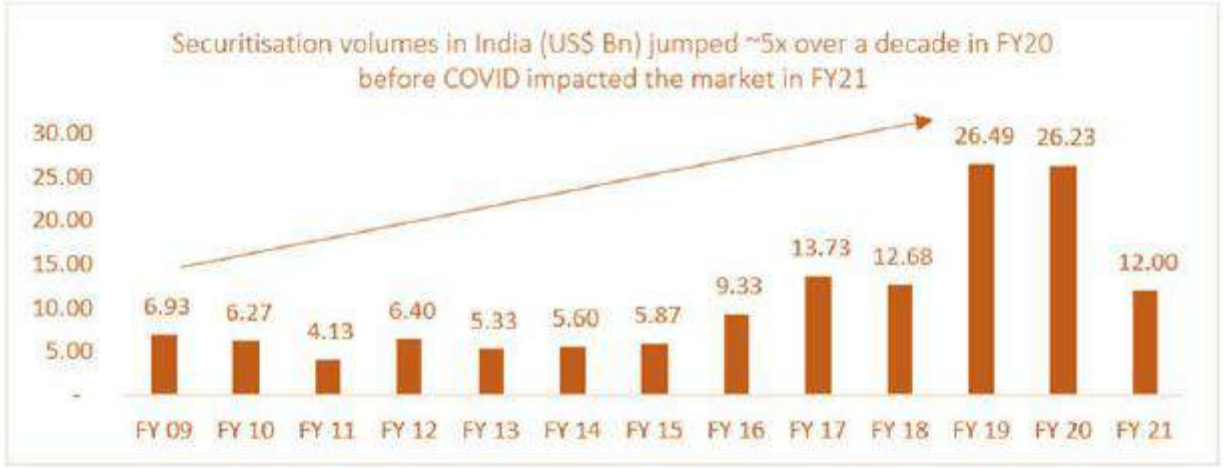
Both are tradable hence helps to generate wealth.

New Opportunities

Both provide opportunities for financial institutions and related agencies to earn income through collection of fees.

Securitization in Indian Context

- Citi Bank pioneered the concept of securitization in India by bundling auto -loans into securitized instruments. Currently the market is dominated by a few players such as ICICI Bank, NHB, HDFC Bank etc
- Initially started with auto loan receivables, it has become an important source of funding for micro finance companies and NBFCs and commercial mortgage.
- In order to encourage securitization, the Government has come out with Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest (SARFAESI) Act, 2002, to tackle menace of Non-Performing Assets (NPAs) without approaching the Court.
- As per a report of CRISIL, securitization transactions in India touched a high of approximately Rs. 1.9 Trillion (~US$ 26 Bn), during pre-pandemic years of FY19 & FY20
- SEBI has allowed FPIs to invest in securitized debt of unlisted companies up to a certain limit.



DERIVATIVES

Last Day Revision Notes / Summary Notes / Concept Notes

Sriram Somayajula CFA, PGP (ISB)

1FIN By IndigoLearn

Derivative ➡ **Contract** ➡ Between **2 parties** ➡ **Derives** its value from ➡ **Underlying Asset** ➡ is subject to **Risks**

Forward Contract:
- Simplest Derivative
- Obligation
- Buy / Sell
- Specified
  - Asset
  - Quantity
  - Quality
  - Price
  - Time
- Delivery Based
- OTC
- Customizable
- Credit Risk
- No Margin
- Low Transaction Costs
- Parties Known

Futures Contract:
Like Forward, But
- Usually, Cash Settled
- On an Exchange
- Specified lot size
- Standardised Qty & Quality
- No Credit Risk
- Margin Required
- Higher transaction costs
- Parties Unknown to each other

Cash Market	Derivatives Market
Deals with tangible assets	Deals with intangible assets like Stocks.
No specified lot size.	Specified lot size.
Consumption / Investment Oriented	Hedgers, speculators, and arbitrageurs act to reduce risk or make profits
No margin requirements	Exchange fixes margins for both parties
Ownership transferred immediately	No ownership transfer on contracting.
Upfront cash commitment required	Only margin or premia needs to be paid

Basic Types of Derivatives
- Forwards
- Futures
- Options
- Swaps
- Commodity Derivatives

Priced Similarly

Net Cost of Carry

$F = S_0 + Cost\ Of\ Carry - Dividend$ = FV of (S_0 – PV of Dividend)

Simple Interest $F = S_0 + (S_0 \times rt)/100$

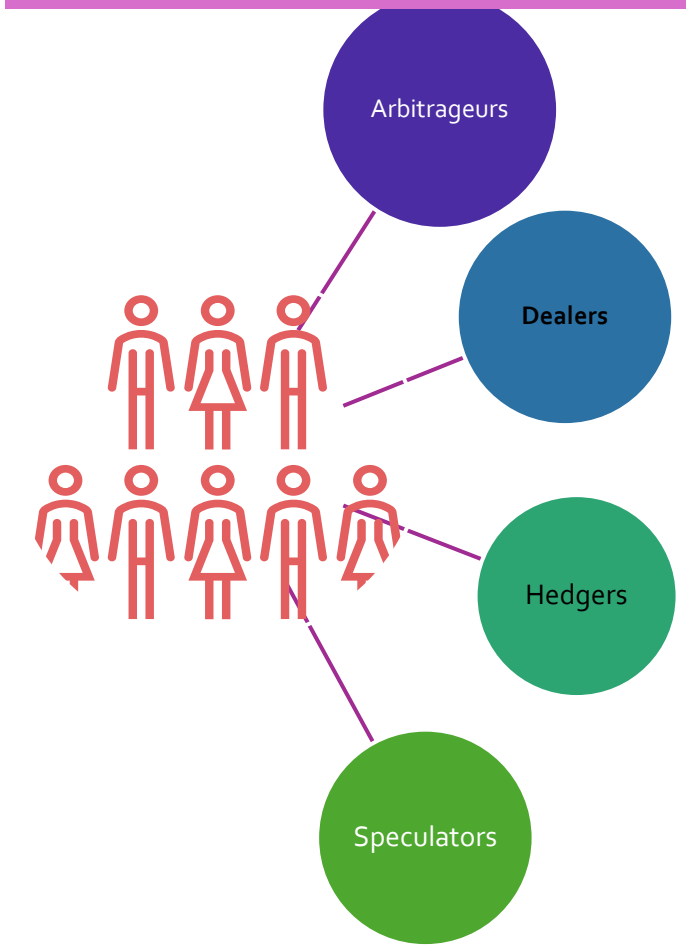
Periodic Compounding $F = S_0 \times (1+r/n)^{nt}$
Eg: Spot = 100, Monthly compounding @ 12% pa, 2 months contract with no dividend
$F = 100\ (1+(12\% - 0\%)/12))^{[12 \times 2 / 12]} = 100 \times (1.01)^{2} = 1.0201$

Continuous Compounding $F = S_0 e^{(r-y)t}$
S_0 = Spot | r = Interest Rate | n = Interest Rest (No. of Compounding) | t = No of periods | y = Dividend Yield
Convert 10.5% PA rate to continuously compounded rate & compute int for 58 days
Ln (1.105) = 0.0998 | $e^{58/365 \times 0.0998} = e^{0.015858} = 1.01598$

Spot Vs Forward	Term	Basis	Market Status
Spot > Forward	Backwardation	+ve	Not Normal
Spot <Forward	Contango	-ve	Normal

The movement of the price of a futures contract toward the spot price of the underlying cash commodity as the delivery date approaches is called "Convergence".

Players in Derivatives Markets



Stock Index Futures Vs. Stock Futures

- Adds flexibility
- Used to Hedge portfolio
- Leverage magnifies gains
- Cost efficient
- Cannot be manipulated
- Less Volatile
- Cash Settled

Types of Problems

- Arbitrage
- Margin
- Portfolio Hedge / Beta

Initial Margin

- Margin Deposited at beginning of Contract
- Higher %

Maintenance Margin

- Margin to be maintained through the contract
- Lower than Initial Margin

SITUATION	STRATEGY
Expects increase in price of a stock in the future	Go long on stock Futures
Expects a decrease in price of a stock in the future.	Go short on stock Futures
Bullish outlook for Indian Market for the month of June 20XX	Go long on June INDEX Futures
Bearish outlook for Indian Market for the month of July 20XX	Go short on July INDEX Futures
Purchased shares of RIL & wish to hedge position till September 20XX	Short September 20XX RIL Futures.
Investor wants to hedge his current portfolio	Short INDEX Futures. Futures value to be shorted is equal to (Portfolio value x Portfolio Beta)

Reverse Cash & Carry Arbitrage
Actual Futures price < Theoretical Futures price
Eg: So = 100, 1 Year Future 102, Int Rate 5% Div 1
=> Ideal Future price is 105

Day 0:	
a. Long Futures	-
b. short sell the stock	+100
c. Invest the sale proceeds	-100
Date of Maturity:	
a. Withdraw the cash along with interest	+105
b. Give cash and take stock delivery on futures contract.	-102
c. Reimburse div to Stock lender	-1
d. Hand over the stock to settle the short position.	2

Cash & Carry Arbitrage
Actual Futures price > Theoretical Futures
Eg: So = 100, 1 Year Future 110, Int Rate 5%
=> Ideal Future price is 105

Day 0:	
a. Borrow the money	+100
b. Invest in stock	-100
c. Short Futures	-
Date of Maturity:	
a. Sell the stock and settle the futures	+110
b. Receive Dividend	+1
c. Repay loan along with interest.	-105
d. Balance amount is the profit	6

Dividend
If no date given assume dividend is received on last date and subtract it directly from FV of spot.
If Div date given, then F = FV of (Spot – PV of Div)

Mr. A has a portfolio of Rs. 5 crore consisting of equity shares of X Ltd. and Y Ltd. with beta of 1.15. Spot Value of Index Future = 21000 Multiplier = 150. Reduce beta of portfolio to 0.85 by :

1. Change in composition through Risk Free securities
2. Index futures

Reduce portfolio beta to 0.85 using Risk free securities

Let proportion of Risk-free securities be RF

0.85 = (1-RF)*1.15+RF*0

0.85= 1.15-1.15RF

1.15RF=0.30

RF = 0.30/1.15 = 26.09%

Security	Weight	Beta	W x Beta
Equity	(1-RF)	1.15	1.15-1.15RF
Cash	RF	0	0 x RF
Total	**1**	**0.85**	**1 x 0.85**

26.09% of portfolio i.e Rs.1.30 Cr should be taken out of X & Y Ltd in their respective weights & invested in Risk free securities to reduce portfolio beta to 0.85

Security	Weight	Beta	W x Beta
Equity	5	1.15	5.75
Future	F(Unknown)	1	1 X F
Total	**5 (F ignored)**	**0.85**	**5 x 0.85**

Changing beta by using Futures	
Reducing Beta to 0.85	
0.85*5=5*1.15-F*1	
4.25=5.75-F	
F= 1.5	
Notional value of Futures contract to be shorted (A)	15,000,000.00
Futures value current (B)	21,000.00
Lot size(C)	150.00
No of futures contracts shorted (D = A/(B x C))	**4.76**

The price of March Nifty Futures Contract on a particular day was 9170. The minimum trading lot on Nifty Futures is 50. The initial margin is 8% and the maintenance margin is 6%. The index closed at the following levels on next five days. Compute MTM & Net P&L

Day	1	2	3	4	5
Settlement Price	9380	9520	9100	8960	9140

Day	Settlement price	Index change	Lot size	MTM Gain / (loss)	OP Margin A/C	Add margin	Closing margin A/C	Main margin req @ 6%	Margin shortfall recouped
0	9,170	-	50	-		36,680	36,680	27,510	
1	9,380	210	50	10,500	36,680		47,180	27,510	
2	9,520	140	50	7,000	47,180		54,180	27.510	
3	9,100	(420)	50	(21,000)	54,180		33,180	27,510	
4	8,960	(140)	50	(7,000)	33,180	10,500	36,680	27,510	10,500
5	9,140	180	50	9,000	36,680	-	45,680	27,510	
Total				**(1,500)**					
Gain / loss		**(1,500) = (9140-9170) x 50**							
Change in margin account (45680-36680-10,500) =(1500)							**(1,500)**		

210 x 50 = 10500

9170 x 50 x 8% = 36680

As 33180-7000 = 26180< 27510
Bring Margin Back to 9170 x 50 x 8% = 36680
So Add Fresh Funds 36,680-26180= 10,500

36680 + 10500 = 47180

Buyer of Call gets RIGHT not Obligation to BUY an asset at pre-determined price

Options

Call | Put

Buyer of Put gets RIGHT not Obligation to SELL an asset at pre-determined price

American Costlier than European

American
Exercise **ANY** time

European
Exercise only on **MATURITY**

Option Price = Intrinsic Value + Time Value

Put Call Parity
$C + (K \times e^{-rt}) = P + S_0$

Situation	Call Option	Put Option
Spot Price > Strike Price	In the Money (ITM)	Out the Money (OTM)
Spot Price = Strike Price	At the Money (ATM)	At the Money (ATM)
Spot Price < Strike Price	Out the Money (OTM)	In the Money (ITM)

In the Money Option (ITM)	Highly Priced
Out the Money Option (OTM)	Cheaper rate
At the Money Option (ATM)	Cheaper ITM Costlier than OTM.

Option Valuation Techniques

1. Binomial Method
   - Delta Shares ▲ Shares – Sell Call
   - Portfolio Replication ▲ Shares + Loan = PV of option Payoff = Option Premium
2. Risk Neutral Approach
   - $P = (e^{(rt)} - d) / (u-d)$ & Value of Option = PV ($P \times C_u + (1-P) \times C_d$)
3. Black Scholes Method
   - With Dividend
   - Without Dividend

$$C = S_0 e^{qt} N(d_1) - K e^{rt} N(d_2) \quad | \quad P = K e^{rt} N(-d_2) - S_0 e^{qt} N(-d_1)$$

$$d1 = \frac{ln\left(\frac{S0}{K}\right) + \left(r - q + \frac{\sigma 2}{2}\right)T}{\sigma\sqrt{T}} \quad | \; d_2 = d1 - \sigma\sqrt{T}$$

S_0 = Spot | K = Strike Price | r = Risk Free Interest Rate | t = Time period in years | q – Dividend Yield | σ – SD in Decimal Values | N(-d) = 1 –N(d)

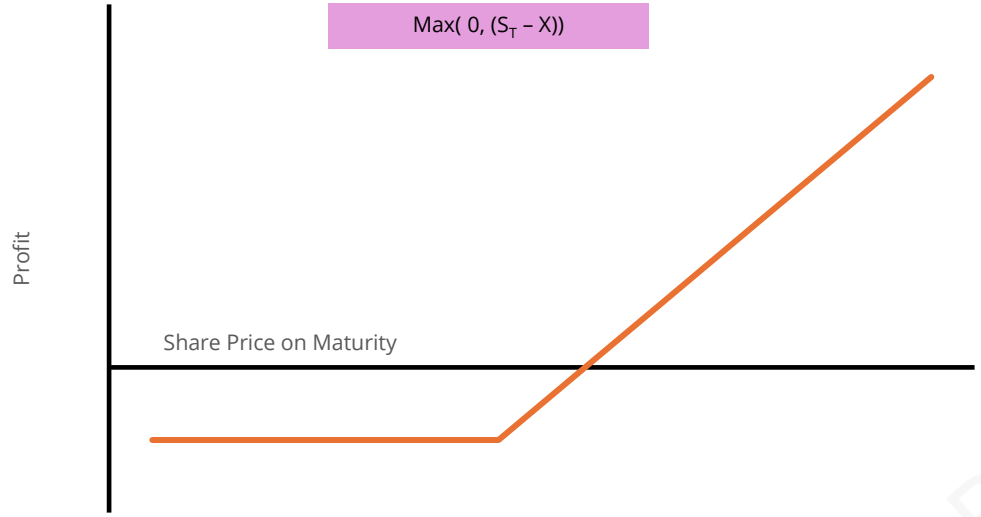
	Call	Put
CMP	↑	↓
Strike Price	↓	↑
Time	↑ *	↑ *
Interest	↑	↓
Volatility	↑	↑
Dividend	↓	↑

Commodity Derivatives Hedge Ratio
Correlation x σ Spot / σ Future

Option payoffs

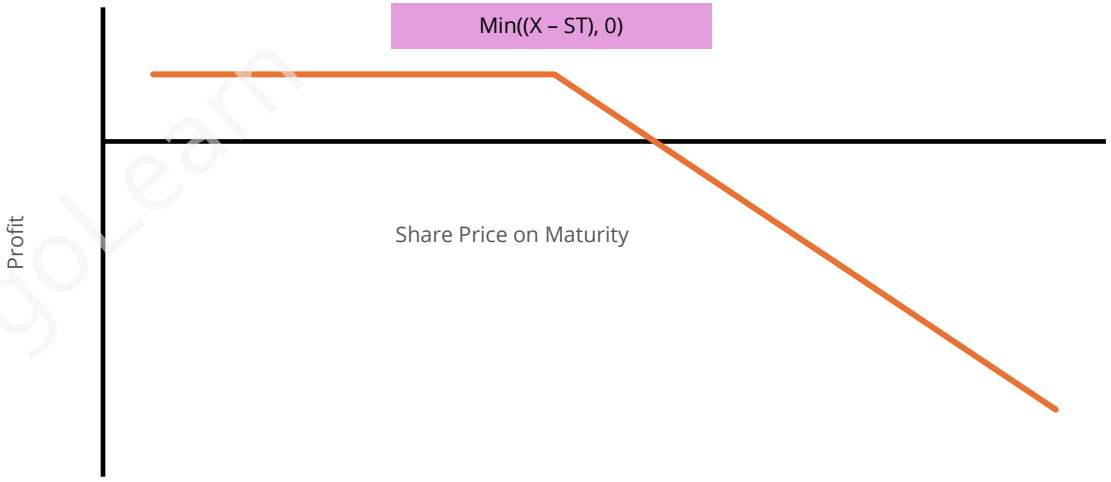
Long Call Pay off

Max(0, (S_T – X))



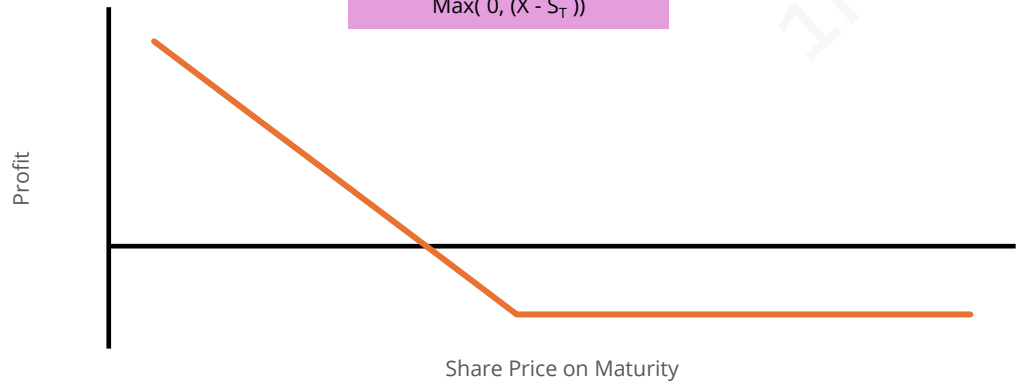
Short Call Pay off

Min((X – ST), 0)



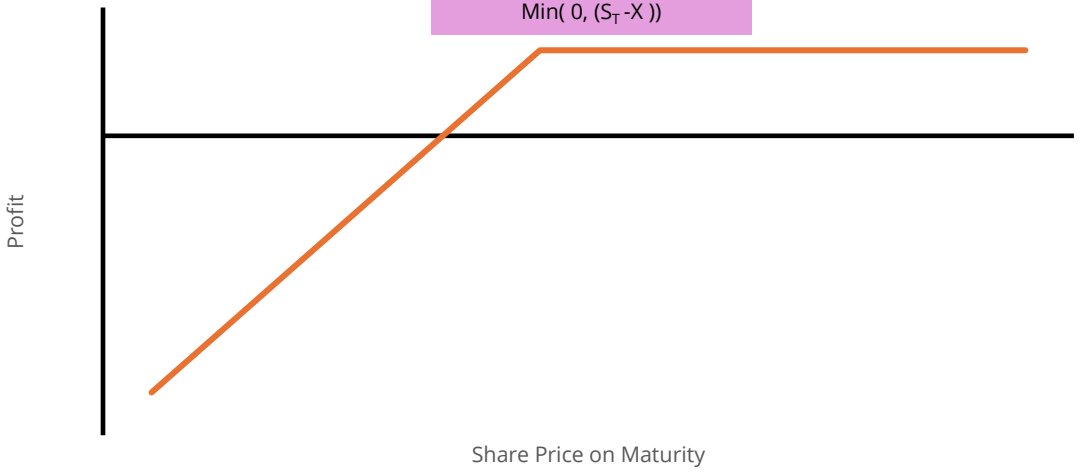
Long Put Pay off

Max(0, (X - S_T))



Short Put Pay off

Min(0, (S_T -X))



Binomial Model

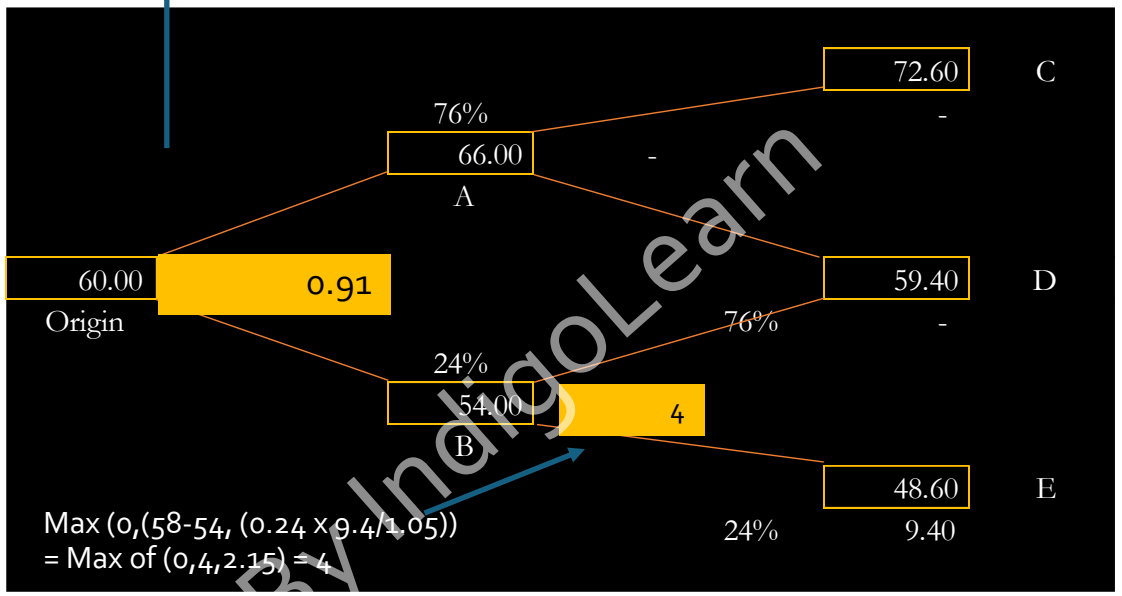
S	60.00
X	58.00
t in years	2
r	5%
Option	Put
A / E	American
P	??
u	1.10
d	0.90
P	$(e^{(rt)}-d)/(u-d)$ = 76%
$e^{(rt)}$	$e^{0.05}$= 1.0512

S	60.00
X	64.00
t in years	1
r	5%
Option	Call
A / E	European
C	??
u	1.10 (Su = 60 x 1.1 = 66)
d	0.90 (Sd = 60 x 0.9 = 54
P	((1+K) -d)/(u-d) = 75%
1+K	1.05
Cu	Max (0,66-64) = 2
Cd	Max (0,54-64) = 0

Under principle of
No arbitrage
PV of Expected Payoffs =
Option Price

Max (0,(58-60, (0.24 x4/1.05))
= Max of (0,-2,0.91)) = 0.91

In an American Option at every node check if option can be exercised in addition to PV of Expected Value Eg at Node B & Origin



e power X on a Normal Calculator

- e = 2.7182
- Eg: If one has to find out value of $e^{0.05}$
- Enter value 2.7182
- Press Square root button 12 times
- Subtract 1
- Multiply the resultant with 0.05
- Add 1
- {x = } do this 12 times

Delta Shares method

△= (cu-cd)/(su-sd) = 2/12 =1/6
Cu 66-64=2 | Cd =max(0,54-64) = 0
Portfolio : △Shares – 1 Call
Portfolio : 1/6 Shares – 1 Call
PV: 1/6 x 60- Call = 10- Call –. Eq 1
Su-Cu: 1/6x66-2 = 9
Sd-Cd: 1/9 x54-0 = 9
Portfolio Same closing value on u & d =>
not affected by volatility => Rf return
⇒ PV of portfolio = 9/(1+rf) = 9/1.05 = 8.57
⇒ Substituting in Eq 1
⇒ 10- call = 8.57 => call = 1.43

Replicating portfolio Method

△Shares + Loan = PV of Portfolio
FV of Portfolio Su = △Shares x 66 + FV of Loan
= 1/6 x 66 + FV of Loan = 11 +FV Loan
FV of Portfolio Sd = 1/6x 54 + FV of Loan
= 1/6 x 54 + FV of Loan = 9 + FV Loan
If Cu = FV of Portfolio in Up case then
2 = 11 + Fv of Loan –> Eq 1
If Cd = FV of Portfolio in Down case then
0 = 9+ FV of Loan –> Eq 2
From Eq 1 & 2 FV of Loan = -9 => PV of Loan = -9/1.05 = -8.57
PV of portfolio = Delta Shares + Loan = 1/6 x 60-8.57
PV of portfolio = 10-8.57 = 1.43
Portfolio has same value on UP & Down side as Cu & Cd
=> PV of portfolio = PV of Call = 1.43

Black Scholes Method

S_0 – Current stock Price
K – Strike Price
T - time remaining until expiration, expressed as a percent of a year
r - current continuously compounded risk-free interest rate
σ – annualized volatility of stock price (the standard deviation of the returns over one year) expressed in decimals
ln – Natural Logarithm
N(x) - Standard normal cumulative distribution function (Area under Normal Curve) – To Use Interpolation to arrive at exact value
N(d1) = hedge ratio

K e^{-rt} N(d2) = borrowing which is equivalent to the present value of the exercise price times an adjustment factor of $N(d_2)$

So	185.00
K	170.00
r	7%
t	3.00
σ	0.18
Call Price	?

Value of Call Option

C = So * N(d1)-Ke $^{(-rt)}$ * N(d2)

d1 = ln(So/K)+(r+σ²/2)*t = 0.3432

--------- = --------- = 1.10071

$\sigma\sqrt{T}$ = 0.3118

N(d1) = 0.86446

d2 $d_1 - \sigma\sqrt{T}$ = 0.78894

N(d2) = 0.7849

C == So * N(d1)-Ke $^{(-rt)}$ * N(d2)

Price of call option ₹ 51.76

Ln (185/170) = ln (1.088235) = 0.077 + 0.0076 = 0.08456

Step 1: on Calculator – Type 1.088235
Step 2: Square root 12 times =
Step 3: Subtract 1
Step 4: Divide by 0.000244172
Ans: 0.08456

$\left(r + \frac{\sigma^2}{2}\right)T$ = (7% +(0.18)² /2) = 0.2586

$\ln\left(\frac{S_0}{k}\right) + \left(r + \frac{\sigma^2}{2}\right)T$ = 0.08456 + 0.2586 = 0.34316 : RO 0.3432

$\sigma\sqrt{T}$ = 0.18 x $(3)^{1/2}$ = 0.18 x 1.732 = 0.31177 : RO 0.3118

N(d1) = N(1.10071)
N(1.10) = 0.8643
N(1.11) = 0.8665
For 0.01 change on LHS , change in RHS is 0.0022 (0.8665-0.8643)
For 0.00071 change in LHS change in RHS (using interpolation) = 0.0022/0.01 x 0.00071 = 0.0001562
N(d1) = N(1.10071) = 0.8643 + 0.0001562 = 0.8644562: RO 0.86446

d2 = $d_1 - \sigma\sqrt{T}$ = 1.10071 – 0.3118 = 0.78894
N(d2) = N(0.78894)
N(0.78) = 0.7823
N(0.79) = 0.7852
For 0.01 change on LHS , change in RHS is 0.0029 (0.7852-0.7823)
For 0.00894 change in LHS change in RHS (using interpolation) = 0.0029/0.01 x 0.00894 = 0.0026
N(d2) = N(0.78894) = 0.7823 + 0.0026 = 0.7849

C = $\boldsymbol{S_0 * N(d_1) - Ke^{-rT}N(d_2)}$
C = $\boldsymbol{185 * 0.86446 - 170 * 0.8106 * 0.7849}$
C = 159.924 - 108.160
C = 51.76

$\mathbf{e^{(-0.21)} = 1 / e^{(0.21)}}$

To find out value of $e^{0.21}$
In Calculator
Step 1: Enter 0.21
Step 2: Divide by 4096
Step 3: Add 1
Step 4: x = 12 times
Step 5: Answer = 1.23367

$e^{(-0.21)}$ = 1/1.23367 = 0.8106

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574

Greeks – Statistical measure of Option price sensitivity

Greek	Description	Formula
Delta	Rate of change in option premium due to change in price of underlying asset Call option 0 to 1 Put option 0 to -1	$\textbf{Delta}\ (\Delta) = \frac{\textbf{Change in the price of the option}}{\textbf{Change in the price of the stock}}$
Gamma	Rate of change of delta : Always +ve	$\textbf{Gamma}\ (\gamma) = \frac{\textbf{Change in the price of the option}}{\textbf{Change in delta}}$
Theta	Rate of decline in the value of an option due to the passage of time	$\textbf{Theta}\ (\theta) = \frac{\textbf{Change in the price of the option}}{\textbf{Change in time period}}$
Vega	Change in the option price for a one-point change in the volatility	$\textbf{Vega}\ (\mathbf{V}) = \frac{\textbf{Change in the price of the option}}{\textbf{1\% Change in Volatility}}$
Rho	Measures the sensitivity of an option or options portfolio to 1 percentage change in interest rate	$\textbf{Rho}\ (\rho) = \frac{\textit{Change in the price of the option}}{\textit{Change in}\ \textbf{Interest rate 1\%}}$

Exotic Options

Structure, features & expiry dates different from plain vanilla options.

Exercise hybrid of American and European options

Expiry falls between these options.

- Exotic option can vary in pay off & time of exercise.
- More complex than vanilla options.
- Mostly Exotic options are traded in OTC market.

Binary Options/ 'Digital Option- guarantees the pay-off based on the happening of a specific event.

Cash or Nothing (Payoff is pre-determined)	Call	Put
Asset or Nothing (Payoff is the value of asset)	Call	Put

Chooser Options

Provides a right to buyer to decide option is call / put.
Premium of Max (call , put)

Compound Options / Split Fee / Option on Option

Right buy another option on the expiry
Payoff : On 1st option Mat date If 2nd option Price > Org Price then 1st option will be exercised.

Asian Options

Pay off determined by the average of the prices of the underlying

Average Price option pay off.

Asian Average Price Buy Call option pay off - Max (o, $S_{Avg} - K$)

Asian Average Price Buy Put option pay off - Max (o, $K - S_{Avg}$)

Average Strike option pay off.

Asian Average Strike Buy Call option pay off - Max (o, $S - S_{Avg}$)

Asian Average Strike Buy Put option pay off - Max (o, $S_{Avg} - S$)

Barrier Option

Contract will become active only if the price of the underlying reaches a certain price during a predetermined period.
Knock out option: If the underlying asset prices reaches a certain level, the option CEASES to exist.
Knock in Option: If the underlying asset prices reaches a certain level, the option COMES INTO EXISTENCE.

A down and Out (Knock Out)	**Call**	**Put**
A down and in (Knock in)	**Call**	**Put**
An Up and Out (Knock Out)	**Call**	**Put**
An Up and in (Knock in)	**Call**	**Put**

Bermuda Option: Compromise between European and American options. Exercise restricted to certain dates or on expiration

Basket Options: Value of option is dependent on value of a portfolio i.e., a basket., instead of a single asset.

Value of the option is computed based on the weighted average of underlying constituting the basket.

Spread Options: Payoff depends on difference between prices of two underlying. Eg: Crude Spread; bond yield spreads etc

Look back options: On maturity holder right to choose most favourable strike price;

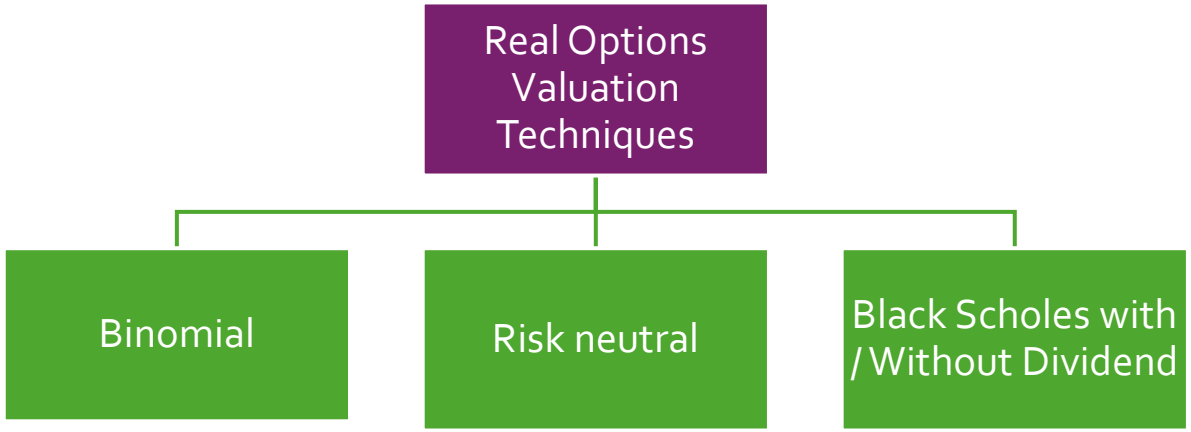
Eg for a buy call, the holder can choose lowest price at which the underlying traded during the life of the option

Real Options

- Approach to **capital budgeting**
- **Relies on Option Pricing theory**
- Used to **evaluate projects.**
- Intended to **supplement,** not replace **DCF**

Types	Action	Feature
Long Call	Right to invest at future date at a price	Flexibility to invest, to enter a business, to expand a business
Short Call	Promise to sell if the counterparty wants to buy	Commitment to disinvest upon the action of another party
Long Put	Right to sell / abandon at future date at a price or Zero	Flexibility to disinvest, to exit from a business
Short Put	Promise to buy if the counterparty wants to sell	Commitment to invest upon the action of another party

	Financial Options	Real Options
Underlying	Shares, stocks, bonds, commodity etc.	Projects not traded in the market.
Pay-off	Specified in contracts & fixed.	Estimated from project cash flows & Varies
Exercise Period	Short <1 year	Long > 1 Year
Approach	Traded in Market - Priced	Used to make decisions- Valued



Types of Real Options	Eq Fin Option	Types of Real Life Projects
Growth Options	European Call	• Investment in R&D activities • Advertisement • Initial investment in foreign market to expand business in future • Acquiring making rights • Acquisition of vacant plot with an intention to develop it in future
Abandonment Options	American Put	• Option to Divest • Without further losses
Timing Options	American Call	• Third choice i.e., delay the decision until later, i.e., option when to invest due to availability of better information or ideas

Growth option – European Call | Illustration

ABC Ltd. Holds a 15 years Drug Patent.
Marketing & Development Spend required = $ 12.5 million - K
Expected PV of CF from Patent for 15 years = $ 16.7 million. -Spot
CF σ^2 = 26.8% of the present value of cashflows.
Rf = 7.8%
Determine the value of the patent.
ln(1.336) =0.2897 | $e^{1.0005}$ = 0.3677 and $e^{-1.17}$ = 0.3104

$$d_1 = \frac{ln\left(\frac{S}{k}\right)+\left(r-q+\frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$d_1 = \frac{ln\left(\frac{16.7}{12.5}\right)+\left(7.8\%-6.67\%+\frac{26.8\%}{2}\right)15}{\sqrt{26.8\%}\sqrt{15}}$$

$$= \frac{0.2897+(0.145333)15}{0.517687*3.87298}$$

$$= \frac{2.4696995}{2.00499} = 1.23177$$

$N(d_1)$ = 0.8910

$d_2 = d_1 - \sigma\sqrt{t}$

$= 1.23177 - \sqrt{26.8\%}\sqrt{15}$

$= 1.2377 - 2.00499 = -0.7732$

$N(-d_2)$ = 1–N(d2)
= 0.2196

$C = N(d_1) * S * e^{-qt} - N(d_2) * k * e^{-rt}$

$= 0.8910 * 16.7 * e^{-0.06667*15} - 0.2196 * 12.5 * e^{-0.078*15}$

$= 0.8910 * 16.7 * e^{-1.0005} - 0.2196 * 12.5 * e^{-1.17}$

$= 0.8910 * 16.7 * 0.3677 - 0.2196 * 12.5 * 0.3104$

Value of Option = **$4.6192 million**

PV of Spot decays over 15 Years @ 1/15 every year = 6.67% - Use BSM with Dividend

Abandonment option – American Put | Illustration

PV of proposal is ₹100 crore without the abandonment option.
However, if market conditions turn out to be favorable the PV of proposal shall increase by 30%.
If market conditions remain sluggish the PV of the proposal shall be reduced by 40%.
In case company is not interested in continuation of the project it can be disposed of for ₹ 80 crore.
If the risk-free rate of interest is 8% then what will be value of abandonment option.

Assume abandonment option exists after a year.

u = 1+30% = 1.3

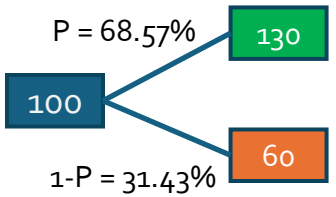
d = 1- 40% = 0.6

$P = \frac{e^{rt}-d}{u-d} = \frac{1.08-0.6}{1.3-0.6} = \frac{0.48}{0.7}$ = **0.6857**

$1-P$ = 0.3143

Expected Value of abandonment option (Put Option) at the end of year 1 = 0.6857* 0 + 0.3143*20 = 6.286

PV of the abandonment option = $\frac{6.286}{1.08}$ = **₹5.8204 Cr**

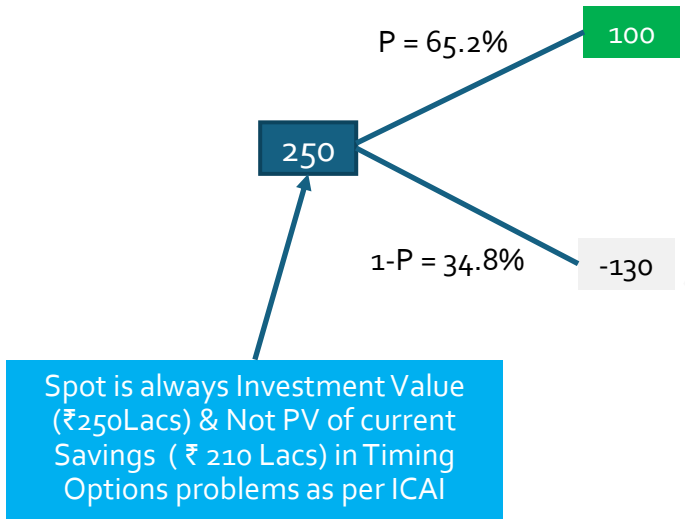


If PV is>100, Project will not be abandoned

Put Option - So Downside value is relevant.
Payoff = Strike – PV, i.e 80-60 = 20

Timing option – American Call | Illustration

- MIS Ltd. is considering installation of solar electricity generating plant - cost ₹ 2.50 crore
- Saving in Annual electricity expenses at current tariff ₹ 21 lakh per year forever.
- Price of electricity is subject to change.
- Saving in electricity can be of ₹ 12 lakh or ₹ 35 lakh per year and forever.
- Assuming WACC of MIS Ltd. is 10% and risk-free rate of rate of return is 8%.
- Decide whether MIS Ltd. should accept the project or wait and see.



Investment	= ₹ 2.5 Cr
Current Savings	= ₹ 21 lakhs per year (WACC @10%)
PV of Current Savings	= *210.1* = ₹ 2.1 Cr
Current NPV	= –2.5+ 2.1 = –0.4 Cr

Delay: Timing Options

Inflow PV Computation	$\frac{12}{0.1}$	$\frac{35}{0.1}$
Inflow	120 Lakhs	350 Lakhs
Outflow	-250 Lakhs	-250 Lakhs
NPV	– 130 Lakhs	100 Lakhs

u	= *350/250*	= 1.4
d	= *120/250*	= 0.48
P	= *Rf–d / u–d*	= *1.08–0.48/ 1.4–0.48*
	= *0.6 / 0.92*	= **0.652**
1–P	= 0.348	

Pay Off (after 1 year) = 100*0.652 + (–130*0.348)
= 65.2 – 45.24
= **19.96 Lakhs**

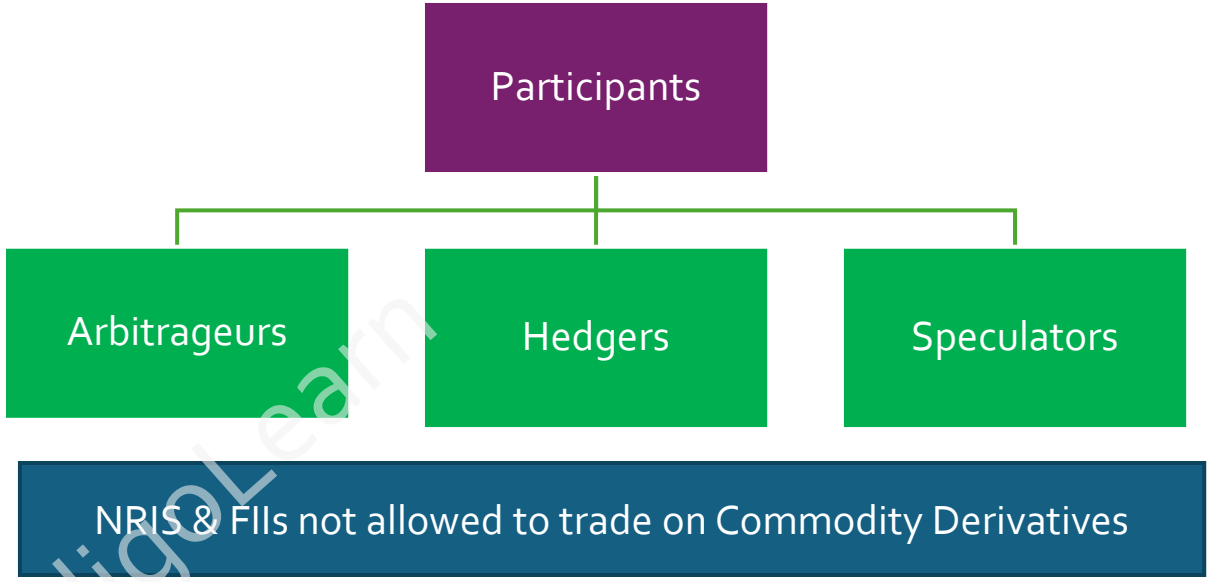
Current Value of Option = *19.96/ 1.08* = **₹ 18.48 Lakhs**

Option has +ve Value hence the company should wait and decide

Commodity Derivatives: Underlying Assets

- Base Metal
- Precious Metal
- Energy
- Cereals
- Oil Seeds
- Spices

To reduce risk arising out of future price uncertainty.
MCX & NCDEX – Major Commodity Exchanges in India



Factors Affecting Prices

- Demand-Supply situation
- Government Trade Policies
- Global economic situation
- Currency Movements
- Geo-political tensions
- Market sentiments
- Investment Funds
- Weather dynamics
- Seasonal cycles

Benefits of Trading in Commodities

- Diversification of Portfolio
- Inflation protection
- Hedge against event risk
- Provides high liquidity.
- Trading on lower margin

Commodity Futures Pricing

$F = S_0 x\ e^{(r+s-c)t}$

S – Spot | r – Interest Rate | S- Storage Cost | C – Convenience Yield

Commodity Options – Call & Put

Commodity Swaps

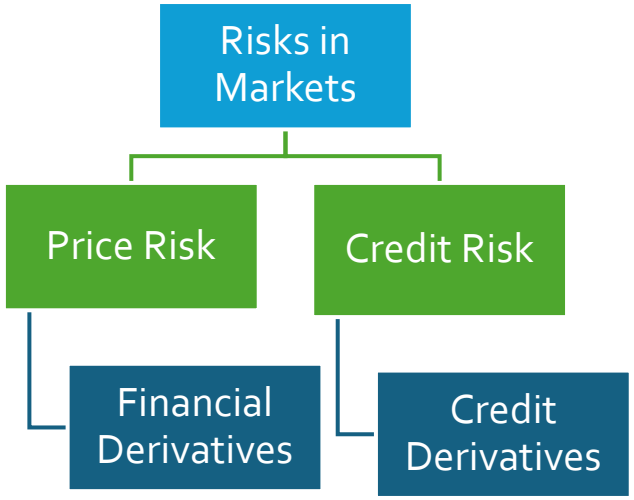
Fixed-Floating Swaps
Just like fixed-floating swaps in IRS except both indices are commodity-based indices.

Commodity-for-Interest Swaps
Like equity swap - Total return on commodity exchanged for money market rate +/- spread).

Issues with Valuing Commodity Swaps:

- Cost of hedging high
- Institutional structure of market
- Liquidity of the underlying commodity market
- Seasonality and its effects on the underlying market
- The variability of the futures bid/offer spread
- Brokerage fees
- Credit risk
- Capital costs and administrative costs

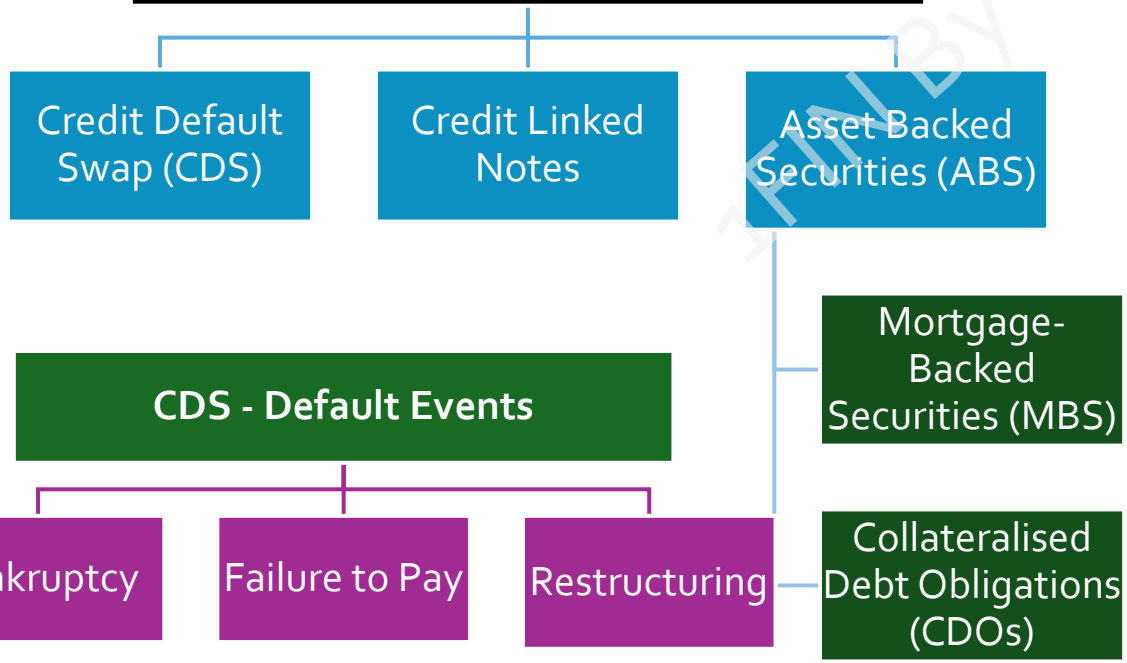
Credit Derivatives

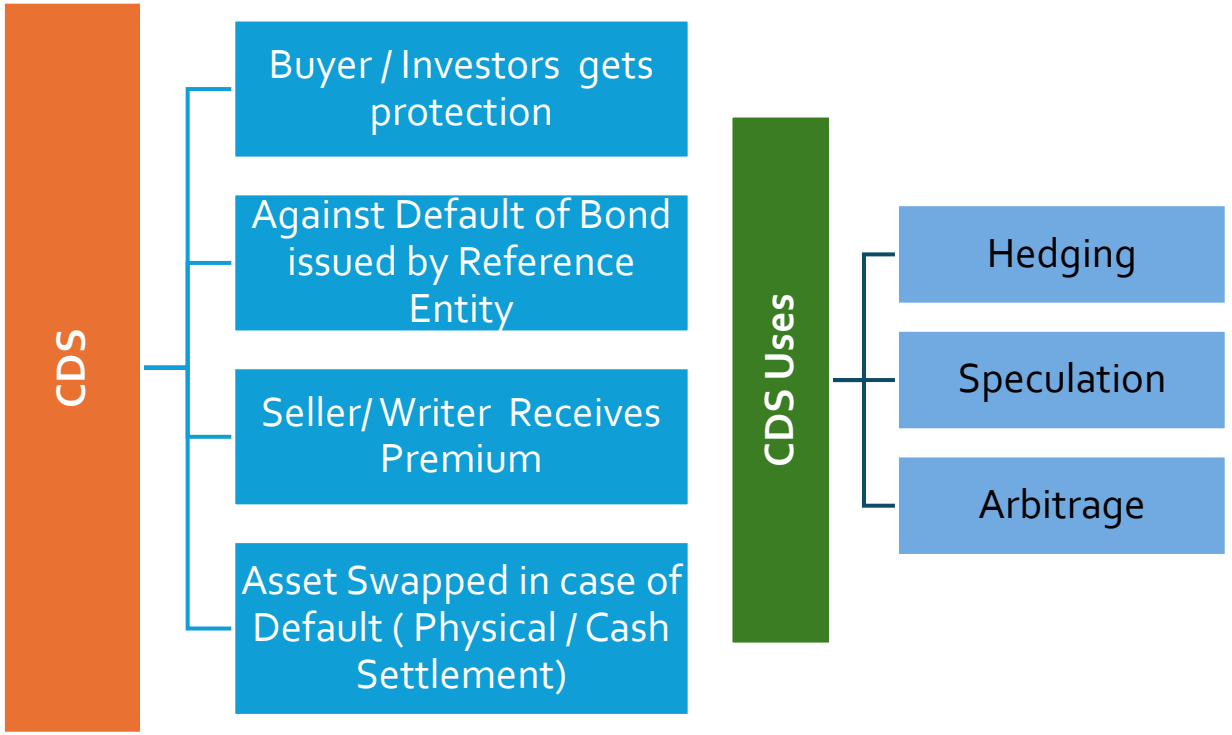


CDS Features

- Non-standardized private contract - covered in the category of Forward Contracts.
- Not normally traded on exchange - free from regulations.
- The International Swap and Derivative Association (ISDA) rules used for CDS contracts
- Can be purchased from 3rd party to protect from default of borrowers.
- An individual bond investor can buy CDS – improves confidence
- The cost or premium of CDS +Ve relationship with risk attached with loans.
- Risky Bonds => higher CDS premium
- CDS buyer without underlying bond investment - "naked CDS".

Types of Credit Derivatives

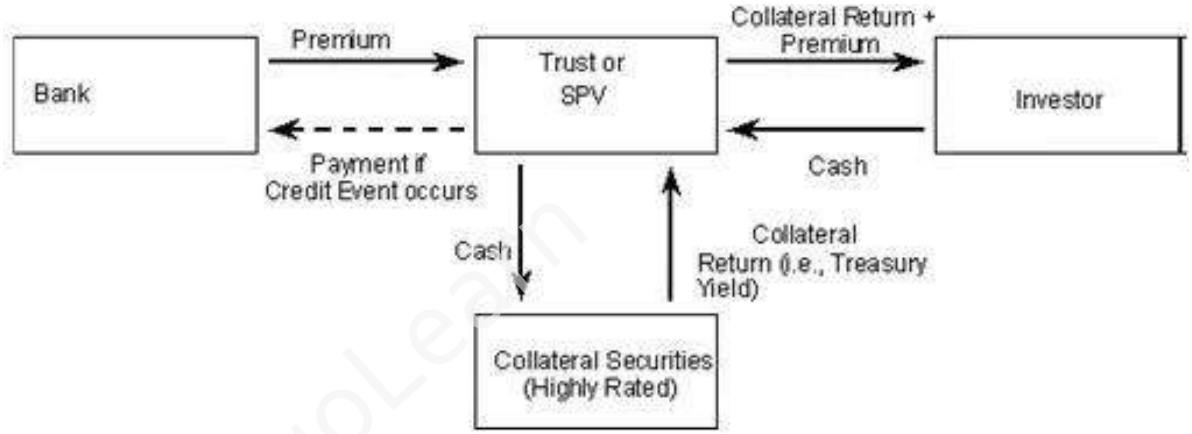




Credit Linked Notes (CLN)

CLN is,

- A funded credit derivative
- Structured as a security with embedded CDS
- Allows issuer to transfer a specific credit risk to credit investors.
- The issuer not obligated to repay the debt if a specified event occurs.
- Eliminates a third-party insurance provider.
- Structured note issued by a SPV or trust,
- Offers investors par value at maturity if referenced entity does not default
- In the case of default, the investors receive a recovery rate
- Purpose of the arrangement is to pass the credit risk to investors
- CLNs backed by U.S. Treasury securities.



Step 1: A bank lends money to a company, XYZ.

Step 2: At the time of loan Bank issues credit-linked notes

Step 3: CLNs are purchased by investors.

Step 4: The interest rate on the notes is determined by the credit risk of the company XYZ.

Step 5: Funds raised by Bank by issuing notes invested in bonds high grade bonds.

Step 6: If company XYZ is solvent, the bank is obligated to pay the notes in full.

Step 7: If company XYZ goes bankrupt, the noteholders/investors become the creditor of the company XYZ and receive the company XYZ loan.

Step 8: The bank in turn gets compensated by the returns on less-risky bond investments funded by issuing credit linked notes.

Asset Backed Securities (ABS) is a pool of assets that consists of any debt like credit card debt, outstanding auto loans, student loans, or any other debts.

- **Various Assets are pooled**
- **Various types of new Securities (known as tranches) are issued based on original assets' cashflows**
- **Different tranches have different risk and return structure**

Figure 8.1 An asset-backed security (simplified); bp = basis points (1 bp = 0.01%).

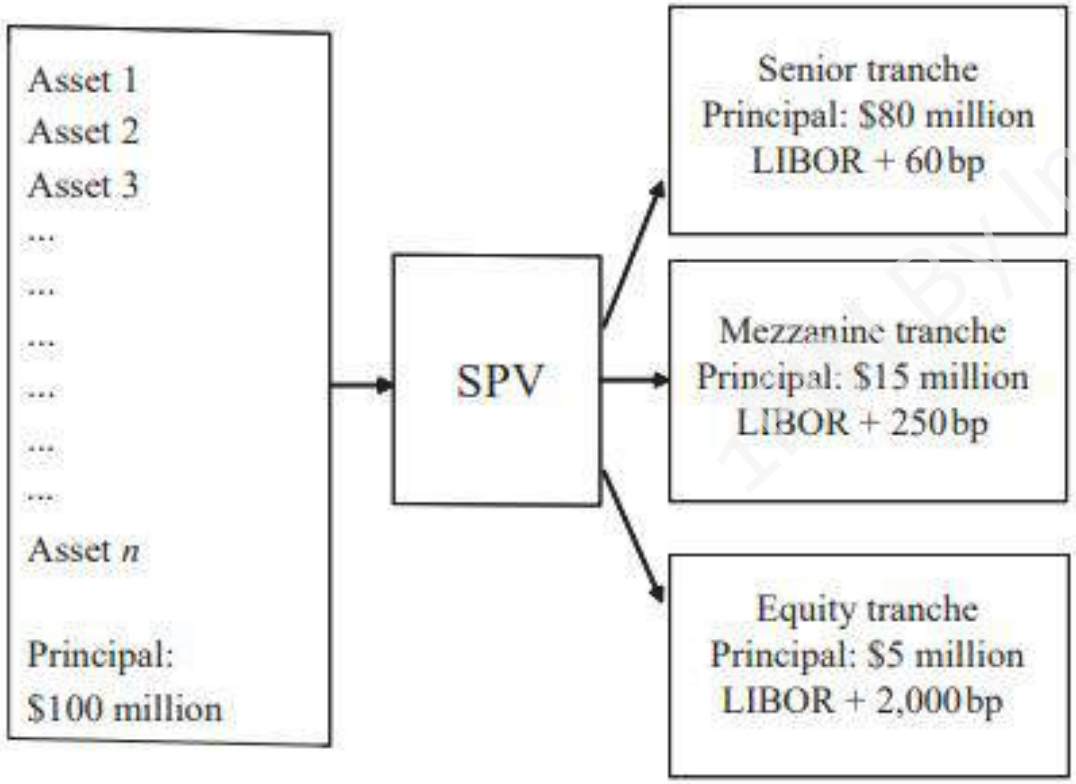
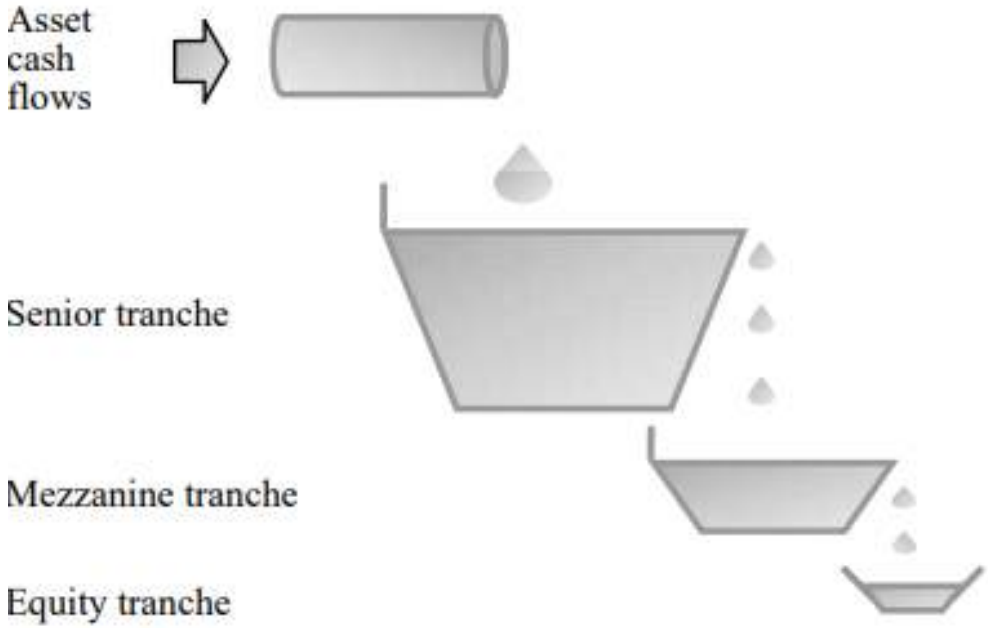
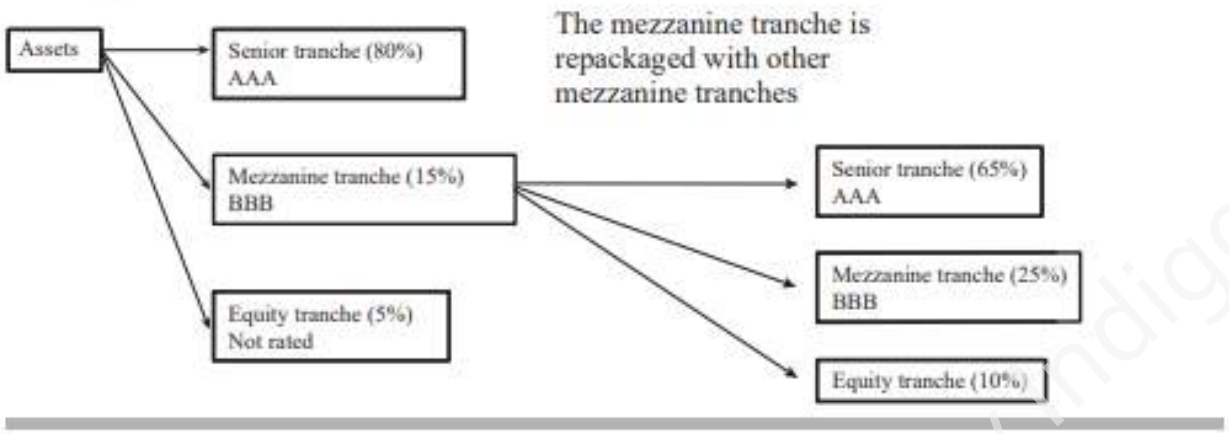


Figure 8.2 The waterfall in an asset-backed security.



Collateralised Debt Obligations (CDO) consists of a pool of debt, such as auto loans or home equity loans & mortgage loans and other ABS

Figure 8.3 An ABS CDO (simplified).



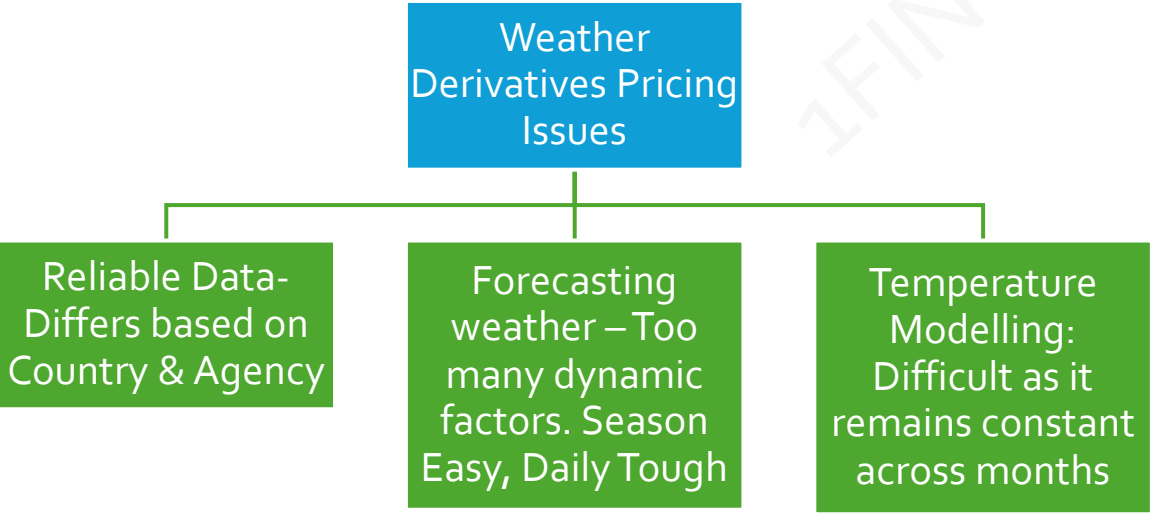
Risks in CDOS	
Default / Credit	Junior tranche – highest Risk
Interest Rate Risk	Basis Risk – Fixed to Floating inflow vs outflow
Liquidity Risk	Mismatch in inflows & outflows
Prepayment Risk	In Falling rate environment , debtors repay fixed loans
Reinvestment Risk	CDO Manager unable to reinvest inflows
Forex Risk	Debts & Loans of Foreign Countries then this risk arises

Types of CDOs

- Cash CDOs - Backed by cash market debt or securities which normally have low risk weight.
- Synthetic CDOs
  - Instead of transferring ownerships of collateral to SPV - credit risk is transferred by originator without actual transfer of assets using CDS (Unfunded) or CLN (Fully Funded) - Partially Funded: - Partially through issue of CLN and partially through CDS.
  - Obtain Regulatory capital relief benefits vis-à-vis cash CDOs.
  - More popular in European market due to less legal documentation requirements.
- Arbitrage CDOs:
  - Issuer captures spread between Underlying collateral return & cost of borrowing to purchase collaterals.
  - Issuer also collects the fee for the management of CDOs.
  - Arbitrage arises due to acquisition of high yielding securities with large spread

What are Weather Derivatives?

- Used to **hedge Volumetric risk** arising out of **unfavourable weather patterns &** Not Price Risk
- Underlying "asset", a **weather measure like rainfall, temperature, humidity**, wind speed, etc. which influences the trading volume of goods.
- Weather derivative Vs. insurance contract:
  - Insurance provides protection to extreme, low probability weather events, such as earthquakes, hurricanes, and floods, etc.
  - Weather Derivatives used to protect the holder from all types of risks, including uncertainty in normal conditions - more likely to occur where less dramatic events can lead to huge losses.
- **Seller receives premium & will provide monetary amount if buyer suffers financial loss due to adverse weather conditions.**



Spot electricity prices are volatile, due to

- smaller market size
- dynamic factors such as
- change in fuel supply positions.
- weather conditions
- transmission congestion
- variation in RE generation, and
- physical attributes of production and distribution

Derivatives can help producers, consumers & distributors & enable future price discovery

Types of electricity derivatives :

(i) forwards,

(ii) futures, and

(iii) swaps.

Electricity Forwards - obligation to buy or sell a fixed amount of electricity at a pre-specified contract price (forward price), at a certain time in the future (called maturity or expiration time).

Payoff of an electricity Forward Contract = (ST - F); where ST is spot price at time T. Underlying electricity is a different commodity at different times.

ST usually calculated based on the average price of electricity over the delivery period at the maturity day "T".

Electricity Swaps : financial contracts that enable holders to pay a fixed price for underlying electricity, regardless of the floating electricity price, or vice versa, over the contracted time.

- referenced to a variable spot price at either a generators or a consumer's location.
- used in providing short-to-medium term price certainty for up to a couple of years.
- can be considered as a strip of electricity forwards with multiple settlement dates and identical forward prices for each settlement.

Electricity Locational Basis Swap : holder agrees to either pay or receive the difference between a specified futures contract price and another locational spot price for a fixed constant cash flow at the time of the transaction. Used to lock-in a fixed price at a geographic location that is different from the delivery point of a futures contract

Lessons from Derivative Mishaps

- Don't buy any derivative product that you don't understand
- Due diligence before making Treasury Department as a Profit Centre
- Specify the Risk Limits
- Separation of Front, Middle and Back Offices
- Ensure that a hedger should not become a speculator
- Carry out Stress Test, Scenario Analysis etc.

Electricity futures contracts are standardized contracts in terms of trading locations, transaction requirements and settlement procedures.

- Quantity < forward contracts.
- Futures traded on the organized exchanges hence transparent
- Net cash Settled.
- Credit risks and monitoring costs lower than forwards
- Strict margin requirements
- Gains and losses paid out daily
- Limitations :
  - Basis risks due to rigidity in futures specification
  - Limited transaction quantities.

FOREX EXPOSURE & RISK MANAGEMENT

CA Final | AFM
Last Day Revision Notes / Summary Notes / Concept Notes
Sriram Somayajula CA, CFA, ISB
1FIN By IndigoLearn

Market Convention USDINR is 85

Base Currency

Quote / Price Currency

- $1 = ₹85
- Rupees Per Dollar = 85
- ₹/$ = 85
- INR Per USD = 85
- INR / USD = 85

ICAI uses USD /INR = 85 as well as INR/USD = 85 interchangeably. Important to remember currency strength (as below) when quotes are given in a confusing manner

Direct Quote

Units of Domestic Currency for 1 Unit of Foreign Currency

Inverse of each other

Indirect Quote

Units of Foreign Currency for 1 Unit of Domestic Currency
INRUSD i.e USD per INR
1/85 = 0.011765

All currencies in the world are quoted Directly with refence to US Dollar except

Only Currencies with Indirect Quote **Always** against USD

Euro / AUD / NZD / GBP

Always	GBP	>	USD	>	INR	>	JPY

Now	GBP	>	CHF	>	EUR	>	USD	>	SGD	>	CAD	>	AUD	>	NZD	>	INR	>	JPY
Vs USD	1.34		1.24		1.17		1.00		0.78		0.73		0.65		0.60		0.011		0.007

In India OTC Forex market is open from 9 AM to 5.00 PM | Exchange trading closes by 3.30 PM

Transaction Type	Settlement
Cash	T +0
Tom	T +1
Spot	T + 2
Forward / Future	For dates beyond 2 days

Normally prices are always quoted in terms of Spot exchange rates

	Quote USD INR
01 Jan 20x1	85.0000
31 Jan 20x1	86.5321
Forward premia in ₹	1.5321
Forward points	153.21
Pips	21
Big Figure	85
Forward premia in %	1.5321 /85 x 12 x100 = 21.63% pa

Forwards & Futures are priced similarly

Fwd / Fut Price = Spot + Premium /Discount

USDINR Spot = 85

USDINR one Month Forward = 87
Rs.2 is Premia

USDINR one Month Forward = 82
Rs.3 is Discount

Premium / Discount = Interest Differential Between Currencies

Spot 85 Fwd 86 → INR Dep & USD App
Spot 85 Fwd 84 → INR App & USD Dep

USD Is Base Currency 👇

USD INR 85.50/51

₹85.50 Bid Rate / Buy Rate	₹85.51 Ask Rate / Offer Rate / Sell rate	Bid Ask Spread% = (Ask – Bid) / (Bid) =(0.01/ 85.50)x 100

If INR Is Base Currency then Bid & Ask Interchange

INRUSD
Bid = 1/85.51= 0.011694
Ask = 1/85.50= 0.011696

B4C Banker Bids to Buy the Base Currency

Bank will Buy 1 USD from a customer @ ₹85.50 Per USD
Bank will Sell 1 USD to a customer @85.51 per USD
₹0.01 or 1 Forward point is the Bid- Ask Spread
Bank will always Buy Cheap & Sell Dear
Customer will always Buy Costly and Sell Cheap

Inter-bank Market (between Banks)

RBI Regulator

HDFC ICICI CITI

Authorised Dealers (ADs)

Merchant Market

Customers → Importers / Exporters

Quote USD INR	
Case 1	
Spot	85.00 /01
1 Month Forward Points	20/21
1 Month Forward Rate	**85.20/22**
Case 2	
Spot	85.00/01
1 Month forward Points	25/20
1 Month Forward Rate	**84.75/84.81**

When Bid Fwd Pts < Ask Fwd Pts, then Fwd pts should be added to spot to get Forward Rates (Bid & Ask)

When Base currency is at a Premium / is appreciating & Quote Currency is Depreciating
FWD>Spot

When Bid Fwd Pts > Ask Fwd Pts, then Fwd pts should be subtracted to spot to get Forward Rates (Bid & Ask)

When Base currency is at a Discount / is Depreciating & Quote Currency is Appreciating
FWD < Spot

FORWARD Points are also known as SWAP Points

Forward Premium = Interest Differential

*Interest Rates are not added / Subtracted Directly, but are Multiplied / Divided

	Quote USD INR
Spot	85.00
Indian Interest Rate	9% pa
USD Interest Rate	3% pa

1 Month Forward Rate

85 x (1+9%/12) / (1+3%/12) = 85.42

In Direct Quote, Base currency Interest Rate is in Denominator & Quote Currency Int Rate is in Numerator when we arrive at Fwd rate from given Spot

F = S x (1+D) / (1+F)

Cross Rates : Exchange rates expressed by any currency pair that **does not involve US dollar** are called cross rates

Spot		Quote
USDINR	INR per Dollar	85.00
GBPUSD	USD per GBP	1.3
GBPINR	INR per GBP	??

$$\frac{85\ \text{INR}}{1\ \cancel{\text{USD}}} \times \frac{1.3\ \cancel{\text{USD}}}{1\ \text{GBP}} = \frac{85 \times 1.3\ \text{INR}}{1\ \text{GBP}} = \frac{110.5\ \text{INR}}{1\ \text{GBP}}$$

Arrange Currency in Proper Order
(X Units Per Y units) before arriving at cross rates

For Bid Ask Quotes, Bid Rates are multiplied with Bid Rates and Ask Rates with Ask Rates to arrive at cross currency Bid/ Ask Quotes

IntRates are almost always given in Per Annum basis (pa). Sometime forward premia may be mentioned for period
Eg 1: Forward Premia :8% PA :Spot 85 => 3 months forward = 85* (1+8%*3/12) = 86.70
Eg 2: 3 Month Premia :5%:Spot 85 => 3 months forward = 85* (1.05) = 89.25

Exchange Margin is usually 0.10% in ICAI Problems

Exchange rates are quoted in 4 decimals and rounded off to 0.25 paise i.e ₹ 0.0025 in some problems

Exchange margin is an income to Dealer

Spot 84 + 1 Month Premium ₹1 Then Forward Rate = 85.00
Exchange margin is calculated on this forward rate

When a merchant Buys USD and gives INR to Dealer, the Merchant Pays exchange margin
85.00 + 0.10% = 85.0850
=> Extra Amount Paid by Customer

When a Merchant Sells USD and gets INR from Dealer, the Dealer deducts Exchange margin
85.00 -0.10% = 84.9150
=> Reduced Amount Received by Customer

Spot (USD INR)	85.00/01
1 Month Fwd Points	20/21
2 Month Fwd Points	30/31
3 Month Fwd Points	40/41
75 Day forward	85.35/37

Broken Period Forwards

Bid = 85 + 0.30 + (0.40-0.30) x 15/30 = 85.35
Ask = 85.01 + 0.31 + (0.41-0.31) x 15/30 = 85.37

Exchange Rate Theories

Interest Rate Parity	Purchasing Power Parity	International Fisher's Effect based on nominal int rate, real int rate & Inflation
Forward Premium = Interest Differential	Forward Premium = Inflation Differential	(1+ nd) = (1 +rd) x (1+inf d) (1+ nf) = (1 +rf) x (1+inf f)
When Interest Rate Parity Exists, Covered Interest Arbitrage is not possible	Absolute Form Spot = α x Price Level Dom / Price Level Foreign α = Sectoral Constant	If real rates are same across countries, then Exchange rates are influenced by Inflation rates
Per Covered Interest Arbitrage F = S x (1+Int D)/ (1+Int F) | [All are Direct Quotes]	Relative Form Exp Spot = So x (1+Inf D)/ (1+Inf F) | [All are Direct Quotes]	F = So x (1+Nominal D) / (1 + Nominal F)
Per Uncovered Interest Arbitrage Exp Spot = S x (1+Int D)/ (1+Int F) | [All are Direct Quotes]		
Currencies of Countries with Lower interest rate appreciate; Eg USD Vs. INR		
Currencies of Countries with higher interest rate depreciate: Eg INRVs. USD		

Covered Interest Arbitrage:
USD INR 85 INR Int Rate 9% pa, USD Int rate 5% pa
1 Year FWD & Exp Spot = 85 x 1.09/1.05=88.23

→ Ideal Premium = 1.09/1.05 = 3.81%

IF 1 Year USD INR forward is mispriced at ₹87 then (Premium % = 2/85 = 2.35%)	
Day 0 – Borrow 1 USD	1
Day 365 – Repay USD loan at 5% Int	1.05
Day 0 – Enter in forward contract to buy 1.05 USD on day 365 @ 87	
Day 0 – Convert to INR	1 x 85= 85
Day 0 – invest in INR @ 9% return	85
Day 365 – Get back INR deposit	85 x 1.09 = 92.60
Day 365 – Buy 1.05 USD using Fwd contract – Buy USD from money received on INR deposit maturity	87 x 1.05 = 91.35
Repay USD Loan	1.05
Arbitrage profit INR	**92.60-91.35 = 1.25**

IF 1 Year USD INR forward is mispriced at ₹90 then (Premium % = 5/85 = 5.88%)	
Day 0 – Borrow in INR Equal to 1 USD	85
Day 365 – Repay INR Loan @ 9% Int	85 x 1.09= 92.65
Day 0 – Enter in forward contract to Sell 1 USD on day 365 @ 90	
Day 0 – Convert INR to USD	85 / 85 = 1 USD
Day 0 – invest in USD @ 5% return	1
Day 365 – Get back USD deposit	1.05
Day 365 – Sell1.05 USD using forward contract – Buy INR from USD received on USD deposit maturity	1.05 x 90 = 94.5
Repay INR Loan	92.65
Arbitrage profit INR	**94.50 – 92.65 = 1.85**

Premium Greater than Interest Differential then Borrow Domestic, else Borrow Foreign – **PGIDBD**

	Int Differential	USDINR 90	USD INR 87
Premium %	3.81%	5.88%	2.35%
Status	-	Premium > Int Differential	Premium < Int Differential
Prem Vs. Int Diff		5.88% >3.88%	2.35% < 3.88%
Borrow in		Borrow in INR	Borrow in USD
Flow		INR Outflow	USD Inflow
Forward Contract		90	87
Buy / Sell		Sell USD on Forward as Forward is costly	Buy USD on Forward as Forward is cheap
Loan		Implies Get INR in hand to repay INR Loan	Implies Get USD in Hand to repay USD Loan
Deposit		Implies USD Deposit	Implies INR Deposit

Money Market hedge Same Principles as "Covered Interest Arbitrage" Apply

USD INR Spot	85.00
Interest Rate India	9%
Interest Rate USD	5%

Import Payable USD 1 Mio

Step	Action	Working	Amount
1	Day 0 – Borrow in INR		INR 8,09,52,385
2	Day 0 – Convert INR to USD @85	USD 952,381 x INR 85 / USD	INR 8,09,52,385
3	Day 0 – invest in USD @ 5% return	USD 1 Mio / 1.05	USD 952,381
4	Day 365 – Get back USD deposit with 5% Return		USD 1 Mio
5	**Day 365 Use USD Deposit Proceeds to Pay USD Supplier**		**USD 1 Mio**
6	Day 365 Repay INR Loan	INR 8,09,52,385 x 1.09	INR 8,82,38,100
7	**Pay INR 8,82,38,100 for USD 1 Mio Implied Exchange Rate**	**INR 8,82,38,100/ USD10,00,000**	**USDINR 88.2381**

Start with Step 5 & Work Backwords

Money Market hedge Same Principles as "Covered Interest Arbitrage" Apply

USD INR Spot	85.00
Interest Rate India	9%
Interest Rate USD	5%

Export Receivable USD 1 Mio

Step	Action	Working	Amount
1	Day 0 – Borrow in USD	USD 1 Mio / 1.05	USD 952,381
2	Day 0 – Convert USD to INR @85	USD 952,381 x INR 85 / USD	INR 8,09,52,385
3	Day 0 – Make INR Deposit @ 9%		INR 8,09,52,385
4	Day 365 Repay USD Loan		USD 1 Mio
5	**Day 365 Use Export proceeds to Repay USD Loan**		**USD 1 Mio**
6	Day 365 Receive INR Deposit	INR 8,09,52,385 X 1.09	INR 8,82,38,100
7	**Receive INR 8,82,38,100 for USD 1 Mio Implied Exchange Rate**	**INR 8,82,38,100/ USD10,00,000**	**USDINR 88.2381**

Start with Step 5 & Work Backwords

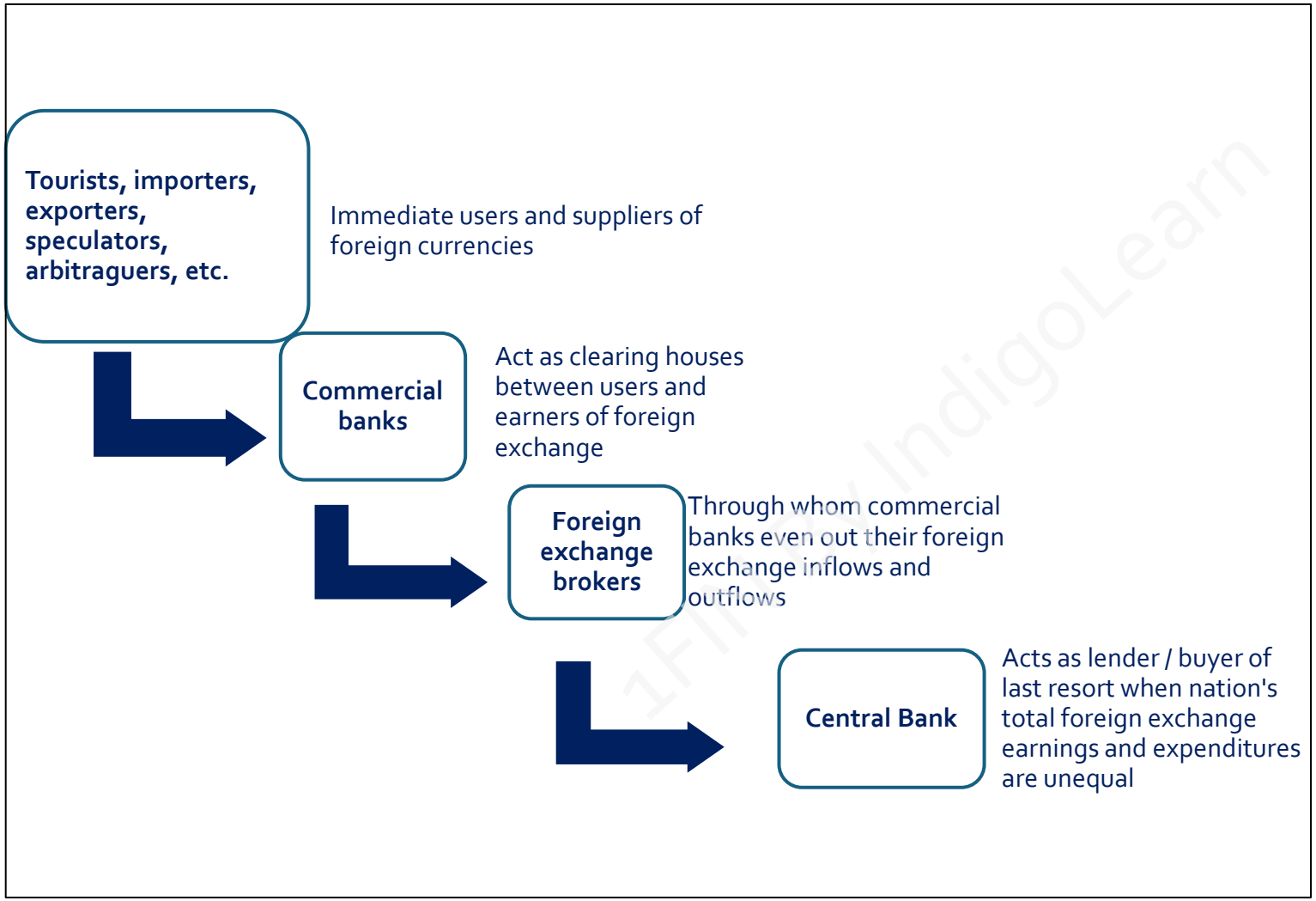
Things to Remember in Problems	
Square Off	Whatever is bought is sold back / Whatever is sold is bought back – Usually looked in USD Terms unless specified in problems
Questions with unclear exchange rates	Always Solve Arbitrage Problems by working using Exchange rates with clear values ; Eg USDINR 85.10& INR USD 0.01 – Chose the first rate 85.10
Arbitrage	Means Buying and selling at same time in different market (geographical or otherwise i.e MUM & London or Spot & Futures) to make risk less profit
LC Commission	Usually paid upfront and is also computed on pa basis
Buyers credit / Suppliers credit	Computed on pa basis
Multiple modes of finance	Compare cost as per all modes of financing for a common date of repayment
Option Premia	When option premia is mentioned in %, it is not pa; Eg 3 month Rs.85 Call premia is 1.5% When USD INR spot is 90, premia is computed as 1.5% of Strike 85 = Paise 127.50 & not on Spot of ₹90
Option Premia	Buyer of an option (call or put) pays premia & seller of an option (call or put) receives premia

Buy Call @ 76.50 | Pay off

USD INR	Prob	Exercise	Pay Off	Exp Payoff
75.00	20%	No	0	0
76.00	30%	No	0	0
77.00	40%	Yes	0.50	40% x 0.50
78.00	10%	Yes	1.50	10% x 1.50
Expected Payoff				**0.35**

Do not Multiply Exchange rate with Probability and arrive at expected Exchange rate & then compute Expected Value of Option (75 x 20% + 76 x 30% + 77 x 40% + 78 x 10% =76.4
Option Payoff = Max(0, 76.40-76.5) = 0

Participants in Forex Markets



SWIFT

- Society for Worldwide Interbank Financial Telecommunication
- A messaging system not DTP System
- Founded in 1973 and HQ, Belgium, an NPO
- Used in 200 countries
- Employs a dedicated computer network system for communicating fund transfers.
- Assigns 3 lettered codes for currencies Eg: USD, INR Etc
- Form of quick settlement as messaging takes place within seconds.
- Has full backup and recovery
- Secure & reliabile helps to reduce Operational Risk
- Catalyst for financial agencies

Payment Gateways

- Virtual mode equivalent to physical mode of transfer of cash
- authenticates and routes payment details in an extremely secure environment.
- "encrypted" channel, between customers, merchants and Banks
- Completes the transaction/ order along with verification vide a reference number.

Disadvantages:

- Customer not have an account with the banks supporting PG.
- Some payment gateways have only limited number of banks.
- There are problems of reliability by Customers

Advantages

- 24x7x365 convenience.
- Real time authorisation of credit/debit cards.
- Rapid, efficient transaction processing.
- Multiple payment options.
- Minimising risk using encryption
- Flexible, powerful real-time reports
- Facility for customer refund.
- Ease of use for Merchants
- CA (Certifying Authority) authenticated
- Multiple host interfaces.

International PGs - Multi-currency payments

- Chances of customer conversion increase
- Customers get ability to pay in the currency they know best – their own.
- Not only accelerate but also make international payments and transactions easy.
- Customers can easily benchmark prices if it is quoted in their own currency.

Letter of Credit (LC) issued by a bank (of customer) to another bank (of supplier) to serve as **guarantee for payments** under specified conditions. LC Opened by Importer on Exporter, Issuer bank will charge some fee from importer for providing this facility.

Usance LC is for specific period **(90 /180 days etc)** - due date for payment fixed / calculated from the date of shipment / BL .

Sight LC, payment upon presentment & at end of normal transit period.

Per FEDAI Rules Sight LC Transit Period

- Bill in Foreign Currencies – 25 days
- Bills in Rupees not under LC – 20 days

Normal transit period means the Average period normally involved from date of negotiation/ purchase/ discount till receipt of bill proceeds.

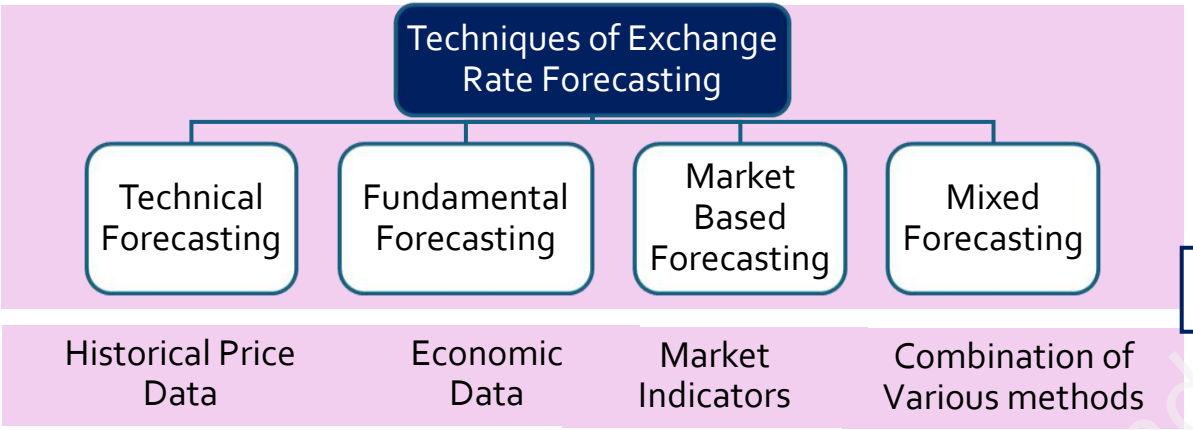
It is not to be confused with time taken for arrival of the goods at destination.

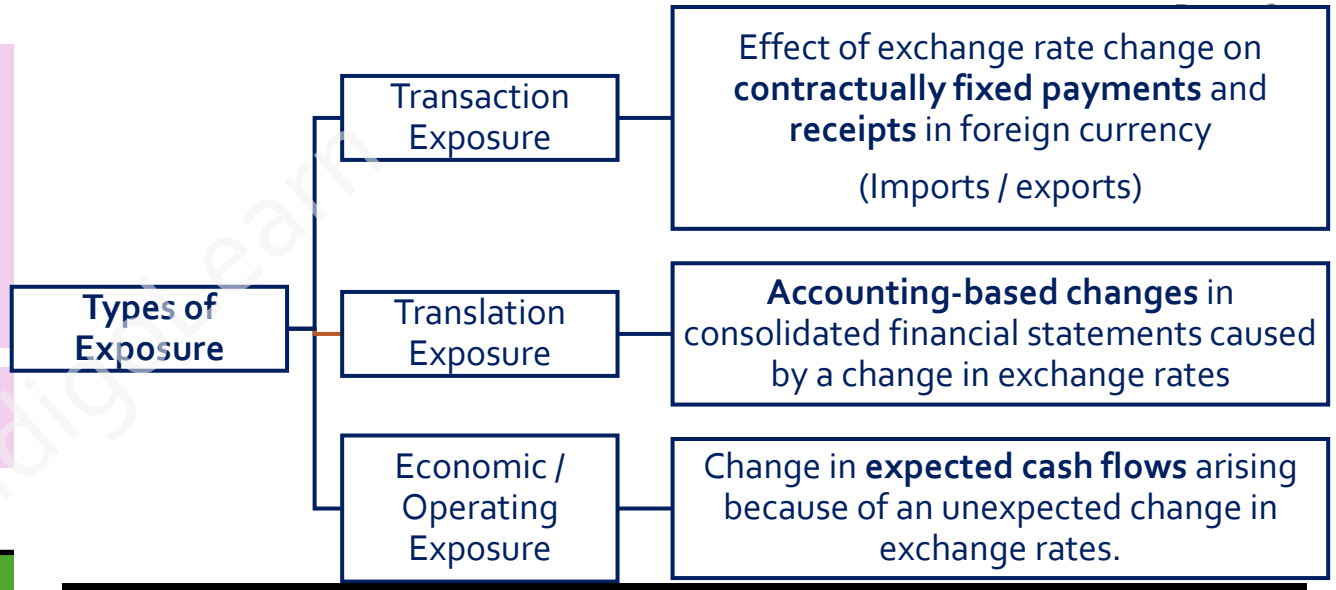
Exchange Earners Foreign Currency (EEFC) Account

- Maintained in FC with CAT 1 AD
- Exporters can credit 100% of their FC receipts without converting to INR & use for Import Payments
- Minimises transaction costs.
- Opened in the form of a Current Account.
- No interest is payable on EEFC accounts.

- Foreign Currency Non-Resident Borrowings (FCNR B) Loans given by Indian Banks in FC out of NRI Deposits
- Packing Credit Foreign Currency (PCFC), Pre & Post Shipment Loans are used by exporters to hedge against receivables.
- Cheaper than Domestic borrowings.
- FC Borrowings repaid by Export Proceeds – Exchange Risk Mitigated

Exchange Rate Forecasting, Revaluation & Devaluation



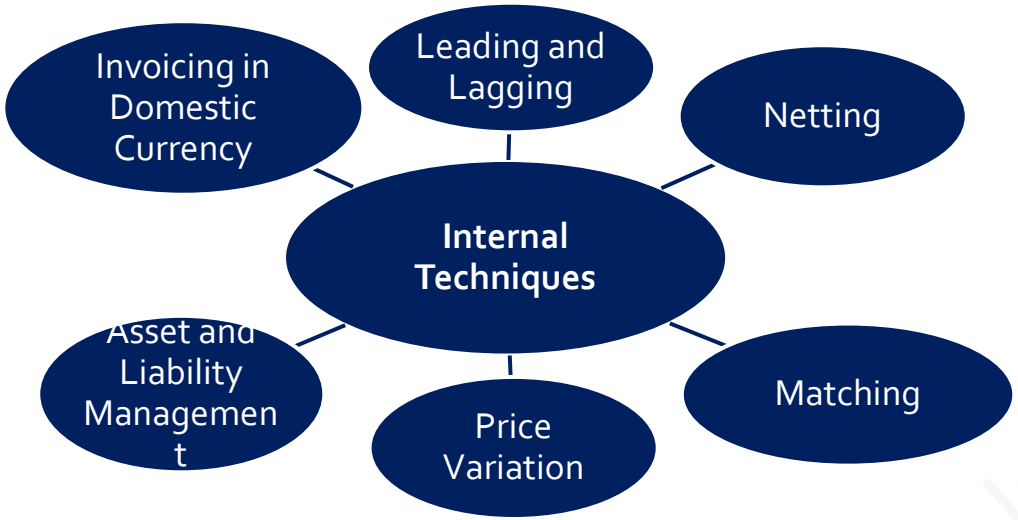


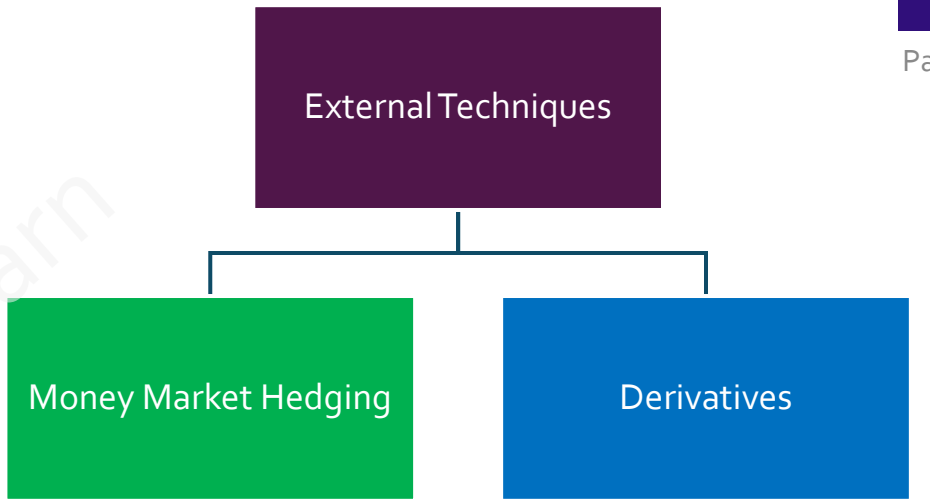
Variable	Revaluation impact	Devaluation impact
Company's export in foreign currency	Decrease	Increase
Interest payments from foreign investments	Decrease	Increase
Company's export in local currency	Decrease	Increase
Local sale, relative to foreign competition in local currency	Decrease	Increase

Variable	Revaluation impact	Devaluation impact
Company's import of material	Decrease	Increase
Interest on foreign debt	Decrease	Increase
Company's export in local currency	Decrease	Increase

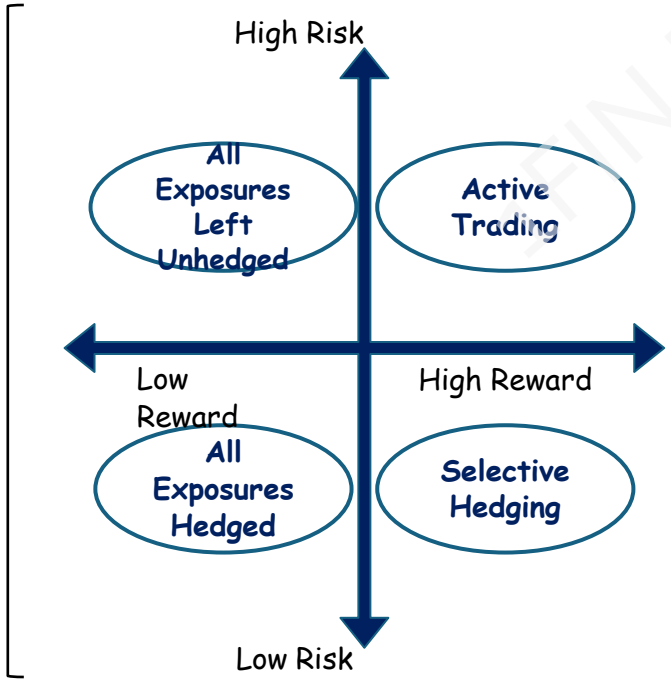
Revaluation	Devaluation
Upward adjustment to country's official exchange rate	Deliberate downward adjustment in official exchange rate
Exports become uncompetitive & imports become competitive	Ideally, done to liberalise exchange rate regime

Forex Risk Management Techniques



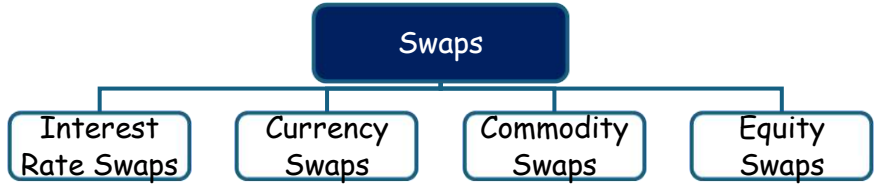


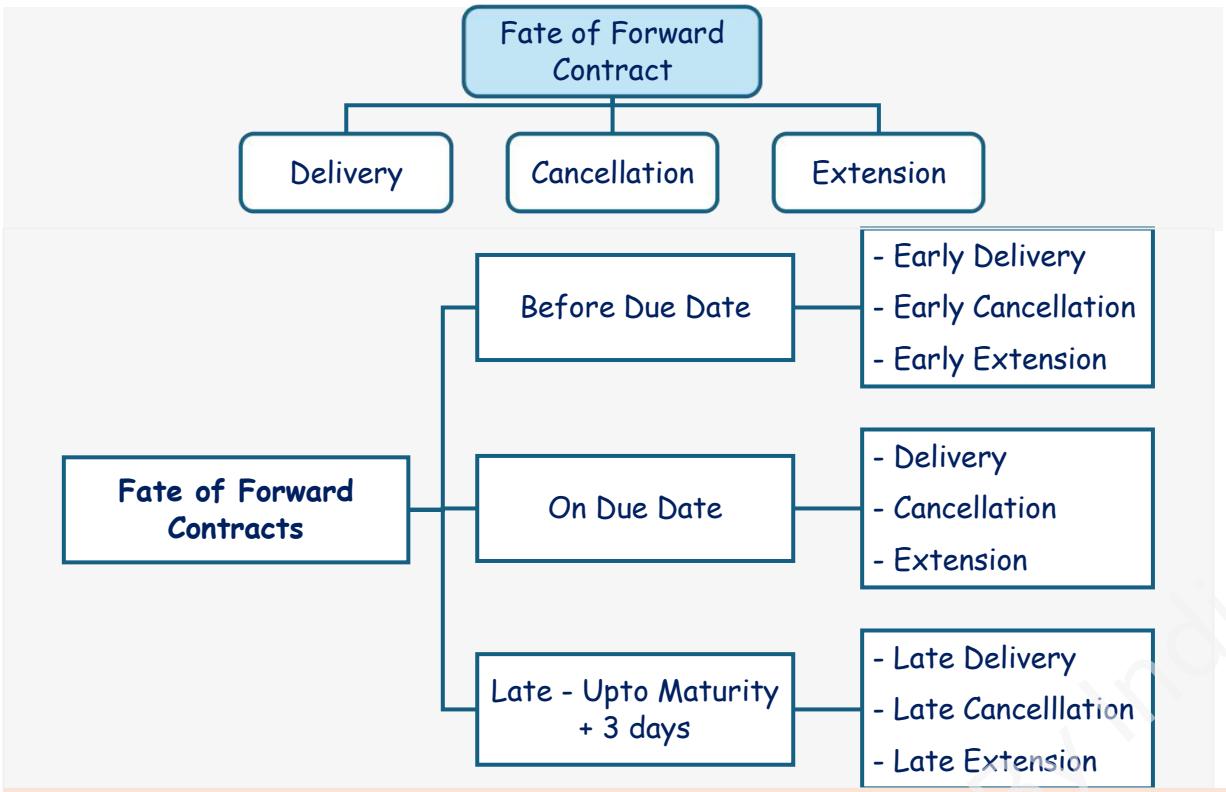
Exposure Management Strategies



Non-deliverable Forward Contract (NDF)

- Cash-settled, short-term forward contracts on thinly traded or non-convertible foreign currency
- 1 month – 1 Year settled in US$
- Fixing date (Diff Between Mkt & Agreed Date Calculated) and a settlement date (Receipt of Payment).





- Forward contract overdue without instructions before automatically cancelled within 3 working days after maturity date.
- Banks Cancel Org Contract on due date & Books Optionally Deliverable Forward Contract (ODFC) for Next 3 days (grace period)
- If Org contract is sought to be extended, it shall be cancelled & rebooked for the new delivery period.
- FEDAI Guidelines rounding off Rs. 0.0025
- Whenever interbank rates are given and bank has to enter into a one side trans due to cancellation request from customer, exchange margin will be applicable & it will be on the last cancellation by the bank.

S	Swap	Swap Charges are applicable when bank is buying & selling for diff time frames due to customer actions - one spot & other Fwd
F	Flat Charges	Usually nominal amount = ₹100 or ₹1000 or so; consider only if it is given in question - usually applicable in all cases where there is an impact
ED/C	Exchange Diff - Cancellation Gain / Loss	Diff between initial rate (agreed with customer) and interbank (sale / buy rate in market on due date) rate entered into by bank due to customer cancellation
I	Interest on funds	Interest is applicable whenever there is inflow and outflow of funds for Bank & In case of post maturity transactions, Bank's B to Back transaction rate will be considered; In other cases that rate will be ignored. In case of early delivery int is NOT computed using B/B rate
N	New Contract	Entered into in case of Extension or Cancellation & Delivery

	Action	Early Action	On Due Date	Late - Up to M + 3	Beyond M + 3
	Delivery	S + I	No impact	ED/C + I + S + N (Spot)	Automatic Cancellation - ED/C + I + S
Canc G / L	Cancellation	ED/C	ED/C	ED/C + I + S	
New contract	Extension	ED/C + N	ED/C + N	ED/C + I + S + N (Fwd)	
			No Interest	No profit share	

Fate Of a Forward Contract - Illustration

On 10th July, an importer entered into a forward contract with bank for US $ 50,000 due on 10th September at an exchange rate of ₹ 66.8400. The bank covered its position in the interbank market at ₹ 66.6800. Exchange margin was 0.1% on buying and selling. Interest on outlay of funds was 12% p.a.

You are required to show the calculations to:

How the bank would react if the customer requested on 7th /10th / 12th September:

(i) to cancel the contract?

(ii) to execute the contract?

(iii) to extend the contract with due date to fall on 10th November?

	7th September	10th September	12th September
Spot	66.3500/3700	66.1500/1700	65.9600/9900
Sep 10th Fwd	66.3800/4000	NA	NA
Spot/September	66.4800/5000	66.2800/3200	66.1200/1800
Spot/October	66.5800/6000	66.4100/4300	66.2500/3300
Spot/November	66.6800/7000	66.5600/6100	66.4000/4900

7 September – Before due date

Date	Customer	Bank
10/7	2 Month forward Buy USD 50,000 @ 66.84 on 10/9	To sell USD 50,000 @ 66.84 on 10/9 (Org Agreed Rate)
		Back-to-Back : Agree to buy USD 50,000 in interbank @ 66.68 rate on 10/9 (Inter-Bank Rate)
7/9	**Cancel request**	**Sell USD 50,000 for 10/9 Delivery**
		Sell USD 50,000 @ 66.3800 (Cancellation Price) less 0.1% margin = 66.3125 (rounded off)
		Exchange difference Loss for bank (Org Agreed Rate, New Inter Bank Fwd) USD 50,000 × (66.8400-66.3125) = 50,000 × 0.5275 = INR 26,375
II 7/9	**Customer ask for execution**	
		Buy on Spot @ 66.37 + Margin (66.4375) to deliver to customer at 66.84 Enter in to a forward contract @ 66.38 Less Margin (66.3125) to sell on 10/9 the USD that we will get from Org B/B
		Interest on cashflows : Spot Buy @ 66.37 + 0.1% USD 50,000 and sell at agreed rate @ 66.84 USD 50,000 (Today's, Spot; Agreed Rate) Net Cash Flow = USD 50,000 × (66.4375-66.84) = 50,000 × -0. 4025 INR per USD = -INR 20,125 Interest = -20,125 × 3/365 × 12% = -INR 19.85
		Swap : Spot Buy @ 66.4375 USD 50,000 and Forward Sell @ 66.3125 USD 50,000 (Today's Spot; New Inter Bank Fwd) Loss = USD 50,000 × (66.4375-66.3125) = 50,000 × 0.1250 INR per USD = INR 6,250
		Swap + Int = INR 6,250- INR 19.85 = INR 6,230.15
III	**Extension to 10/11**	Cancellation loss + extension with new contract @ 66.70 +0.1% margin (New Customer Contract) = INR 26,375+ 50,000 × 66.7675

10 September – On due date

Date	Customer	Bank
10/7	2 Month forward Buy USD 50,000 @ 66.84 on 10/9	To sell USD 50,000 @ 66.84 on 10/9 (Org Agreed Rate)
		Back-to-Back : Agree to buy USD 50,000 in interbank @ 66.68 rate on 10/9 (Inter-Bank Rate)
10/9	**Cancel request**	**Buy USD 50,000 on 10/9 @ 66.68** (Inter-Bank Rate) **Sell USD in Mkt on Spot @ 66.15 less Margin**
		Sell on spot USD 50,000 @ 66.1500(Cancellation Price) less 0.1% margin (Today's Spot Rate) = 66.0850 (rounded off)
	Exchange difference Loss for bank (Org Agreed rate) (Today's Spot Rate) USD 50,000 × (66.8400 – 66.0850) = 50,000 × 0.7550 = INR 37,750	
II	**Customer ask for execution**	
	Deliver @ 66.84 (Agreed Rate)	
III	**Extension to 10/11** Cancellation loss + extension with new contract @ 66.61 +0.1% margin (New Customer Contract) = INR 37,750 + 50,000 × 66.6775	

12 September – After due date, within 3 days from Maturity Date

Date	Customer	Bank
10/7	2 Month forward Buy USD 50,000 @ 66.84 on 10/9	To sell USD 50,000 @ 66.84 on 10/9 (Org Agreed Rate)
		Back-to-Back :
	(Inter-Bank Rate)	Agree to buy USD 50,000 in interbank @ 66.68 rate on 10/9
10/9	No action	Buy interbank USD 50,000 @ 66.68
	(Inter-Bank Rate Spot Cancellation Rate on Org Due Date)	Sell on spot USD 50,000 @ 66.15 instead of selling it to customer
		Optionally deliverable forward contract:
	(ODFC for Month End)	To buy USD 50,000 @ 66.3200
12/9	**Cancel request**	**Buy USD 50,000 on 12/9 @ 66.3200**
	(New Inter Bank Cancellation Rate on Post Mat Date)	Sell on spot USD 50,000 @ 65.9600 (Cancellation Price) less 0.1% margin
		= 65.8950 (rounded off)

Swap : Spot sold @ 66.15 USD 50,000 and
Forward buy @ 66.32 USD 50,000
Loss = USD 50,000 × (66.32-66.15)
= 50,000 × 0.17 INR per USD
= INR 8,500

Interest on cashflows : spot sale @ 66.15 USD 50,000 and Forward buy @ 66.68 USD 50,000

(Interbank rate) (Inter-Bank Rate Spot Cancellation Rate on Org Due Date)

Loss = USD 50,000 × (66.68 -66.15)
= 50,000 × 0.53 INR per USD
= INR 26,500
Interest = 26,500 × 2/365 × 12% = INR 17.42

Exchange difference Loss for bank

(New Inter Bank Cancellation Rate on Post Mat Date) (Org Agreed Rate)

USD 50,000 × (65.8950 – 66.8400)
= 50,000 × 0.945
= INR 47,250

Total loss to be borne by customer on account of cancellation = 47,250 + 8,500 +17.42 = INR 55,767.42

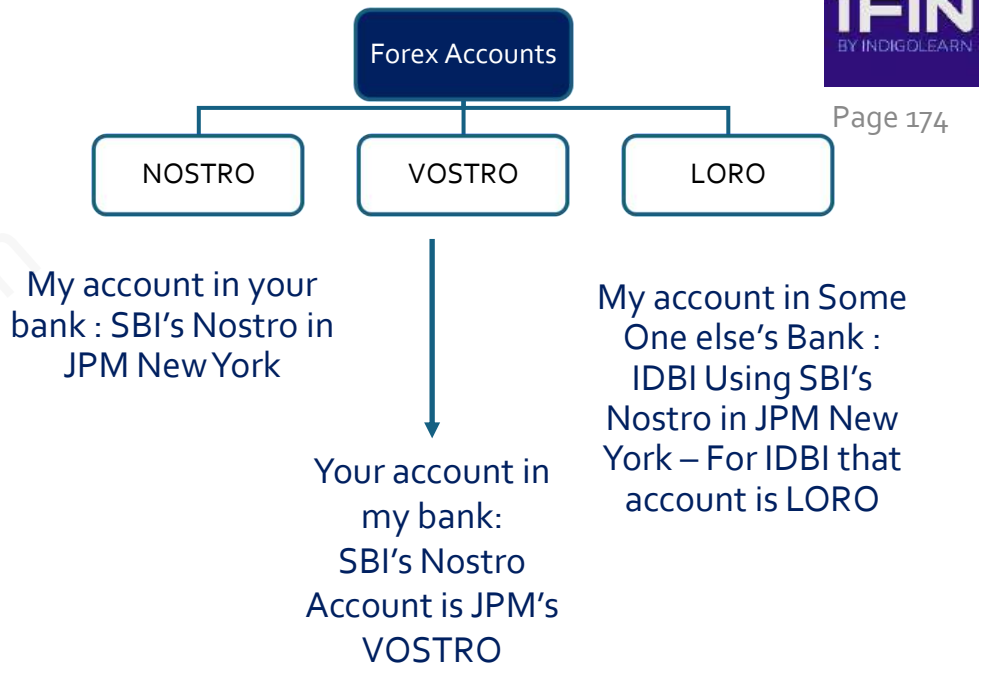
II Customer ask for execution

Cancellation + Swap + Int + New spot
= INR 55,767 + USD 50,000 × (65.9900+ 0.1% margin)
= 55,767 + 50,000 × 66.0550 (New Customer Spot Contract)
= INR 33,58,517

III Extension to 10/11

Cancellation loss + Swap + Int + extension with new contract @ 66.49 +0.1% margin
= INR 55,767 + 50,000 × 66.5575 (New Customer Fwd Contract)
= INR 33,83,642

Exchange Position	Cash Position on NOSTRO
Total commitment of bank to purchase or sale foreign exchange	OS Balance of FC
Actual Delivery Immaterial	Purchases of FC – Credited Sales of FC – Debited
Includes all Cash Transactions too	All transactions of Exchange position do not affect Cash Position
Debits • Opening Bal Overbought • DD Bought • Purchased Bill • Draft on Foreign Location Cancelled • Purchase of cheques not Yet Credited • Fwd Contracts Purchased Credit • Opening Bal Oversold • Fwd Contracts Sold • Sold Forward TT • DD issued • Forward Purchase Cancelled • TT remittance	Debits • TT Remittance Credits • TT Inwards / Received • Spot Purchases



INTERNATIONAL FINANCIAL MANAGEMENT

CA Final | AFM

Last Day Revision Notes / Summary Notes / Concept Notes

Sriram Somayajula CA, CFA, ISB

1FIN By IndigoLearn

Complexities in International Capital Budgeting

- CF Conversion to Currency of Parent
- Parent Vs Project CF are different
- Project Profits remittance subject to Double Taxation
- Foreign Exchange risk
- Political risk
- Changes in rates of inflation
- Restrictions in Remittance of CF abroad
- Initial investment may be blocked
- Concessions/benefits in host country increase profitability
- Estimation of TV is difficult

- Risk Cannot be adjusted in both CF & Discount Rate
- Project inflation of host country using PPP
- Forecast the exchange rate and apply it.
- Adjust Project CF remitted to parent for political / exchange rate using certainty equivalents.

Problems & Solutions for Foreign Investment Analysis

Forex Risk	• Forecast & Adjust for Host Country's Inflation
Repatriation Restrictions	• Internal Transfer Pricing & Overheads
Blocked Funds	• Adjust in other projects & Consider investment net off blocked funds
Dual Taxation	• Use higher tax rate for project evaluation

- Project Cash Flows Different from Parent Cashflows
- Investment evaluated only on basis of After-Tax CF to Parent

(1+Rf) x (1 + Risk Premium) = (1 + RADR)

Home Currency Approach: Discount All CF in HC

Evaluating Intl Projects using Foreign Currency Approach :

1. **FC CF discounted using FC RADR**
2. **Compute FC NPV**
3. **Convert to Home Currency at Current Spot**

$$APV = -I_0 + \sum_{t=1}^{n} \frac{X_t}{(1+K)^t} + \sum_{t=1}^{n} \frac{T_t}{(1+i_d)^t} + \sum_{t=1}^{n} \frac{S_t}{(1+i_d)^t}$$

I_0 is the Present Value of Investment Outlay

$\frac{X_t}{(1+K)^t}$ is the present value of operating cash flow

$\frac{T_t}{(1+i_d)^t}$ is the present value of Interest Tax shields

$\frac{S_t}{(1+i_d)^t}$ is the present value of Interest subsidies

Operating cash flow to be discounted with Ke

Interest tax shield & interest subsidies discounted at pretax Kd of home currency

Foreign Currency Convertible Bonds (FCCBs) - A bond issued by an Indian company in foreign currency, with principal & interest payable in foreign currency. The bond is convertible to equity at a pre-determined price & time.

Advantages of FCCBs to Investors	Advantages of FCCBs to Companies:	Disadvantages of FCCBs
• Flexibility to convert if Eq share price is high or redeem if share price is low. • Minimum fixed interest earnings • Easily marketable	• Lower Coupon cost as Equity Component has high value • Leads to delayed dilution of equity • If Co. is growing faster, Dilution will be lower as Conversion will be at a higher price	• Forex risk on Interest Payments • Forex risk on repayment if bond not converted to equity

American Depository Receipts (ADRs)

- These Offer US investors to invest in Non-US Stocks
- Avoids complexities of dealing in foreign stock markets.
- Require Compliance with SEC Guidelines
- Created by depositing securities with a Custodian Bank (CB) in issuer Country.
- CB informs the depository in US that ADRs can be issued
- ADRs may be listed on NYSE or traded OTC

Global Depository Receipts (GDRs)

- Most commonly used when raising capital locally, in US & RoW
- Very similar to ADR
- Listing is in the Luxemburg exchange.
- Till conversion, the GDR does not carry any voting rights.
- Usually represents one or more shares or convertible bonds

Impact on Indian Capital Markets

- Market Shifting from Mumbai to Luxemburg.
- There is arbitrage possibility in GDR issues.
- Indian stock market linked to rest of the world.
- Improves pricing outcome for issuers

$$MIRR = \left(\frac{\text{FV of Inflows at Reinvestment Rate}}{\text{PV of all outflows at Borrowing Rate}} \right)^{(1/n)}$$

GDR Issue related Questions

Eg: Right Limited has proposed to expand its operations for which it requires funds of $ 30 million, net of issue expenses which amount to 4% of the issue size. It proposed to raise the funds though a GDR issue. It considers the following factors in pricing the issue:

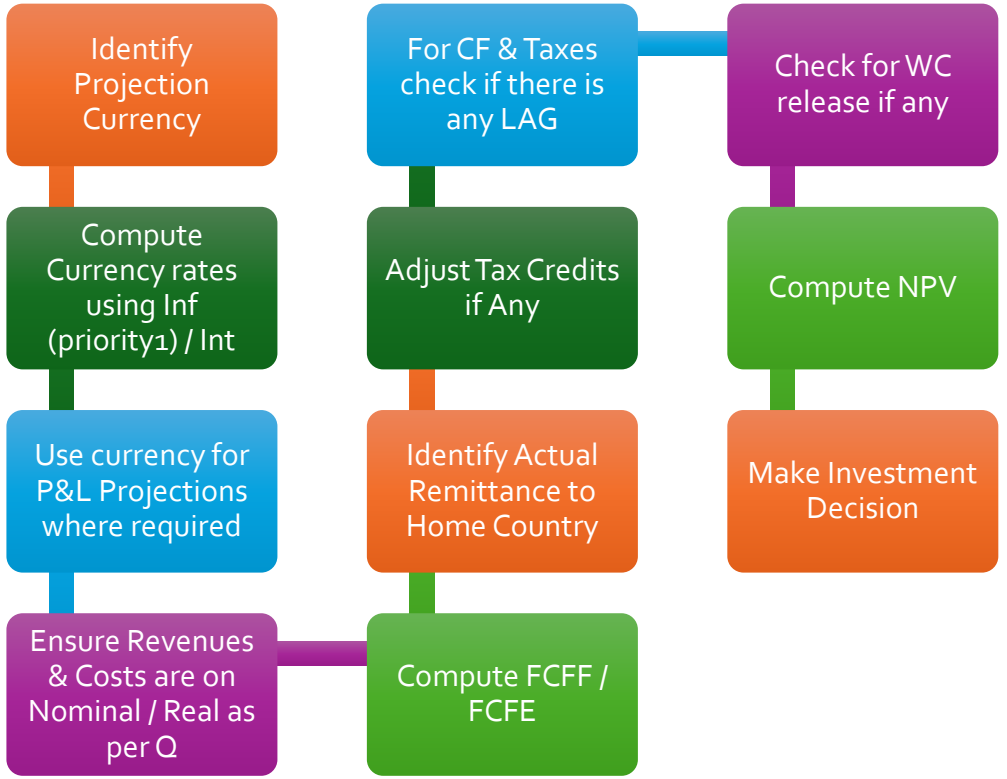
(i) The expected domestic market price of the share is ₹ 300 (Face Value of ₹ 10 each share)
(ii) 4 shares underly each GDR
(iii) Underlying shares are priced at 20% discount to the market price
(iv) Expected exchange rate is ₹ 70/$

Compute the number of GDR's to be issued and cost of GDR to Right Limited, if 20% dividend is expected to be paid with a growth rate of 20%.

Particulars	
Market Price of share	₹300
GDR Equivalent MP of equity shares	₹300 × 4 = ₹1200
GDR Discount	20% of Equity Price
GDR Price	₹ 1200 × 80% =₹960
Expected Exchange rate	USD INR 70
USD price per share	$= \frac{960}{70}$ = USD 13.7142
Total Funds required	USD 30 Million
Floatation Cost	4%
Funds to be raised	USD $\frac{30\ Million}{96\%}$ = USD 31.25 Mn
GDRs issued	$\frac{\textbf{Funds Raised}}{\textbf{Price of GDR}} = \frac{\textbf{USD 31.25 Mn}}{\textbf{USD 13.7142}}$ **= 2,278,660**

Cost of GDR	Gross of Floatation Cost	Net of Floatation Cost
GDR in INR Equivalent	INR 960	INR 960 – 4% = INR 921.60
D1	20% of FV of 10 × 4 shares per GDR = 10 × 4 × 20% = 8	20% of FV of 10 × 4 shares per GDR = 10 × 4 × 20% = 8
Ke	$= \frac{D1}{p0} + g$ $= \frac{8}{960} + 20\%$ **= 20.83%**	$= \frac{8}{921.6} + 20\%$ **= 20.868%**

Foreign Investment Questions



Characteristics of Depository Receipts

- Holders participate in the economic benefits but have No voting rights.
- They are settled through CEDEL & Euro-clear international book entry systems.
- GDRs are listed on the Luxemburg stock exchange. ADRs are listed on NYSE
- Trading takes place between professional market makers on OTC basis.
- The instruments are freely traded.
- They are marketed globally in more than one currency.
- Exchange risk on the instrument & Dividend is with the Investor
- GDR may be cancelled any time after a cooling period of 45 days.
- Overseas depository requests Domestic custodians bank to cancel the GDR & get underlying shares released in favour of NR investor.
- The price of shares on BSE / NSE on the date of advice of redemption shall be taken as the cost of acquisition of the underlying ordinary share.

Euro Convertible Bonds

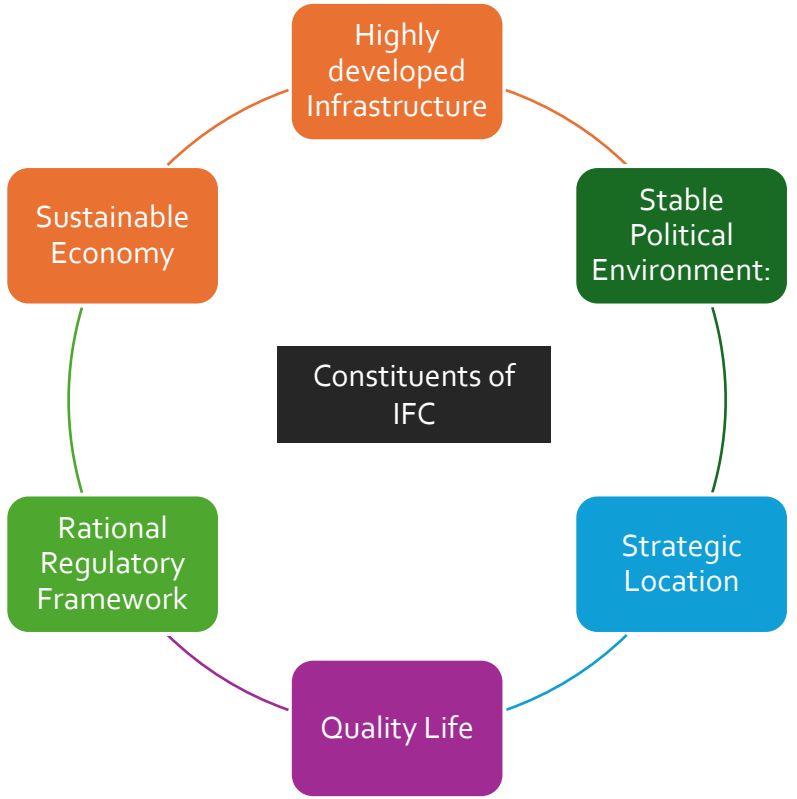
- Bonds issued by Indian companies in the foreign market
- Have option to convert them into pre-determined number of equity shares of the company.
- Carry fixed rate of interest and Conversion price
- May carry one of the two options –
  - Call Option:
    - The issuer can call the bonds for redemption before the date of maturity.
    - If the share price has appreciated substantially, the issuer company can exercise the option.
    - Forces the investors to convert the bond into equity.
  - Put Option:
    - Enables bondholder, a right to sell his bonds to the company at a pre-determined price and date.
    - The payment of interest and the redemption of the bonds will be made by the issuer company in US dollars.

Other Debt routes for foreign exchange funds

Euro Bonds	• LT Bearer bonds Issued offshore in a currency other than issuer's country • Can be Fixed / Floating / Convertible
Euro Convertible Zero Bonds	• ZCBs. Conversion on maturity (usually 5 years) at a pre-determined price. • Treated as deferred equity issue.
Euro Bonds with Equity Warrants	• Carry a market determined coupon rate • The warrants are detachable & Pure bonds are traded at a discount. • Fixed income funds' managements may like to invest for the purposes of regular income
Euro Commercial Papers	• ST money market securities issued at a discount, for maturities less than one year
Syndicated bank loans	• Traditional way of raising funds from banks. The interest rate set with reference to an index: LIBOR/SOFR + spread (depending on borrower credit rating) • Covenants set by lending institution like maintenance of key financial ratios
Yankee Bonds	• Denominated in USD & issued in the US by foreign banks & corporations & are usually registered with SEC
Samurai Bonds	• Bonds denominated in Yen and issued in Tokyo by a non-Japanese borrower.
Bulldog Bonds	• Foreign bond issued by non-British corporations seeking to raise capital in GBP from British investors.
Masala Bonds	• Rupee-denominated bonds issued by an Indian entity in foreign markets to raise money, in INR

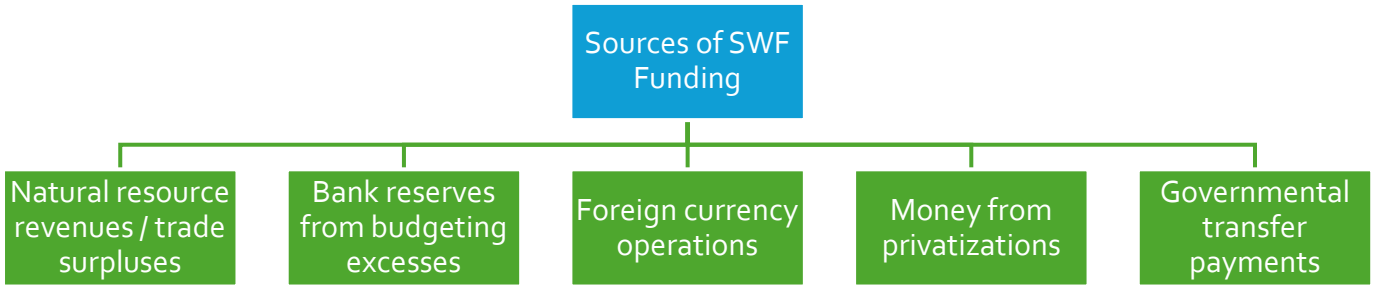
International Financial Centre (IFC) is a financial centre that caters to the needs of the customers outside their own jurisdiction.

- Is a hub that deals with flow of funds, financial products and financial services even though in own land (country) but with different set of regulations and laws
- Provides flexibility in currency trading, insurance, banking and other financial services.
- This flexible regime attracts foreign investors benefitting not only to the stakeholders but as well as for the country hosting IFC itself.



GIFT IFSC

- India Set up IFSC Gandhinagar to compete with its rival FSC in Dubai, Hong Kong etc
- Main motive - retain the financial services businesses in India from moving out
- GIFT city provides foreign investors a separate jurisdiction to do business with relaxed tax and other laws.
- GoI operationalized IFSC at GIFT Multi Services SEZ in April 2015.
- The Union Budget 2016 provided competitive tax regime for the IFSC at GIFT SEZ.
- India's first International Exchange – India INX, a wholly owned subsidiary of BSE inaugurated on 9th January 2017.
- India INX has stated trading in Index, currency, commodity and equity derivatives.
- On 5th June 2017, NSE also launched its trading at GIFT in equity, currency, interest rate futures and commodities.
- GIFT IFSC provides very competitive cost of operations with very competitive tax regime, single window clearance; relax company law provisions, international arbitration centre with overall facilitation of doing business. GIFT IFSC is now moving toward unified regulatory mechanism.
- GIFT City is a new Financial & Technology Gateway of India for the World.
- FEMA is not applicable at GIFT city.
- New financial institutions are setting business units in GIFT as they will pay reduced taxes as valid for SEZs and can easily offer foreign currency loans to Indian Companies abroad and foreign firms.



Sovereign Wealth Funds (SWFs)

- It is a state-owned investment fund comprised of money generated by the government.
- This money is derived by Government from country's own surplus reserves.
- SWFs provide a benefit for a country's economy and its citizens.
- The legal basis on which these are created varies from Government to Government.
- The legal basis for a sovereign wealth fund can be Constitutive Law, Fiscal Law, Constitution, Company Law or any Other Laws and Regulations.

- Classifications of SWFs
  - Stabilization funds
  - Savings or future generation funds
  - Public benefit pension reserve funds
  - Reserve investment funds
  - Strategic Development Sovereign Wealth Funds
- Types of SWFs
  - Sovereign Wealth Funds (SWFs)
  - Public Pension Funds
  - State-Owned Enterprises
  - Sovereign Wealth Enterprises
- Complexities in International Financial Management
  - Wider Financing Options Local + Global
  - Variation of interest and tax rates among different countries.
  - Foreign exchange risks, Political risks
  - Blockage of funds
  - Rules and regulations of transfer pricing

- International Working Capital Management
  - Multinational Cash Management
  - International Inventory Management
  - International Receivables Management

Objectives of Multinational Cash Management

- Effectively managing and controlling cash resources of the company.
- Improving cash collections and disbursements
- Accurately forecasting cash flow pattern.
- Achieving optimum utilization and conservation of funds.
- Making money available as and when needed
- Minimizing the cash balance level
- increasing the risk adjusted return on funds that is to be invested.

Objectives of Effective system of international cash management

- Minimize currency exposure risk.
- Minimize overall cash requirements of the company without disturbing subsidiary operations
- Minimize transaction costs.
- Minimize country's political risk.
- Take advantage of economies of scale as well as reap benefits of superior knowledge.

Conflicting Objectives

Centralized cash management leads to Centralization of

- Information
- Reports and decision-making process
- Movement and investment

Benefits of a Centralized cash system

Maintaining minimum cash balances → Manage liquidity requirements → Minimize foreign exchange exposure → Generate maximum returns by investing all cash resources optimally. → Netting to reduce transaction costs and currency exposure → Use Transfer Pricing to Increase Profits → Exploit currency movement correlations

Ways to optimize cash flows in a multinational cash management setting

Accelerating Cash Inflows	• Faster cash recovery helps firm to use in WC / invest & earn return
Managing Blocked Funds	• Reinvest locally to create jobs & reduce unemployment • Local Bank Loans repaid by blocked funds • Analyze potential future funds blockage & attached political risks
Leading and Lagging	• Adjust Timing of CF with Money Movements - Reduces Forex exposure & Increases working capital. • Accelerate (lead) or delay (lag) the timing of Forex payments by adjusting credit terms • Importer applies the leading strategy if home currency is depreciating. • Exporter applies the lagging strategy if home currency is depreciating.
Transfer Pricing(TP)	• Higher TP implies Higher profits for transferor division • Transfer pricing are subject to exchange restrictions • Also to consider inflation differentials, import duties, tax rate differentials, quotas imposed by host country, etc.
Netting	• Used to reduce administrative and transaction costs on currency conversion. • Payables and receivables are offset => reduces number of transactions. & minimizes total inter-company fund flow. • Types - Bilateral / Multilateral Netting
Investing Excess Cash through a centralized Cash Management	• Pool excess funds from all subsidiaries - Earn higher returns on larger deposits Eg: Euro Currency market & Euro Dollar deposits • Convert excess pooled funds into a single currency after undertaking a cost benefit analysis • Diversify portfolio to different currencies & avoid

Bilateral Netting System

- Involves transactions between the parent and a subsidiary or between two subsidiaries.
- A purchases $10 Million of goods from B & B purchases $ 15 Million of goods from A. In bilateral netting, B pays only $5 Million to A.

Multinational Netting System

- Payment arrangement among multiple parties - transactions are summed & settled than individually.
- Netting is centralized in one area
- This calls for the consolidation of information and net CF positions for each pair of subsidiaries.

Inter Subsidiary Payment Matrix (in $ Million)

Receiving Affiliate \ Paying Affiliate	India	USA	UK	Italy	Total
India		100	50	100	250
USA	40		70	30	140
UK	30	20		100	150
Italy	80	40	50		170
Total	**150**	**160**	**170**	**230**	710

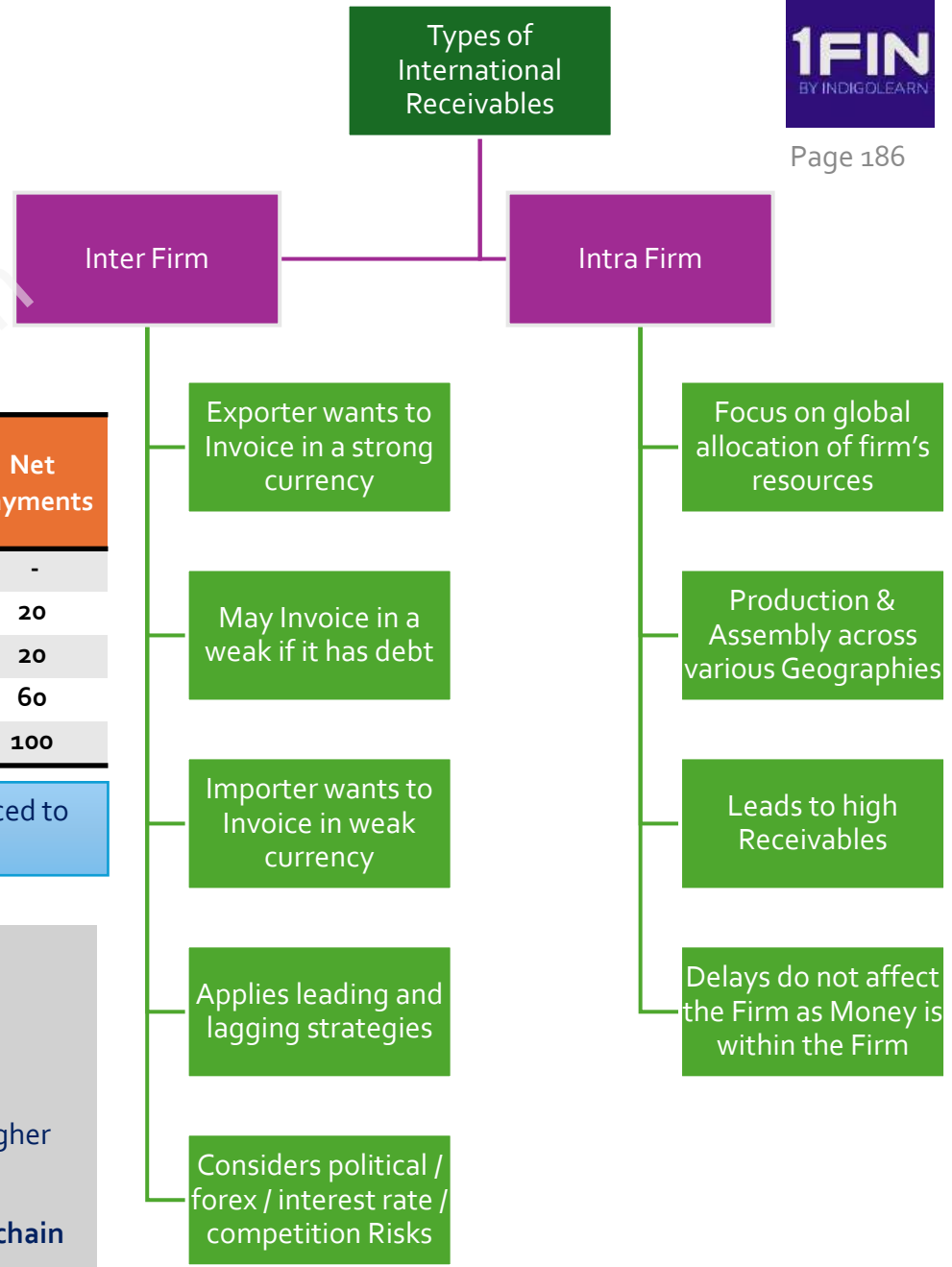
Netting Schedule (in $ Million)

	Receipt	Payment	Net Receipt	Net Payments
India	250	150	**100**	-
USA	140	160	-	**20**
UK	150	170	-	**20**
Italy	170	230	-	**60**
Total			**100**	**100**

Without netting the total payments are $710 Million. Through multinational netting, these transfers can be reduced to $100 Million

International Inventory Management

- MNC Firms source inventory from global affiliates
- They normally possesses a higher than EOQ Stock - known as stock piling.
- Helps avoid political uncertainties, bottleneck on imports, forex risks etc.
- If the probability of interruption in supply is very high => stock piling even if it is not justified on account of higher cost.
- **MNCs must consider risk and reward of maintaining higher inventory especially in international supply chain management.**



INTEREST RATE RISK MANAGEMENT

Last Day Revision Notes / Summary Notes / Concept Notes

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1FIN By IndigoLearn

Interest rate risk is the probability that a change in overall interest rates will reduce the value of a bond or other fixed-rate investment.

Factors Affecting Interest Rates

- Demand & Supply of Money
- Inflation
- Govt's Operations

High Interest Rate	Demand ↑ Supply ↓	Inflation ↑	Tight Policy ↑
Low Interest Rate	Demand ↓ Supply ↑	Inflation ↓	Loose Policy ↓

GAP Analysis

Positive GAP

Rate sensitive Assets (RSA)> Rate sensitive Liabilities (RSL)

↑ in Int Rates will lead to Increase in Net Interest Income (NII)

Negative GAP

Rate sensitive Liabilities (RSL) > Rate sensitive Assets (RSA)

↓ in Int Rates will lead to Increase in Net Interest Income (NII)

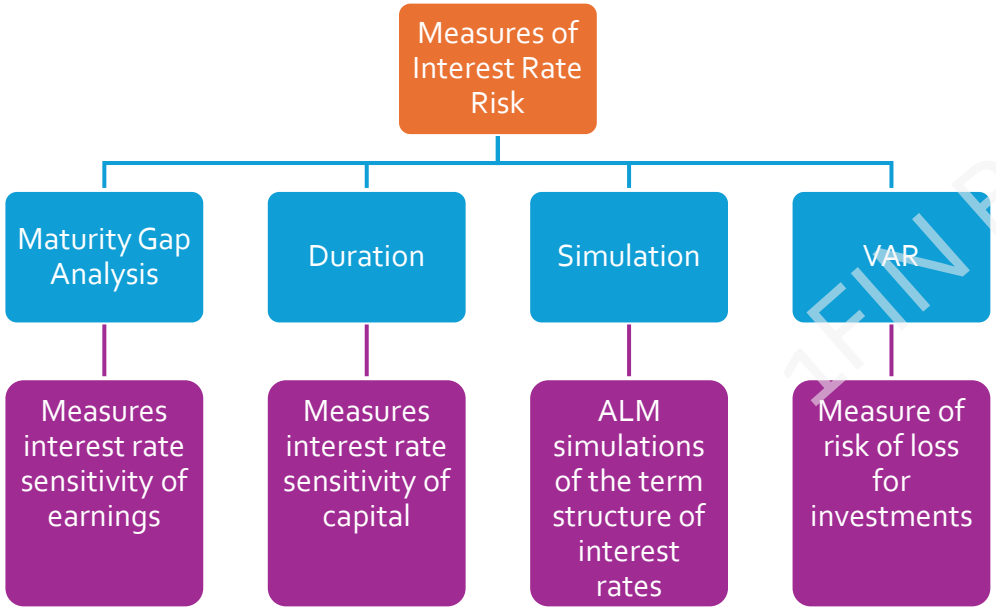
EAR - Earnings at risk is the amount of change in NII due to changes in interest rates | GAP x probable change in Interest Rate = impact of Interest Rate Change on Earnings.

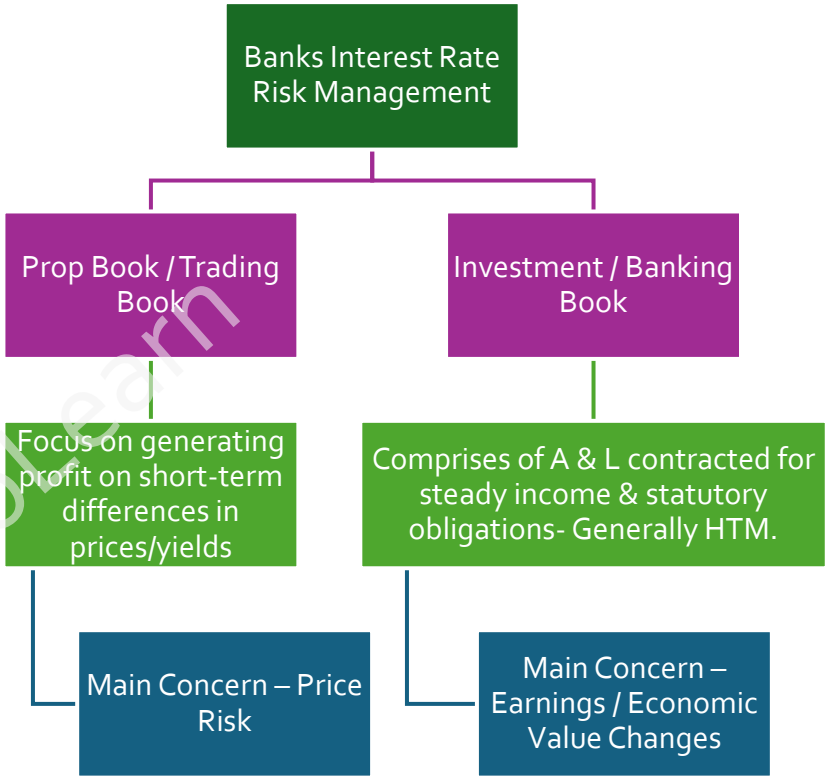
Types of Interest Rate Risks

- **Gap Exposure** — Difference between a Bank's Rate Sensitive Assets & Liabilities
- **Basis Risk** — Risk that the interest rate of different assets, liabilities & off-balance sheet items may change in different magnitude; Eg: Assets Fixed, Liabilities Floating
- **Embedded Option Risk** — Risks such as call pre-pay, delay in repayment, default in interest & principal payments.
- **Yield Curve Risk** — Risk of change in Bond Prices, due to changes in Yield Curve
- **Price Risk** — Risk that the value of a security or investment will decrease, when assets are sold before their maturity
- **Reinvestment Risk** — Uncertainty on interest rate at which the future cash flows could be reinvested; High for Bonds with High Maturity & Coupon

Limitations of GAP

- Considers only the time difference between re-pricing dates of A & L - Fails to measure the impact of basis risk & embedded option risks
- Assumes that all assets and liabilities are matured or re-priced simultaneously
- Ignores differences in the timing of payments consequent to changes in interest rates
- Assumes parallel shift in yield curves – not practical
- Doesn't consider impact of interest rate changes on non-interest-based revenue / expenses (eg: upfront fees, LC commission, etc)





Fixed interest – same interest rate for the entire term of the loan

Floating interest rate - Interest rate that is variable / changes during the loan tenure Eg: BPLR, MCLR , MIBOR etc

Benchmark Rates

- These rates form the basis for determination of other interest rates – also known as 'Reference Rates'.
- Very important in any economy / banking system / financial transactions
- Form basis of financial contracts - bank OD, loans, mortgages & complex financial transactions.
- Used in derivative transactions such as Forward, Future, Options & Swap
- Forms basis for floating rate loans
- Generally based on relative credit rating spread in basis points (bps) added over benchmark rate for loan / Bond issuance
- Decided by an independent body after considering various factors.
- In financial transactions both domestic as well as international benchmark rates are used
- Most popular benchmark rates - LIBOR (London Interbank Offered Rate).
  - However, after manipulations by some banks in 2012, decided in 2017 that LIBOR would cease to exist.
  - From 1st January 2022, companies are required to use Alternative Reference Rates (ARRs)
  - ARRs are different from LIBOR

(i) ARRs based on actual overnight transactions either secured or unsecured

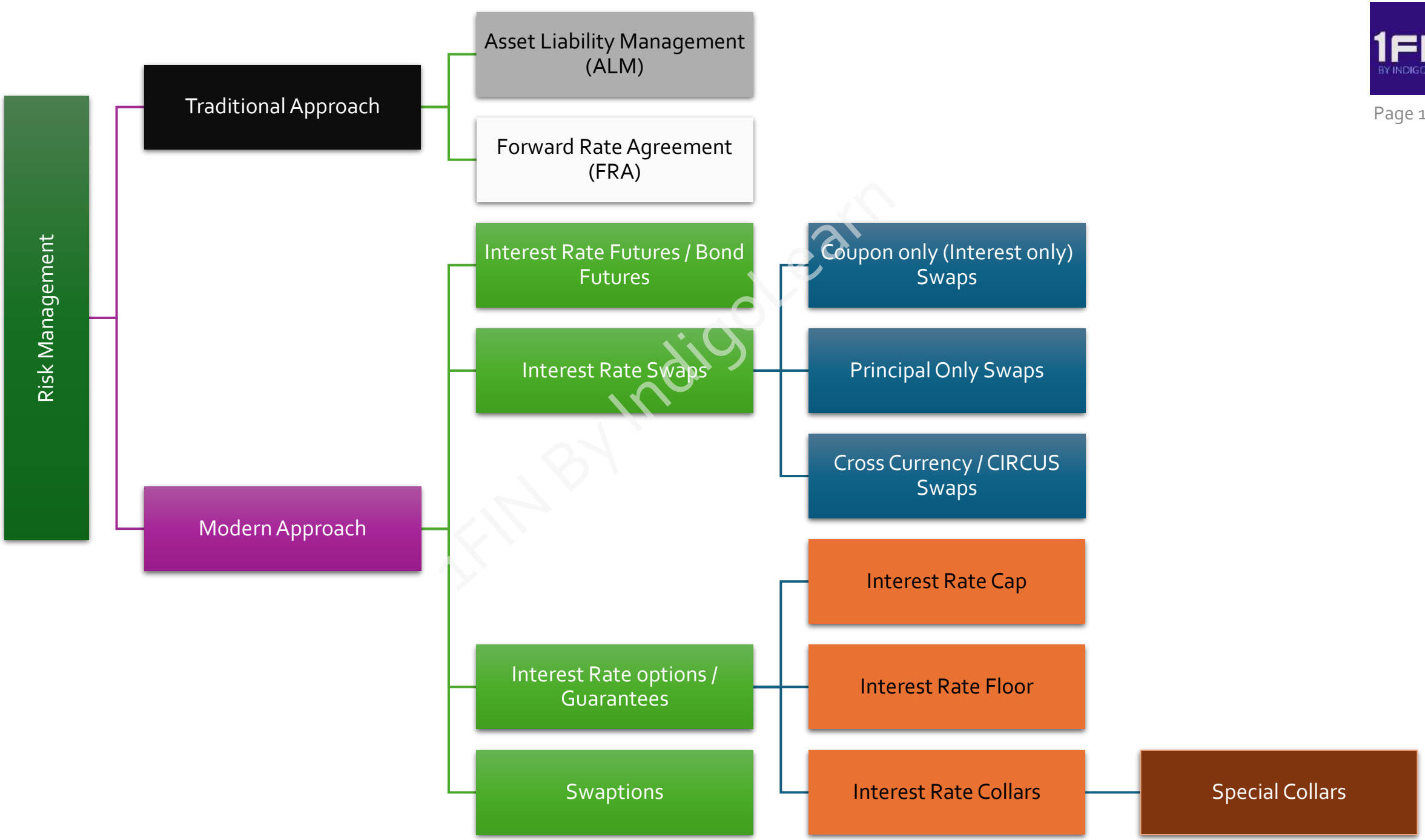
(ii) LIBOR is unsecured without any collateral - relies on the judgment of the panel banks

(ii) ARRs near risk free rates with no term premium

(iii) ARRs have different names, regulator, and nature

(iv) ARRs based on geographical locations of currencies.

USA	Secured Overnight Financing Rate **(SOFR)** – Secured	Federal Reserve Bank ofNew York
UK	Sterling Overnight Index Average **(SONIA)**- Unsecured	Bank of England
Europe	Euro-Short-Term Rate **(€STER)** – Unsecured	European Central Bank
Japan	Tokyo Overnight Average Rate **(TONAR)** – Unsecured	Bank of Japan
Switzerland	Swiss Average Rate Overnight **(SARON)** - Secured	SIX (Swiss Stock Exchange)
India	**MIBOR & MIBID** Mumbai Interbank Offered / Bid Rate	RBI



Asset Liability Management (ALM):

- Important tools of risk management in commercial banks of India
- Asset inflows are scheduled in such a way that they match Liabilities Cash outflows
- Objective - to never run short of money to meet liabilities and not have surplus money without earning return.
- Banks need to implement strong ALM to ensure its customer deposits can be paid at any given time
- ALM addresses risks (interest, currency, inflation, financial and market) resulting from a mismatch of assets and liabilities.
- The risk managing team under ALM evaluates the impact of business decisions on A & Land feeds inputs into bank's business decisions.

FRA – Forward Rate Agreements

- Agreement entered today to borrow specified amount at a future date for a specific interest rate and specific tenure
- The underlying in the contract is interest.
- OTC contracts
- Cash Settled
- Settlement Amount is arrived on fixing date (i.e borrowing date)
- PV of settlement amount changes hands
- Settlement amount = Diff between Contract rate & Reference rate (Floating rate in Mkt)
  - Used by banks to fix interest costs on anticipated future deposits or interest revenues on variable-rate loans indexed to Benchmark Interest Rate
  - It is an off-Balance Sheet instrument.
  - It is on notional value i.e. it doesn't involve actual exchange of the principal.

Borrower is a Fixed Rate Payer & Floating Rate Receiver

Lender is a Floating Rate Payer & Fixed Rate Receiver

FRA – Settlement Value

$$Settlement\ Value = \frac{N(RR - FR)\left(\frac{dtm}{DY}\right)}{\left[1 + RR\left(\frac{dtm}{DY}\right)\right]}$$

N = notional principal amount

RR = Reference Rate prevailing on the contract settlement date;

FR = Agreed-upon Forward Rate;

dtm = days of loan (FRA Specified period)

DY = Total number of days (360 or 365 days)

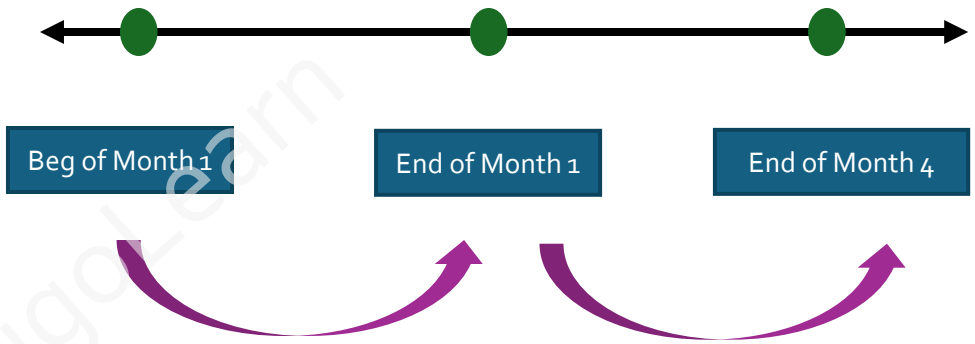
If **RR > FR**, then long FRA gains (i.e. borrower gains)

If **RR < FR**, then short FRA gains (i.e. lender gains)

When does borrowing start? After 1 Month from Today

$ 1 Mio | 1 x 4 FRA @ 5%

When does borrowing end? After 4 Months from Today



$ 1 Mio | 2V3 FRA @ 5%

Borrowing after 2 years for a period of 1 Year

Market rate for 3 month $ 1 Mio borrowing on Day 30 –> 6%

$$Settlement\ Value = \frac{\$\ 1\ Mio(6\% - 5\%)\left(\frac{90}{365}\right)}{\left[1 + 6\%\left(\frac{90}{365}\right)\right]}$$

$$Settlement\ Value = \$2429.806$$

Use months / days as per data given. Always use 365 unless specified otherwise

Interest Rate Futures - IRF

- Exchange traded product
- **Cash Settled**
- Internationally, **Bond futures** have delivery-based settlement whereas **IRFs** are cash settled. But in India**, both are same**
- Contract to **buy / sell a bond in future** at a predetermined price
- Underlying instrument - interest paying Bond.
- **IRF is not a future on interest rate**
- Used to hedge against the risk of change in interest rates.
- The bond mentioned in the I**RF is not an actual security,** but an artificial or **notional security** created.
- At the time of delivery, actual deliveries are used based on the Conversion Factor (CF) specified by the exchange.
- **(Conversion Factor) x (Futures Price) = Delivery price for a bond (A)**
- **Delivery price (A) – Quoted Spot Bond Price (B) = Loss / Gain**
- Bond which shows lowest loss / Highest Gain **= Cheapest to Deliver (CTD) Bond.**

SMD Bank sold 7% IRF underlying Notional 7.5% Coupon Bonds. Details of eligible securities that can be delivered are below. Recommend CTD security if Future settlement price is 10000.

Security	Quoted Spot Price of Bonds	Conversion Factor
6.55 GOI 2025	9264.0	0.9060
6.80 GOI 2029	8775.5	0.9195
6.85 GOI 2026	9723.0	0.9643
8.44 GOI 2027	11463.0	1.1734
8.85 GOI 2028	12017.0	1.2428

Security	Future Settlement Price	Conversion factor	FSP x Con. Factor A	Quoted spot price B	Profit / loss A-B
6.55GOI 2025	10000	0.9060	9060	9264	(204)
6.80 GOI 2029	10000	0.9195	9195	8775	420
6.85 GOI 2026	10000	0.9643	9643	9723	(80)
8.44 GOI 2027	10000	1.1734	11743	11463	280
8.85 GOI 2028	10000	1.2428	12428	12017	411

Has highest profit : CTD Bond

Interest Rate CAP

- If Mkt interest rate > Cap Rate, Buyer has the right to receive (Mkt Interest cost- Cap rate) x Notional Principal from seller
- If Mkt Int rate < Cap Rate - Buyer need not pay anything to seller.
- Cap is an option not an obligation for the buyer.
- Buyer pays premium to seller to purchase this option
- Cap rate = strike / exercise price of option
- Settlement amounts are determined by the value of the benchmark rate on interest rate reset dates.
- Caps are cash settled & settlement amount is discounted to fixing date;
- Borrowers with floating rate borrowing enter into Interest Rate Caps to restrict the interest cost
- Interest rate CAP contract is a sum of caplets
- Unless specified, all computations are made on Actual / 365
- CAP is like an Option to borrow using an FRA

$$\text{Settlement Amt Received} = (N)\max(0, R_A - R_C).\frac{dt}{\text{Days in year}}$$

Interest Rate Floor

- If Mkt interest rate < Floor Rate, Buyer has the right to receive (Floor rate – Mkt Int rate) x Notional Principal from seller
- If Mkt Int rate > Floor Rate - Buyer need not pay anything to seller.
- Floor is an option not an obligation for the buyer.
- Buyer pays premium to seller to purchase this option
- Floor rate = strike / exercise price of option
- Settlement amounts are determined by the value of the benchmark rate on interest rate reset dates.
- Floors are cash settled & settlement amount is discounted to fixing date;
- Lenders with floating rate borrowing enter into Interest Rate Floors to ensure minimum Interest Income
- Interest rate Floor contract is a sum of Floorlets
- Unless specified, all computations are made on Actual / 365
- Floor is like a Option to Lend using FRA

$$\text{Settlement Amount Received} = (N)\max(0, R_F - R_A).\frac{dt}{\text{Days in year}}$$

N - notional principal amount of the agreement | R_A- actual spot rate on the reset date | R_C - cap rate (expressed as a decimal) | dt - is # of days from the interest rate reset date to payment date

Interest Rate Collar

- A specialized combination of a Cap and Floor.
- It involves the simultaneous purchase of an interest rate cap and sale of an interest rate floor on the same index for the same maturity and notional principal amount.
- A Collar protects from adverse change in interest rates on both high side and the low side.
- Long Collar = buying a cap & selling a floor.
- Short Collar = buying a floor and selling a cap
- Zero Cost Collar – Premium paid for Cap is equivalent to premium received for floor
- The premium received from writing the Floor pays for the purchase of the Call option.

$$Payment = (N)[\max(0, R_A - R_C) - \max(0, R_F - R_A)].\frac{dt}{Days\ in\ year}$$

Interest Rate Swaps

- Parties to IRS (swap counterparties) agree to exchange payments indexed to two different interest rates.
- Payment is computed on notional principal amount of swap and net cash settlement is done.
- Usually involves exchange of liability with fixed or floating rate for a liability with floating or fixed rate respectively.
- Currency Swap or Cross Currency Swap - used to hedge ECBs with interest rate & exchange fluctuation risks.
- Modified Mumbai Inter-bank Forward Offer Rate (MIFOR) Swap – A composite rate with the USD SOFR and USD INR forward premia as its components.
- Modified MIFOR represents the cost of borrowing in US dollars and swapping the same to INR - synthetically representing the domestic term interest rate.
- The swap dealer who facilitates this swap gets a brokerage fee.
- The cost of the brokerage fee is considered to determine the overall benefit from the swap.
- IRS = Series of FRAs

IM is an American firm having its subsidiary in Japan and JI is a Japanese firm having its subsidiary in USA: They face the following interest rates. IM wishes to borrow USD at floating rate and JI JY at fixed rate. The amount required by both the companies is same at the current Exchange Rate. A financial institution requires 25 basis points as commission for arranging Swap. The companies agree to share the benefit/ loss equally.
You are required to find out

(i) Whether a beneficial swap can be arranged?
(ii) What is the rate of interest for both IM and JI ?

	IM	JI
USD Floating rate	SOFR+0.5%	SOFR+1.0%
JPY Fixed rate	3%	4.25%

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Combined Cost of loan originally available = SOFR+ 0.5% + 4.25%
= SOFR +4.75%

Combined Cost of loan after Swap = SOFR + 1.0% + 3%
= SOFR + 4.0%

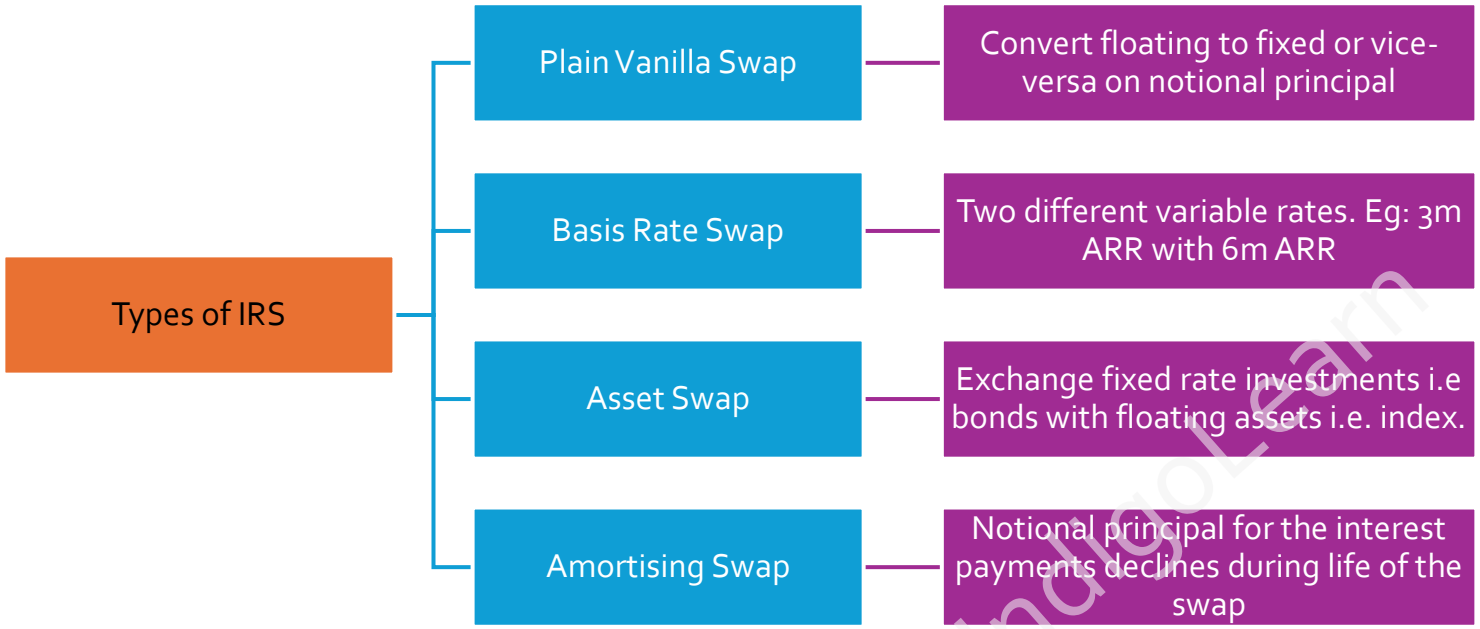
		IM will borrow Fixed	JI will borrow Floating
Interest Outflow pa post swap	**A**	**3%**	**SOFR + 1%**
Receive from Counterparty	B	3.875%	SOFR + 1%
Pay to Counterparty	C	SOFR+1%	3.875%
Gross Cost (A - B + C)	**D**	**SOFR+0.125%**	**3.875%**
Dealer Commission	E	0.125 %	0.125%
Net Interest Cost (D +E)	**F**	**SOFR+0.25%**	**4.0%**
Cost of loans originally available	P	SOFR+0.5%	4.25%
Net Savings (P – F)	**Q**	**0.25%**	**0.25%**

A Swap can be arranged because ,
Combined Cost of Loan after swap is < Cost of loans originally available

- IM will borrow Fixed even though it wants Floating
- JI will borrow Floating even though it wants Fixed
- Then they will swap the loans

Gross Savings = SOFR + 4.75% - (SOFR + 4.0%) = 0.75% = 75 bps
Dealer commission =25 bps
Net Savings = 50bps shared equally i.e 25bps each

A Swap is not possible if the above condition is not satisfied. Also note, both loans cannot be taken by the same party



Key Features of Swaptions

- Effectively an option on a forward-start IRS, i.e exact terms like the fixed rate, the floating reference interest rate and the term are established upon conclusion of the swaption contract.
- A 3-month X 5-year swaption means an option to enter into a 5-year IRS, 3 months from now.
- The 'option period' refers to the time which elapses between the transaction date and the expiry date.
- The swaption premium is expressed as basis points.
- Swaptions can be net cash settled.

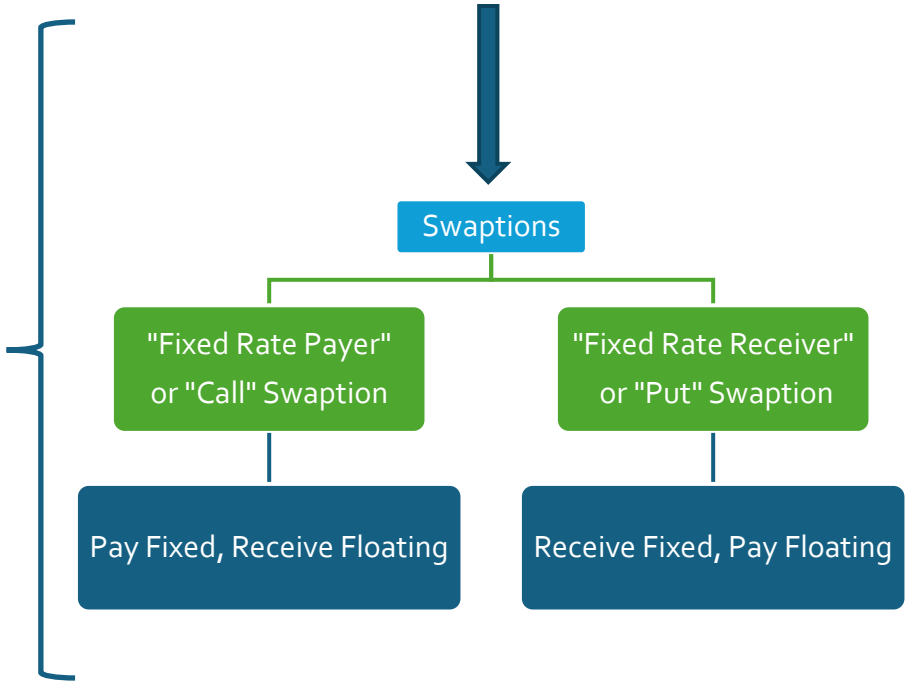
Uses of Swaptions

- It is useful to borrowers targeting on acceptable borrowing rate.
- Swap traders use for speculation purposes or to hedge.
- Useful to borrowers targeting an acceptable borrowing rate.
- Swaptions also provide protection on callable/puttable bond issues.

Pricing

- Swaptions are priced using probability-based forecast of zero-coupon yield curve.

An option to enter into an interest rate swap. It gives the holder the right but not the obligation to enter into an interest rate swap at a specific date in the future, at a particular fixed rate and for a specified term.



Overnight Index Swap (OIS) - IRS for overnight Fixed Vs. Floating rates (Typically MIBOR)

X Bank into a plain vanilla OIS on a principal of ₹ 10 crores and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap will commence on 3rd August, Tuesday & run for a period of 7 days. Respective MIBOR rates for Tuesday to Monday were:

7.75%,8.15%,8.12%,7.95%,7.98%,8.15%.

If X Bank received ₹ 317 net on settlement, calculate Fixed rate and interest under both legs.

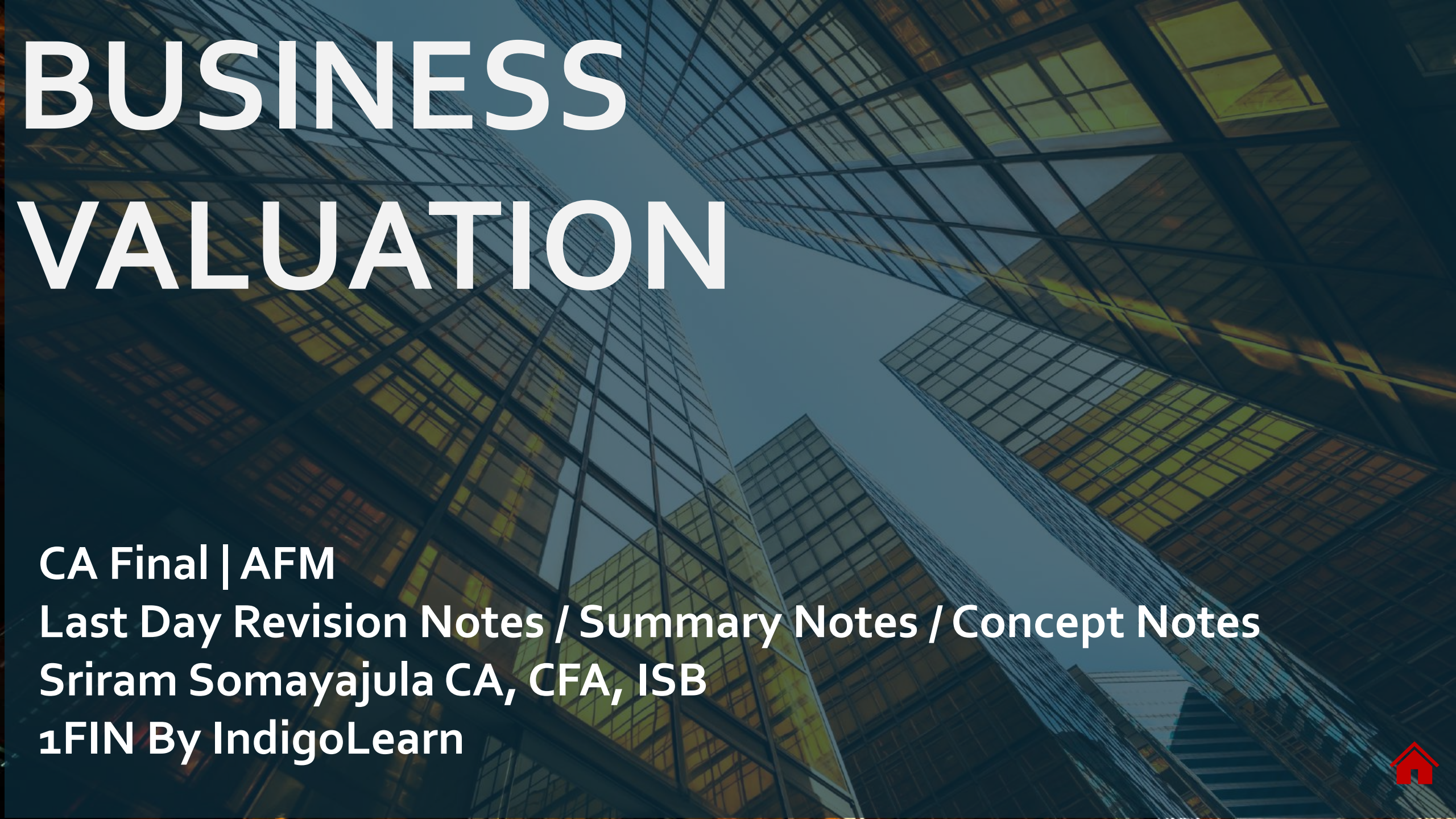
(i) Sunday is Holiday.

(ii) Work in rounded rupees and avoid decimal working.

Days	Interest Rate (%)	Principal	Interest
Tuesday	7.75	10,00,00,000	21,233
Wednesday	8.15	10,00,21,233	22,334
Thursday	8.12	10,00,43,567	22,256
Friday	7.95	10,00,65,823	21,795
Saturday	7.98	10,00,87,618	21,882
Sunday	7.98	10,01,09,500	21,887
Monday	8.15	10,01,31,387	22,358
	Total		**153,745**

To be received on floating = 153,745
Net received = INR 317
Paid fixed = 153,745 – 317 =**153,428**
Fixed rate for which interest is INR 153,428 on INR 10,00,00,000 for 7 days is **8%** (153,428/10 Cr ×365/7)

If on Sunday interest is also compounded, then interest for Sunday is INR 21,887, otherwise it is INR 21,882.



BUSINESS VALUATION

CA Final | AFM

Last Day Revision Notes / Summary Notes / Concept Notes

Sriram Somayajula CA, CFA, ISB

1FIN By IndigoLearn

Need For Valuation

- Acquisitions
- Internal Use
- Future listing
- Management Efficiency
- Strategic Planning
- Start Ups

Approaches to Valuation

- Asset based
- Income / Earnings based
  - PE Ratio or Earnings Yield Multiplier
    Price = PE x EPS
  - Capitalisation of Earnings
    Price = Maintainable Profit / (1/PE)
- Cash Flow based
- Relative valuation
- Other Approaches

Limitations of Earnings Based Approach

- PE Ratio is mainly followed for listed companies
- PE Ratio of equivalent companies / industry for unlisted companies
- Involves judgement - estimation of expected future profit
- Difference in treatment of extra ordinary and exceptional items.
- Adjusted PE / Multiple Ratios give better results

Methods of Asset Based Valuation

- Net Asset Value
  - Value @ Book Values
- Net Realisable Value
  - Value at sale price of assets
- Replacement Value / Cost
  - Value at which new is bought

Net Assets = Fixed Assets + Net Current Assets – Long Term Debt

Limitations of Asset Based Approach

- Dependent on historical and irrelevant inputs
- Presumption of lot of tangible assets.
- Not suitable for intangible assets
- Doesn't consider future revenues, future operations and cash flows
- Least important for IT companies with fewer 'hard' assets but more IP & HR

Cash Flow Based Approach

Free Cash Flows

- To Firm (FCFF)
- To Equity (FCFE)

Determine Free Cash Flows → Project Future Cash Flows → Ascertain Discount rate → Find Terminal Value → Discount FCF & TV - find Present Value

FCFF	EBIT (1-T) + Depreciation - Increase in WC - Capex
FCFF	EBITDA (1-T) + Depreciation (T) - Increase in WC - Capex
FCFF	PAT + Depreciation - Increase in WC - Capex + Preference Dividend + Interest Expense (1-T) - Dividend & Interest Income (1-T)
FCFF	CFO - Capex- Interest Expense (T) + Dividend & Interest Income (T)
FCFE	FCFF - Preference Dividend - Preference shares repaid + Preference Shares Issued + Debt Raised - Debt Repaid - Interest (1-T)

E(R) Computation

- Capital Asset Pricing Model: $E(R) = R_f + \beta(R_m - R_f)$
- Arbitrage Pricing Theory: $E(R) = R_f + \beta_1(RP)_1 + \beta_2(RP)_2 \ldots$

$$Mcap_0 = \frac{FCFE_1}{(Ke - g)}$$

$$EV = M\ Cap + Debt\ - Cash$$

$$EV_0 = \frac{FCFF_1}{(WACC - g)}$$

$$Mcap\ = EV - Debt + Cash$$

Limitations of CF Based Approach

WACC / Discount rate computation is tough → Which Risk Free rate should be used? → What is Market Return? → Beta Computation → Terminal Value Computation

Value as per Earnings Capitalisation Method
Future Maintainable Profits (Usually PAT) / Capitalisation Rate

External Funds Requirement (EFR) = Money to be raised in Debt & Equity to meet increased Asset Size

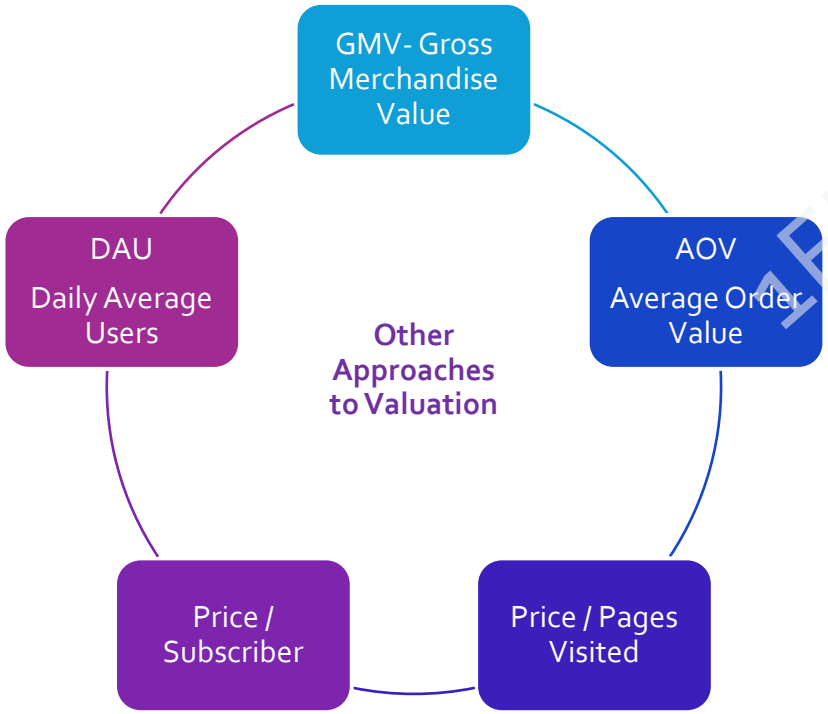
For Buyback (BB) Questions Assume BB Price as X & BB Shares as Y and solve simultaneously equations

Beta of Assets : $\beta_a = \beta_e \left[\frac{E}{E+D(1-t)}\right] + \beta_d \left[\frac{D(1-t)}{E+D(1-t)}\right]$

Where,
β_a – Ungeared or Asset Beta
β_e – Geared or Equity Beta
β_d – Debt Beta
E – Equity
D is Debt
t is Tax rate

If β_d is considered as Zero then

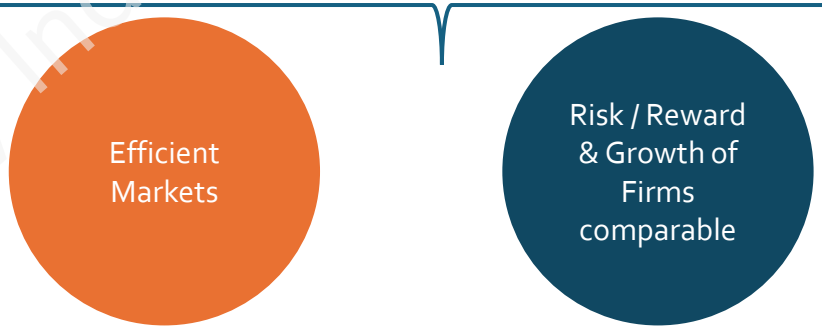
$$\beta_e = \beta_a * \left[1 + \frac{D}{E}(1-t)\right]$$



Relative Valuation

- Identify Drivers
- Identify Comparable Firms
- Analyse Competition
- Ignore outliers, if any
- Determine correct matrix to arrive at EV

Inherent Assumptions



Equity value-based multiples

PE & PB Ratios most popular

PEG Ratio = $\frac{PE\ Ratio}{Growth\ rate\ of\ EPS}$ used by high growth companies

Enterprise value-based multiples

$\frac{EV}{EBITDA}$	Most popular
$\frac{EV}{Sales}$	Used for early-stage companies without profits
$\frac{EV}{Capital\ employed}$	More appropriate to capital intensive enterprises

Leveraged Buy Out (LBO)

PE Firm and / or Acquirer

70-80% of Cost of Acquisition
Loan raised by Pledging Target's Assets

20-30%
Own Equity

Target

Works where future cash flows are certain – Targets with stable, non-cyclical, predictable can go for an LBO.

Management Buy Out (MBO)
Instead of an External Acquirer, when the Existing Management along with a PE does an LBO, it is called as MBO

Management incentives are aligned towards Organization success

Management Buy In
When A PE brings in New Management to replace the Old Management in an LBO it is called Management Buy in

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Exit Multiples Method
- Used to compute TV in a DCF Valuation
- Existing EBITDA / PE multiples are used

Chop Shop Method Also known as Sum of the Parts (SOTP) is used to value Conglomerates

Identify the industries to whom such business segments belong → Calculate a value for each business segment based on appropriate drivers of each industry → Aggregate the values of all segments → Discount the aggregate value to determine the "chop-shop" value of the firm.

1 **Economic Value Added (EVA) =** $\text{NOPAT} - \text{Capital Charge} = \text{EBIT}\,(1 - \text{Tax rate}) - \text{Invested Capital} * \text{WACC}$

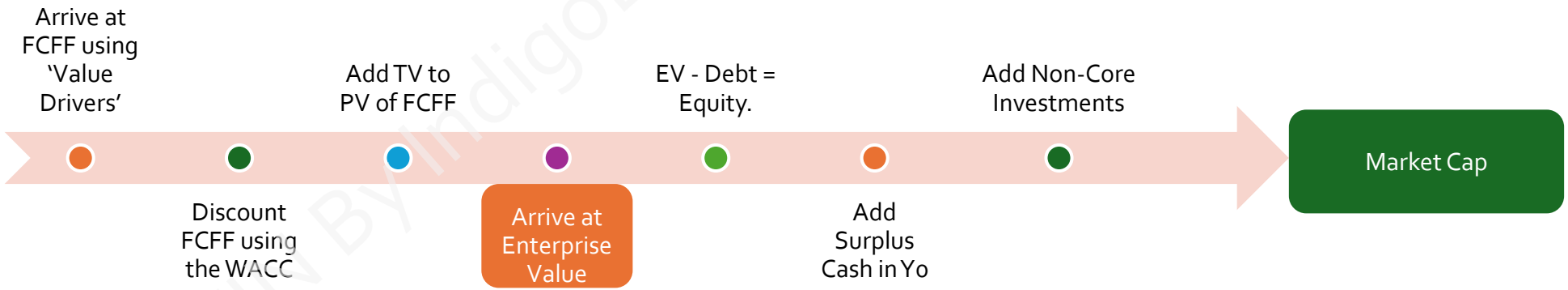
NOPAT = Net Operating Profit After Taxes
EBIT = Earnings before Interest and Tax

Invested Capital = Equity + Debt = Total Assets – Non-Interest-Bearing Liabilities (All are Book Values)

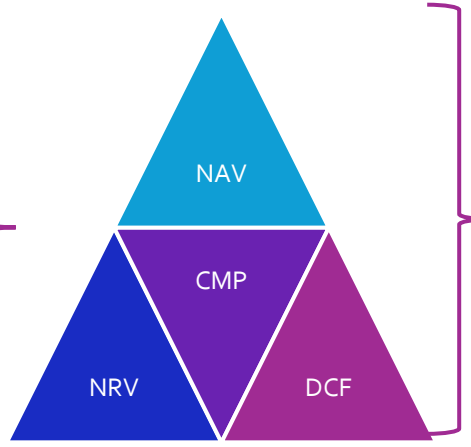
- Adjust both EBIT and Invested Capital for non-cash charges (other than depreciation) like provisions for doubtful debts, P&L adjustments.
- Adjustments should be made post tax and corresponding BS items like Equity, CA, CL should also be made

2 **Market Value Added (MVA) = MV of Equity & Debt less Invested Capital**

3 **Shareholder Value Analysis: Overcomes shortcomings of EVA by arriving at Future Value of Equity using Value Drivers**



Fair Value



- All methods of Arriving at FV have Inherent Challenges
- Better to have a Range of Values
- FV is one which is Min Acceptable to Seller & Max Payable by Buyer

- For a CA it is the Arms-Length Value
- For an Analyst, it is PV of CF
- For a Speculator, one which open aribtrage opportunities

Use Multiple Methods to Arrive at a range of Values

↓

Provide Comments for each Method

↓

Arrive a Final Conclusion based on additional Info if any

Distressed Companies

Value of Net Assets

−

Value of Net Liabilities

=

High Debt levels

High Opex

Revenue Downturn

Leads to Delays in Payments/ Distress

Does Not mean Company is worthless

- Estimating CF is tough due to declining revenues
- TV is difficult to compute as immediate CF may be –Ve
- Therefore, cannot use DCF
- Risk of Bankruptcy is high
- Discount rates reflecting probability of failure should be used

Liquidation Value + PV of FCF + GW + Intangibles = Going Concern Value

Non-Going Concern Value

- Impact of Bad Reputation
- Lay off critical employees
- Low Realisable values for Assets
- No Value for GW / Intangibles

Distressed Company Valuation

- Modified DCF
- DCF + Distress Valuation
- APV
- Relative valuation

Distressed Company Valuation

Modified DCF

- Estimate Probability Distribution for all Cashflows
- Arrive at Expected CF for each Period
- Arrive at revised Ke based on updated D:E & Unlevered Beta
- Estimate Kd based on updated measures of default risk
- If unable to estimate entire distribution, Probability of distress for each period to be estimated and used as below:

Expected cash flow t = Cash flow t * (1 - Probability of distress)

DCF + Distress Value

- DCF overstates Value if there is a probability of failure; hence.
  - Value a business as Going Concern = DCF Ve
  - Determine Probability of Distress over lifetime
  - Estimate the distress sale value as a percentage of book value or as a percentage of DCF value.

V_e = DCF V_e (1 - Probability of distress) + Distress V_e (Probability of distress)

Adjusted Present Value (APV)

- Investment & Financing decisions Separated
- Part 1 : Compute Unlevered Firm Value by discounting FCF at unlevered Ke
- Part 2 : Compute PV of Expected Tax Benefits of Debt
- Part 3: Expected Bankruptcy Costs = (Unlevered firm value - Distress Sale Value)* Probability of Distress

Firm Value = Unlevered Firm Value + (Tax Benefits of Debt - Expected Bankruptcy Cost from the Debt)

Relative Valuation

- Use Revenue / EBITDA Multiples
- PE / PB cannot be used
- Subjectively Adjust the multiple of a distressed company when comparing to an industry multiple or peer multiple

No established Businesses → Little historical information → Value based on Future growth potential → Untested idea / Anticipated Consumer behavior → Founders' Competence, Self Belief & Drive dependent → Founders Walk in the Dark & Convince investors of their night vision ☺

Startup Valuation

- **Earnings / CF based Approach**
  - -ve CF behaviour normalised
  - Difficult to Value startups with no CF / Earnings
- **Asset Approach**
  - Startup have negligible Tangible Assets
  - Valuing Intangible assets is tough for a business that is yet to be established
  - Despite being new entities, Startups operate under the Going-Concern Assumption, Incorrect to value at Realisable Value
- **Market Approach**
  - Generally, few /no established competitors
  - Competition may be in form of other startups
  - Metrics of Other startups may be skewed too
  - However, Market approach is better of the lot to value startups

Startups Value Drivers

- **Product:** Unique & Prototype command higher valuation
- **Management:** Founding Team academic Background, Credentials & well-rounded team drives valuation
- **Traction:** Higher the Traction (growth), higher the value
- **More Revenue Streams, Greater Value**
- **Attractive Industry & Scalable business => Greater Value**
- **Lesser Competition, greater the Value**

Startup Valuation Methods

Berkus Approach

- Considers 5 Factors
  - Basic Value
  - Technology
  - Execution
  - Strategic Relationships
  - Production & Sales
- Assign Weights based on Criticality
- Pre-Revenue Val capped @ $ 2 Mio
- Post-Revenue Val capped @ $ 2.5 Mio

Cost To Duplicate

- Considers all costs & expenses associated with product development & physical assets to determine the startup's Fair market Value
- Does not focus on future revenue projections

Comparable Transactions

- Uses Metrics of Comparable Start ups
- Eg: Users, Downloads etc.
- Easy to use precedent
- Multiples to be adjusted for proprietary technologies, intangibles, industry penetration, locational advantages

Scorecard based valuation

- Used for Pre-revenue businesses
- Find the average pre-money valuation of comparable companies
- Value = Sum product of all factors of current Vs. comparable startup for following metrics
  - Team Strength : 0-30%
  - Opportunity Size: 0-25%
  - Product / service: 0-15%
  - Competition: 0-10%
  - Sales & Marketing: 0-10%
  - Investment req: 0-5%
  - Others: 0-5%

First Chicago Method

- Expected DCF of 3 scenarios
  - Best
  - Worst
  - Base

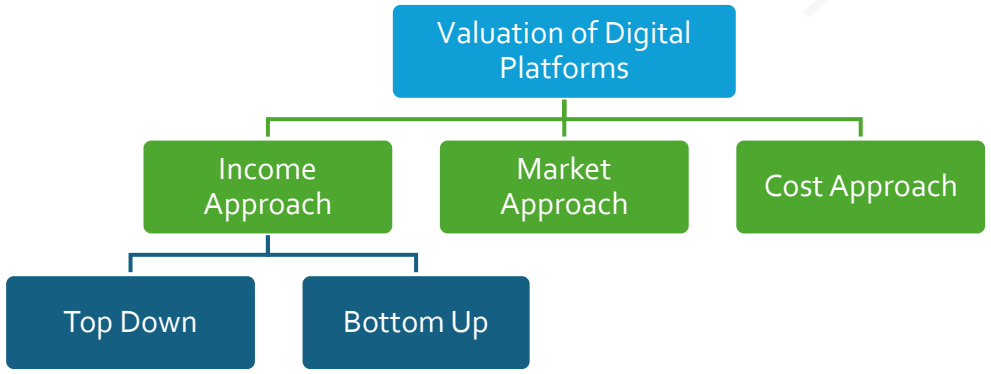
VC Method

- Return on Multiple of Initial Investment 10x , 20x , 30x on initial investment
- Return multiple Based on expected IRR

Valuation of a startup is much more than the application of various methods – it is about understanding the story of the future trajectory and communicating that narrative using substantial numbers.

Various types of Digital Platforms : A digital platform is a software based online infrastructure that facilitates interactions and transactions between users

Market Place	• Multiple Buyers Matched with Multiple Suppliers • Booking.com, Amazon.com
Search Engine	• People looking for information are matched to multiple sources of information • Google, Bing, and Baidu
Repository	• Suppliers 'deposit' their materials into a type of library • Spotify, GitHub, YouTube
Digital Communication	• Users Send messages & Documents to Each Other • Whatsapp, Teams etc
Digital Community	• Virtual Connections with Other People • Facebook, Snap etc
Payments Platform	• Senders send money to receivers • Gpay, PayTM etc



Top-Down Approach

Estimate Total Addressable Market (TAM) → Estimate Serviceable Addressable / Obtainable Market SOM/ SAM → Project Market share & revenues

Platforms have high cash burn due to penetrative strategies – Difficult to estimate market size & Market share

Bottom-Up Approach focusses on projecting financials based on current financial position& scaling efficiently

Specific Considerations in valuing using Bottom up / Top-Down Approach

- Use FCFF & WACC / FCFE & Ke
- Estimating Beta for startups is a challenge
- Survival of platform dependent on Management Quality
- Company Specific Risk Premium (CSRP) needs to be added to CAPM to arrive at Ke
- CSRP higher for nascent Companies

Market Approach

- Use Ratios like PE, EV/ EBITDA, PB, Price to Sales
- Choosing right Metric is important
- Fewer listed Platforms
- Earnings are minimal for platforms
- Platforms are usually Capital Lite
- Focus is hence on Revenue based Drivers

Category of Digital Platform	Drivers of Revenue
Marketplace	No. of Booking made, No. of registered users, volume of Transactions
Payment	No. of active subscriber, No. of merchants registered on the platform, Compatibility and speed of the operating system, Security, Ease of Use
Community	Number of users, subscription fees, platform for professionals
Communication	Number of users, sponsored links, advertising revenue
Repository	Number of readers and contributors, authenticity of data, duration of use, quality and variety of data
Search	Number of users, relevant search results, time taken per search

Cost Approach

- Estimates Value based on total cost incurred to build the platform
- Estimate hours required to write code
- However, ignores revenue generating capacity of the Platform

Conclusion: Value of Platform Depends on

- Business Understanding
- Revenue Model
- Management Quality
- Risk Reward Ratio

Valuing Professional / Consultancy Firms

Compare Historical & Current KPIs with Industry Benchmarks

↓

Compare Audited Financials & IT Returns Data with competition

↓

Under Income Approach, Terminal Value determination is tricky due to Inherent risk of Future Earnings Not Materializing

↓

Normalisation of Net Income & Cash Flow is Important to improve comparability; Eg: Add back non cash items

↓

Different Industries have Different KPIs

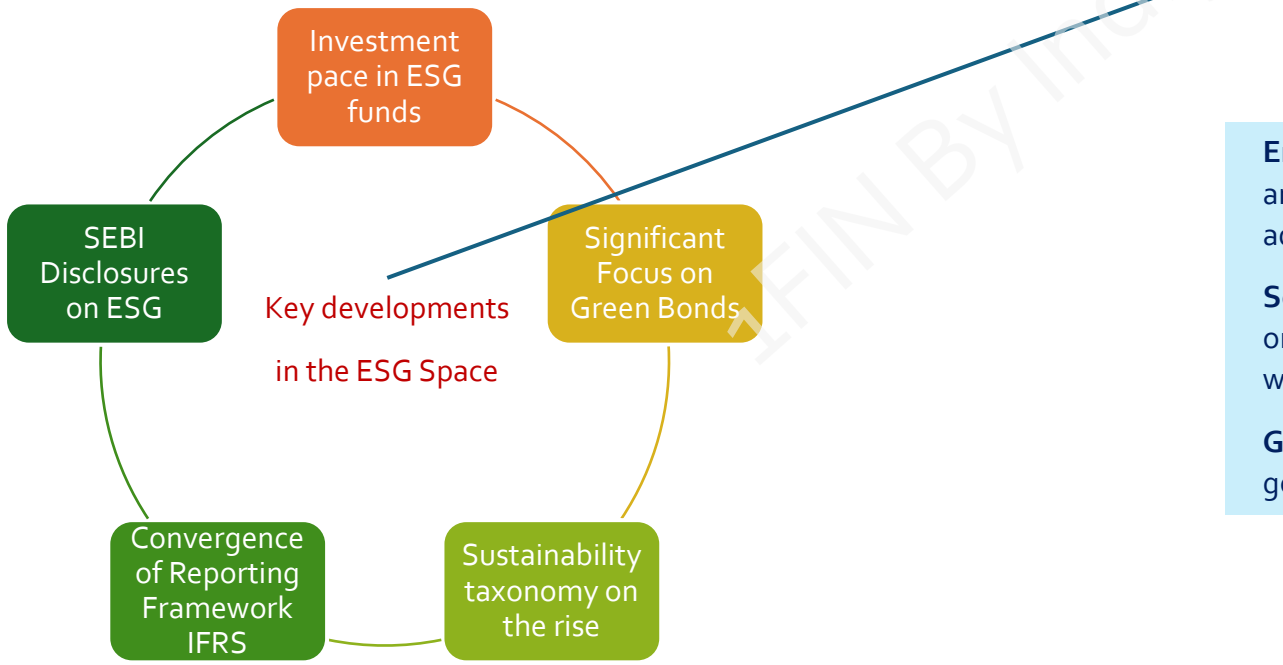
↓

Look at KPIs that are important for acquirer & not all KPIs

Environmental, Social, Governance (ESG) is a framework designed to be embedded into an organization's strategy that considers the needs and ways in which to generate value for all organizational stakeholders (such as employees, customers and suppliers and financiers).

Illustrative List of ESG Factors

Environmental	Social	Governance
Climate change	Employee development	Board Independence
Water	Diversity & inclusion	Board diversity
Waste generation	Community development	Anti-Corruption & Bribery
Emissions	Health & Safety	Tax transparency
Biodiversity	Customer	Ethical conduct



- Companies with high ESG focus get benefits in the form of preferential / **lower cost of debt** or access to specialized financial products like the Green, Social and Sustainability linked Bonds.
- ESG has become **Must have** from **Good to Have**
- Business case for ESG begins with **operational efficiency** and risk reduction and then extends to **longer-term** operational and organizational **resiliency and sustainability**
- Impact of ESG risks can be incorporated either in **discount rate or expected cash flows** to include ESG risks in Company Valuation
- Generally, people Increase Discount Rate but **adjusting CF is more explicit & appropriate**

Incorporating ESG Risks in CFs

Environment risk can be incorporated by carrying out 2-degree scenario analysis i.e. if temperature of the plant is increased by 2 degrees. Similarly, adjustment in cash flows can be made by considering carbon points.

Social risk can be considered by adjusting the impact of social measures cost on the revenue such as better labour working conditions, CSR, and other welfare measures for the various stakeholders.

Governance risk can be considered by adjusting the impact of poor governance on revenue in the form of penalty, fines, taxes etc.

M&A AND CORPORATE RESTRUCTURING

CA Final | AFM

Last Day Revision Notes / Summary Notes / Concept Notes

Sriram Somayajula CA, CFA, ISB

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Acquisitions - one player buys out the other to combine with itself, by

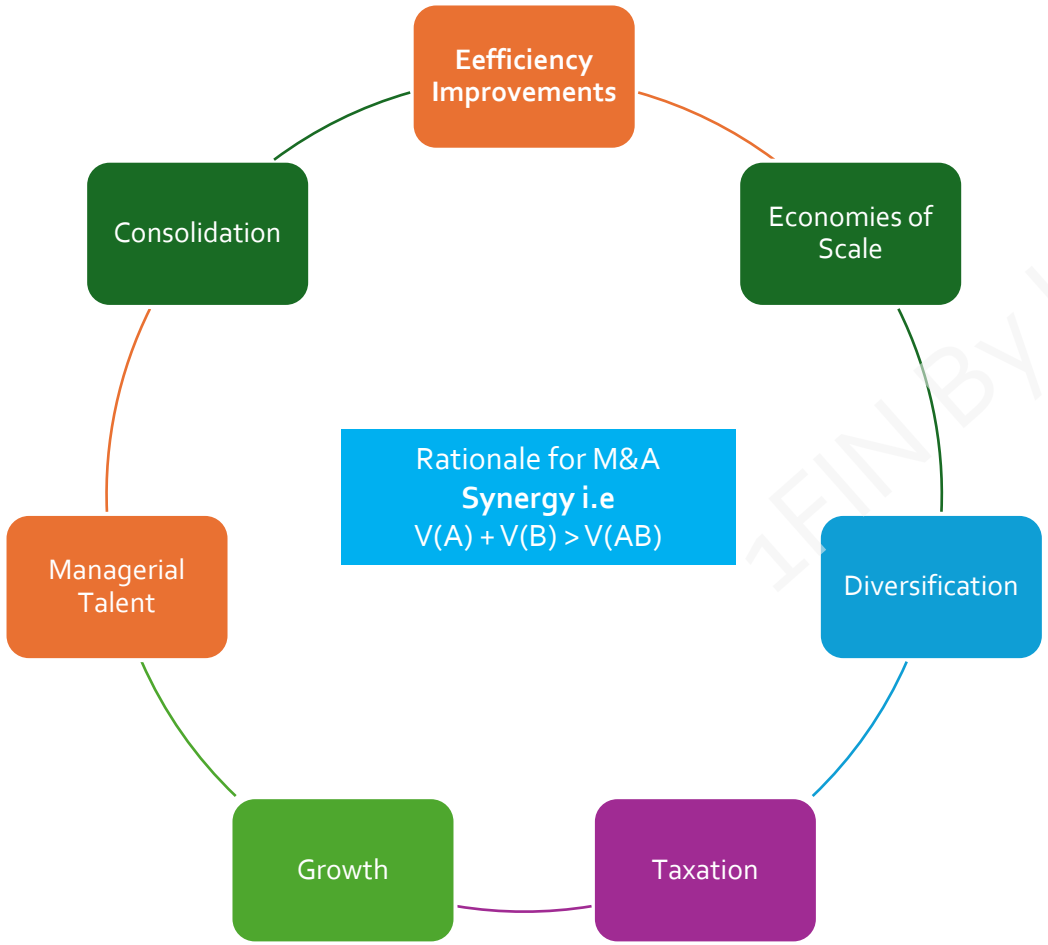
- a purchase, where one business buys another (or)
- a management buyout, where the management buys the business from its owners.

Amalgamation

- Absorption and blending of one by the other (or)
- Two or more companies join to form a new company.

Demerger, a form of corporate restructuring in which the entity's business operations are segregated into one or more components.

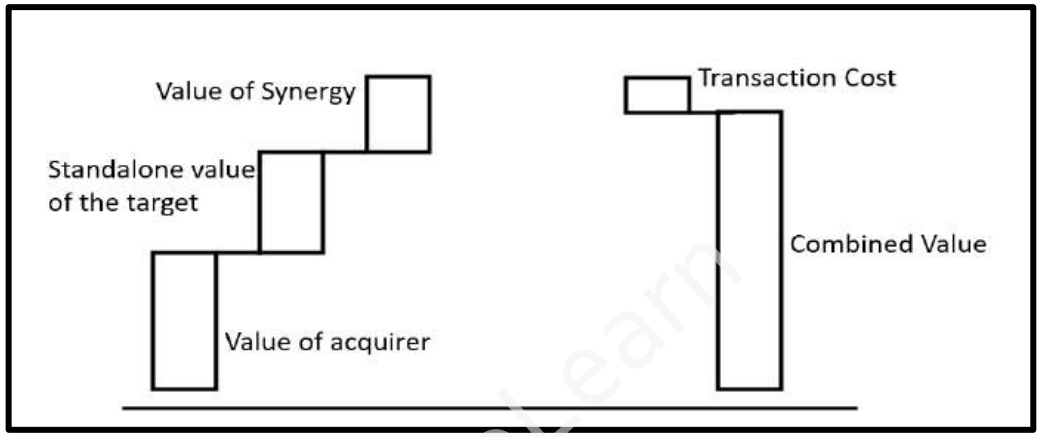
A Cross-border merger is a merger of two companies that are in different countries. Eg: Indian company merging with a Foreign Company or vice versa.



Merger Types

- Horizontal – Competitors
- Vertical – Buyers / Sellers
- Conglomerate - Unrelated
- Congeneric – Related industry but Diff products
- Reverse – Small acquiring Big, usually a Shell acquiring Public Co.
- Acquisition – Acquiring controlling interest

Gains/ Synergy from Mergers



Scheme of Amalgamation: A document outlining transfer of assets, consideration, rights, obligations etc

Appointed Date: Date on which the merger/transfer takes place

Effective Date: Date on which the merger is completed, and the merged companies are dissolved by the RoC.

Take Over Process

- Friendly – Target Board Agrees for acquisition
- Hostile – Target Board disagrees & Acquirer forced to make an open offer

Hostile Takeover → Strategies / Tactics

Street Sweep

Acquirer picks up large stake in target before making an Open Offer

Bear Hug

Acquirer threatens Open Offer & Target agrees for a settlement

Strategic Alliance

Start as a partner & takeover in due course

Brand Power

Ally with powerful brands to displace competing Brands

Factors considered in Financial Evaluation in an M&A Deal

- What is the maximum price of the target company?
- What are the principal areas of risk?
- What are the cash flow and balance sheet implications of the acquisition?
- What is the best way of structuring the acquisition?
- Valuation differs on a case/case basis
- How to pay for Acquisition? (cash / stock / mix)

Practical Questions Tips

1

	Acquirer	Target
EPS in Rs.	30	20
EPS Ratio	3	2
Swap Ratio (ULTA)	2	3

Swap Ratio i.e 2 Shares of Acquirer exchanged for 3 Shares of Target

2

Market Capitalization (Mcap) Rs. =
Market Price per Share (Rs.) x Total Share Count (Nos.)

3

Promoter Holding (%) = Shares Held By Promoter x 100 / Total Share count of Company

4

Free Float (%) = 100% - Promoter Holding %

5

Free Float Mcap = Total Mcap in Rs. x Free Float %

6

Exchange ratios used
- Ratio of EPS
- Ratio of Market Price of Shares
- Ratio of Intrinsic Value of Shares
- Ratio of Book Value of Shares

7

Usage of Weighted Average of various Swap / Exchange Ratios

	Acquirer (A)	Target (T)	Ratio (A:T)	Decimal (R =A/T)	Swap Ratio (S = T/A)	Weights (W%)	Weighted (S x W%)
EPS	3	2	3:2	1.50	1/1.5 = 0.667	30%	0.2000
Book Value	8	5	8:5	1.60	1./1.6 = 0.625	10%	0.0625
Intrinsic Value	7	5	7:5	1.40	1/1.4 =0.714	20%	0.1428
Market price	2	1	2:1	2.0	½ = 0.5	40%	0.2000
Weighted Average							**0.6053**

⇒ Shares of Acquirer are more valuable
⇒ Swap Ratio is 1 Shares of T for 0.6053 Share of A
⇒ Or 1.6520 Shares (1/0.6053) of T for 1 Share of A

8

When Question says Swap ratio of 1:2 without detailing who is Acquirer or Target, it usually implies
1 share of acquirer to be exchanged for 2 shares of the target

9

When Question mentions both Bonus and Split without specific order, it is first bonus followed by split

Practical Questions Tips (Cont'd)

10
- Question states that Exchange ratio should be on a No-loss basis to shareholders;
- If Question is specific about EPS then use Ratio of EPS
- If question is not specific then solve using both EPS ratio as well as Current Market Prices Ratio

11
Post Merger Valuation of Combined Entity
- Sum of Pre Merger Mcaps + Synergy
- Use Acquirer PE for valuation of merged entity only if specified

12
True Cost of Merger For Acquirer
Post Merger M cap of Target – Consideration Paid (if available) , else
Post Merger M cap of Target – Pre Merger M Cap of Target

13
Gain from Merger
Value Received - Price Paid
Net Gain from Merger for Acquirer
Synergy Gain – Premium paid for target

14
Gains / Losses for shareholders of both firms (In M cap terms)
Post Merger share of M cap of A – Pre Merger Mcap A
Post Merger share of M cap of T – Pre Merger Mcap T

15
Gains / Losses for shareholders of both firms (In Share Price terms)
Post Merger Price per share of A – Pre Merger Price per share of A
Post Merger Price per share of Equivalent Shares of T – Pre Merger Price per share of T

16
Eg: Swap Ratio is 3 shares of Target for 2 share of Acquirer
⇒ 2 shares of A = 3 shares of T (i.e 1 share of A for 1.5 shares of T)
Assume Pre merger price of A =100 , T =80 & Post merger price of A = 105
⇒ Equivalent share price of T = 105/1.5 = 70
⇒ Gain / (Loss) to share holder of T = 70 – 80 = Loss of 10

17
Equivalent EPS
Eg: Swap Ratio is 3 shares of Target for 2 share of Acquirer
⇒ 2 shares of A = 3 shares of T (i.e 1 share of A for 1.5 shares of T)
Assume Pre merger EPS of A =20 , T =21 & Post merger EPS A = 24
⇒ Equivalent EPS of T = 24/1.5 = 16
⇒ EPS Gain /(Loss) to share holder of T = 16-21= Loss of 5

18
Maximum Exchange ratio acceptable to Acquirer
=> All benefits to Target & Pre Merger Value to Acquirer
Minimum Exchange ratio acceptable to Target
=> All benefits to Acquirer & Pre Merger Value to Target

19
Minimum Value acceptable to Promoters of Target
Market Value of Shares + Lost income of Promoters

20
Merger of Banks :Capital Reserves in post merger BS(Bal Fig) =
- Book value of Shares of Target
- - FV of Shares in Acquirer issued to shareholders of Target

21
Restructuring of Companies
- Sources of Benefits = Usage of Benefits
- Compute Cash Balance
- Compute Revised balances of BS items

Takeover Defensive Tactics

Divestiture	• Divest or Spin off a business, reducing attractiveness
Crown Jewels	• Selling most attractive part of business
Poison Pill	• Dilute holdings ; issue Converts in case of Hostile Takeover
Poison Put	• Issue Bonds with redemption at very high premium
Greenmail	• Buy Back own shares from hostile takeover bidder
White Knight	• Sell out to a friendly Company instead of hostile bidder
White Squire	• Sell out to a Company Not interested in this business
Golden Parachute	• Offer hefty payouts to Key employees in case of a Hostile Takeover
Packman Defence	• Try and Acquire the acquirer in a hostile manner

Demerger: Involves a company selling one of its divisions or & is used in following cases:

- Restructuring of an existing business
- Division of family managed business
- Management buy-out

Reasons for divestment or demerger

- To pay attention on core areas of business
- Divest Non-contributing business
- Business being too big to handle
- Meet Urgent cash requirement

Sell Side Imperatives

- Increasing competitor pressure.
- No access to new technologies and developments
- Strong barriers to market entry
- Poor positioning on supply and demand side
- Inability to achieve Critical mass
- Inefficient utilisation of distribution capabilities
- Inability to develop New strategic business units for future growth
- Inadequate capital to complete the project
- Window of opportunity: Possibility to sell the business at an attractive price
- Focus on core competencies

In the best interest of the shareholders – where a large well-known firm brings up the proposal, the target firm may be more than willing to give up.

Reverse Merger

- Smaller company gains control of a larger one
- Used for Sick Company Revival
- Also Known as Backdoor Listing

Tests to be satisfied

- Assets of transferor > transferee
- Equity capital issued by transferee > original capital.
- The change of control in the transferee company through the introduction of a minority holders

Benefits for the acquirer

- The assets of the transferor company are greater than the transferee company.
- Equity capital to be issued by the transferee company pursuant to the acquisition exceeds its original issued capital.
- The change of control in the transferee company through the introduction of a minority holder or group of holders.

Financial Restructuring

Need - Inability to repay debt - Stakeholders come together to protect & stabilize the entity

Meaning - refers to changes made by the management in Assets and Liabilities stakeholders' consent.

Suitable for entities with sizeable losses over a period with negligible NW

Aimed at reducing the debt/payment burden of the corporate firm.

Results in

- Reduction/Waiver in stakeholder claims
- Revaluing properties/assets & using Revaluation profits to w/o accumulated losses / fictitious assets

Forms of divestment/ demerger/ divestitures

Sell off

- It is of an asset, factory, division, product line or subsidiary by one entity to another
- Reasons
  - Non-Core
  - Combined businesses undervalued due to poor synergy
  - Raise cash to pay off debts.

Spin-off

- A part of the business is separated as new Entity
- The existing shareholders get proportionate ownership.
- There is no change in ownership
- Separate identity to a division.
- Valuable division is spun-off. As takeover defence
- To separate regulated & unregulated businesses

Split-up

- Breaking up entire firm into a series of spin-off.
- The parent firm no longer legally exists
- Newly created entities survive.
- Divisions become separate legal entities
- Enhances shareholders value and bring efficiency /effectiveness.

Equity Carve-outs

- Defined as partial spin-off - create new subsidiary and IPO it.
- Control retained with parent
- Generates cash from IPO
- Unlocks the value of subsidiary unit
- Enhances parent's value.

Demerger /Division of Family-Managed Business

- Pressure to yield control to professional managements.
- Hive off divisions meet succession problems.
- Consolidating core businesses

Types of Ownership Restructuring

Leveraged buyout (LBO)

- Acquisition happens using borrowing
- Target assets used as collateral
- Target no longer remains public post LBO
- Intent – to improve operational efficiency , sales & cash flow
- Post LBO, target managed by private investors.
- Post turn around & Debt repayment, may go public again.
- Large acquisitions without having to commit a lot of capital.

Equity Buy-Out

- Company Buys back own shares
- Results in Capital Reduction.
- Strengthens promoter's position
- Company uses surplus cash to buy shares from the public.

Management Buy-Out

- Buyouts initiated by the management team of a company
- The company is bought by its own management team.
- MBOs used to exit non-core divisions

Going Private

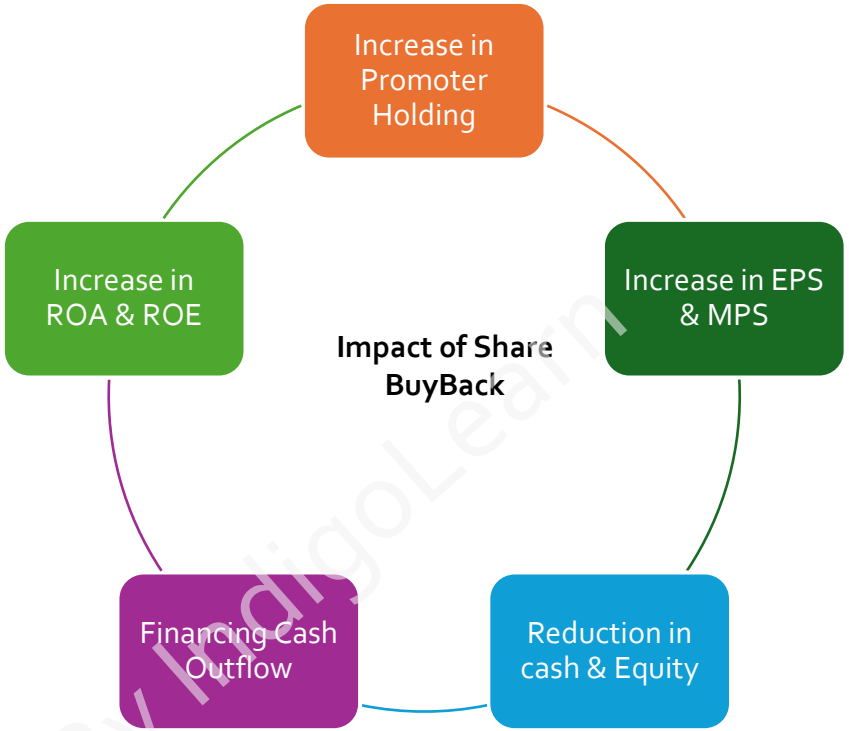
- Listed company is converted into a private company
- Buys Back all Shares OS in the markets.
- Happens when there are no benefits of being a public company.

How to Unlock Value through M&A

- Horizontal growth helps achieve optimum size, enlarge the market share, curb competition and use unutilized capacity.
- Vertical combination helps to economize costs and eliminate avoidable taxes /duties.
- Diversification of business.
- Utilize idle funds of target for the expansion
- Merger of an export, investment, or trading company with an industrial company or vice versa with a view to increase cash flow.
- Merging subsidiary company with the holding company to improve cash flow.
- Taking over a 'shell' company with licenses
- Nourishing a sick unit in the group & maintain group image.

How to Unlock Value through business restructuring

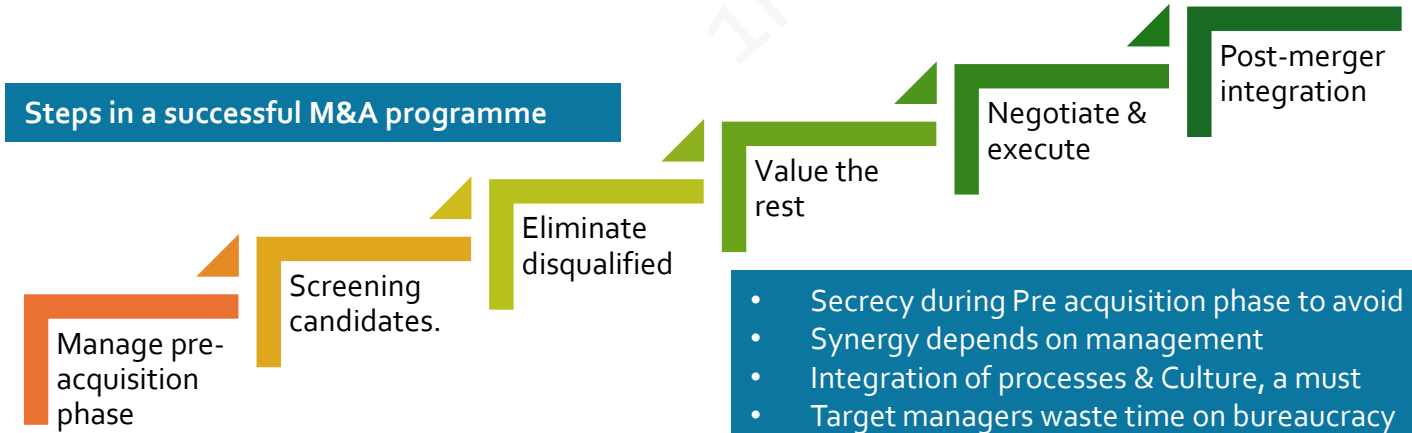
- Competitive positioning
- Surviving adverse economic climate,
- Providing a new direction.



Premium Vs. Discount in an M&A Deal

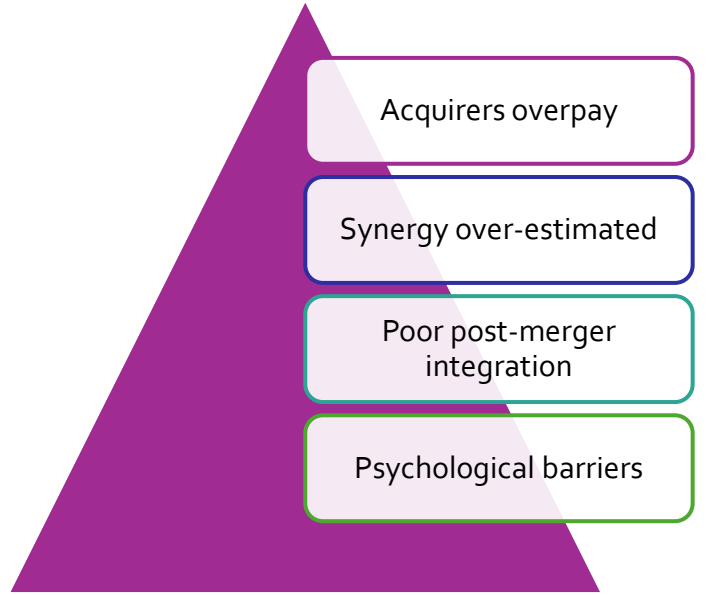
- Timing is a critical in an M&A deal
- During bull phase, there are more buyers but not sellers
- Synergies non-realization risk is high due to corporate, market, economic reasons, or wrong estimation
- Have range of values for the transaction in different situations
- Use transaction multiple, comparable company, DCF, PE Ratio, NAV, past earnings approach etc

Steps in a successful M&A programme

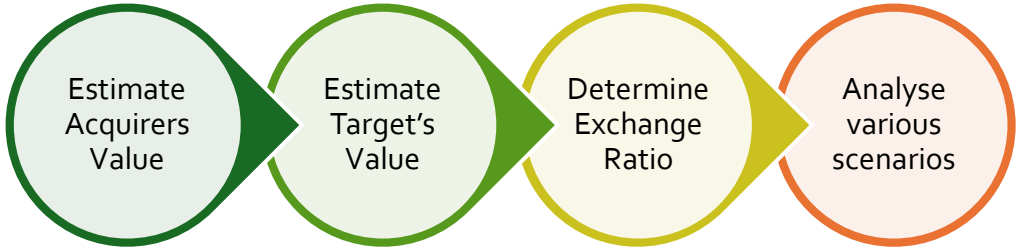


- Secrecy during Pre acquisition phase to avoid price increase of target
- Synergy depends on management
- Integration of processes & Culture, a must
- Target managers waste time on bureaucracy
- Motivated Managers a must for successful integration

Reasons for M&A Failure



Acquisition Through Shares



- Target Shareholders will agree only if they benefit in terms of Share price
- The value of combined business = combined earnings x combined PE ratio.
- A lower combined PE ratio can offset the synergy gains
- A higher P/E ratio can lead to higher value of business, even if there is no synergy.

Factors Influencing Cross Border M&A

Globalization of production and distribution of products and services. → Integration of global economies. → Expansion of trade and investment relationships on international level. → Take Advantage of investment and tax incentives for foreign investment. → Privatisation of state-owned enterprises and consolidation of the banking industry

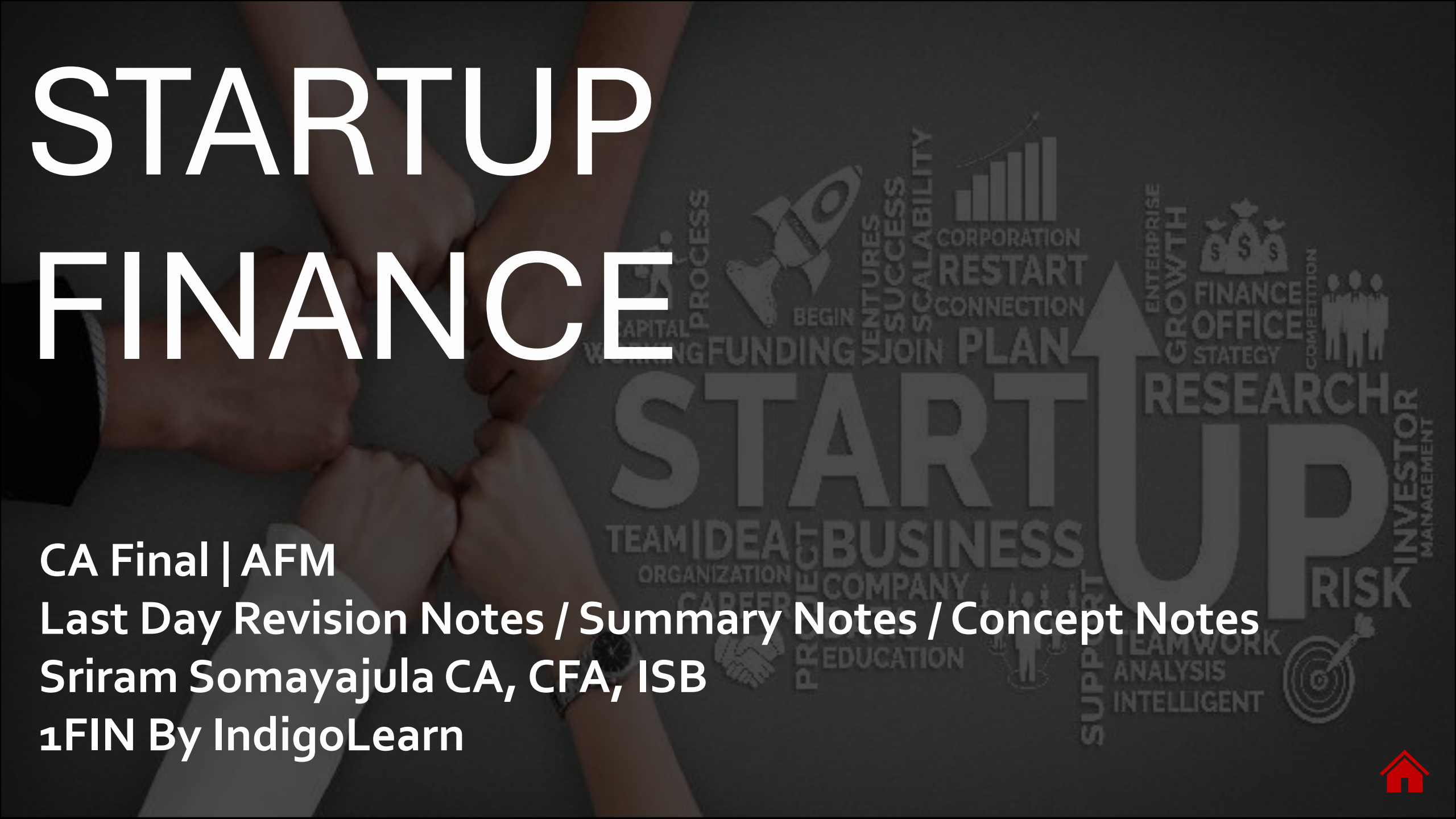
SPAC – Special Purpose Acquisition Company

- SPAC Raises money through IPO
- Money used to Merge with a Company to be identified later
- Shell firm structure is often called a "blank-cheque company
- IPO proceeds held in a trust till acquisition is made
- If Acquisition not made within a period, money returned net of costs
- IPO shareholders have option to redeem shares if they do not like the target
- SPAC target is announced only after Agreements are signed
- SPAC faces Complex accounting & financial reporting/registration requirements
- Should be ready to operate as a public Company within 5 months from Letter of Intent
- India does not support SPACs
- IFSC Gandhinagar, published a white paper exploring feasibility in India

Need & rationale for M&A

- Instantaneous growth, Snuffing out competition, Increased market share
- Acquisition of a competence or a capability
- Entry into new markets/product segments
- Access to funds
- Tax benefits

STARTUP FINANCE



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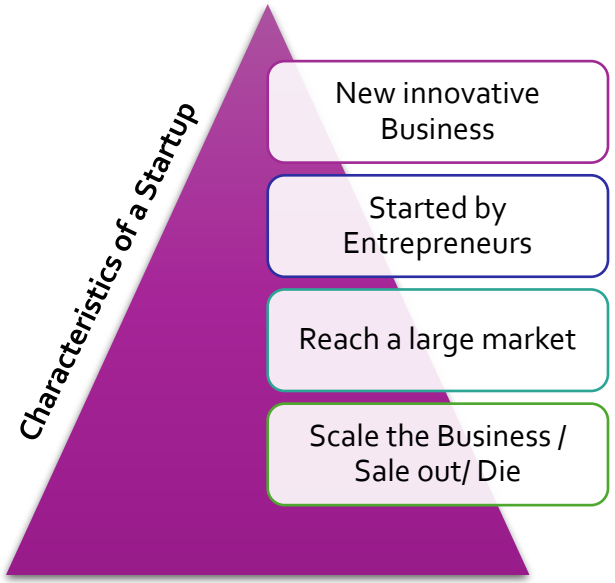
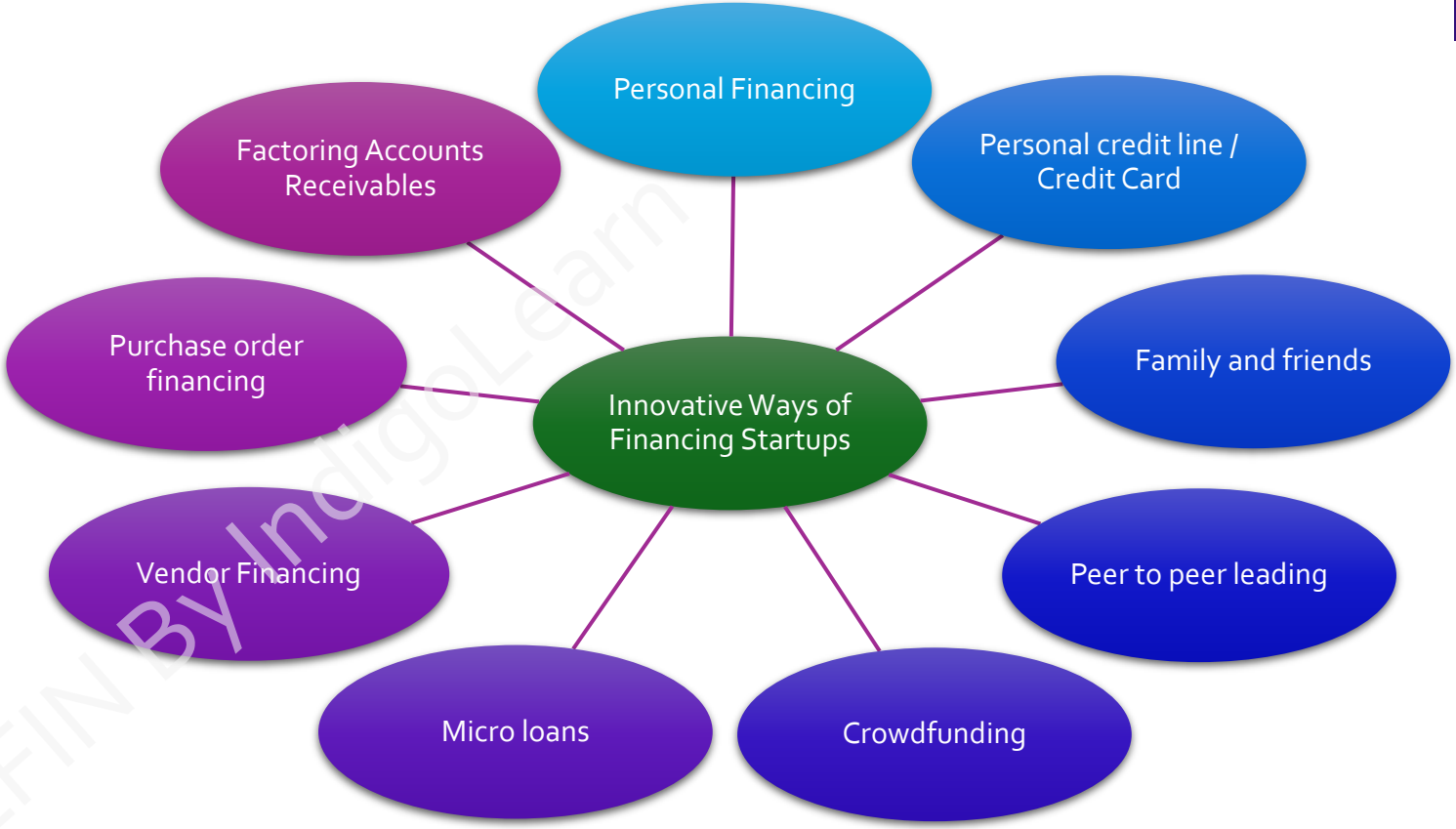
Startup financing means some initial infusion of money needed to turn an idea (by starting a business) into realty





Components of a Pitch presentation

- **A Unicorn** is a mythical animal
- W.r.t Startups the term was coined by VC Aileen Lee in 2013
- A Unicorn is a privately held start-up Valued @ US$ 1 billion or more
- The Term represents the statistical rarity of successful ventures
- Emphasis is on the rarity of success of such start-up.
- Other features of a Unicorn are focus on new ideas, disruptive innovation, consumer focus, high on technology etc.
- A Startup with Valuation > US$ 10 Billion is known as a Decacorn
- InMobi is India's first unicorn and as on date India has more than 100 Unicorns

Build a company from personal finances / operating revenues

Modes of Startup Financing

Bootstrapping

Angel Investors

Venture Capital Funds

- Get Credit from RM Suppliers
- Delayed payments attract Interest
- Works well in Retail Ops

Trade Credit

- AR of sold to a commercial finance Company at a discount
- Factor assumes task of collection
- Factor can be on Non-Notification and / or Non-Recourse basis
- Reduce costs
- Frees up receivables
- Useful for raising money & keeping cash flowing

Factoring

Leasing

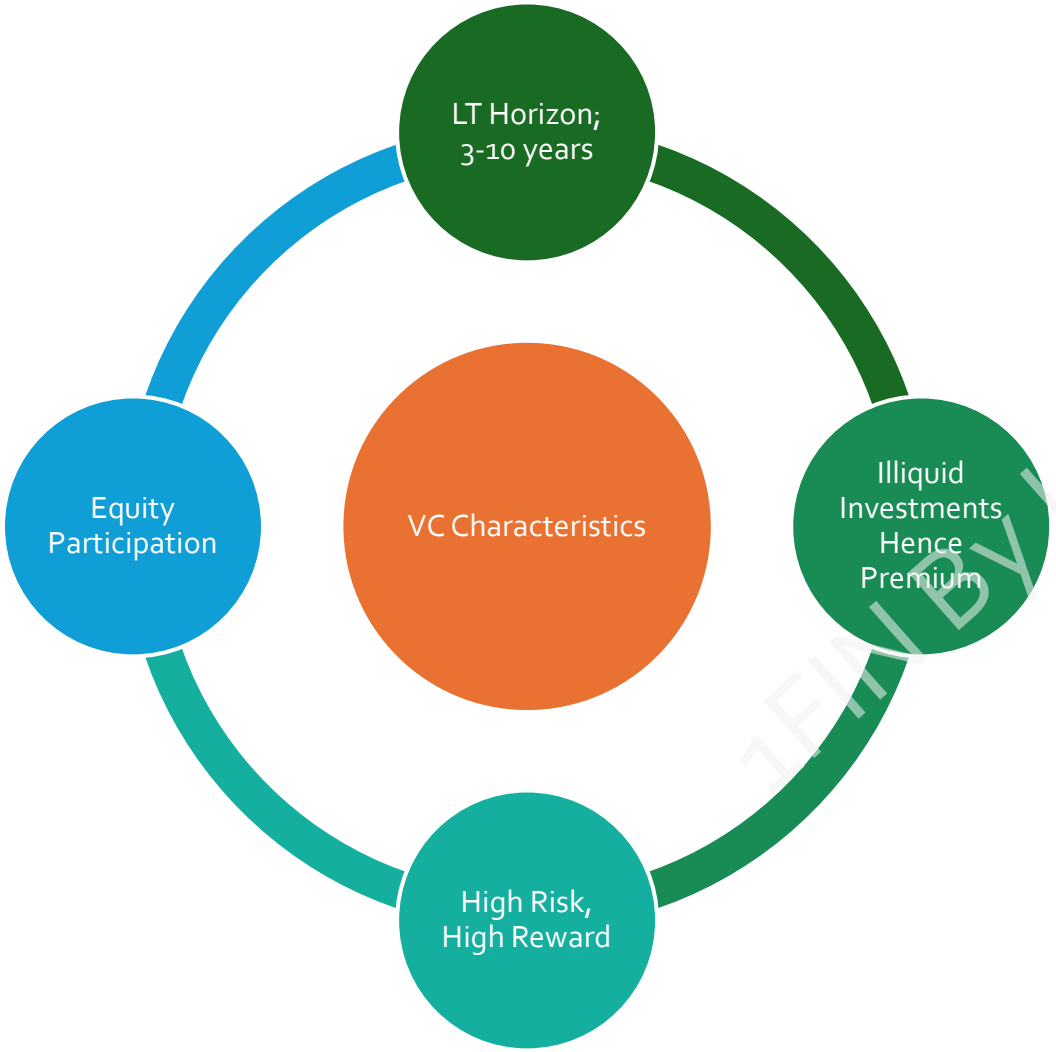
- Reduces capital Investment
- Lessee get tax exemption on lease payments
- Lessor enjoys tax benefits on depreciation
- Lessor gains include capital appreciation & profit from the lease.

- Angel investors help startups take their first steps
- Not focussed on Profits
- Opposite of venture capitalists.
- Use their own money unlike VC Funds
- Also called informal investors, angel funders, private investors, seed investors or business angels
- Invest through crowdfunding platforms online or build angel investor networks to pool in capital.

- Money provided by professionals who management & invest in young, rapidly growing companies

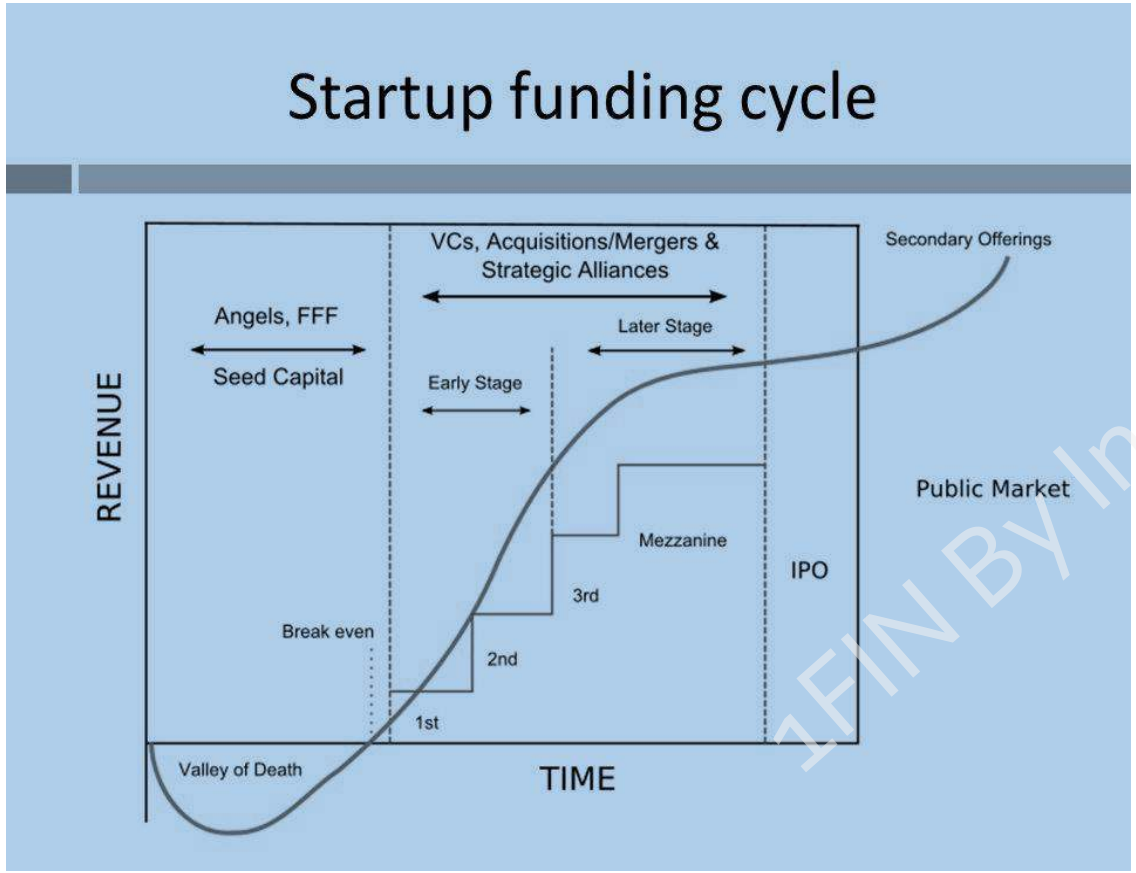
VCs

- Purchase equity securities
- Assist in the development of new products or services
- Add value to the company through active participation.



Advantages of VC Financing

- Inject long- term equity finance – a solid capital base for future growth.
- VCs are business Partners sharing both the risks and rewards
- Provide practical advice and assistance to the company based on past experience
- Has a network of contacts in many areas
- Capable of providing additional rounds of funding to finance growth.
- Experienced in prep for Domestic / Overseas IPO
- Can facilitate a trade sale.



RISKS

Financial Stage	Lock in Period	Risk Perception	Activity to be financed
Seed Money	7-10	Extreme	For supporting a concept or idea or R&D for product development and involves low level of financing.
Start Up	5-9	Very High	Initializing prototypes operations or developing products and its marketing.
First Stage	3-7	High	Started commercials production and marketing.
Second Stage	3-5	Sufficiently high	Expanding market and growing working capital need though not earning profit.
Third Stage	1-3	Medium	Market expansion, acquisition & product development for profit making company. Also called Mezzanine Financing.
Fourth Stage	1-3	Low	Facilitating public issue i.e., going public. Also called Bridge Financing.

VC investment process

Deal Origination	• VCs operates directly or through intermediaries. • They Focus on Sector / Stages of business / Promoter / Turn over • Startups provide business plan consisting of business model, financial and exit plans in an IM
Screening	• Generally carried out by a committee consisting of senior level people of the VC.
Term Sheet	• Contains the terms of investment such as funding, governance, operations, liquidation, Etc,
Due Diligence	• Handled by external bodies where, VC would try to verify the veracity of the documents taken. • Fees of due diligence are generally paid by the VC but may also be shared between VC and Investee.
Deal Structuring	• A convertible structure is preferred • Promoters retain the right to buy back the share. • (Tag Along Clause - A promoter has also to sell part of its stake along with the VC
Post Investment	• VC Part of BoD • Corporate Governance fairly Important • Periodically update VC on mile-stones & reasons for meeting / Not meeting them. • Bring in Professional Management
Exit	• Failure or death of Startup • Selling to third party/ Merger • IPO • Secondary Exit

Historical perspective of Indian VC Funds

Initiated in 1970,s IDBI, ICICI & IFCI started VCs in 1980s.

CCI guidelines of 1988 were very restrictive - Made VC investments highly risky and unattractive.

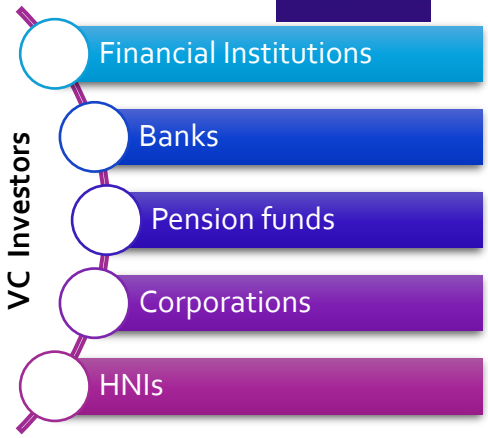
Soon, GoI liberalized the VC Industry and abolished the CCI

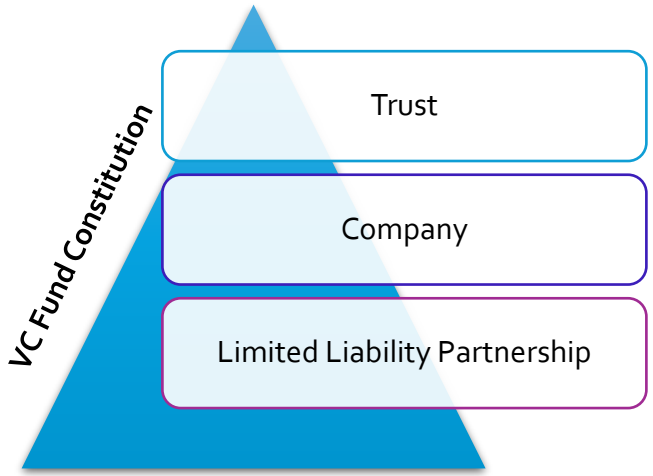
In 1995 Foreign Finance companies were allowed to invest in the country.

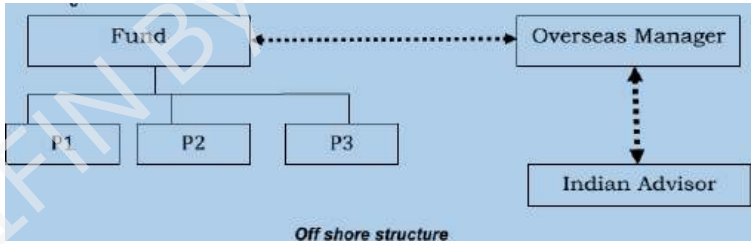
The new guidelines issues in 1996 created an unequal playing ground that favoured the foreign players.

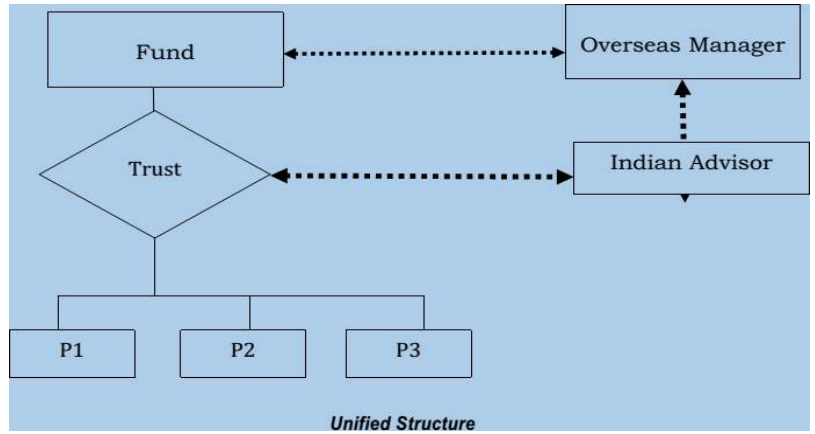
VC investing boosted by the IT revolution in 1997

Few VCs survived Dot Com Bust. Survivors shifted to late stage Financing









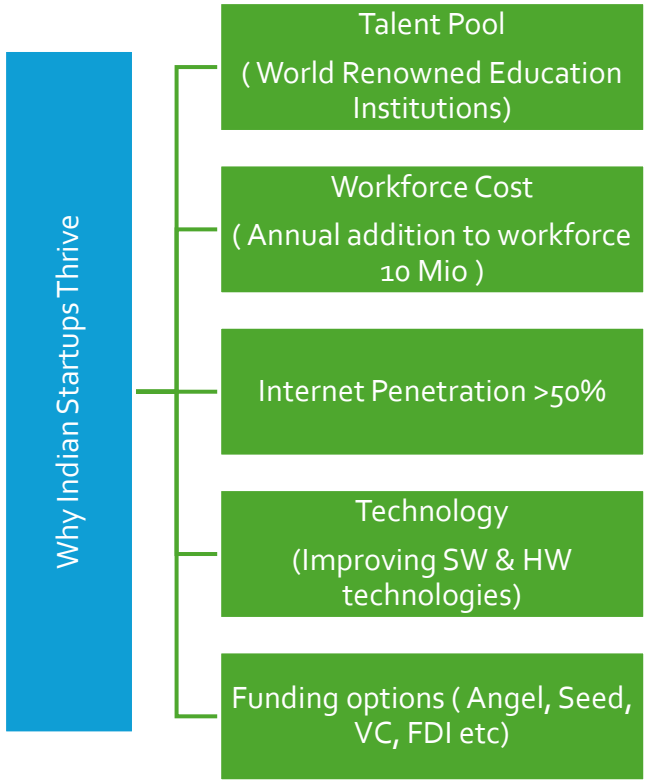
Domestic Funds:
- Raised domestically
- Structured as Trust / Company (Vehicle) for the pooling Investor funds
- Separate investment adviser that carries duties of asset manager.

Offshore Funds (Offshore Structure):
- Investments are made directly into Indian portfolio companies
- Assets managed by an offshore manager, while the investment advisor in India carries out the due diligence and identifies deals.

Offshore Funds (Unified Structure):
- Used when domestic & Foreign investors participate
- Overseas investors pool assets in an offshore vehicle that invests in a locally managed trust
- Domestic investors directly contribute to the trust.
- Trust makes local portfolio investments

Startup India Initiative

- Initiated by the Government of India on 16th of January 2016
- GSR Notification 127 (E) dated 19th February 2019 defines a Startup
- An entity registered as a Pvt Company / Partnership Firm / LLP
- Considered as a Startup for a period of 10 years from Date of Reg
- Turnover in any FY < ₹100 Cr
- Working towards Innovation, development or improvement of products or processes or services, or
- Has a scalable business model with a high potential of employment generation or wealth creation.
- Entity formed by splitting up or reconstruction of an existing business shall not be considered a 'Startup'.

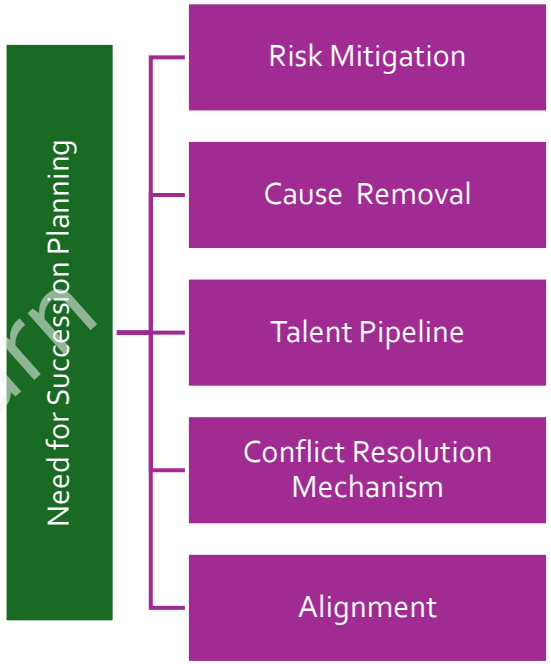


How Start up India Initiative help the growth of Startups

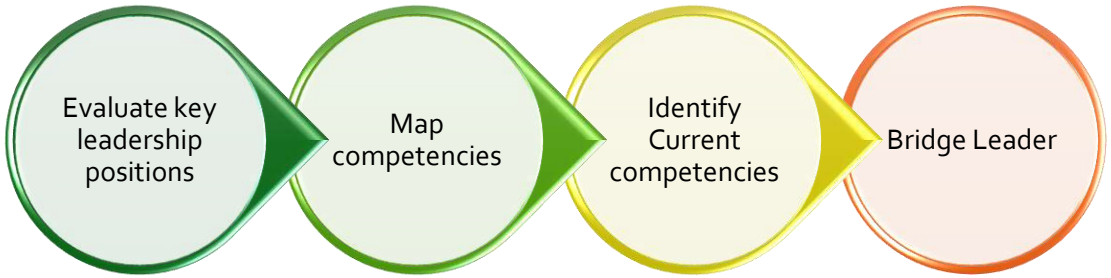
- Launch of Startup India and StandUp India programs in year 2016.
- Creating awareness in public about start- ups & boosted entrepreneurial mindset.
- GoI set up a SIDBI-run Electronic Development Fund (EDF),
- GoI became an LP in a fund for the first time ever
- Additional Push from
  - Mudra Scheme
  - 100% tax benefits u/s 80-IAC
  - Angel taxation exemption
- DPIIT created ₹ 945 Cr Startup India Seed Fund Scheme in Jan'21 to
  - Provide financial assistance to start-ups for Proof of Concept, prototype development, product trials, market entry, and commercialization.
  - Expected to support
    - 3,600 entrepreneurs
    - through 300 incubators
    - in the 4 years.
- A DPIIT recognized start-up incorporated in last 2 years with a business idea can apply for Start up India Seed Funding Scheme (SISFS).
- Start-up seed funding under SISFS - INR 50 Lakh
- Priority sectors for SISFS
  - Social impact
  - Waste/Water management
  - Textiles
  - Financial inclusion
  - Education
  - Agriculture & food processing
  - Biotechnology & healthcare
  - Oil & Gas, Energy, mobility & Railways
  - Defense & space

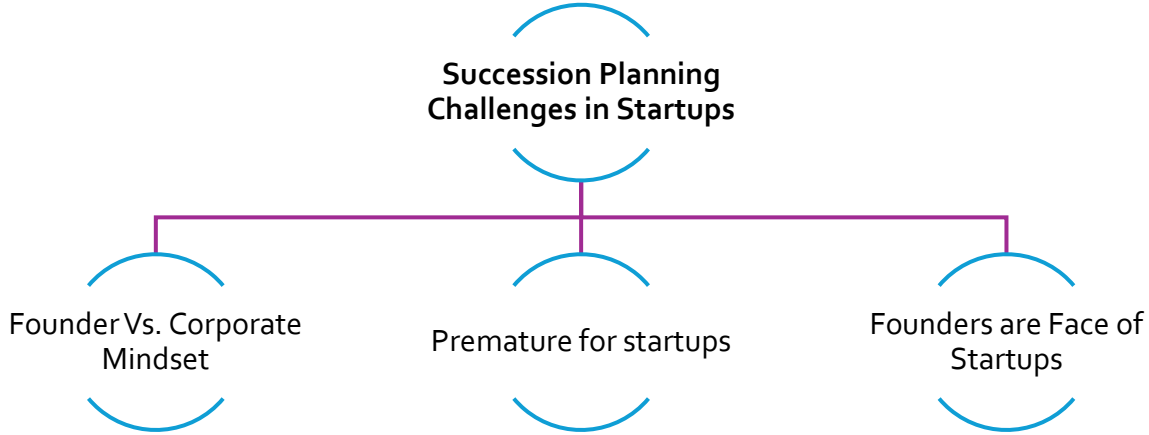
Succession planning is the process of identifying the critical positions within an organization and developing action plans for individuals to assume those positions.

- Identifies future need of people with the skills and potential to perform leadership roles.
- Important priority for family-owned businesses, managed by a non-family leader, ownership with the family.
- Ensures that the right people are available for the right jobs today and tomorrow.
- Also provide a liquidity event, which enables the transfer of ownership in a going concern to rising employees.
- Good way to promote and advance all employees



Business succession strategy





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