

ADVANCED FINANCIAL MANAGEMENT

**LEARN CONCEPTS WITH
MCQ/EXAMPLES**

**FOR CA FINAL NEW
SYLLABUS [MAY 2024
ONWARDS]**

BY CA. DINESH JAIN

**DEDICATED TO MY LOVABLE
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Important Links:

Concept Revision video playlist	https://bit.ly/afm_concept_revision
New RTP/MTP/SA	https://bit.ly/ca_final_inter_notes_dinesh_jain
Link to purchase Fast track classes/Regular Classes	www.instamojo.com/bharadwajinstitute

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Chapter 2 – Risk Management

1. What is Value at Risk?
The VAR concept serves as a valuable tool in risk management by providing insights into the potential maximum loss under adverse scenarios. The magnitude of this loss is contingent upon the risk associated with the investment, a metric measured through the standard deviation.
Loss for a single day = Amount invested x Daily SD x Multiple for respective confidence level
Loss for 20 days = Daily loss x $\sqrt{20}$
Loss for 250 days = Daily loss x $\sqrt{250}$
To obtain the final Value at Risk, a crucial parameter is introduced – namely, the confidence level. The final calculation incorporates this factor as follows: Multiple for 95% confidence level is 1.65 and 99% confidence level is 2.33 [Please remembers these two numbers and the same may/may not be provided in question paper]
Example: Suppose you hold worth 2 crore shares of X Ltd. whose market price standard deviation is 2% per day. Assuming 252 trading days a year, determine maximum loss level over the period of 1 trading day and 10 trading days with 99% confidence level. Answer: - Loss for single day = Rs.2 crores x 2% x 2.33 = Rs.9.32 lacs - Loss for ten days = 9.32 lacs x $\sqrt{10}$ = Rs.29.47 lacs

2. Daily SD vs Monthly SD vs Annual SD
Let us assume a month consist of 20 trading days. Hence monthly SD and daily SD from Annual SD is computed as under
Monthly SD = $\frac{\text{Annual SD}}{\sqrt{12}}$ (or) Annual SD = Monthly SD x $\sqrt{12}$
Daily SD = $\frac{\text{Monthly SD}}{\sqrt{20}}$ (or) Monthly SD = Daily SD x $\sqrt{20}$
The crucial point to note is that when converting between monthly and annual standard deviation, it is incorrect to simply multiply or divide by 12. Instead, the formula requires the use of the square root of 12.
Example: You own a portfolio of 10 crores. The daily standard deviation is 2%. What will be the loss for 10 days at 95 percent confidence interval? a. Rs.104.36 lacs b. Rs.63.25 lacs c. Rs.330 lacs d. Rs.200 lacs Answer: Portfolio = 1,000 lacs; Daily SD = 1,000 lacs x 2% = Rs.20 lacs Daily loss = 20 lacs x 1.65 = Rs.33 lacs Loss for ten days = Rs. 33 lacs x $\sqrt{10}$ = Rs. 104.36 lacs
You are holding portfolio of Rs.1,00,000. The standard deviation is 21% per annum. What is monthly VAR at 99% confidence level? a. Rs.1,750 b. Rs.4077.50 c. Rs.6,062 d. Rs.14,125 Answer: Annual SD = 1,00,000 x 21% = Rs.21,000 Monthly SD = $21,000 / \sqrt{12}$ = Rs. 6,062.18 Monthly VAR = 6,062.18 x 2.33 = Rs.14,125

3. Reverse working of amount to be invested with target VAR
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- Certain questions may present a target VAR (Value at Risk) that necessitates computation of the amount to be invested. In such cases, we can assume the initial amount invested as 'X' and subsequently calculate the same

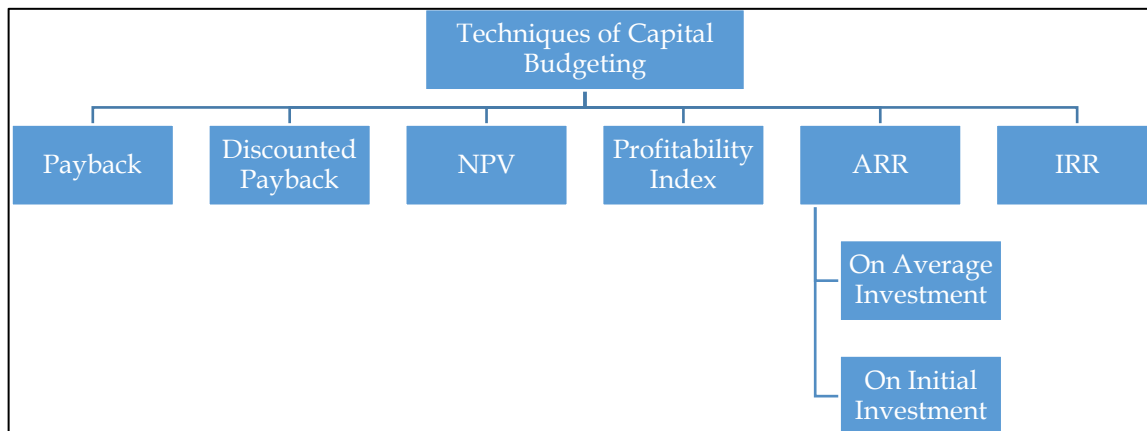
Example:

Acceptable loss = Rs.2,33,000. Standard deviation of the security is 1.5 percent per day. What is the maximum acceptable investment where VAR should not exceed acceptable loss? The required confidence level is 99 percent and the investment is to be done for 9 days.

- Rs.66,66,667
- Rs.22,22,222
- Rs.7,40,741
- Rs.1,00,00,000

Answer:

Daily SD = 1.50%; SD for 9 days = $1.5\% \times \sqrt{9} = 4.50\%$
Multiple for 99 percent confidence = 2.33
Value at risk = $4.5\% \times 2.33 \times \text{Amount of investment}$
$2,33,000 = 4.5\% \times 2.33 \times \text{Amount of investment}$
Amount of investment = $\frac{1,00,000}{4.5\%} = \text{Rs. } 22,22,222$

Chapter 3 – Advanced Capital Budgeting Decisions**1. Payback Method**

- Payback refers to the number of years taken to recover the initial investment. **It ignores time value of money**

$$\text{Payback} = \text{Base year} + \left(\frac{\text{Unrecovered cash flow of Base year}}{\text{Cash flow of next year}} \right)$$

Note: Base year refers to the last year in which cumulative cash flow is negative

Example:

A project is likely to generate following cash flows. Compute the payback period?

Year	Cash flow
0	-10,00,000
1	4,50,000
2	5,00,000
3	2,50,000
4	2,00,000

Answer:

Year	Cash flow	Cumulative Cash Flow
0	-10,00,000	-10,00,000
1	4,50,000	-5,50,000
2	5,00,000	-50,000
3	2,50,000	2,00,000
4	2,00,000	4,00,000

$$\text{Payback} = \text{Base Year} + \frac{\text{Unrecovered cash flow of Base Year}}{\text{Cash flow of next year}} = 2 + \frac{50,000}{2,50,000} = \mathbf{2.20 \text{ years}}$$

2. Discounted Payback Method

- Discounted payback refers to the number of years taken to recover the initial investment. **It considers time value of money**

$$\text{Discounted Payback} = \text{Base year} + \left(\frac{\text{Unrecovered discounted cash flow of base year}}{\text{Discounted cash flow of next year}} \right)$$

Note: Base year refers to the last year in which cumulative cash flow is negative

Example:

A project is likely to generate following cash flows. Compute the discounted payback period if cost of capital is 10%?

Year	Cash flow
0	-10,00,000
1	4,50,000
2	5,00,000
3	2,50,000
4	2,00,000

Answer:

Year	Cash flow	PVF @ 10%	DCF	Cumulative DCF
0	-10,00,000	1.000	-10,00,000	-10,00,000
1	4,50,000	0.909	4,09,050	-5,90,950
2	5,00,000	0.826	4,13,000	-1,77,950
3	2,50,000	0.751	1,87,750	9,800
4	2,00,000	0.683	1,36,600	1,46,400

Payback = Base Year + $\frac{\text{Unrecovered discounted cash flow of Base Year}}{\text{Discounted cash flow of next year}} = 2 + \frac{1,77,950}{1,87,750} = 2.95 \text{ years}$

3. Net Present Value [Most Commonly Used Method]

- NPV is the excess of Present value of cash inflows over present value of cash outflows
- NPV = PV of cash inflows - PV of cash outflows

Example:

A project with an initial investment of Rs.50,000 generates annual cash inflows of Rs.15,000 for the next five years. The discount rate for the project is 10%. How much is the NPV of the project?

- Rs.25,000
- Rs.6,865
- Rs.10,000
- Rs.15,000

Answer:

- NPV = PV of inflows - PV of outflows
- NPV = 15,000 × PVAF (10%,5) - 50,000 = (15,000 × 3.791) - 50,000 = **Rs.6,865**

4. Profitability Index (or) Benefit Cost Ratio (or) Present Value Index (or) Desirability factor

- It is a ratio of PV of cash inflows (benefits) as compared to present value of cash outflow (cost)

$$PI = \frac{\text{PV of cash inflow}}{\text{PV of cash outflow}}$$

- PI can be expressed both in times and in percentage

Example:

NPV of the Project = Rs.2,00,000; Initial Outflow = Rs.10,00,000. How much is the Profitability Index?

- 0.80 Times
- 1.00 Times
- 0.20 Times
- 1.20 Times

Answer:

- NPV = PV of inflow - PV of outflow; 2,00,000 = PV of inflow - 10,00,000
- PV of inflow = Rs.12,00,000

$$PI = \frac{\text{PV of cash inflow}}{\text{PV of cash outflow}} = \frac{12,00,000}{10,00,000} = 1.20 \text{ Times}$$

5. Accounting Rate of Return

- It is the ratio of Average PAT to initial investment (or) average investment

$$\text{ARR on Initial Investment} = \frac{\text{Average PAT}}{\text{Initial Investment}} \times 100$$

$$\text{ARR on Average Investment} = \frac{\text{Average PAT}}{\text{Average Investment}} \times 100$$

$$\text{Average Investment} = \frac{\text{Opening Investment} + \text{Closing Investment}}{2}$$

$$\text{Closing Investment} = \text{Salvage Value}$$

Example:

Initial investment = Rs.5,00,000; Salvage value = Rs.1,00,000; Average PAT = Rs.1,00,000. How much is the ARR on average investment?

- 20.00%
- 40.00%
- 16.67%
- 33.33%

Answer:

$$\text{ARR on average investment} = \frac{\text{Average PAT}}{\text{Average Investment}} \times 100 = \frac{1,00,000}{3,00,000} \times 100 = 33.33\%$$

$$\text{Average investment} = \frac{\text{Opening invt} + \text{Closing invt}}{2} = \frac{5,00,000 + 1,00,000}{2} = 3,00,000$$

6. Internal Rate of Return

- IRR is the rate of return earned by the project considering time value of money. This technique also focuses on cash flows
- IRR is the rate of return (Discount rate) at which **NPV of the project is zero**

NPV	IRR
Positive	IRR is greater than Discount rate
0	IRR = Discount rate
Negative	IRR is less than Discount rate

Steps in computation of IRR:

- In order to calculate IRR, it is essential to have **two discounting rates**. If these rates are provided in the question, utilize them; otherwise, it becomes necessary to make an **initial assumption or guess rate and proceed**.
- Compute the Accounting Rate of Return (ARR) based on the Average Investment. The initial guess rate can be set at **2/3 of ARR on Average Investment**
- Increase the discount rate if we get positive NPV and decrease the discount rate if we get negative NPV. Repeat step we get one positive NPV and one negative NPV

$$\text{IRR} = L_1 + \left(\frac{\text{NPV at } L_1}{\text{NPV at } L_1 - \text{NPV at } L_2} \times (L_2 - L_1) \right)$$

Note:

- L1 = Lower discount rate
- L2 = Higher discount rate

Short-method for computation of IRR:

- There is only one outflow and number of years are 2,4,8,16....then we can use the below formula

$$\text{FV} = \text{PV} \times (1 + r)^n$$
- In the above equation, r would be equal to IRR

Future cash flows are perpetual:

$$\text{Present Value} = \frac{\text{Perpetuity Amount}}{\text{Rate of Interest} - \text{Growth Rate}}$$

Example:

NPV at discounting rate of 10% = Rs.1,250 and NPV at discounting rate of 11% = -Rs.200. IRR of the proposal is _____

- 11.86%
- 10.86%
- 9.87%
- 11.96%

Answer:

$$\text{IRR} = 10 + \frac{1,250}{1,250 - (-200)} \times (11 - 10) = 10 + 0.86 = 10.86\%$$

Example:

Initial Outlay of Project = Rs.50,000, Cost of capital = 12.00%; Life of the project = 4 years. Aggregate future value of cash inflows = Rs.1,04,896.0. How much is the MIRR of the proposal?

- 20.35%
- 21.53%
- 31.25%
- 12.25%

Answer:

$$\text{FV (inflow)} = \text{PV (outflow)} \times (1 + r)^n$$

$$1,04,896.50 = 50,000 \times (1 + r)^4$$

$$2.09793 = (1 + r)^4; (1 + r) = 1.2035; \text{Hence MIRR} = 20.35\%$$

Example:

Annual cost saving = Rs.40,000; IRR = 15%; Profitability Index = 1.064 Times; How much is the NPV of the Project?

Answer:

- IRR is the rate of return at which NPV of the project is zero
- Cost of Project = PV of inflow = $40,000 \times \text{PVAF}(15\%, 4 \text{ years}) = 40,000 \times 2.855 = \text{Rs.}1,14,200$

$$\text{Profitability index} = \frac{\text{PV of inflows}}{\text{PV of outflows}}$$

$$1.064 = \frac{\text{PV of inflows}}{1,14,200}; \text{PV of inflows} = (1,14,200 \times 1.064) = \text{Rs.}1,21,509$$

$$\text{NPV} = \text{PV of inflow} - \text{PV of outflow} = 1,21,509 - 1,14,200 = \text{Rs.}7,309$$

7. What discount rate to be used for project evaluation?

- Cost of capital specific to the project is generally the discount rate for project evaluation
- Cost of capital can change in case of revision in investor expectation. For instance, cost of capital can be 10% for year 1 and increase by 2% for every year.

$$\text{PVF of year 1} = \frac{1}{1 + \text{Discount rate of year 1 (10\%)}} = 0.909$$

$$\text{PVF of year 2} = \frac{0.909}{1 + \text{Discount rate of year 2 (12\%)}} = 0.812$$

$$\text{PVF of year 3} = \frac{0.812}{1 + \text{Discount rate of year 3 (14\%)}} = 0.712$$

$$\text{PVF of year 4} = \frac{0.712}{1 + \text{Discount rate of year 4 (16\%)}} = 0.614$$

Care should be taken to take the previous year PVF and then divide by (1 + Discount rate of next year)

Example:

A is working on a capital project valuation and needs to determine the appropriate discount rate. She has the following information available:

- Risk-free-rate = 8%
- Market Beta = 1.0
- Company Beta = 1.1
- Project Beta = 1.2
- Expected market return = 13%
- Trailing 12-months market return = 12%

Which of the following is closest to the most appropriate discount rate?

- 13.5%
- 13.0%
- 14.0%
- 12.8%

Answer:

- Discount rate = Risk-free rate + Project Beta x (Market return – Risk-free rate)
- Discount rate = $8\% + 1.20 \times (13.0\% - 8\%) = 14.00\%$
- We will have to use the expected market return as Return of market in the formula

Example:

Discount rate for year 1 = 15%. Discount rate increases by 1% per year. What will be the PVF for year 3?

- 0.624
- 0.675
- 0.641
- None of the above

Answer:

$$\text{PVF of year 1} = \frac{1}{1.15} = 0.870$$

$$\text{PVF of year 2} = \frac{\text{PVF of year 1}}{1 + \text{DR of year 2}} = \frac{0.870}{1.16} = 0.750$$

$$\text{PVF of year 3} = \frac{\text{PVF of year 2}}{1 + \text{DR of year 3}} = \frac{0.750}{1.17} = \mathbf{0.641}$$

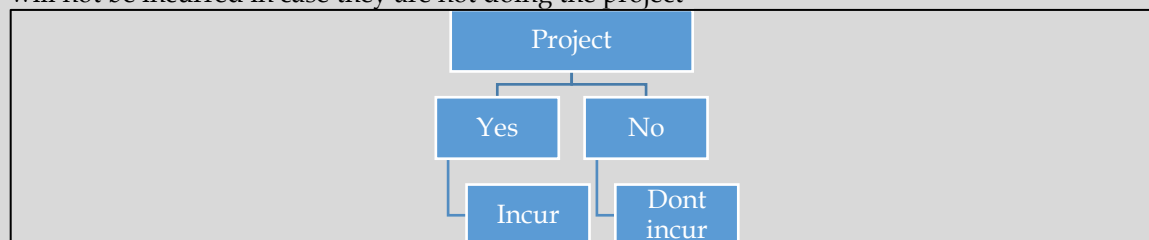
8. Rules for computation of Cash flows

- **Depreciation:** Depreciation, while being a non-cash item, holds significance in cash flow analysis due to its impact on tax savings. **Since depreciation is tax-deductible, the tax benefits derived from it should be incorporated into cash flow calculations.**
- **Opportunity Cost:** Opportunity cost, representing the **value of the next best** alternative or the benefits foregone, must be factored into cash flow calculations. **Example:** Rent on owned buildings, Salary of Proprietor
 - Opportunity cost given is pre-tax - Deduct before PBT computation
 - Opportunity cost given is post-tax - Deduct after PAT computation
- **Sunk Cost:** Sunk costs, being historical and already incurred, should be ignored in cash flow computations. **Example:** Market survey expense, Feasibility study, Research and Development Cost
- **Overheads:**
 - Apportioned/General/Corporate overheads = Irrelevant
 - Specific/Incremental overheads = Relevant
- **Working Capital:** Changes in working capital have a direct impact on cash flows. **An increase in working capital signifies an outflow, while a decrease denotes an inflow of cash**
- **Reward Exclusion Principle:** Cash flows between the owner (**Equity shareholder, Preference Shareholder, and debenture holder**) and the company, such as interest, equity dividends, loans repaid, and loans taken, should be excluded from cash flow calculations.
- **Incremental Principle:** When conducting NPV analysis, focus solely on incremental cash flows, calculated as the cash flow post-project minus the cash flow before the project. This incremental approach ensures a more accurate assessment of the project's financial viability.

Simple rule for finding a relevant item:

Example 1:

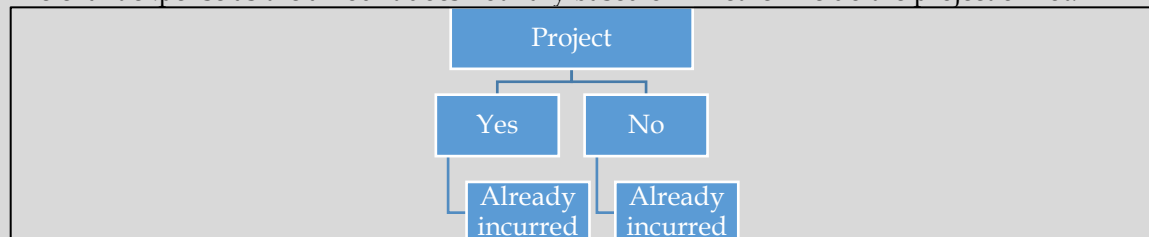
A company will incur marketing expenses of Rs.40,00,000 if they take up a new project. However, the same will not be incurred in case they are not doing the project



- In above example, it is a relevant item as the amount varies based on whether we do the project or not.

Example 2:

A company has incurred market survey expense of Rs.10,00,000 for a new project. In this example, it is an irrelevant expense as the amount does not vary based on whether we do the project or not.



Example:

A new project has been apportioned factory overheads of Rs.100 lacs. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of Rs.90 lakh per annum payable on this venture. How much is the relevant factory overhead cost?

- Rs.100 lacs
- Rs.90 lacs
- Rs.10 lacs

d. Rs.190 lacs

Answer:

Relevant Overhead cost = Rs.90 lacs which is specific to this project

Example:

The initial working capital invested in the project amounts to Rs.20,00,000. In the first year, it is anticipated to rise to Rs.25,00,000, and in the second year, it is expected to decrease to Rs.22,00,000. How much is the working capital adjustment in year 1 and 2?

- Outflow of Rs.5,00,000 and Rs.2,00,000 in year 1 and 2 respectively
- Outflow of Rs.5,00,000 in year 1 and inflow of Rs.3,00,000 in year 2
- Inflow of Rs.5,00,000 and Rs.2,00,000 in year 1 and 2 respectively
- Inflow of Rs.5,00,000 in year 1 and outflow of Rs.3,00,000 in year 2

Answer:

Outflow of Rs.5,00,000 in year 1 and inflow of Rs.3,00,000 in year 2

- Working capital has increased in year 1 and hence the same is an outflow of Rs.5,00,000 in year 1
- Working capital has decreased by Rs.3,00,000 in year 2 and hence the same is an inflow in year 2

Example:

The company has invested Rs.2,00,000 in conducting a market survey to assess the market response to its new product. In accordance with the survey findings, the company intends to spend Rs.10,00,000 towards machinery and Rs.4,00,000 towards working capital. How much is the initial outflow of the project?

- Rs.14,00,000
- Rs.16,00,000
- Rs.12,00,000
- Rs.10,00,000

Answer:

Rs.14,00,000

- Market survey expense is a sunk cost and hence irrelevant
- Total outflow = Rs.10,00,000 + Rs.4,00,000 = Rs.14,00,000

Example:

The hospital is contemplating the acquisition of a diagnostic machine, which is expected to generate an after-tax cash flow of Rs.80,000. Currently, the hospital is outsourcing the diagnostic work and earning commission income of Rs.20,000. The applicable tax rate for these financial considerations is 40%. How much is the incremental CFAT due to the new machine?

- Rs.60,000
- Rs.1,00,000
- Rs.68,000
- Rs.36,000

Answer:

Rs.68,000

- Incremental CFAT = 80,000 – Opportunity cost of Rs.12,000 = Rs.68,000
- Commission income is an opportunity cost and the post-tax commission income currently is Rs.12,000 (20,000 – 40%)

Example:

A company follows block of assets method of depreciation and it has several other machines in the block. The company is selling an existing machine with book value of Rs.3,00,000 for Rs.5,00,000. It will purchase a new machine for Rs.10,00,000. Depreciation rate is 10% and tax rate is 40%. How much is the tax paid on sale and incremental depreciation in year 1?

- Rs.80,000 (tax paid) and depreciation of Rs.70,000
- Nil tax paid and depreciation of Rs.70,000
- Rs.80,000 (tax paid) and depreciation of Rs.50,000
- Nil tax paid and depreciation of Rs.50,000

Answer:

Nil tax paid and depreciation of Rs.50,000

- Company will not pay tax as there are other assets in the block
- Block value post purchase = 3,00,000 + 10,00,000 – 5,00,000 = Rs.8,00,000; Depreciation post purchase = 8,00,000 × 10% = Rs.80,000
- Earlier depreciation = 3,00,000 × 10% = Rs.30,000
- Incremental depreciation = 80,000 – 30,000 = Rs.50,000

9. Steps in computation of cash flows**Step 1: Initial Outflow**

Particulars	Amount
Capital expenditure	(XXX)
Working capital	(XXX)
Total outflow	(XXX)

Note:

- There may be some other items of initial outflow such as installation charges, compensation etc.
- We should capture only the amount which has been paid on day 0 in initial outflow. It is possible that entire purchase price of machine is not paid on day 0. In that case balance amount paid would be reflected in step 2 (in-between cash flow)

Step 2: In-between cash flows:

Particulars	Amount
Incremental Revenues	XXX
Incremental cost savings	XXX
Less: All costs other than depreciation	(XXX)
Profit before depreciation and tax (PBDT)	XXX
Less: Depreciation	(XXX)
Profit before Tax (PBT)	XXX
Less: Tax	(XXX)
Profit after Tax (PAT)	XXX
Add: Depreciation	XXX
Cash flow after tax (CFAT)	XXX
Add/ Less: Increase/ decrease in Working capital	XXX
Less: Purchase of additional machinery / payment for original machine	(XXX)
Revised CFAT	XXX

- Incremental means only the extra revenue generated or extra cost incurred will be considered for cash flow. This is because company would have earned some revenue even without the new project

Step 3: Terminal flow:

Particulars	Amount
Net salvage value of capital expenditure (Note 1)	XXX
Recapture of working capital	XXX
Total terminal flow	XXX

Note 1: Calculation of Net Salvage Value:

Particulars	Amount
Sale value	XXX
Less: Book value	(XXX)
Capital gain/loss	XXX
Tax Paid/saved	XXX
Net salvage value (Sale value + Tax saved - Tax Paid)	XXX

Step 4: Consolidate the cash flows in the below format and calculate appropriate technique (assuming life of 5 years):

Year	Cash flow
0	Step 1
1	Step 2
2	Step 2
3	Step 2
4	Step 2
5	Step 2 + Step 3

Examples on computation of Net Salvage Value:

Particulars	Example 1	Example 2	Example 3
Sale value	1,00,000	50,000	-
Less: Book value	50,000	50,000	50,000
Capital gain/loss	50,000	-	-50,000
Tax paid/saved @ 40%	-20,000	-	20,000
Net Salvage Value [SV +/- Tax]	80,000	50,000	20,000

Note:

- If Sale value is equal to book value, then there is no tax and hence sale value is equal to net salvage value
- If tax is to be ignored on capital gain, then sale value = Net Salvage Value
- If sale value is 0, it does not mean NSV is zero (Refer Example 3)
- If resale value is equal to cost of removal, then sale value is equal to zero.

Block of Assets Method:

- Capital loss will not arise unless all assets of the block are sold. In case we replace an old machine with new machine, block will continue and hence STCL cannot arise
- Capital gain can arise if the value of block becomes negative. (Rarest scenario)
- Depreciation is charged on the block value and not purchase price of the new asset. Block value = Existing block value – sale value of old asset + Purchase price of new asset

Example:

ABC Limited is considering the replacement of its outdated machine with a new automatic machine, specifically Model A, which comes with a price tag of Rs.5 lakhs. The existing machine holds a salvage value of Rs.1 lakh. As part of the upgrade, all current utilities must be replaced with new ones incurring an additional cost of Rs.2 lakhs. However, the old utilities are expected to yield a salvage value of Rs.0.20 lakhs. How much is the initial outflow?

- Rs.5,00,000
- Rs.5,80,000
- Rs.7,00,000
- Rs.6,00,000

Answer:

- Initial outflow = Purchase price of new machine + Utilities purchased – Sale value of existing machine – sale value of utilities
- Initial outflow = 5,00,000 + 2,00,000 – 1,00,000 – 20,000 = **Rs.5,80,000**

Example:

The company is considering the installation of a new machine that would result in material cost savings of Rs.2,00,000 and labor cost savings of Rs.4,00,000. Additionally, there will be maintenance costs associated with the machine amounting to Rs.3,00,000. The machine itself, with a lifespan of 5 years, has a cost of Rs.10,00,000. How much is the annual CFAT if tax rate is 30%?

- Rs.3,00,000
- Rs.3,30,000
- Rs.2,70,000
- Rs.2,00,000

Answer:

Particulars	Amount
Saving in cost	6,00,000
Less: Maintenance cost	-3,00,000
PBDT	3,00,000
Less: Depreciation	-2,00,000
PBT	1,00,000
Less: Tax @ 30%	-30,000
PAT	70,000

Add: Depreciation	2,00,000
CFAT	2,70,000

Example:

The company presently incurs a cost of Rs.2 per tonne to dispose of 1,00,000 tonnes of waste. However, it has identified an alternative approach to process the waste, enabling it to sell the processed waste at Rs.20 per tonne. The processing cost is Rs.15 per tonne. How much is the annual cash flow to be considered in evaluation of project? Ignore tax

- Rs.5,00,000
- Rs.3,00,000
- Rs.7,00,000
- Rs.17,00,000

Answer:

Cash flow = $1,00,000 \times (20 - 15) + \text{cost saving of } 2,00,000 (1,00,000 \times 2) = \text{Rs.7,00,000}$

10. Asset purchase at beginning of year

- Capital budgeting assumes that cash flows will happen at end of year. However, some assets could be purchased at beginning of the year and these cash flows will be considered in the earlier year.
- Example:** Purchase of asset at beginning of year 5 is equal to end of year 4 and this cash flow will be considered in year 4

11. Impact of losses

- Losses can save taxes as they are set-off against profits of the company
- Immediate set-off is possible if there are other businesses where company is making profits – Tax saving will be considered as inflow in the year of loss
- Carry forward of losses and set-off against future profits in other scenarios - In this no tax saving considered in year of loss and lower tax will be considered in year of set-off.

Example:

Following is taken from income statement of a company:

Particulars	Year 1	Year 2	Year 3	Year 4
Profit before tax	-80,000	50,000	1,20,000	1,10,000

Tax rate = 30%. The loss of any year will be set-off from the profits of subsequent two years. How much is the Profit after tax of year 3?

- 1,20,000
- 84,000
- 93,000
- 63,000

Answer:

Rs.93,000

- PAT of year 3 = PBT – Tax paid of year 3
- PAT of year 3 = $1,20,000 - 27,000 = \text{Rs.93,000}$

Note: Taxable income of year 3 is Rs.90,000 as there is carry forward loss of Rs.30,000 at end of year 2. Tax paid on Rs.90,000 is Rs.27,000 ($90,000 \times 30\%$)

12. Tax Exemption for specific % of Profits

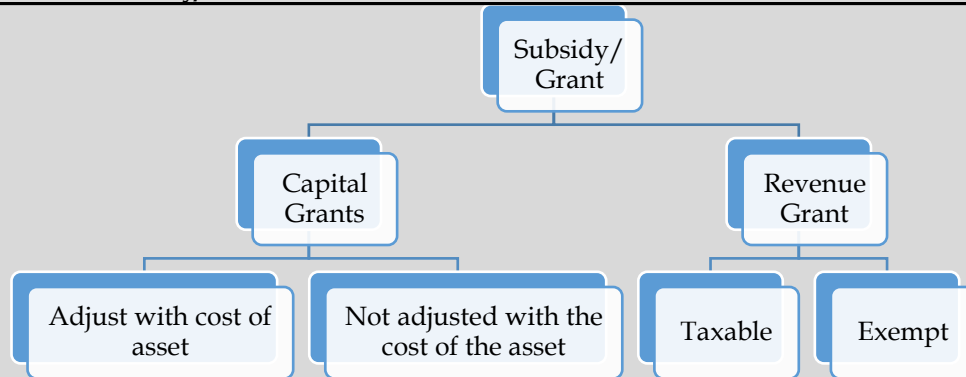
- Effective Tax Rate = Normal Tax Rate $\times (1 - \text{Exemption \%})$

Example:

- Tax rate is 40%. 25% of the profits are exempt.
- Effective Tax Rate = $40\% \times (1 - 25\%) = 30.00\%$
- Hence in this situation **we should compute taxes at effective tax rate of 30%**

13. Expenses not paid in the year of incurrence

- If an expense is not paid in the year of incurrence, then it would not impact the cash flow. **However, this has tax impact.** Hence, we should consider it is an expense in computing PBT and pay tax on the same.
- Unpaid expense will be reflected as current liability and hence would be factored in working capital adjustment**

14. Treatment of Subsidy/Government Grant**Note:**

- Question will not clearly specify the treatment for capital grants and we will have to take an assumption and proceed. If the grant is adjusted with the cost of the asset, **then it will lead to lower depreciation expense**

15. Concept of utility value [Not a very logical concept but one problem is there in ICAI Material]

- A project has the potential to yield multiple cash flows, each associated with a given probability. **Each cash flow carries a corresponding utility value**
- The utility value of a project is determined by calculating the weighted average of the various utility values assigned to its cash flows
- **Decision:** We should select a project **having higher utility value**

16. FCFF vs FCFE Approach

Approach	Cash flow used	Discount rate	NPV	IRR
Long-term funds (D+E+P)	FCFF	Cost of capital	Project NPV	Project IRR
Equity shareholders approach	FCFE	Cost of equity	Equity NPV	Equity IRR

Note:

- **We normally follow FCFF approach** for evaluating a project and compute Project NPV by discounting cash flows at cost of capital
- However, if there are two projects and **one project has some financial benefit over other like lower interest rates**, then we should factor the financial benefits in analysis and follow FCFE approach.
- In FCFE approach we will have to **reduce interest and its tax benefit from cash flows** and repayments are also considered in computation of cash flows. FCFE cash flows is discounted at cost of equity to compute Equity NPV

Example:

Compute FCFF and FCFE from following information:

Particulars	Amount
Revenues	10,00,000
Less: Expenses	-6,00,000
PBDIT	4,00,000
Less: Depreciation	-1,00,000
PBIT	3,00,000
Less: Interest	-50,000
PBT	2,50,000
Less: Tax @ 40%	-1,00,000
PAT	1,50,000
Capital expenditure	50,000
Working capital increase	25,000
Loans repaid	50,000
New loans taken	25,000
Equity Dividends Paid	10,000

Answer:**FCFF:**

Particulars	Amount
PBIT/PBT	3,00,000
Less: Tax @ 40%	-1,20,000
PAT	1,80,000
Add: Depreciation	1,00,000
Less: Capital expenditure	-50,000
Less: Working capital increase	-25,000
FCFF	2,05,000

Note: Items like interest, repayment of loan, new loans taken and equity dividend paid will be ignored in FCFF approach

FCFE Computation:

Particulars	Amount
PBIT	3,00,000
Less: Interest	-50,000
PBT	2,50,000
Less: Tax @ 40%	-1,00,000
PAT	1,50,000
Add: Depreciation	1,00,000
Less: Capital expenditure	-50,000
Less: Working capital increase	-25,000
Less: Loans repaid	-50,000
Add: New loans taken	25,000
FCFE	1,50,000

17. Adjusted Present Value

- NPV under APV Approach = Base Case NPV - PV of issue costs + PV of debt financing benefit
- **Base case NPV:** Base Case NPV is computed by discounting cash flows at unlevered cost of equity
- **PV of debt financing benefit:** PV of debt financing benefit comprise of tax saving + lower interest rate due to some subsidy. This needs to be discounted at **pre-tax cost of debt**. In case of perpetual debt, tax benefit would be equal to amount of debt x tax rate.
- PV of issue cost needs to be deducted as the same would reduce the amount of NPV. Issue cost can be incurred only on debt (or) on both debt and equity

Example:

A company is taking a loan at the rate of 4 percent. Their normal interest rate on loan is 7 percent. Loan is for a period of 5 years. Loan amount = Rs.10,00,000 and it would be repaid at one stretch after 5 years. Tax rate = 30 percent. How much is the present value of debt financing benefit?

Answer:

Particulars	Amount	PVF @ 7%	DCF
Year 1 to 5 Tax Saving on interest (10,00,000 x 4% x 30%)	12,000	4.100	49,200
Year 1 to 5 Interest saving (10,00,000 x 3%)	30,000	4.100	1,23,000
Total			1,72,200

18. Equated Annual Benefit (EAB) (or) Equated Annual Cost (EAC)

- EAB/EAC concept needs to be used while comparing two options with unequal lives.
- This concept assumes that process of purchase of asset will be repeated many times.
- We should select a project with lower EAC/higher EAB

$$EAB = \frac{NPV}{PVA(r, \text{life})}$$

$$EAC = \frac{PV \text{ of Outflow}}{PVA(r, \text{life})}$$

Example:

Company A is evaluating two mutually exclusive projects. Both projects can be repeated indefinitely. Project A has NPV of Rs.20,000 over three years and Project B has NPV of Rs.25,000 over five years. The cost of capital is 12%. Which project should the company select?

- Project A
- Project B
- Indifferent between Project A and B
- Both projects to be rejected

Answer:

We need to compute EAB for selection of the project.

$$\text{EAB of Project A} = \frac{20,000}{2.402} = 8,326$$

$$\text{EAB of Project B} = \frac{25,000}{3.605} = 6,935$$

We should go ahead with selection of Project A

19. Abandonment Decision

- We are trying to evaluate whether to sell existing machine today (or) use the machine for balance life and then sell it. Cash flows will be calculated as if we are continuing with the machine.

Step 1: Initial outflow

Particulars	Amount
NSV of existing asset at year 0	(XXX)
Working capital	(XXX)
Total outflow	(XXX)

Note:

- In year 0 there is no actual outflow. But opportunity cost of inflow is there. If we abandon the machine today, we get back its NSV today. But since we continue with the asset, we don't get anything and hence this becomes opportunity cost
- The same logic applies for working capital as well.

Step 2: In-between flows – No change

Step3: Terminal flow:

Particulars	Amount
NSV of existing asset at the end of life	XXX
Recapture of working capital	XXX
Total terminal flow	XXX

Step 4: Consolidation of cash flows and calculation of NPV – No change

Conclusion: If the NPV of the project is positive then we should continue with the asset. However, if the same is negative then we have to abandon the asset

Example:

A company is re-evaluating the decision to continue with an existing machine. The machine was purchased for Rs.20,00,000 three years ago and is being depreciated based on an economic life of 8 years. The company is following SLM method of depreciation. The machine can be sold today for Rs.10,00,000. The tax rate on business profits and capital gains is 25% and 20%. How much is the opportunity outflow related to old machine today?

- Rs.10,00,000
- Rs.9,50,000
- Rs.10,50,000
- Rs.10,62,500

Answer:

Opportunity outflow is equal to net salvage value of the machine today.

Particulars	Amount
Sale Value	10,00,000
Less: Book value [20,00,000 – 3 x 2,50,0000]	-12,50,000
Capital loss	2,50,000

Tax saved @ 20%	50,000
Net salvage value [SV + Tax Saved]	10,50,000

20. Replacement Decision

- Under replacement decision we are deciding whether to replace an existing asset with a new asset.
- Cash flows for replacement decision will be done by comparing abandonment cash flow (existing machine) and new purchase cash flow (new machine)

Step 1: Initial outflow:

- Capital Expenditure of New machine = Rs.1,00,000
- NSV of existing machine today = Rs.20,000
- Incremental cash outflow of replacement = 1,00,000 – 20,000 = Rs.80,000

Step 2: In-between flows:

- Compute CFAT of old machine = Rs.5,00,000
- Compute CFAT of new machine = Rs.8,00,000
- In-between cash flow of replacement decision = Rs.3,00,000 [New – Old]

Step 3: Terminal flow:

- Compute Terminal flow of old machine - This has to be computed assuming we had continued with old machine
- Compute terminal flow of new machine
- Terminal flow of replacement decision = New - Old

Step 4: Compute NPV:

- Compute NPV with replacement cash flows
- NPV positive (Go ahead with replacement) and NPV Negative (reject the replacement)

Example:

A company is considering replacement of an existing machine with a new machine. How much would be the initial outflow from following information?

Purchase price of the new machine	Rs.8,000
Shipping and Installation charge	Rs.2,000
Sale price of old machine	Rs.6,000
Book value of old machine	Rs.2,000
Inventory increases if installed	Rs.3,000
Accounts payable increase if installed	Rs.1,000
Tax rate on capital gains	25%

- Rs.7,000
- Rs.10,000
- Rs.3,000
- Rs.5,000

Answer:

Initial outlay = Purchase cost of new machine (Rs.10,000) + WC increase (Rs.2,000) – Net salvage value of old machine (6,000 – 1,000) = Rs.7,000

21. Types of Replacement Decision**Type 1: Evaluating the Replacement of an Existing Machine with a New One**

- Calculate the cash flows associated with the old machine and the new machine.
- Determine the incremental cash flows by subtracting the cash flows of the old machine from those of the new machine.
- Decide on the basis of the NPV of the incremental cash flows.

Type 2: Determining the Optimal Life of an Asset Yet to be Purchased or just now purchased (and not yet used):

- Assume a potential asset life of 4 years.
- Compute the NPV/PV of outflows for four alternatives (1-year life, 2-year life, 3-year life, and 4-year life).

- Calculate Equivalent Annual Benefit (EAB) or Equivalent Annual Cost (EAC) for each alternative.
- Decide on the optimum life based on the analysis.

Type 3: When to replace an existing machine which has already been used:

- Let us assume existing machine has balance life of 2 years
- Consider three alternatives: immediate replacement, replacement at the end of year 1, and replacement at the end of year 2.
- Compute cash flows, NPV/PV of outflows, and EAB/EAC for each alternative
- Make decision on the basis of above analysis

22. Inflation in Capital Budgeting

- Discount rate/cash flows can be with/without inflation impact.

Type of Cash Flow	Discount Rate	Inflation
Money/Nominal	Money/Nominal	Includes
Real	Real	Excludes

Example:

- Today's sales = 1,000 units x Rs.50 = Rs.50,000
- Next year sales = 1,200 units x Rs.55 = Rs.66,000
- Real increase = 20% (1,000 units becoming 1,200 units)
- Inflation = 10% (Rs.50 becoming Rs.55)
- Nominal increase = 32% (Rs.50,000 becoming Rs.66,000)

Discounting Rate:

- Money cash flows will be discounted at Money discount rate and real cash flows will be discounted at real discount rate.

Link between Real Discount Rate and Money Discount Rate:

- $(1 + \text{Money Discount Rate}) = (1 + \text{Real Discount Rate}) \times (1 + \text{Inflation rate})$

Example:

Inflation rate = 10%; Real discount rate = 4%. How much is nominal discount rate?

- 14%
- 14.40%
- 6%
- 5.6%

Answer:

$$(1 + \text{Nominal Discount rate}) = (1 + \text{Inflation rate}) \times (1 + \text{Real discount rate})$$

$$(1 + \text{NDR}) = (1.10 \times 1.04)$$

$$\text{NDR} = 1.144 - 1 = 0.144 \text{ (or) } 14.40\%$$

Real revenues of year 2 is Rs.10,00,000. Inflation for year 1 is 10% and year 2 is 8%. How much is nominal revenues of year 2?

- Rs.11,00,000
- Rs.10,80,000
- Rs.11,88,000
- Rs.11,66,400

Answer:

$$\text{Nominal revenues} = \text{Real revenues} \times (1 + \text{Inflation rate of year 1}) \times (1 + \text{Inflation rate of year 2})$$

$$\text{Nominal revenues} = 10,00,000 \times (1 + 10\%) \times (1 + 8\%) = \text{Rs.11,88,000}$$

23. Expected Value, Standard Deviation and Co-efficient of Variation

- Expected value (NPV/Cash flow) is the weighted average of various possible values with probability being the assigned weight
- Standard deviation is the expected deviation (upward/downward) from the expected value (Mean)
- Coefficient of Variation (CV) is risk per unit of return. $CV = (\text{SD} / \text{Expected NPV})$

Format for computation:

NPV	Prob	Product	Deviation	Pd ²
-----	------	---------	-----------	-----------------

-20	0.4	-8	-42	705.6
40	0.5	20	18	162
100	0.1	10	78	608.4
		22		1476

- Expected NPV = 22
- SD = $\sqrt{1476} = 38.42$
- CV = $38.42/22 = 1.75$ Times

Note:

- Product = NPV x Probability
- Deviation = NPV - Sum of Products (22)
- $Pd^2 = \text{Probability} \times \text{Deviation} \times \text{Deviation}$

Example:

A project is likely to generate cash flows of Rs.1,00,000 (20% probability), 50,000 (40% probability) and -25,000 (40% probability). How much is the standard deviation?

- Rs.48,477
- Rs.27,386
- Rs.37,417
- Rs.50,000

Answer:

CF	Prob	Product	Deviation	Pd^2
100	0.2	20	70	980
50	0.4	20	20	160
-25	0.4	-10	-55	1210
Total		30		2350

Standard deviation = $\sqrt{2350} = 48.477 \times 1,000 = \text{Rs.} 48,477$

Example:

Project A generates NPV of Rs.10,00,000 and has standard deviation of Rs.5,00,000. Project B has NPV of Rs.14,00,000 and Standard deviation of Rs.8,00,000. Which project is to be selected if co-efficient of variation is used as a measure of risk?

- Project A
- Project B
- Indifferent
- Both projects to be rejected

Answer:

Co-efficient of variation = $\frac{\text{Standard deviation}}{\text{NPV}}$

Project A = $\frac{5,00,000}{10,00,000} = 0.50$ times

Project B = $\frac{8,00,000}{14,00,000} = 0.5714$ times

Project A is to be selected as the same has lower co-efficient of variation

24. SD for Dependent and Independent Cash Flows

- Dependent cash flows **carry inherent risks**, as a downturn in one year tends to lead to a series of consecutive adverse years and vice versa.
- In contrast, independent cash flows are characterized by **lower inherent risk**, as subsequent cash flows are not contingent upon the performance of the preceding year.

Steps:

- Step 1:** Compute SD of each year cash flow
- Step 2:** SD of project would be computed using below format

Year	SD	PVF	DSD	DSD^2

- SD of Dependent Cash Flow = Sum of DSD
- SD of Independent Cash Flow = $\sqrt{\text{Sum of DSD}^2}$

Note:

- PVF would be computing using the risk-free rate
- Discounted SD = SD x PVF
- $\text{DSD}^2 = \text{DSD} \times \text{DSD}$

Probability of NPV:

- Probability of Dependent cash flow NPV = Probability of the cash flow in year 1
- Probability of independent cash flow NPV = (Probability of the cash flow in year 1)ⁿ

Example:

A project has life of 2 years. The probability of the best cash flow is 30% in each year. What would the probability of best case NPV if cash flows are (i) perfectly correlated and (ii) independent overtime.

- 30% and 30%
- 30% and 60%
- 30% and 9%
- 9% and 30%

Answer:

Probability of correlated cash flows = 30%

Probability of independent cash flow = 30% x 30% = 9%

Hence 30% and 9% is the answer

25. RADR

- RADR operates on the principle of **applying a higher discount rate to risky projects** and a lower discount rate to low-risk projects
- The discount rate is determined by adding **the risk-free rate to the risk premium.**
- Measurement of risk can be accomplished using standard deviation, coefficient of variation (CV), or a risk index. **The question will specify the connection between the risk factor and the RADR to be employed**
- **If a risk index is provided**, the RADR formula is expressed as follows: RADR = Risk-free rate + Risk Index x (Normal Cost of Capital - Risk-free rate). This formula is similar to CAPM

Example:

Risk index of project is 2.00. Minimum required rate of return of the firm is 15% and the risk-free interest rate is 10%. How much is the RADR?

- 10%
- 15%
- 20%

Answer:

Risk index is basically Beta. RADR = 10 + 2 x (15 - 10) = 20.00%

26. CEF

- Certainty equivalent factor (CEF) is ratio of certain cash flows to uncertain cash flows
- Less the certainty, lower the value of CEF. Hence risk is considered to be more when CEF is less

Steps:

- Convert uncertain cash flows into certain cash flows
 - Certain Cash Flow = Uncertain Cash Flow x Certainty equivalent factor (CEF)
- The appropriate discount rate is risk-free rate of return
- Compute NPV

Example:

Project A and B are for a 3-year period. Certainty equivalent factor of project A is 0.80 and project B is 0.70. Which of these two projects should be discounted with a higher Risk-adjusted discount rate?

- Project A
- Project B
- Same rate for both projects

Answer:

Project A has a higher CEF whereas Project B has a lower CEF. Higher CEF indicates more certainty and less risky. Hence Project A is less risky and Project B is riskier. **We should therefore use a higher RADR for Project B.**

Example:

Certain cash flow of a project under CEF approach is Rs.2,00,000. CEF factor is 0.80. How much is the uncertain cash flow?

- Rs.1,60,000
- Rs.2,00,000
- Rs.2,50,000

Answer:

Certain cash flow = Uncertain cash flow x CEF

2,00,000 = Uncertain cash flow x 0.80

Uncertain cash flow = $\frac{2,00,000}{0.80} = \text{Rs. } 2,50,000$

27. Sensitivity and Scenario Analysis

- Sensitivity and scenario analysis finds out the **impact on NPV/decision** for changes in input variables (Capex, selling price, variable cost, fixed cost)
- Sensitivity analysis considers one variable change** at a time whereas **scenario analysis considers multiple variable changes** at a time.

Two Approaches for Sensitivity Analysis:**Approach 1 (Uniform change in input variable)**

- Consider uniform adverse change in every variable and compute the impact on NPV
- Variable which has maximum impact on NPV is the most sensitive factor

% change in NPV = $\frac{\text{Fall in NPV}}{\text{Old NPV}} \times 100$

Approach 2 (Change in input parameter to have zero NPV)

- Identify the value of input variable at which NPV will be zero.
- Parameter has lowest sensitivity % (**cushion available**) is the most sensitive factor

Sensitivity % for input parameter = $\frac{\text{Change}}{\text{Base}} \times 100$

Note: Sensitivity analysis for life is done by computing the discounted payback (Discounted payback is the period for which NPV would be zero).

Example:

Project cost = Rs.12,000; Annual cash flow = Rs.4,500; Cost of capital = 14%; Life = 4 years; PVIFA(14%,4) = 2.9137, then the sensitivity of the project with respect to project cost is

- 9.27%
- 10.27%
- 9.72%
- 10.72%

Answer:

PV of cash inflows = $4,500 \times 2.9137 = 13,111.65$

NPV of project = $13,111.65 - 12,000 = 1,111.65$

Project will have zero NPV if the outflow of the project increase by Rs.1,111.65

Sensitivity % = $\frac{\text{Change}}{\text{Base}} \times 100 = \frac{1,111.65}{12,000} \times 100 = 9.27\%$

Example:

Identify the factor which causes maximum sensitivity to the project from the following information:

Base NPV	Rs.200 lacs
NPV with 10% variation in Selling price	Rs.150 lacs
NPV with 10% variation in cost price	Rs.180 lacs
NPV with 10% variation in life	Rs.100 lacs
NPV with 10% variation in units sold	Rs.160 lacs

- Selling price
- Cost price

- c. Life
- d. Units sold

Answer:

Project is most sensitive to life factor as 10% variation in life has led to maximum impact on NPV

Example:

A project currently has NPV of Rs.25 lacs. However, the project is sensitive to multiple factors with a significant variation in the factors causing reversal of investment decision. The analysis is summarized in the below table

Factor	% variation for reversal of decision
Selling price	25%
Cost price	45%
Units sold	70%
Fixed cost	10%

The project is most sensitive to which factor?

- a. Selling price
- b. Cost price
- c. Units sold
- d. Fixed cost

Answer:

Project is most sensitive to Fixed cost factor. This is because a small deviation of 10% in fixed cost will lead to rejection of the project

28. Decision Tree

- Decision tree is a diagrammatical representation of the various alternative course of action. This is useful for sequential decision making.

Rules:

- A decision tree begins with a decision node. **Decision node** (D1/D2) is denoted by **rectangle**. The value of decision node is **highest of the branches coming out from the decision node**
- Chance Node** (C1/C2) is denoted by **circle**. The value of chance node is **weighted average of the values of the branches coming out from chance node with probability being the assigned weight**
- A decision tree is drawn from left to right whereas the evaluation is done from right to left

Joint Probability:

- Joint probability refers to the happening of two events together and would be extensively used in evaluation of decision tree
- Joint Probability = Probability of Event 1 x Probability of Event 2

Example:

Probability of cash flow of Rs.50,000 in year 1 is 40%. If the cash flow turns out to be 50,000 in year 1, then the probability of getting 24,000 in year 2 is 20%. What is the joint probability of getting cash flow of 24,000 in year 2?

- a. 20%
- b. 80%
- c. 8%
- d. 40%

Answer:

Joint Probability of earning 24,000 in year 2 = Probability of earning 50,000 in year 1 x Probability of earning 24,000 in year 2

Probability = 40% x 20% = 8.00%

29. Simulation

- Simulation is an exercise to imitate a real time problem and arrive at expected results for large number of experiments.
- Final result can be taken as simple average of multiple experiments

Steps:

- Step 1:** Identify parameters (items that don't change) and variables (items that change) for a project

- **Step 2a:** For each variable, arrange the values in ascending order and calculate cumulative probability at the end of each value
- **Step 2b:** Construct random number class interval for each variable
- **Step 3:** Based on random number and class interval, select the values of various variables
- **Step 4:** Compute NPV of each set. The appropriate discount rate to be used is risk-free rate (if the question specifies a different rate, then we can follow the alternative rate given in question)
- **Step 5:** The simple average of the computed NPV is the final NPV.

Example:

A project is likely to generate following annual cash flows

Cash flow	Probability
10,000	0.25
20,000	0.45
30,000	0.30

The company has employed simulation technique to evaluate the project and has started the simulation exercise. Random number of 70 was generated in the first experiment and this would correspond to annual cash flow of _____

- Rs.10,000
- Rs.20,000
- Rs.30,000

Answer:

Cash flow of Rs.30,000

Cash flow	Prob	Cum prob	RN
10,000	0.25	0.25	00-24
20,000	0.45	0.70	25-69
30,000	0.30	1.00	70-99

RN of 70 would correspond to annual cash flow of Rs.30,000 as per above table

30. Option in Capital Budgeting

- Under this situation there will be a base project and another option either to expand/abandon.
- We have to first compute the NPV of the base project and the same would be called as base NPV
- We have to separately value the option of expansion/abandonment
- Final NPV of project = Base NPV + Value of option
- If the final NPV is positive we should go ahead with project even if base NPV is negative

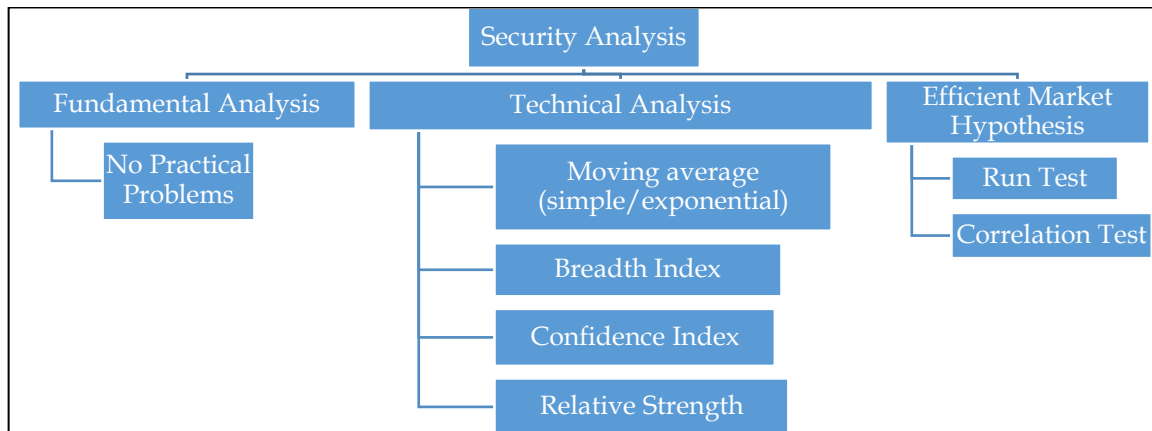
Example:

ABC Limited is evaluating a new piece of equipment that will automatically install power windows in cars coming off the production line. The equipment cost is Rs.35,00,000, and the firm estimates that the present value of the annual cost savings from installing the equipment is Rs.28,00,000. The production manager is also considering purchasing a module that will allow the equipment to be used for company's SUV production. The additional module represents a real option with a cost of Rs.11,00,000. The production manager estimates that adding the module would give cost savings of an additional Rs.20,00,000. What is the NPV of the project before and after considering the real option?

- 7,00,000 and 2,00,000
- 7,00,000 and 18,00,000
- 13,00,000 and 2,00,000
- 7,00,000 and 9,00,000

Answer:

- NPV of base project = 28,00,000 – 35,00,000 = -7,00,000
- NPV of real option = 20,00,000 – 11,00,000 = 9,00,000
- Hence NPV of the project before is -7,00,000 and after the option is Rs.2,00,000 [-7,00,000 + 9,00,000]

Chapter 4 – Security Analysis**1. Fundamental Analysis [EIC Analysis]**

- Fundamental analysis is based on the assumption that the **share prices depend upon the future dividends expected by the shareholders**
- The **present value** of the future dividends can be calculated by discounting the cash flows at an **appropriate discount rate** and is known as the '**intrinsic value of the share**'.
- A share that is priced **below the intrinsic value must be bought**, while a share quoting **above the intrinsic value must be sold**
- Fundamental Analysis = Economic Analysis + Industry Analysis + Company Analysis

Example:

A company's financial statements show a significant increase in its accounts receivable balance compared to previous periods. What would be a prudent action for an analyst conducting fundamental analysis?

- Consider it a positive sign of increasing sales and future profitability.
- Investigate further to determine if there are any underlying issues with revenue recognition or collection
- Ignore the accounts receivable balance and focus on other financial ratios
- Assume it is a temporary fluctuation and does not impact the company's financial health.

Answer:

Investigate further to determine if there are any underlying issues with revenue recognition or collection

2. Technical Analysis

- Technical Analysis is a method of **share price movements** based on a study of price graphs or charts on the assumption **that share price trends are repetitive, that since investor psychology follows a certain pattern**, what is seen to have happened before is likely to be repeated.

3. Simple Moving Averages (SMA)

- SMA is the average data of most recent observations.
- 5-day SMA is the average price of last 5 days whereas 10-day SMA is the average price of last 10 days.
- **Equal weightage is given to all observations in SMA**

4. Exponential Moving Averages (EMA)

- In EMA we give extra weights to recent observations and less weights to earlier observations
- Weight of latest observation is exponent value.

$$\text{Value of exponent} = \left(\frac{2}{n+1} \right)$$

- **Approach 1 to compute EMA:** EMA = (Previous day EMA x (1 - Exponent)) + (latest value x Exponent)
- **Approach 2 to compute EMA:** New EMA = Previous EMA +/- EMA adjustment
- EMA adjustment = Value of exponent x (Today value - Previous EMA value)

Format for computation of EMA:

Date	Sensex	EMA of previous day	Change (Col 2 - Col 3)	EMA Adjustment (Col 3 x 30-day exponent)	New EMA (Col 3 + Col 5)
6	14,522	15,000.00	-478	-29.64	14,970.36
7	14,925	14,970.36	-45.36	-2.81	14,967.55

Example:

An investor is using exponential moving average for the purpose of technical analysis. What is the value of exponent for 10 days EMA?

- 0.2000
- 0.1818
- 0.2222
- 0.4000

Answer:

$$\text{Exponent} = \frac{2}{n+1} = \frac{2}{10+1} = 0.1818$$

Simple moving average of Sensex for the month of December 2022 is 60,000. You are planning to evaluate the technical strength through EMA. The value of exponent is 0.125. Sensex for 1st trading day stood at 61,000. What would be the new EMA by end of 1st trading day?

- 61,000
- 60,000
- 60,125
- 59,875

Answer:

- EMA Adjustment = [Sensex on day 1 - old EMA] x EMA exponent
- EMA Adjustment = [61,000 - 60,000] x 0.125 = 125
- New EMA = Old EMA + EMA Adjustment = 60,000 + 125 = 60,125

5. Breadth Index

- It is an **index that covers all securities traded**. It is computed by dividing the **net advances or declines in the market by the number of issues traded**.

$$\text{Breadth Index} = \frac{\text{No of securities Advanced} - \text{No of securities Declined}}{\text{Total Securities traded}}$$

- Interpretation:** The breadth index either **supports or contradicts the movement of the Dow Jones Averages**. If it supports the movement of the Dow Jones Averages, this is considered sign of technical strength and if it does not support the averages, it is a sign of technical weakness i.e. a sign that the market will move in a direction opposite to the Dow Jones Averages.

Example:

Compute breadth index from the following information

Number of securities advanced	25
Number of securities declined	20
Number of securities unchanged	5

- 0.11
- 0.10
- 0.50
- 5.00

Answer:

$$\text{Breadth index} = \frac{\text{Number of securities advanced} - \text{Number of securities declined}}{\text{Total number of securities}} = \frac{25 - 20}{25 + 20 + 5}$$

$$\text{Breadth index} = 0.10$$

6. Confidence Index

- It is supposed to reveal how **willing the investors are to take a chance in the market**. It is the ratio of **high-grade bond yields to low-grade bond yields**.

$$\text{Confidence Index} = \frac{\text{Yield on high grade bond}}{\text{Yield on low grade bond}}$$

- **Interpretation:** A rising confidence index is expected to precede a rising stock market, and a fall in the index is expected to precede a drop-in stock price.

Example:

Compute the confidence index from the following information:

Yield on high-grade bonds	6.00
Yield on low-grade bonds	9.00

- 150%
- 66.67%
- 60.00%
- 90.00%

Answer:

$$\text{Confidence index} = \frac{\text{Yield on high grade bonds}}{\text{Yield on low grade bonds}} \times 100 = \frac{6}{9} \times 100 = 66.67\%$$

7. RSI Index

- The relative strength concept suggests that the prices of some securities rise relatively faster in a bull market or decline more slowly in a bear market than other securities i.e. some securities exhibit relative strength.

$$\text{Relative Strength} = \frac{\text{Average gain}}{\text{Average loss}}$$

$$\text{Relative Strength Index} = 100 - \left(\frac{100}{1 + \text{RS}} \right)$$

- **Interpretation:** The RSI ranges from 0 to 100, with values above 70 typically considered overbought (indicating a potential reversal or correction) and values below 30 indicating oversold conditions (suggesting a potential upward price movement)

Example:

Compute the Relative Strength index from the following information:

Average gain over last 14 days	8.00
Average loss over last 14 days	10.00

- 55.56
- 44.44
- 100.00
- 80.00

Answer:

$$\text{Relative Strength} = \frac{\text{Average gain}}{\text{Average loss}} = \frac{8}{10} = 0.80$$

$$\text{Relative Strength Index} = 100 - \left(\frac{100}{1 + \text{RS}} \right) = 100 - \left(\frac{100}{1 + 0.80} \right) = 100 - 55.56 = 44.44$$

8. Run Test

- Extract the past price data
- Mention the sign of change in the third column. Sign of price change is +(positive) if index has moved up and it will be -(negative) if index has come down
- **Compute number of positive changes (n1), number of negative changes (n2), and number of runs.** For example, the sign of price change is positive, negative, negative, positive, positive, positive, negative and positive. In this example r will be taken as 5 (we started with positive and then it shifted to negative on day 2. It again got changed to positive on day 3. Then sign changed to negative on day 7 and it got changed to positive on day 8)
- A run would indicate continuous increase/decrease in price. Any change in sign of price change would indicate a new run
- Compute the tolerable limit for runs and check if actual number of runs is within tolerable limit. If actual runs is within tolerable limit, then market exhibits weak form of efficiency. Conversely, if it is outside the limit, then market is inefficient

Tolerable Limit Computation:

Compute Mean $\mu_r = \frac{2n_1n_2}{n_1 + n_2} + 1$

Compute SD $\sigma_r = \sqrt{\frac{(Mean - 1)(Mean - 2)}{n - 1}}$

- Upper limit = Mean + (SD x t-value)
- Lower Limit = Mean - (SD x t-value)
- t-value is to be computed for given significance level and (n-1) degrees of freedom

Example:

You have decided to do run-test to check the weak form of efficiency. Number of positive changes = 8 and Number of negative changes = 6. How much is the expected mean of runs?

- 7
- 7.86
- 7.58
- 8.00

Answer:

Expected mean of runs = $\frac{2n_1n_2}{n_1 + n_2} + 1 = \frac{2 \times 8 \times 6}{8 + 6} + 1 = 7.86$

9. Auto-Correlation/Serial Correlation Test

- Identify two data for which correlation is to be computed. **Example: Price change of Jan 2021 with price change of Jan 2022**
- Identify change for various observations of data 1 and data 2.
- **Absolute changes** are considered in **Auto-correlation test** and **% changes** are considered in **serial correlation test**
- Compute correlation coefficient using format 2 of Portfolio chapter
- If the computed correlation coefficient is closer to +1 or -1, market is inefficient. If the same is closer to 0 then market exhibits weak form of efficiency

Chapter 5 – Security Valuation

Security Valuation	Convertible Instruments	Bond Valuation	Money Market	Miscellaneous Areas
•Walter's Model •Gordon's Model •Step-up Growth Model •H-Model •PE Multiple Approach •Earning Growth Model •FCFE Model	•Conversion Value •Conversion Parity Price •Conversion Premium •Straight Value •Downside Risk •Premium Payback Period •Favourable income differential	•Valuation •YTM and Current Yield •Realized YTM •Duration •Volatility •Convexity •Immunization •Bond refunding •Forward Rates •Yield Curve	•Computation of issue price •Yield •Clean Price •Dirty Price	•Rights Issue •Buyback •Enterprise Valuation •Preference shares valuation •Warrants Valuation

1. How to calculate price under Walter's Model?

$$P_0 = \left(\frac{D}{K_e} \right) + \frac{\left(\frac{r}{K_e} \right) \times (E - D)}{K_e}$$

Where:

Term	Meaning	Formula/other notes
P_0	Fair Market Price	
D	Dividend per share	$\frac{\text{Total Dividend}}{\text{Number of shares}}$ (or) $\text{EPS} \times \text{Payout ratio}$
R	Return on equity (or) Internal rate of return (or) Return on retained earnings (or) Return on investment	$\frac{\text{EAES}}{\text{Value of Equity}}$ (or) $\frac{\text{EPS}}{\text{Book value per share}}$
E	Earnings per share	$\frac{\text{EAES}}{\text{Number of shares}}$ (OR) $\text{Book value per share} \times \text{ROE}$ $\text{EAES} = \text{PAT} - \text{Preference Dividend}$
K_e	Cost of equity	This is also called as: • Investor's required rate of return • Opportunity cost of capital • Rate of capitalization • Cost of capital (100% equity company) • Equity capitalization rate

Example:

EPS = Rs.10; Payout ratio = 25%; Cost of equity = 10%; Return on equity = 5%. What is the price of share as per Walter's model?

- Rs.100
- Rs.200
- Rs.175
- Rs.62.50

Answer:

$$P_0 = \left(\frac{D}{K_e} \right) + \frac{\left(\frac{r}{K_e} \right) \times (E - D)}{K_e} = \left(\frac{2.50}{10\%} \right) + \frac{\left(\frac{0.05}{0.10} \right) \times (10 - 2.50)}{10\%} = \text{Rs. } 62.50$$

2. How to value share under Gordon's Model?

$$P_0 = \frac{D_1}{K_e - G} \text{ (or) } \frac{D_0(1 + G)}{K_e - G} \text{ (or) } \frac{\text{EPS}_1(1 - \text{retention ratio})}{K_e - G}$$

Where:

Term	Meaning	Formula/other notes
P_0	Fair Market Price	
D_1	Dividend of next year	- This is one important assumption as the question would not be clear whether it is nearby dividend (D_0) or Distant Dividend (D_1) - If the question is not clear, then we should write our assumption and also solve answer with both assumption (i.e. taking dividend as D_0 and D_1) Majority of ICAI answers we will have assumption of taking dividend as D_1 and hence that would be our primary answer and alternate answer would be by taking the dividend as D_0
K_e	Cost of equity	Same as per Walter's Model
G	Growth rate	Explained in other concepts

Example:

Long term growth of 8% is expected. Company is expected to pay a dividend of Rs.4 per share next year. The cost of equity is 12%. What is the fair value of share?

- Rs.50
- Rs.75
- Rs.100
- Rs.33.33

Answer:

$$P_0 = \frac{D_1}{K_e - G} = \frac{4}{12\% - 8\%} = \text{Rs. } 100$$

3. Computation of Price of Different Years [as per MM Approach of CA Inter]

Closing price of a share is equal to opening price + required rate of return. However, share price will fall by the dividend amount in case company declares dividend. This has led to the following formula for computing price.

$$P_1 = P_0 \times (1 + K_e) - D_1$$

$$P_2 = P_1 \times (1 + K_e) - D_2$$

We can use above formula and compute price for different years

Example:

Price at end of year 3 = Rs.300; Cost of equity = 20%. Company will pay Dividend of Rs.10 in year 1, Rs.30 in year 2 and Rs.60 in year 3. How much is the price of share today?

- Rs.173.61
- Rs.400.00
- Rs.237.50
- Rs.200.00

Answer:**Computation of Price at end of year 2:**

$$P_3 = P_2 \times (1 + K_e) - D_3; 300 = P_2 \times (1 + 0.20) - 60; 360 = 1.20P_2; P_2 = \frac{360}{1.20} = 300$$

Computation of Price at end of year 1:

$$P_2 = P_1 \times (1 + K_e) - D_2; 300 = P_1 \times (1 + 0.20) - 30; 330 = 1.20P_1; P_1 = \frac{330}{1.20} = 275$$

Computation of today price:

$$P_1 = P_0 \times (1 + K_e) - D_1; 275 = P_0 \times (1 + 0.20) - 10; 285 = 1.20P_0; P_0 = \frac{285}{1.20} = 237.50$$

4. Holding Period Return

$$\text{Holding Period Return} = \frac{\text{Dividend}(D_1) + \text{Capital Appreciation}(P_1 - P_0)}{\text{Opening Price}(P_0)} \times 100$$

Example:

Share price on January 1 (Purchase date) = Rs.40; Share price on December 31 = Rs.45; Dividend paid (December 31) = Rs.5; Cost of equity = 11%; Cost of debt = 8%; Debt: Equity = 1:3. What is the holding period return (ignore taxes)?

- a) 25.00%
- b) 12.50%
- c) 22.50%
- d) 14.00%

Answer:

$$\text{Holding period return} = \frac{(45 - 40) + 5}{40} \times 100 = 25.00\%$$

5. Ex-Dividend Price vs Cum-Dividend Price

- Price computed as per any dividend valuation model would be the ex-dividend price. In case shares are quoting cum-dividend in the market then the fair cum-dividend price would be equal to fair ex-dividend price + Amount of dividend.
- **Share price will fall by the amount of dividend once the share goes ex-dividend. Hence, we should only use the ex-dividend price in formula to compute any missing item.**

Example:

The cum dividend price of share is Rs.11 (including dividend of Rs.1). Growth rate is 5%. What is cost of equity?

- a) 15.5%
- b) 14.55%
- c) 15%
- d) 14.09%

Answer:

$$K_e = \left(\frac{D_1}{P_0} \right) + G = \frac{1.05}{10} + 0.05 = 0.155 \text{ or } 15.50\%$$

Note:

- Next-year dividend = 1 + 5% = Rs.1.05
- Price in the above formula is ex-dividend price and the same would be Rs.10 (11 - 1)

6. How to compute Growth Rate?

Approach 1 - Formula based: Growth rate = [IRR (or) ROE] × Retention Ratio

Example:

IRR of company = 20%; Investor's required rate of return = 15%; Dividend = Rs.2 per share; EPS = Rs.5 per share. What will be the growth rate?

- a. 8%
- b. 12%
- c. 6%
- d. 9%

Answer:

Particulars	Amount
Payout ratio (DPS/EPS)	40.00%
Retention ratio (100% - Payout ratio%)	60.00%
Growth rate (IRR x Retention ratio)	12.00%

Approach 2 - Based on Past Data:

- Take the first available dividend as Present value and the latest available dividend as future value
- Number of years gap will be taken as n
- Use below formula and compute r as balancing figure. The computed r will be taken as growth rate
- Future value = Present Value × (1 + r)ⁿ

Example:

Dividend of 1996 = Rs.2.115; Dividend of 2002 = Rs.3. The company's earnings and dividend have experience constant growth. What will be the growth rate in dividends using below information? PVF of 5% for 6 years = 0.746; PVF of 6% for 6 years = 0.705; PVF of 7% for 6 years = 0.666

- a. 5%
- b. 6%

- c. 7%
d. None of the above

Answer:

Dividend of 1996 = PV = 2.115; Dividend of 2002 = FV = Rs.3;

Present value = Future value x Present Value Factor

$$2.115 = 3 \times \text{Present Value Factor}; \text{Present value factor} = \frac{2.115}{3} = 0.705$$

PVF of 0.705 correspond to 6 years and 6 percent. Hence growth rate of the company is 6 percent

7. Growth rate based on EPS vs DPS

Growth rate should be computed based on EPS. This is because EPS reflects real growth of company and DPS growth would mirror EPS growth unless there is a change in a payout ratio. This approach is followed in case growth is computed based on past data.

Example:

SRK Limited is a listed company and it has just announced annual dividend for the year ending 2013-14.

Earnings per share (EPS) and Dividend per share (DPS) for 5 years is as follows:

Particulars	2013-14	2012-13	2011-12	2010-11	2009-10
EPS (Rs.)	14.00	13.60	13.10	12.70	12.20
DPS (Rs.)	8.20	8.10	7.90	7.80	7.70

What is to be considered as growth rate for valuation of share?

- a) 3.50%
b) 1.59%
c) 2.50%
d) 2.55%

Answer:

Company had earnings of 12.20 in 2009-10 and the same had increased to 14.00 in 2013-14. This would mean that 12.20 has become 14.00 in 4 years. **Growth rate has been computed based on EPS. This is because EPS reflects real growth of company and DPS growth would mirror EPS growth unless there is a change in a payout ratio**

Earnings of Year 0 (PV) = 12.20; Earnings of year 4 (FV) = 14.00; n = 4 years; r = ?

- ❖ Future value = Present Value x $(1 + r)^n$
- ❖ $14.00 = 12.20 \times (1 + r)^4$
- $(1 + r)^4 = \left(\frac{14.00}{12.20}\right); (1 + r)^4 = 1.1475; (1 + r)^2 = 1.0712; (1 + r) = 1.035$
- ❖ r = 3.5% and hence growth rate is 3.5%

8. Time value of Money Concepts**Future Value of single cash flow:**

Future value = Present value x $(1 + r)^n$

Example:

Ram has deposited Rs.55,650 in a bank, which is paying 15 per cent rate of interest on a ten-year time deposit. Calculate the amount at the end of ten years?

Answer:

Amount = $P \times (1 + r)^n$

$$\text{Amount} = 55,650 \times (1 + 15\%)^{10} = 55,650 \times 4.0456 = \text{Rs. } 2,25,138$$

Present value of single cash flow:

Present value = $\frac{\text{Future value}}{(1 + r)^n}$

Example:

Suppose you have celebrated your 19th birthday. A rich uncle of yours has set up a trust fund for you that will pay you Rs.2,50,000 when you turn 30. If the time value of money is 9.0%, how much is this fund worth today?

Answer:

Present value = $\frac{\text{Future value}}{(1 + r)^n}$

$$\text{Present value} = \frac{2,50,000}{(1 + 9\%)^{11}}$$

$$\text{Present value} = \frac{2,50,000}{2.580} = \text{Rs. } 96,899$$

Future value of multiple cash flows:

We need to compute future value of every cash flow and then compute the future value. This concept will also help us in computation of realized YTM.

Example:

An investor will receive Rs.100 of interest for next three years and also receive Principal of Rs.1,000 at end of third year. How much is the maturity cash flow at end of year 3 if re-investment rate is 8%.

Year	Cash flow	Period	FVF (1 + r) ⁿ	Future value
1	100.00	2	1.1881	118.81
2	100.00	1	1.0900	109.00
3	1,100.00	0	1.0000	1,100.00
Maturity cash flow				1,327.81

Note:

Future value factor is computing by using the formula of $(1 + r)^n$ where $r = 8\%$ and $n = \text{Number of periods of investment (Column 3)}$

Present value of multiple cash flows:

We need to compute present value of every cash flow and then compute the present value. This concept will be extensively used in security valuation/business valuation

Example:

You are likely to receive Rs.10,000 in year 1, Rs.20,000 in year 2 and Rs.30,000 in year 3. Discount rate = 10%. How much is the worth of the same today?

Year	Cash flow	PVF @10%	DCF
1	10,000	0.909	9,090
2	20,000	0.826	16,520
3	30,000	0.751	22,530
Present Value			48,140

Note:

Present value factor is computing by using the formula of $\frac{1}{(1+r)^n}$ where $r = 10\%$ and $n = \text{Number of years of discounting (Column 1)}$

Present Value of Annuity:

Annuity would mean equal payments or receipts for a specified period.

Present value of Annuity = Annuity Amount x PVAF (r, n)

Example:

Compute the amount of deposit to be made today if you want to receive Rs.25,500 at the end of each of next 15 years.

Answer:

Present value = Annuity Amount x PVAF(r, n)

Present value = 25,500 x PVAF(10%, 15)

Present value = 25,500 x 7.606 = Rs. 1,93,953

Present value of Perpetuity

$$PV = \frac{CF_1}{\text{Discount Rate} - \text{Growth Rate}}$$

Example:

Assuming that the discount rate is 7% per annum, how much would you pay to receive Rs.50, growing at 5%, annually, forever?

Answer:

$$\text{Present value} = \frac{CF_1}{\text{Discount rate} - \text{Growth Rate}} = \frac{50}{7\% - 5\%} = \text{Rs. } 2,500$$

Loan amortization based on concept of Annuity Factor:

PVAF can be used for various computations such as loan amortization, sinking fund investment etc.

Example:

A has taken a 20-month car loan of Rs.6,00,000. The rate of interest is 12 percent per annum. What will be the monthly loan amortization?

Answer:

Present value = Annuity Amount x PVAF(r, n)

$$6,00,000 = \text{Annuity Amount} \times \text{PVAF}(1\%, 20)$$

$$6,00,000 = \text{Annuity Amount} \times 18.045$$

$$\text{Annuity Amount} = \frac{6,00,000}{18.045} = \text{Rs. } 33,250$$

Note:

- N = 20 months
- Rate of interest = 12% per annum (or) 1% per month
- We should ensure that time period (months) and rate of interest (1%) is for the same time period in the above formula

9. Link between EPS, BVPS and ROE

$$\text{ROE} = \frac{\text{EPS}}{\text{Book value per share}}$$

Example:

Book value per share = Rs.100; DPS = Rs.4; Payout ratio = 25%. How much is ROE?

- 4%
- 1%
- 16%
- 8%

Answer:

Particulars	Amount
EPS (DPS/Payout ratio)	16.00
Book value per share	100
ROE (EPS/BVPS x 100)	16.00%

10. How to compute Return on Equity

$$\text{ROE} = \frac{\text{EAES}}{\text{Book value of equity}} \text{ (or) } \frac{\text{EPS}}{\text{Book value per share}}$$

Note:

- Book value of equity = Networth = SC + Reserves – Fictitious Assets

Example:

Profit before Tax = 10,00,000; Tax Rate = 50%; No of equity shares of Rs.10 each = 50,000; 10% Preference capital = 10,00,000; Reserves and Surplus = Rs.45,00,000; Fictitious assets = 10,00,000. How much is ROE?

- 80%
- 8%
- 40%
- 10%

Answer:

Particulars	Amount
Profit before tax	10,00,000
Less: Tax @ 50%	-5,00,000
Profit after tax	5,00,000
Less: Preference dividend (10,00,000 x 10%)	-1,00,000
EAES	4,00,000
Amount of equity [Equity share capital + Reserves – Fictitious assets]	40,00,000
ROE [EAES/Amount of equity]	10.00%

11. Computation of cost of equity (Dividend Paying Company with constant growth)

$$K_e = \left(\frac{D_1}{P_0} \right) + G$$

Example:

The current share price is Rs.100. Long term growth of 8% is expected. Company is expected to pay a dividend of Rs.4 per share next year. What rate of return does an investor expect?

- 8%
- 12%
- 12.32%

d. 4.32%

Answer:

$$K_e = \left(\frac{D_1}{P_0} \right) + G = \frac{4}{100} + 0.08 = 0.12 \text{ or } 12\%$$

12. Computation of cost of equity (Dividend Paying company - Planning a new issue and incurs floatation costs)

A company planning a new issue of equity shares may incur floatation costs such as brokerage, issue expenses. In such a situation below formula would be used to compute cost of equity

$$K_e = \left(\frac{D_1}{P_0 - F} \right) + G$$

Example:

Issue price of a share is Rs.105 and Floatation cost on issue is Rs.5. Long term growth of 8% is expected. Company is expected to pay a dividend of Rs.4 per share next year. How much is the cost of new issue?

- a. 8%
- b. 12%
- c. 12.32%
- d. 4.32%

Answer:

$$K_e = \left(\frac{D_1}{P_0 - F} \right) + G = \frac{4}{105 - 5} + 0.08 = 0.12 \text{ or } 12\%$$

13. Computation of cost of equity (Dividend Paying Company with multiple growth rates)

If there are multiple growth rates the Gordon's formula cannot be used to find cost of equity. In that scenario we need to assume discount rates and get NPV of the cash flows. Once we get one positive and one negative NPV we can calculate the IRR of the cash flows. The computed IRR would be taken as cost of equity. **We should take care of terminal cash flows while computing NPV as the terminal cash flows (perpetuity) valuation can change based on discount rate.**

Example:

The current share price is Rs.100. Last paid dividend is Rs.10 and the same will grow at 20% for two years. Growth will stabilize at 10% from third year onwards. How much is the cost of equity? **Use Discount rate of 22% and 23% to compute cost of equity.**

- a) 22.00%
- b) 23.00%
- c) 22.98%
- d) 22.02%

Answer:

Year	Cash flow	PVF @ 22%	DCF	Cash flow	PVF @ 23%	DCF
0	-100.00	1	-100.00	-100.00	1	-100.00
1	12.00	0.82	9.84	12.00	0.813	9.76
2	14.40	0.672	9.68	14.40	0.661	9.52
2	132.00	0.672	88.70	121.85	0.661	80.54
NPV			8.22			-0.18

Note:**P2 if cost of equity is 22%**

$$P_2 = \frac{D_3}{K_e - G} = \frac{14.40 + 10\%}{22\% - 10\%} = 132.00$$

P2 if cost of equity is 23%

$$P_2 = \frac{D_3}{K_e - G} = \frac{14.40 + 10\%}{23\% - 10\%} = 121.85$$

Computation of cost of equity (IRR):

IRR	$L_1 + \frac{\text{NPV at } L_1}{\text{NPV at } L_1 - \text{NPV at } L_2} \times (L_2 - L_1)$	$22 + \frac{8.22}{8.22 - (-0.18)} \times (23 - 22)$	22.98%
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14. Computation of cost of equity (Non-Dividend Paying Company)

Cost of equity = $R_f + \text{Beta} \times (R_m - R_f)$

- R_f = Risk-free rate; R_m = Market return; $(R_m - R_f)$ = Risk premium of market

Example:

Risk-free rate is 6% whereas risk premium of market is 8%. How much is the cost of equity if Beta is 1.5 Times?

- 9.00%
- 12.00%
- 18.00%
- 21.00%

Answer:

- Risk-premium of the market is difference between $R_m - R_f$.
- Cost of equity = $6\% + 1.5 \times (8\%) = 18.00\%$

15. What is the appropriate Dividend Payout Ratio?

Scenario	Payout Ratio
$r > K_e$	0%
$r = K_e$	Indifferent (Any payout ratio)
$r < K_e$	100%

Example:

Total earnings = 1,00,000; No of equity shares = 1,00,000 of Rs.10 each; Price Earning Multiple = 8 times. The company is currently following 100% payout ratio. What should be the optimum payout?

- 0%
- 100%
- Indifferent

Answer:

$$\text{ROE} = \frac{\text{Total earnings}}{\text{Value of equity}} = \frac{1,00,000}{10,00,000} = 10.00\%$$

$$K_e = \frac{1}{\text{PE Multiple}} = \frac{1}{8} = 12.50\% \quad [K_e \text{ can be taken as inverse of PE Multiple if payout ratio is 100\%}]$$

Optimum payout ratio for the company would be 100% as cost of equity is higher than ROE

16. How to compute cost of GDR?

Cost of GDR works in same manner as cost of equity. GDR will have underlying equity shares and we can compute the amount of dividend per GDR. Also, it can have floatation cost and hence Price (P_0) is replaced with net proceeds ($P_0 - F$) in the formula.

Example:

Cum-dividend price of share = Rs.400; Dividend = Rs.20. Five shares underly each GDR. Shares will be priced at discount of 20%. Exchange rate is Rs.100/USD. Growth rate is 10%. What is the net realization (in USD) per GDR if floatation cost is 5%? Also compute cost of equity?

- 16.88%
- 17.62%
- 16.25%
- 16.58%

Answer:

Particulars	Calculation	Amount
Ex-Dividend price per share [Real worth of share]	$400 - 20$	380.00
Value of 5 shares	380×5	1,900.00
Issue price per GDR (in INR)	$1,900 - 20\%$	1,520
Net realization post FC (in INR)	$1,520 - 5\%$	1,444
Net realization in USD	1,444/100	14.44

$$\text{Cost of GDR} = \left(\frac{D_1}{P_0 - F} \right) + G = \frac{(20 + 10\%) \times 5}{1,520 - 5\%} + 0.10 = 0.0762 + 0.10 = 0.1762 \text{ or } 17.62\%$$

17. What is limiting value?

Limiting value is the minimum possible value of a share and same is calculated at a payout ratio which is opposite of optimum payout ratio.

Example:

Return on equity = 20%; Cost of equity = 15%; EPS = 10. What will be the limiting value as per Walter's model?

- a. 50.00
- b. 66.67
- c. 88.89
- d. 60.00

Answer:

The return on equity is 20% whereas cost of equity is 15%. This is a case of declining firm and hence optimum payout ratio is 0%. Limiting value is minimum possible value of a share and is computed by following a payout ratio which is opposite of optimum payout ratio. Hence, we will work with 100% (opposite of 0%) and compute the answer. EPS is Rs.10 and hence DPS will also be Rs.10 considering 100% payout ratio.

$$P_0 = \left(\frac{D}{K_e} \right) = \frac{10}{15\%} = \text{Rs. } 66.67$$

18. Step-up Growth Model

- This refers to a scenario where growth happens in multiple stages (initial stage, intermediate stage and final stage)
- **Step 1:** We should compute dividends till the first year of stabilization phase. Stabilization phase is reached where growth rate as well as cost of equity is stabilized and will remain same till perpetuity
- **Step 2:** Compute the price at beginning of stabilization phase using Gordon's formula
- **Step 3:** Discount the above cash flows at cost of equity and arrive at fair value of the share

Example:

Last paid dividend is Rs.10 and the same will grow at 20% for two years. Growth will stabilize at 10% from third year onwards. Historical Cost of equity is 22% but from today the cost of equity will be 20% due to lower risk of company. How much is fair value of share?

- a) Rs.158.40
- b) Rs.50.00
- c) Rs.129.92
- d) Rs.125.96

Answer:**Step 1: Computation of Dividends till the first year of stabilization phase:**

Dividend growth will stabilize at 10% from third year onwards. Hence third year is the year of stabilization.

Year	Dividend
1	12.00 [10 + 20%]
2	14.40 [12 + 20%]
3	15.84 [14.40 + 10%]

Step 2: Computation price at beginning of stabilization phase (Beginning of Year 3 = End of Year 2)

$$P_2 = \frac{D_3}{K_e - G} = \frac{14.40 + 10\%}{20\% - 10\%} = 158.40$$

Step 3: Valuation of share at cost of equity of 20% (Future Ke)

Year	Cash flow	PVF @ 20%	DCF
1	12.00	0.833	10.00
2	14.40	0.694	9.99
2	158.40	0.694	109.93
Fair value of share			129.92

19. Linear Fall in Growth Rate

This would mean that dividend growth rate will fall by same percentage every year. Annual fall in growth rate = [Total fall in growth rate/Number of years]. If the question does not specify the number of years, then we will take the same as 1 percent fall every year.

Example:

Dividends will grow at 20 percent for four years. Growth will have a linear fall and stabilize at 14 percent. What will be the dividend growth in 6th year?

- 20 percent
- 14 percent
- 19 percent
- 18 percent

Answer:

Growth will have a linear fall and stabilize at 14 percent. It has not been mentioned that fall is for how many years and hence it will be taken as 1 percent fall every year. Growth rate of year 5 is 19 percent and growth rate of year 6 is 18 percent

Example:

Dividends will grow at 20 percent for four years. Growth will have a linear fall and stabilize at 14 percent in year 7. What will be the dividend growth in 6th year?

- 20 percent
- 18 percent
- 16 percent
- 14 percent

Answer:

$$\text{Annual fall in growth rate} = \frac{20 - 14}{3} = 2\%$$

Hence Growth rate of year 5 is 18% (20% - 2%) and growth rate of year 6 is 16% (18% - 2%)

20. Change in Growth rate with change in payout ratio

In order to compute future DPS, we should first compute the EPS and based on EPS we should compute DPS. This approach will ensure correct DPS projection in case there is a change in Dividend Payout Ratio.

Example:

The company has paid out Dividend of Rs.3 per share based on payout ratio of 50%. Earnings and Dividend will grow at 20 percent for four years. Growth will fall to 10 percent in year 5 and dividend payout ratio will increase to 60%. Cost of equity of the company is 20%. What should be the MPS at the end of year 5?

- Rs.90.30
- Rs.75.20
- Rs.82.10
- Rs.68.40

Answer:

Particulars	Amount
EPS of last (DPS/Payout ratio)	6.00
EPS of year 1 (6 + 20%)	7.20
EPS of year 2 (7.20 + 20%)	8.64
EPS of year 3 (8.64 + 20%)	10.37
EPS of year 4 (10.37 + 20%)	12.44
EPS of year 5 (12.44 + 10%)	13.68
EPS of year 6 (13.68 + 10%)	15.05
DPS of year 6 (15.05 x 60%)	9.03
Price of year 5 = $\left(\frac{D_6}{K_e - G}\right) = \left(\frac{9.03}{20\% - 10\%}\right)$	90.30

21. Implied Growth Rate

In this situation, we're asked to calculate the implied growth rate based on the actual market price. When a P/E multiple is provided, we can use it to determine the current market price. Then, by substituting the current market price into Gordon's formula, we can derive the implied growth rate.

Example:

DPS (D₀) = Rs.10; Payout ratio = 50%; Current PE Multiple = 10 Times. What is the implied growth rate if cost of equity is 20%?

- 14.92%
- 15.00%
- 14.29%
- None of the above

Answer:

$$P_0 = \frac{D_1}{K_e - G}; 200 = \frac{10 \times (1 + G)}{0.20 - G}; 40 - 200G = 10 + 10G; 30 = 210G; G = \frac{30}{210} = 14.29\%$$

Note:

DPS = Rs.10; Payout ratio is 50% and hence EPS is Rs.20 (10/50%). PE Multiple is 10 times and hence the current market price is Rs.200 (20 x 10)

22. Present Value of Growth Opportunities (PVGO)

PVGO represents the additional value that investors are willing to pay for a company's stock due to its potential for future growth. In other words, it reflects the premium attached to the stock price because of anticipated expansion, earnings growth, or other profitable opportunities the company may pursue. PVGO = Current market price - Price if there was no growth.

Example:

MPS of company = Rs.100; EPS of company = Rs.8; Cost of equity = 10%. What is present value of growth opportunities?

- 80.00
- 20.00
- 100.00
- 50.00

Answer:

PVGO = CMP - Fair price with no growth = 100 - 80 = Rs.20

Fair price with no growth would be computed with company having a payout ratio of 100%. This is because payout will be 100% (retention of 0%) and the same would lead to no growth.

$$\text{Fair price with no growth} = \left(\frac{D}{K_e} \right) = \frac{8}{10\%} = \text{Rs. } 80$$

23. Multiple Cost of Equity

Cost of equity can change in case of revision in investor expectation. For instance, cost of equity can be 10% for year 1 to 4 and thereafter it can be 14%. We should use the respective discount rate for perpetuity valuation and PVF should be computed based on below rules:

$$\text{PVF of year 1} = \frac{1}{1 + \text{Discount rate of year 1 (10\%)}} = 0.909$$

$$\text{PVF of year 2} = \frac{0.909}{1 + \text{Discount rate of year 2 (10\%)}} = 0.826$$

$$\text{PVF of year 3} = \frac{0.826}{1 + \text{Discount rate of year 3 (10\%)}} = 0.751$$

$$\text{PVF of year 4} = \frac{0.751}{1 + \text{Discount rate of year 4 (10\%)}} = 0.683$$

$$\text{PVF of year 5} = \frac{0.683}{1 + \text{Discount rate of year 5 (14\%)}} = 0.599$$

Care should be taken to take the previous year discount factor and then divide by (1 + Discount rate of next year)

Example:

The company will pay Dividend of Rs.20 in year 1, Rs.24 in year 2 and Rs.30 in year 3. Share will be sold for Rs.300 at end of year 3. Cost of equity is 10% in year 1 and same will increase by 1% every year due to higher risk. How much is the fair value of share?

- 185.83
- 171.95
- 179.07
- 178.74

Answer:

Year	Cash flow	PVF	DCF
1	20.00	0.909	18.18
2	24.00	0.819	19.66
3	330.00	0.731	241.23
Fair value of share			179.07

Note:

$$\text{PVF of year 1} = \frac{1}{1 + \text{Discount rate of year 1 (10\%)}} = 0.909$$

$$\text{PVF of year 2} = \frac{0.909}{1 + \text{Discount rate of year 2 (11\%)}} = 0.819$$

$$\text{PVF of year 3} = \frac{0.819}{1 + \text{Discount rate of year 3 (12\%)}} = 0.731$$
24. Impact of bonus issue on terminal value

The fair price of a share is determined by calculating the present value of its future cash flows, discounted at the cost of equity. In the case of a bonus issue, each existing share could be converted into an increased number of shares, such as 1.2 or 1.5 shares, depending on the bonus ratio. **Therefore, the terminal cash flow should factor in the sale price of this higher number of shares.**

Example:

Mr. A plans to buy 1 share of company A. The company is expected to give bonus of 1:5 in fourth year. The share is expected to be sold in 7th year at expected price of Rs.900 each. Incidental expense on sale of share is 5%. What will be the net realization in year 7?

- 855.00
- 900.00
- 1080.00
- 1026.00

Answer:

The investor will get 1.2 shares for every 1 share due to bonus issue. Sale value of 1.2 shares = $900 \times 1.20 = 1080$ and net realization = $1080 - 5\% \text{ expenses} = 1080 - 54 = \text{Rs.}1026$

25. Impact of transaction cost on Maximum Purchase Price

The fair price of a share is the present value of its future cash flows, discounted at the cost of equity. Typically, this fair value serves as the maximum purchase price. However, in practice, the maximum purchase price will be lower than the fair value, as the investor must account for incidental expenses related to the purchase.

$$\text{Max Purchase Price} = \frac{\text{Fair value of share}}{1 + \text{Transaction cost on purchase}}$$

Example:

Present value of future cash inflows = 525. The investor has to pay 5 percent brokerage on purchase of share. What shall be the maximum purchase price of share?

- 525
- 500
- 498.75
- 551.25

Answer:

PV of cash inflows = 525. Hence the maximum outflow has to be Rs.525. The investor has to pay 5 percent brokerage and hence the maximum purchase price = $525 / 105\% = \text{Rs.}500$

26. H Model for Three-Stage Dividend Discount Model

- In the first stage, dividends grow at a high rate for a defined period. In the second stage, the growth rate decreases for another set period, eventually stabilizing at a sustainable growth rate.
- The H Model assumes that as the extraordinary growth rate transitions to a normal rate, it declines linearly over time.

$$P_0 = \frac{D_0(1 + g_n)}{r - g_n} + \frac{D_0 H_1 (g_c - g_n)}{r - g_n}$$

Where:

- G_n = Normal growth rate Long run
- G_c = Current growth rate i.e. initial short-term growth rate
- H_1 = Half of duration of the transition growth period

Example:

Calculate value of equity share using H Model from the following information:

Dividend paid in last year	Rs.25
Cost of equity	8%
High-growth rate (short-term growth)	12%
Long-term growth rate	5%
Number of years for transition from high-growth to normal rate	5 years

- 875.00
- 1020.83
- 1025.00
- 1000.00

Answer:

$$P_0 = \frac{D_0(1 + g_n)}{r - g_n} + \frac{D_0 H_1 (g_c - g_n)}{r - g_n}$$

$$P_0 = \frac{25(1 + 0.05)}{0.08 - 0.05} + \frac{25 \times 2.5 (0.12 - 0.05)}{0.08 - 0.05} = 875 + 145.83 = \text{Rs. } 1,020.83$$

27. Maintenance of Dividend Income

An investor wants to maintain dividend income for meeting his regular expenses. However, the company may stop paying dividends due to growth opportunities. In that case, the investor can maintain the dividend income by partial sales of shares till company starts paying dividends again.

Example:

Dividend per share is Rs.2. An investor owns 500 shares of company. He wants to continue to earn same amount of dividend income ever year. Dividends will not be paid for next three years. Dividend of year 4 is likely to be Rs.2.50. Growth rate is 7% and cost of equity is 8%. How many shares are to be sold in year 2 to get the minimum amount?

- 4 shares
- 3 shares
- 8 shares
- 5 shares

Answer:

$$P_3 = \frac{D_4}{K_e - G} = \frac{2.50}{8\% - 7\%} = \text{Rs. } 250$$

$$P_2 = \frac{P_3}{1 + K_e} = \frac{250}{1 + 8\%} = \text{Rs. } 231.48$$

$$\text{No of shares to be sold in year 2} = \frac{\text{Amount needed}}{\text{Price}} = \frac{1,000}{231.48} = 4.32 \text{ shares}$$

Note: 4.32 shares will be rounded off to 5 as investor needs minimum 1,000. Sales of 4 shares will not give Rs.1,000

28. PE Multiple Approach

- Fair Price of share = EPS × PE Multiple
- PE Multiple will be directly given in the question. If the same is not available, then we can take PE Multiple as (1/Cost of equity) (or) (1/Return on equity)

Multiple Versions of PE Multiple:

$$\text{Trailing 12 month PE Multiple} = \frac{\text{MPS}}{\text{EPS of last 12 months}}$$

$$\text{One – year forward PE Multiple} = \frac{\text{MPS}}{\text{EPS of Next Year}}$$

$$\text{Two – year forward PE Multiple} = \frac{\text{MPS}}{\text{EPS of second year from now}}$$

Example:

Find out the value of share under PE Multiple Approach is ROE = 8% and EPS = Rs.3.00.

- a) Rs.24.00
- b) Rs.2.40
- c) Rs.37.50
- d) Rs.12.50

Answer:

Particulars	Amount
Return on equity	8%
PE Multiple (1/ROE)	12.5
EPS	3.00
Fair market price (EPS x PE Multiple)	37.50

29. Earning Growth Model

$$P_0 = \frac{EPS_1}{K_e - G}$$

Example:

Find out the value of share under earning growth model if current EPS = Rs.3.00; Cost of equity = 8%; Growth rate = 2%

- a) Rs.50.00
- b) Rs.51.00
- c) Rs.37.50
- d) Rs.38.25

Answer:

Market Price	$\frac{E_1}{(K_e - G)}$	$\frac{3 + 2\%}{(8\% - 2\%)}$	Rs.51 per share
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30. Free Cash Flow Approach

$$P_0 = \frac{FCFE_1}{K_e - G}$$

Where:

Term	Meaning	Formula/other notes
FCFE₁	Free cash flow to equity shareholders of next year	- FCFE = PAT – Equity funding for net capex and working capital - Equity funding for net capex and working capital = Net Capex and Working Capital x (100 – Debt ratio%) - Debt ratio basically represent what percentage of capex and working capital will be funded with debt.

- This approach can be followed if the problem gives data on capital expenditure, depreciation, working capital change and debt ratio

Example:

EPS = 10; Depreciation per share = 20; Capex per share = 30; WC increase per share = 2; Debt ratio = 0.60. What will be FCFE per share?

- a) 10
- b) -2
- c) 5.2
- d) 2.8

Answer:

Particulars	Amount
Net Capex (30 – 20)	10.00
WC increase per share	2.00
Net capex and WC requirement	12.00
Funded with debt (12.00 x 60%)	7.20
Funded with equity (12.00 x 40%)	4.80
FCFE (EPS – Equity needed for capex and WC)	5.20

31. Impact of new project on share price

A new project will affect the share price if it has a positive or negative NPV. The share price will rise by the amount of positive NPV per share or decrease if the NPV is negative.

New share price = Existing Price + Positive NPV per share – Negative NPV per share

Example:

EPS (100% payout) = Rs.10; MPS = Rs.100. Number of shares = 1,00,000 The company is fully equity financed. The company plans to do a project Rs.1 Cr at end of year 1. It will generate Rs.21 lacs from year 2 onwards. How much is the new share price?

- Rs.210 per share
- Rs.200 per share
- Rs.21 per share
- Rs.100 per share

Answer:

Company is following 100% payout ratio and hence EPS = DPS. Additionally, growth rate will also be zero.

$$K_e = \left(\frac{10}{100} \right) + 0 = 10\%$$

Year	Cash flow	PVF @ 10%	DCF
1	-1.00	0.909	-0.909
1	2.10 [21/10%]	0.909	1.909
NPV of project			1.000
NPV per share [1 Crore/1 lac]			100.00
New share price [100 + 100]			200.00

Note: Perpetual cash flow is received from year 2 and it is to be valued a year in advance (year 1)

32. Under-valued vs over-valued security

- A share is said to be under-valued if current market price is lower than intrinsic value whereas a share is said to be over-valued if market price is higher than intrinsic value.
- Intrinsic value is basically computed as per any of the valuation models.
- Investor should buy an under-valued security and sell an over-valued security.**

Example:

ABC Limited has a leading price-to-earnings (P/E) ratio of 28 while the median leading P/E of a peer group of companies within the industry is 38. Based on the method of comparables, an analyst would most likely conclude that ABC Limited should be:

- bought as an undervalued stock
- sold short as an overvalued stock
- sold as an overvalued stock
- bought as an overvalued stock

Answer:

Let us assume EPS to be Rs.10. Hence Actual Market price is Rs.280 (10 x 28) whereas fair price based on industry PE is Rs.380. Hence share is undervalued and the share should be bought.

33. Component of required return

- Required Return = Inflation rate + Real-rate of return on risk-free investment + Risk Premium
- Risk-free rate = Inflation rate + Real rate of return on risk-free investment
- Required return = Risk-free rate + Risk Premium

Example:

Inflation rate = 6%; Real rate of return on investment in A Limited (risky asset) = 10%; Risk premium of A Limited = 4%. What is the risk-free rate of return?

- 6%
- 16%
- 10%
- 12%

Answer:

Inflation rate = 6%. Real rate of return on risky asset is 10%. This would mean the return of A Limited is 16% (Inflation + Real rate). Risk Premium of A Limited is 4%. Hence risk-free rate of return = 16% - risk premium of 4% = 12%

34. Inflation Premium

Inflation premium forms part of risk-free rate of return. Any increase in inflation premium will increase the risk-free rate and vice versa

Example:

Risk-free rate of security is 9 percent. Return from market is 13 percent. Beta of Security is 1.3 times. Growth rate of security is 8 percent. How much is the required return of security if inflation premium increase by 3 percent?

- a) 12.80%
- b) 14.20%
- c) 13.30%

Answer:

- Existing risk-free rate = 9%; Revised risk-free rate = 9% + Inflation premium = 9% + 3% = 12.00%
- Required return = $R_f + \text{Beta} \times (R_m - R_f) = 12.00 + 1.3 \times (13 - 12) = 13.30\%$

35. Format of Income Statement

Particulars	Amount
Sales	XXX
Less: Cost of Goods Sold	(XXX)
Gross Profit	XXX
Less: Operating expenses (Selling and admin expenses)	XXX
Operating Profit/EBIT	XXX
Less: Interest expenses (Note 1)	(XXX)
EBT	XXX
Less: Tax	(XXX)
EAT	XXX
Less: Preference Dividend [Preference capital x Coupon %]	(XXX)
Earnings available to equity shareholders	XXX
No of equity shares	XXX
EPS [EAT/No of equity shares]	XXX

Note 1: Interest cost

- Question can give data on interest rates for different types of debt and also an effective interest rate for entire debt structure.
- If both are given, then overall interest cost = Total debt x Effective interest rate %. Otherwise, interest cost = Sum of (Respective debt x Respective interest rate)

Example:

	Rs. In lakhs
8% Debentures	125
10% bonds (2007)	50
Equity shares (Rs.10 each)	100
Reserves and surplus	300
Current Liabilities	25
Assets turnover ratio	1.1
Effective interest rate	8%
Effective tax rate	40%
Operating margin	10%

Compute the amount of PAT of the company?

- a) Rs.31.20 lacs
- b) Rs.30.60 lacs
- c) Rs.52 lacs
- d) Rs.51 lacs

Answer:

Particulars	Calculation	Amount
Sales	Total Assets x Asset Turnover 600×1.1 Total Assets = Total liabilities Total liabilities = Debt + ESC + Reserves + CL Total liabilities = $125 + 50 + 100 + 300 + 25 = 600$	660.00
Less: Operating expenses	$660 \times 90\%$	(594.00)

Operating profit/EBIT		66.00
Less: Interest (Note 2)	175 x 8%	(14.00)
Earnings before tax		52.00
Less: Tax @ 40%	52 x 40%	(20.80)
Earnings after tax/EAES		31.20

36. Important Ratios													
	Ratio	Formula	Remarks										
1	Current Ratio	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$											
2	Quick ratio / liquid ratio / acid test ratio	$\frac{\text{Quick Assets}}{\text{Current Liabilities}}$	Quick assets = Current Assets – Inventories – Prepaid expenses										
3	Debt Ratio	$\frac{\text{Total Debt}}{\text{Capital Employed}}$	- Capital Employed = Equity capital + Reserves and Surplus + Preference capital + Debt – Fictitious assets [OR] - Capital Employed = Fixed assets + Current assets – Current liabilities										
4	Equity Ratio	$\frac{\text{Total Equity (or) Networth}}{\text{Capital Employed}}$	Equity = Equity capital + Reserves and Surplus – Fictitious assets										
5	Debt to equity ratio	$\frac{\text{Total Debt}}{\text{Total Equity}}$											
6	Capital gearing ratio	$\frac{\text{Total Debt} + \text{Preference}}{\text{Equity SC} + \text{Reserves}}$											
7	Proprietary ratio	$\frac{\text{Proprietary funds}}{\text{Total Assets}}$	Proprietary funds = Equity capital + Reserves – Fictitious assets										
8	Interest coverage	$\frac{\text{EBIT}}{\text{Interest}}$											
9	Preference Dividend coverage ratio	$\frac{\text{PAT}}{\text{Preference Dividend}}$											
10	Equity dividend coverage ratio	$\frac{\text{EAES}}{\text{Equity Dividend}}$											
11	Total assets turnover ratio	$\frac{\text{Sales}}{\text{Total Assets}}$	Other variants:										
			<table><tr><th>Variant</th><th>Denominator</th></tr><tr><td>Fixed assets Turnover ratio</td><td>Fixed assets</td></tr><tr><td>Current asset turnover ratio</td><td>Current assets</td></tr><tr><td>Working capital turnover ratio</td><td>Working capital</td></tr><tr><td>Capital turnover ratio</td><td>Capital Employed</td></tr></table>	Variant	Denominator	Fixed assets Turnover ratio	Fixed assets	Current asset turnover ratio	Current assets	Working capital turnover ratio	Working capital	Capital turnover ratio	Capital Employed
			Variant	Denominator									
			Fixed assets Turnover ratio	Fixed assets									
			Current asset turnover ratio	Current assets									
Working capital turnover ratio	Working capital												
Capital turnover ratio	Capital Employed												
12	Debtors turnover ratio	$\frac{\text{Credit Sales}}{\text{Debtors}}$											
13	Creditors turnover ratio	$\frac{\text{Credit Purchases}}{\text{Creditors}}$											
14	Inventory Turnover ratio	$\frac{\text{COGS}}{\text{Stock}}$											
15	Conversion of turnover ratios into days	$\frac{365}{\text{Turnover ratio}}$	For instance, debtor days = 365/Debtors turnover ratio										
16	Gross Profit ratio	$\frac{\text{Gross Profit}}{\text{Sales}} \times 100$	Other variants:										
			<table><tr><th>Variant</th><th>Numerator</th></tr><tr><td>Net Profit ratio</td><td>Net Profit</td></tr><tr><td>Operating profit ratio</td><td>EBIT</td></tr><tr><td>COGS ratio</td><td>COGS</td></tr></table>	Variant	Numerator	Net Profit ratio	Net Profit	Operating profit ratio	EBIT	COGS ratio	COGS		
			Variant	Numerator									
			Net Profit ratio	Net Profit									
Operating profit ratio	EBIT												
COGS ratio	COGS												

17	Pre-tax ROI/ROCE	$\frac{\text{EBIT}}{\text{Capital Employed}} \times 100$	
18	Post-tax ROI/ROCE	$\frac{\text{EBIT} \times (1 - \text{Tax rate})}{\text{Capital Employed}} \times 100$	
19	Return on equity	$\frac{\text{EAES}}{\text{Amount of equity}} \times 100$	
20	Dividend Yield	$\frac{\text{DPS}}{\text{MPS}} \times 100$	
21	Earning Yield	$\frac{\text{EPS}}{\text{MPS}} \times 100$	
22	Dividend Rate	$\frac{\text{DPS}}{\text{Face Value}} \times 100$	
23	Earnings per share	$\frac{\text{EAES}}{\text{No of equity shares}}$	
24	Dividend per share	$\frac{\text{Total Dividend}}{\text{No of equity shares}}$	
25	Dividend Payout Ratio	$\frac{\text{DPS}}{\text{EPS}} \times 100$	

Example:

Total Debt = 600 lacs; Debt Ratio = 0.40; How much is equity value?

Answer:

$$\text{Debt Ratio} = \frac{\text{Total Debt}}{\text{Capital Employed}}; 0.40 = \frac{600}{\text{CE}}; \text{CE} = 1,500 \text{ lacs};$$

$$\text{CE} = \text{Total Debt} + \text{Total equity}; 1,500 \text{ lacs} = 600 \text{ lacs} + \text{Total equity}; \text{Total equity} = 900 \text{ lacs}$$

Example:

Interest expenses = Rs.400 lacs. Interest expense will increase by 20% and EBIT will increase by 30%. How much is the revised interest coverage if existing interest coverage is 4 Times.

Answer:**Existing data:**

$$\text{Interest coverage} = \frac{\text{EBIT}}{\text{Interest}}; 4.00 = \frac{\text{EBIT}}{400}; \text{EBIT} = 1,600 \text{ lacs}$$

Revised data:

$$\text{Interest coverage} = \frac{\text{EBIT}}{\text{Interest}} = \frac{1,600 + 30\%}{400 + 20\%} = \frac{2,080}{480} = 4.33 \text{ Times}$$

Example:

Dividend Yield of Industry = 2.00%; Earning Yield of industry = 10.00%. EPS of Company = Rs.4.00; Payout ratio = 40%. How much is the fair value of share under dividend yield and earning yield approach.

Answer:

$$\text{Dividend of company} = 4 \times 40\% = \text{Rs.1.60 per share}$$

Value of share under Dividend Yield Approach:

$$\text{Dividend Yield} = \frac{\text{DPS}}{\text{MPS}}; 2.00\% = \frac{1.60}{\text{MPS}}; \text{MPS} = \frac{1.60}{2\%} = \text{Rs. 80.00}$$

Value of share under Earning Yield Approach:

$$\text{Earning Yield} = \frac{\text{EPS}}{\text{MPS}}; 0.80\% = \frac{4.00}{\text{MPS}}; \text{MPS} = \frac{4.00}{10.00\%} = \text{Rs. 40.00}$$

Example:

Current capital employed = 2,000 lacs; Current EBIT = 200 lacs. The company plans to raise Rs.400 lacs in the form of debt or equity. Return is expected to increase by 2%. What will be the new EBIT of next year?

- a) 200 lacs
- b) 240 lacs
- c) 288 lacs
- d) 204 lacs

Answer:

$$\text{Current ROCE} = \frac{\text{EBIT}}{\text{Capital Employed}} = \frac{200}{2,000} = 10\%$$

$$\text{Revised ROCE} = 10\% + 2\% = 12\% \text{ and the revised capital employed is } 2,000 + 400 = 2,400 \text{ lacs; New EBIT} = 2,400 \text{ lacs} \times 12\% = \text{Rs.288 lacs}$$

Example:

Industry sales = 2,000 lacs; ABC's market share = 25%; GP margin = 40%; Expenses other than COGS is half of COGS. For the next year industry will grow by 10% and ABC's market share will increase to 30%. What will be the PBT of next year?

- 50 lacs
- 66 lacs
- 200 lacs
- 264 lacs

Answer:

Particulars	Calculation	Amount
Next year industry sales	2,000 + 10%	2,200
Next year ABC sales	2,200 x 30%	660
Less: COGS	660 x 60%	-396
Gross Profit	660 x 40%	264
Less: Other expenses	396/2	-198
PBT of next year		66

Example:

Gross profit = 20%. Inventory Turnover Ratio = 10 Times; Inventory = 2,00,000. How much is the sales of the company?

- Rs.20,00,000
- Rs.16,00,000
- Rs.25,00,000
- Rs.24,00,000

Answer:

Inventory Turnover Ratio = $\frac{\text{COGS}}{\text{Inventory}}$; $10 = \frac{\text{COGS}}{2,00,000}$; COGS = 20,00,000

GP is 20% of sales and hence COGS is 80% of sales

20,00,000 = 80% of sales; Sales = $\frac{20,00,000}{80\%} = 25,00,000$

37. Fixed Interest and Fixed Dividend Coverage Ratio

If the question states that PAT should cover fixed interest and fixed dividends xx times. In this case this ratio would be calculated as under:

Fixed Interest and Fixed Dividend coverage ratio = $\frac{\text{PAT} + \text{Interest}}{\text{Interest} + \text{Preference Dividend}}$

Example:

EBIT = 32,00,000; 12% debt = 64,00,000; Tax rate = 35%; 8% Preference capital of Rs.40,00,000. How much is the fixed interest and fixed dividend coverage ratio?

Answer:

Particulars	Amount
Profit before Interest and Taxes	32,00,000
Less: Interest on debentures (64,00,000 x 12%)	(7,68,000)
Profit before tax	24,32,000
Less: Tax @ 35% (24,32,000 x 35%)	(8,51,200)
Profit after tax	15,80,800

Fixed interest and fixed dividend coverage = $\frac{\text{PAT} + \text{Fixed interest}}{\text{Fixed interest} + \text{Fixed Dividend}}$
 $\frac{15,80,800 + 7,68,000}{7,68,000 + 3,20,000} = 2.16 \text{ Times}$

38. Impact of adverse/Favourable ratios on required Yield

The required return of a security can be estimated using the required return of a similar proxy entity. However, adjustments may be needed based on the company's risk profile. A straightforward way to adjust the required return is by comparing financial ratios. **For example, if TCS has stronger coverage ratios than Infosys, it indicates that TCS is less risky, which justifies a lower required return for TCS compared to Infosys.**

Example:

Capital gearing ratio of industry = 0.75; Equity share capital of company A = 100; R&S of company = 50; Preference capital = 100; Debt = 200; Required return of industry = 10%. Required return is to be changed by 2 bps for every 1 bps deviation in capital gearing. What is the required return for company A?

- a) 12.50%
- b) 11.25%
- c) 8.75%
- d) 7.50%

Answer:

$$\text{Capital gearing} = \frac{\text{Debt} + \text{Preference}}{\text{ESC} + \text{Reserves}} = \frac{100 + 200}{50 + 100} = 2 \text{ Times}$$

Gearing of company is 1.25 times higher than that of industry. The company is riskier than industry and hence will need higher return. Higher gearing of 1.25 times will be compensated by higher return of 2.50 % (1.25 x 2) and hence the required return of company A is 12.50%

39. Operating Income vs Net Income

The term operating profit is basically EBIT and net income is basically PAT

40. Theoretical Ex-Rights Price

$$\text{Theoretical ex - rights price} = \frac{(\text{Existing shares} \times \text{Existing Price}) + (\text{New shares} \times \text{Rights Price})}{\text{Existing shares} + \text{New shares}}$$

Example:

CMP = Rs.130; No of shares outstanding = 10 lacs; Company needs to raise 2 Crores for a new project. What will be the ex-rights price if the firm offers rights in the ratio of 1:2?

- a) 130
- b) 93.33
- c) 100
- d) 150

Answer:

$$\text{Theoretical ex - rights price} = \frac{(\text{Existing shares} \times \text{Existing Price}) + (\text{New shares} \times \text{Rights Price})}{\text{Existing shares} + \text{New shares}}$$

$$\text{Theoretical ex - rights price} = \frac{(10 \text{ lacs} \times 130) + (5 \text{ lacs} \times 40)}{10 \text{ lacs} + 5 \text{ lacs}} = \text{Rs. } 100$$

Note:

$$\text{New shares issued} = 10,00,000 \times \frac{1}{2} = 5,00,000$$

$$\text{Issue price} = \frac{200 \text{ lacs}}{5 \text{ lacs}} = \text{Rs. } 40$$

41. Value of one right

Term	Meaning
Value of one right share	Theoretical ex-rights price - Rights issue price
Value of one right [per share]	$\frac{\text{Value of one right}}{\text{Rights Ratio}}$

- If the expected post-rights price is provided in the question, it will replace the theoretical ex-rights price in the formula above

Example:

CMP of stock = 50; Rights issue price = 40; Rights ratio = 1:5; What is the value of a right (per share) when the stock sells ex-rights at 50?

- a) 1.67
- b) 2.00
- c) None of the above

Answer:

Theoretical value of right = Ex-rights price - Rights issue price

Theoretical value of right = 50 - 40 = Rs.10 per rights share (or) Rs.2 per right per share

42. Rights issue and impact on wealth

Shareholder's wealth will not be impacted in case a shareholder subscribes to rights issue or sells the rights. However, the wealth will fall in case the shareholder ignores the rights issue

Situation 1: Subscription to rights issue:

Particulars	Calculation	Amount
Existing Wealth	Existing shares x Existing price	XXX
Revised Wealth:		
Value of shares	Revised shares x Ex-rights Price	XXX
Less: Cash paid for purchase of rights shares		(XXX)
Revised wealth		XXX

Situation 2: Sale of rights:

Particulars	Calculation	Amount
Existing Wealth	Existing shares x Existing price	XXX
Revised Wealth:		
Value of shares	Existing shares x Ex-rights Price	XXX
Add: Cash received on sale of rights		XXX
Revised wealth		XXX

Situation 3: Ignores rights issue:

Particulars	Calculation	Amount
Existing Wealth	Existing shares x Existing price	XXX
Revised Wealth	Existing shares x Ex-rights Price	XXX

Example:

The current share price is Rs.100. The rights ratio is 1:4. Rights price is 80. Mr.A hold 1,000 shares and has neither subscribed nor sold rights? What will be the change in networth of Mr A?

- No Change
- Networth to improve by Rs.1,00,000
- Networth to fall by Rs.1,00,000
- Networth to fall by Rs.4,000

Answer:

$$\text{Theoretical ex - rights price} = \frac{(4 \text{ shares} \times 100) + (1 \text{ share} \times 80)}{4 + 1} = \text{Rs. } 96$$

Share price will fall by Rs.4 due to rights issue and hence the investor will have loss of Rs.4,000 (1,000 shares x 4) as he has neither subscribed nor sold rights

43. Impact of Positive/Negative NPV on ex-rights price

If the information on rights issue proceeds is available then we can compute the NPV of the project. Total NPV (positive/Negative) will have to be added to numerator to compute ex-rights price

Example:

PE Multiple of company = 12 times. Company does a project which cost 200 lacs. Company is expected to earn 8 percent on the project. Current market price is Rs.200 and company has 1,00,000 shares. It will do rights issue of 2,00,000 shares at Rs.100. How much is the ex-rights price?

- 133.33
- 197.33
- 138.67
- 130.67

Answer:**Note 1: NPV of project:**

Particulars	Calculation	Amount
Earnings from project	200 lacs x 8%	16 lacs
Value of project (Earnings x PE Multiple)	16 lacs x 12	192 lacs
Cost of project		200 lacs
NPV of project	192 lacs - 200 lacs	-8 lacs

Theoretical exrights price

$$= \frac{(\text{Existing shares} \times \text{Existing Price}) + (\text{New shares} \times \text{Rights Price}) - \text{Negative NPV}}{\text{Existing shares} + \text{New shares}}$$

$$\text{Theoretical exrights price} = \frac{(1,00,000 \times 200) + (2,00,000 \times 100) - 8,00,000}{1,00,000 + 2,00,000} = \text{130.67 per share}$$

44. Buyback and impact on EPS

Buyback can increase the EPS if the total earnings remain same and the number of shares reduce due to buyback of shares

Example:

No of shares = 10,000; Share price = Rs.100; Buyback size = 50,000; Current EPS = 3; What will be the post-buyback EPS if the PAT is maintained?

- 3
- 3.16
- 2.85
- 3.30

Answer:

Particulars	Calculation	Amount
Existing PAT (EPS x No of shares)	3 x 10,000	30,000
Buyback size	Given	50,000
Buyback price		100
No of shares bought back	50,000/100	500
No of shares post buy-back	10,000 - 500	9,500
Post-buyback EPS	30,000/9,500	3.16

45. Buyback funded with debt

- Buyback can impact the total earnings if buyback is funded with debt. Revised PAT = Existing PAT - [Interest cost x (1 - Tax rate)].
- The question can also for reverse working to find the amount of acceptable interest expenditure and the amount of debt. This would help us in finding the buyback price per share and buyback premium.

Example:

Existing EPS = 10; No of shares = 1,00,000. PE Multiple = 20. The company does buyback of 20 percent of shares at a premium of 50% to CMP. The same is funded with 10% debt. Tax rate is 30%. What will be the new EPS?

- 5
- 7.25
- 10
- 12.50

Answer:

Particulars	Calculation	Amount
Existing PAT (EPS x No of shares)	10 x 1,00,000	10,00,000
Existing MPS (EPS x PE Multiple)	10 x 20	200.00
Buyback price per share	200 + 50%	300.00
Amount of buyback (Price x No of shares)	300 x 20,000	60 lacs
Interest paid on loan	60 lacs x 10%	6,00,000
After-tax cost of interest	6,00,000 x 70%	4,20,000
New PAT post buyback	10,00,000 - 4,20,000	5,80,000
No of shares post buyback	1,00,000 - 20,000	80,000
Post-buyback EPS	5,80,000/80,000	7.25

46. Impact of Buyback on Book Value Per Share

Buyback will have an impact on book value per share as the overall Networth will decline with decline in number of shares. Any buyback done at a price different from the book value per share will change the book value per share.

$$\text{Revised Book value per share} = \frac{\text{Existing Networth} - \text{Buyback Size}}{\text{Existing shares} - \text{Shares bought back}}$$

Example:

The share price of ABC Limited is Rs.5 per share. There are 50 lac shares outstanding and the company has a book value of Rs.900 lacs. What is the book value per share (BVPS) after the share buyback of Rs.10 lacs?

- Rs.18.54
- Rs.21.24

- c. Rs.14.76
d. Rs.18.00

Answer:

$$\text{Book value per share} = \frac{900 \text{ lacs} - 10 \text{ lacs}}{50 \text{ lacs} - 2 \text{ lacs}} = \text{Rs. 18.54 per share}$$

Note: Networth will decline by Rs.10 lacs on buyback. It is assumed that buyback is happening at current market price and hence number of shares bought back is 2 lacs.

47. Convertible Instruments - Conversion Value

Conversion value refers to the value of the instrument once conversion happens.

Term	Formula
Conversion Value (or) Stock Value	CMP of share x Conversion ratio

Example:

Face value of bond = Rs.100; Rate of interest on bond = 8%; Return on similar bonds = 9.5%. Term = 4 years. Bond is convertible into 5 shares. CMP of equity share = 15. What is bond's conversion value?

- a) 100
b) 95.24
c) 75
d) 15

Answer:

Conversion value = CMP of equity shares x No of shares post conversion = 15 x 5 = Rs.75

48. Convertible Instruments - Conversion Premium

Conversion premium refers to the extra amount paid for buying a convertible instrument in excess of the conversion value

Term	Formula
Conversion premium in Rs. (Per convertible instrument)	Current market price - Conversion value
Conversion premium in Rs. (Per equity share)	$\frac{\text{Conversion Premium in Rs.}}{\text{Conversion Ratio}}$
Conversion premium in %	$\frac{\text{Conversion Premium in Rs.}}{\text{Conversion value}} \times 100$

Example:

Face value of bond = Rs.100; CMP of bond = Rs.100 Rate of interest on bond = 8%; Return on similar bonds = 9.5%. Term = 4 years. Bond is convertible into 5 shares. CMP of equity share = 15. What is bond's conversion premium per share?

- a) 20
b) 15
c) 5
d) 25

Answer:

Conversion premium = CMP - Conversion value; 100 - 75 = Rs.25 per bond (or) Rs.5 per share

49. Convertible Instruments - Straight value (or) Intrinsic value (or) Floor Value (or) Minimum Price

Straight value or intrinsic value is the present value of future interest and principal discounted at investor's required rate of return

Example:

Face value of bond = Rs.100; Rate of interest on bond = 8%; Return on similar bonds = 9.5%. Term = 4 years. Bond is convertible into 5 shares. CMP of equity share = 15. What is bond's straight value?

- a) 100
b) 75
c) 95.26
d) 89.67

Answer:

Straight value is present value of bond's cash flows discounted at required rate of return. Required rate of return in this case will be 9.5% as that is the return on similar bonds

Straight value of bond = $(8 \times 0.913) + (8 \times 0.834) + (8 \times 0.762) + (108 \times 0.696) = 95.26$

50. Convertible Instruments - Downside risk

Downside risk is the potential fall in price of convertible instrument. This can also be called as the premium over straight value.

Term	Formula
Downside risk in Rs.	Current market price - Straight value
Downside risk in % (% of Straight value)	$\frac{\text{Downside Risk in Rs.}}{\text{Straight value}} \times 100$
Downside risk in % (% of CMP)	$\frac{\text{Downside Risk in Rs.}}{\text{Current Market Price}} \times 100$
Premium over straight value (in %)	$\frac{\text{CMP} - \text{Straight Value.}}{\text{Straight value}} \times 100$

Example:

Face value of bond = Rs.100; CMP of bond = Rs.100; Rate of interest on bond = 8%; Return on similar bonds = 9.5%. Term = 4 years. Bond is convertible into 5 shares. CMP of equity share = 15. What is downside risk (in Rs.)?

- a) 0
- b) 10.33
- c) 4.74
- d) 25

Answer:

Downside risk = Current Market price - Straight value

Downside risk = 100 - 94.22 = 4.74

Note:

Straight value = $(8 \times 3.205) + (100 \times 0.0.696) = \text{Rs.}95.26$

51. Convertible Instruments - Conversion Parity Price

Conversion Parity Price is the price of equity share at which investor has no loss/gain on conversion

Term	Formula
Conversion parity Price (or) Market Conversion Price (or) Minimum market price at which conversion is to be exercised (or) Break-even price	$\frac{\text{CMP of convertible instrument}}{\text{Conversion Ratio}}$

Example:

Face value of bond = Rs.100; CMP of bond = Rs.100; Rate of interest on bond = 8%; Return on similar bonds = 9.5%. Term = 4 years. Bond is convertible into 5 shares. CMP of equity share = 15. What is conversion parity price?

- a) 20
- b) 15
- c) 100
- d) 10

Answer:

Conversion parity price = $\frac{\text{CMP of bond}}{\text{Conversion ratio}} = \frac{100}{5} = \text{Rs.}20$

52. Convertible Instruments - Favourable income differential

Favourable income differential is the extra income received from bond vis-à-vis getting dividend income from equity shares

Term	Formula
Favourable income differential per bond.	Interest income per bond - (Dividend per share x Conversion Ratio)
Favourable income differential per share	$\frac{\text{Favourable income differential per bond.}}{\text{Conversion ratio}} \times 100$

Example:

Face value of bond = Rs.100; Interest rate on bond = 10%. Bond is convertible into 10 shares. Likely dividend per share is Rs.0.2. What is favorable income differential per share?

- a) 9.80
- b) 0.20
- c) 0.80
- d) 8.00

Answer:

Particulars	Calculation	Amount
Interest income of bond	$100 \times 10\%$	10.00
Dividend income per 10 shares	0.20×10	2.00
Favorable income differential per bond	$10 - 2$	8.00
Favorable income differential per share	$8/10$	0.80

53. Convertible instruments – Premium Payback Period

Premium Payback Period refers to the number of years taken to recover the conversion premium paid.

Term	Formula
Premium payback period	Conversion premium per bond
	Favourable income differential per bond
	(OR)
	Conversion premium per Share
	Favourable income differential per Share

Example:

Conversion premium per bond = Rs.100. One bond is convertible into 10 shares. Favorable income differential per share = Rs.4. How much is the premium payback period?

- a) 25 years
- b) 2.5 years
- c) 10 years
- d) None of the above

Answer:

Particulars	Calculation	Amount
Conversion premium per bond		Rs.100
Favorable income differential per share		Rs.10
Favorable income differential per bond	10×4	Rs.40
Premium payback period	$100/40$	2.50 years

54. Valuation of Convertible Bond

A bond's value is the present value of its future cash flows, discounted at the investor's required rate of return. **For redemption, the cash flow should be the higher of the bond's conversion value at maturity or its redeemable value as debt.** However, in cases where the expected conversion value at maturity is not provided, the redeemable value will be used as the redemption cash flow.

Example:

Face value = Rs.1,000; Rate of interest = 10%. The bond is convertible into 10 equity shares whose current market price is Rs.80. Growth rate in equity share is 10%. What will be the terminal cash flow at end of year 5?

- a) 800
- b) 1,000
- c) 1,288.41
- d) None of the above

Answer:

Particulars	Calculation	Amount
Conversion value at end of year 4	$10 \times (80 \times 1.1^5)$	1,288.41
Redeemable value		1,000
Terminal value (Higher of two)		1,288.41

55. Floor value or Minimum Price of Convertible Bond

This is calculated by considering the bond's cash flows as a debt instrument, **using the redeemable value as the principal redemption amount, rather than the higher possible conversion value.** This represents the bond's minimum value, based on its guaranteed cash flows.

56. Decision on Conversion
A bond can be converted into equity share only if the conversion value (CMP of share x conversion ratio) is higher than current market price of bond. <u>If the value is less then we should continue the same as bond and not opt for conversion</u>
Example: CMP of bond = Rs.1,200. One bond is convertible into 10 shares. CMP of share is Rs.125. Should the investor opt for conversion? a) Yes b) No c) Investor would be indifferent on conversion Answer: Value if conversion is done = $125 \times 10 = \text{Rs.}1,250$ whereas the CMP of bond = Rs.1,200. We should therefore go ahead with conversion as the value of bond is higher post conversion

57. Stock Lending
- Stock lending, also known as securities lending, is a financial practice where one party (the lender) temporarily lends their shares of a particular stock or other securities to another party (the borrower). Lender: They lend their securities to borrowers in exchange for a fee, often a percentage of the value of the lent securities. Borrower: The borrower pays a fee to the lender for the privilege of borrowing the securities. The borrower would be taking the security to fulfil their commitment if they have done short-sell of shares - Income of person lending stock = Lending fees + Dividend income - Income/loss of person borrowing stock = Profit/loss on price change - Lending fees- bank guarantee charges
Example: Mr. A is holding 1000 shares of face value of Rs.100 each of M/s. ABC Ltd. He wants to hold these shares for long term and have 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: - Lending Fees to be paid by Lender to Borrower = Rs.30,000 - Borrower needs to give Bank Guarantee and the Bank Guarantee charges = Rs.20,000 - Company has paid Dividend in the interim of Rs.20 per share - Share price quoted at Rs.1,000 on Jan 1, 2020 and it increased to Rs.1,200 by end of short-sell period Compute the income of person lending stock and person borrowing stock? a) Profit of Rs.30,000 and loss of Rs.30,000 b) Profit of Rs.50,000 and loss of Rs.50,000 c) Profit of Rs.50,000 and Loss of Rs.2,50,000 d) Profit of Rs.30,000 and Profit of Rs.1,50,000 Answer: Income of person lending stock = Lending Fees + Dividend Income = $30,000 + 20,000 = \text{Rs.}50,000$ Income of person borrowing stock: - Share price has increased by Rs.200 and this would result in loss for person doing short-sell as he has sold share at Rs.1,000 and needs to buyback the same at Rs.1,200 - Loss on short-sell = $200 \times 1,000 = 2,00,000$ - Overall loss = $2,00,000 + \text{Lending fees } (30,000) + \text{Guarantee charges } (20,000) = \text{Loss of } 2,50,000$

58. Basic Terms Associated with Bond	
Term	Meaning
Face value or coupon value	Value written across the face of the certificate
Coupon rate	Interest rate written on the face of the certificate
Interest Amount (Always on Face Value)	Face value x Coupon Rate

Maturity value/Redemption Value (Assumed as par if problem is silent)	Value payable at the end of the life of a bond
Yield to maturity/ Cost of debt/ Discount rate/ Required return of investor/ Expected return/ Opportunity cost/ Market rate of interest/ prevailing interest rate of similar bond/ Going rate of interest	The rate of return earned by an investor who buys the bond today and hold it until maturity
Current yield	Current yield refers to the ratio of interest to current market price

59. Valuation of Bond

- **Value in year 0:** Value of bond is present value of future cash flows of bond discounted at investor's required rate of return.
- **Value at end of year 1:** Value in year 1 = [Value in year 0 + Discount rate] - Interest of year 1
- **Value at end of year 2:** Value in year 2 = [Value in year 1 + Discount rate] - Interest of year 2

Example:

The nominal value of 10% bond is Rs.100. The redeemable value is Rs.120 in two years. Investor's expected rate of return is 14%. What should be the value of bond?

- 140
- 71.43
- 108.74
- 104

Answer:

Year	Cash flow	PVF @ 14%	DCF
1	10	0.877	8.77
2	130	0.769	99.97
Value of Bond			108.74

Example:

CMP of bond = Rs.1,000; Face value of bond = Rs.1,000; Interest rate on bond = 12%; YTM of bond = 15%. What will be the price at end of year 2?

- 1,000
- 1064.50
- 1,060
- 940

Answer:

Particulars	Amount
CMP (Day 0)	1,000.00
Add: Required return of year 1 (1,000 x 15%)	150.00
Less: Interest paid in year 1 (1,000 x 12%)	-120.00
Fair price at end of year 1	1,030
Add: Required return of year 2 (1,030 x 15%)	154.50
Less: Interest paid in year 2 (1,000 x 12%)	-120.00
Fair price at end of year 2	1,064.50

60. Half-yearly Bond

When a bond pays **interest semi-annually**, the cash flows should be **discounted on a semi-annual basis**. In this case, the discount rate applied must also reflect a **semi-annual yield**, effectively matching both the **frequency of cash flows and the discounting rate with the bond's payment** schedule for accurate valuation.

Example:

10% bond pays interest in September and March of every year. Face value is Rs.100. YTM is 12%. What will be current market price with balance life of 2 years?

- 96.6
- 107.33
- 96.53
- 109.89

Answer:

It is a half-yearly bond and hence we should opt for half-yearly discounting. Cash flow will be 5 in period 1, 5 in period 2, 5 in period 3 and 105 in period 4. Cash flows will be discounted at half-yearly YTM of 6 percent

$$\text{Market price} = (5 \times 0.943) + (5 \times 0.890) + (5 \times 0.840) + (105 \times 0.792) = \text{Rs.96.53}$$

61. Step-up/step-down discount rate

- When valuing debt it's essential to identify whether the given rates are forward rates or spot yields.
- If forward rates are provided, we use a step-up or step-down discount rate approach. It is computed similar to multiple cost of equity.
- However, if spot yields are given, the method changes: for instance, to calculate the present value factor (PVF) for year 2, we use the 2-year yield and discount it over two years.

Example [Forward Rate]

Discount rate for year 1 = 10%. Discount rate increases by 2% per year. What will be the PVF for year 3?

- 0.751
- 0.675
- 0.712
- None of the above

Answer:

$$\text{PVF of year 1} = \frac{1}{1.10} = 0.909$$

$$\text{PVF of year 2} = \frac{\text{PVF of year 1}}{1 + \text{DR of year 2}} = \frac{0.909}{1.12} = 0.812$$

$$\text{PVF of year 3} = \frac{\text{PVF of year 2}}{1 + \text{DR of year 2}} = \frac{0.812}{1.14} = 0.712$$

Example [Spot Yield]

ABC Ltd. wants to issue 9% Bonds redeemable in 3 years at its face value of Rs. 1,000 each. The annual spot yield curve for similar risk class of Bond is as follows:

Year	Interest Rate
1	12%
2	11.62%
3	11.33%

What would be the issue price of the bond?

Example:

Year	Cash flow	PVF	DCF
1	90.00	0.893	80.37
2	90.00	0.803	72.27
3	1,090.00	0.725	790.25
Issue price of Bond			842.89

Note: Spot Yield curve would mean that the given 2 year-yield is for year 0 to 2 and hence PVF would be computed in below manner:

$$\text{PVF of Year 1} = \frac{1}{1 + 12\%}$$

$$\text{PVF of Year 2} = \frac{1}{(1 + 11.62\%)^2}$$

$$\text{PVF of Year 3} = \frac{1}{(1 + 11.33\%)^3}$$

62. What is to be used as discount rate of a Bond

- **Discount rate:** Investor's required rate of return will be taken as discount rate. This can also be called as yield of comparable bond (or) going rate of interest.
- **Higher-yield offered by company:** Sometimes the company may want to give a higher yield to investor. In this case, the issue price will be computed based on the yield proposed to be given by the company

Example:

Treasury bill rate = 9%; Discount rate for A rated bond = T bill rate + 3%; Discount rate for AA rated bond = AAA rate + 1%; Discount rate for AAA rated bond = A rated bond - 2%. What should be the discount rate for AA rated bond?

- a) 9%
- b) 12%
- c) 11%
- d) 10%

Answer:

Particulars	Amount
Discount rate for A rated bond (9 + 3)	12.00%
Discount rate for AAA rated bond (12% - 2%)	10.00%
Discount rate for AA rated bond (10 + 1)	11.00%

Example:

The company plans to issue 10% debentures. Yield on similar debenture is 15%. The company plans to issue in such a manner it gives 18% return to investors. What should be the discount rate for valuation of bond?

- a) 10%
- b) 15%
- c) 18%

Answer:

Normally the discount rate would be rate on similar debentures. However, company wants to give return of 18% and hence the same will be taken as discount rate

63. Annuity Bond

Annuity Bond is wherein annual inflow (interest + Principal) would be same every year. Annual inflow is calculated as under:

$$\text{Annual Inflow} = \frac{\text{FV of Bond}}{\text{PVAF}(r, n)}$$

Example:

Life of annuity bond = 4 years; Interest rate = 12%; Face value = Rs.1,000. What will be the annual cash flow?

- a) 250
- b) 329.27
- c) 370

Answer:

$$\text{Annual cash flow} = \frac{\text{CMP}}{\text{PVAF}(4 \text{ years}, 12\%)} = \frac{1,000}{3.037} = \text{Rs. } 329.27$$

64. Broken Period Bond Valuation

- Let's assume a bond pays interest semi-annually on June 30 and December 31. When valuing the bond on a date between these payment dates, such as September 1, we are performing a **broken-period bond valuation**.
- Using the investor's required rate of return to discount future cash flows will provide the bond's value only on the specified payment dates (June 30 and December 31). To determine the bond's value for a broken period, additional adjustments are necessary.
- For example, to calculate the bond's value on September 1, we proceed as follows:
- Value on September 1 = Value as of July 1 + Accrued interest from July 1 to August 31
- This adjustment accounts for the interest accrued during the broken period, providing an accurate bond valuation on September 1.**

Example:

MP as on Jan 1, 2019 = Rs.100. Face value of Rs.100 and interest rate is 10%. Interest is payable half-yearly on June 30 and December 31. What will be price of the bond on Oct 1, 2019?

- a) 107.50
- b) 100
- c) 102.50

Answer:

- Current market price is equal to face value and hence interest rate and YTM will be same. This would mean that bond will quote at par value of Rs.100 once interest is paid out
- Price as on October 1, 2019 = Price as on June 30, 2019 + Accrued interest
- Price as on October 1, 2019 = 100 + (100 × 10% × (3/12)) = 100 + 2.50 = 102.50

65. Impact of Transaction Cost

- Transaction cost will reduce investor yield (return) due to extra expense incurred on purchase of bond.
- Yield with transaction cost = Normal Yield × (1 – Transaction cost)

$$\text{Number of days to break – even transaction cost} = \frac{\text{Transaction cost}}{\text{Normal YTM}} \times \text{No of days in a year}$$

Example:

A bond pays coupon rate of 10% and is currently quoted at par. 1% is the transaction cost. What is the effective Yield and time period taken to recover the transaction cost?

- 9% and 36.5 days
- 11% and 73 days
- 9.90% and 36.5 days
- 10.10% and 73 days

Answer:

Bond is quoted at par and hence YTM of bond is equal to coupon rate

$$\text{Yield with transaction cost} = \text{Normal Yield} \times (1 - \text{Transaction cost}) = 10 \times (1 - 0.01) = 9.90\%$$

$$\text{Number of days to recover} = \frac{\text{Transaction cost}}{\text{Normal YTM}} \times \text{No of days} = \frac{1}{10} \times 365 = 36.50 \text{ days}$$

66. YTM of Bond

Method 1	Calculate IRR of the bond considering the future cash flows
Method 2 (Short-cut method)	$\frac{\text{Interest income} + \text{Average other income}}{\text{Average funds employed}}$ Where: Interest income = Face Value × Coupon Rate $\text{Average other income} = \frac{\text{Redemption value} - \text{Net investment}}{\text{Life of instrument}}$ $\text{Average funds employed} = \frac{\text{Redemption value} + \text{Net investment}}{2}$

Note:

- We have to compute YTM only as per formula 1 in exam. Formula 2 can help us in getting the initial guess rate for IRR computation.
- **Spread of yield from comparable bond:** Spread of Bond X = YTM of Bond X – Yield of comparable bond

Example:

YTM of convertible bond = 10.76%. Yield of comparable bond is 9%. What is the spread of yield of convertible bond from that of comparable bond?

- 10.76%
- 9.00%
- +1.76%
- 1.76%

Answer:

$$\text{Spread of bond} = \text{YTM of convertible bond} - \text{YTM of comparable bond}$$

$$\text{Spread of bond} = 10.76\% - 9\% = +1.76\%$$

Example:

Face value of bond = Rs.100; Coupon Rate = 11%; Current Market Price = Rs.97.60. Life = 3 years. How much is the YTM under short-cut method?

Answer:

$$\text{Yield} = \frac{\text{Interest} + \text{Average other income}}{\text{Average funds employed}}$$

$$\text{Interest} = \text{Rs.11}$$

$$\text{Average other income} = \frac{100 - 97.60}{3} = 0.80$$

$$\text{Average funds employed} = \frac{100 + 97.60}{2} = 98.80$$

$$\text{Yield} = \frac{11 + 0.80}{98.80} \times 100 = 11.94\%$$

Example:

If the market price of the bond is Rs.95; years to maturity = 6 years; coupon rate = 13% p.a. (paid annually) and issue price is Rs.100. What is the yield to maturity?

Use PVF of 14.00% and 15.00% to compute YTM

Answer:

Year	Cash flow	PVF @14%	DCF	PVF @15%	DCF
0	(95)	1.000	(95.00)	1.000	(95.00)
1 to 6	13	3.888	50.54	3.785	49.21
6	100	0.456	45.60	0.432	43.20
			1.14		(2.59)

Computation of YTM:

$$\text{IRR} = L_1 + \frac{\text{NPV at } L_1}{\text{NPV at } L_1 - \text{NPV at } L_2} \times (L_2 - L_1)$$

L1 = Lower rate of 14%; NPV at L1 = 1.16

L2 = Higher rate of 15%; NPV at L2 = -2.59

$$\text{IRR} = 14 + \frac{1.14}{1.14 - (-2.59)} \times (15 - 14); \text{IRR} = 14 + \frac{1.14}{3.73} \times (1); \text{IRR} = 14 + 0.31 = 14.31\%$$

67. Post-tax YTM

In this case we should consider taxation on interest income and capital gain and consider net inflows of the investor for computing YTM

Example:

Issue price of bond = Rs.80; Redemption value in year 5 = Rs.120; Face value of bond = Rs.100; Interest rate on bond = 10%; Tax rate on interest = 30%; Tax rate on capital gain = 20%. What will be the post-tax cash flow of year 5 including interest?

- 130
- 120
- 119
- 123

Answer:

Particulars	Amount
Post-tax interest outflow (10 x 70%)	7.00
Capital gain in year 5 (120 - 80)	40.00
Tax on capital gain (40.00 x 20%)	8.00
Net realization post capital gain (120 - 8)	112.00
Overall realization (Interest (7) + RV (112))	119.00

68. Relationship between YTM, Coupon Rate and Bond Price

Coupon Rate = YTM	Bond will quote at par
Coupon Rate > YTM	Bond will quote at premium
Coupon Rate < YTM	Bond will quote at discount

Note:

- This would mean that if Bond is quoted at par, then YTM of Bond will be equal to coupon rate
- The above relationship will work only if redemption is happening at par value. If redemption is at premium/discount, then we need to compute YTM as per the approach given in other concepts.

Example:

Interest rate on Bond = 10%; YTM of bond = 12%; what will the bond quote at?

- Bond will quote at premium
- Bond will quote at discount
- Bond will quote at par

Answer:

Bond will quote at discount as the company is not able to meet investor expectations of 12 percent

69. Increase/decrease in interest rates

Any increase/decrease in interest rate will have to be taken as change in investor expectation (yield/discount rate) and not as change in bond interest rate. This is because interest rate of a bond/debenture does not change and would remain as per original terms of debenture

70. Variable Bond

A variable bond is one whose interest rate changes with investor expectation. Interest rate on these bonds will always be equal to yield prevailing in the market and hence they will always quote at par value provided redemption is at par.

Example:

A company issues a variable bond where interest rate changes based on prevailing interest rates. Bond was issued when interest rate was 10%. It has remaining life of two years and the interest rate is now 8%. What will be the value of bond today if face value is Rs.1000?

- a) 1,000
- b) 1,035.30
- c) 900
- d) None of the above

Answer:

Variable bond is one where prevailing interest rate and interest rate paid on bond will be same. Hence this bond will always be meeting expectation of bond holders (*Provided redemption is also happening at par*). Hence it will always quote at par value which in this case is Rs.1,000

71. Expected Price of Bond

Expected price of bond = Intrinsic value of bond x Beta [There is no logic for this formula. But this is frequently tested in exams and hence students are requested to remember and apply this]

Example:

- Intrinsic value of Bond = Rs.900; Beta of Bond = 1.10 Times.
- Expected Price = $900 \times 1.10 = \text{Rs.}990$

72. YTM From company point of view

- This is also equal to IRR of cash flows
- Company will have inflow on day 0 and will have series of outflow over the life of the bond. Hence while calculating IRR, we should increase the discount rate if we get negative NPV and decrease the discount rate if we get positive NPV [Following an approach opposite of normal approach]

73. Current Yield of Bond

$$\text{Current Yield} = \frac{\text{Interest}}{\text{Current Market Price}}$$

Example:

10% Govt of India security is quoted at 125 (Face value of Rs.100). Yield is expected to go up by 1 percent. What will be the revised price?

- a) 90.91
- b) 111.11
- c) 100
- d) None of the above

Answer:

$$\text{Current yield} = \frac{\text{Interest}}{\text{CMP}} = \frac{10}{125} = 8\%$$

Yield will go up by 1 percent and hence it will become 9 percent

$$\text{Revised price} = \left(\frac{10}{9\%} \right) = \text{Rs.}111.11$$

74. Yield and Price Relationship

- Yield and price has inverse relationship and any increase in yield will reduce the price and vice versa

- **For an irredeemable bond, current yield formula will be used to find the revised price with the change in yield.** For a redeemable bond, the concept of volatility is used to find the revised price. Any increase in yield will reduce the CMP and any decrease in yield will increase the CMP

75. Realized Yield

- Realized yield assumes that interim cash flows from a bond will be reinvested at a realistic reinvestment rate
- Terminal value of cash flows is calculated with the reinvestment rate and the same is compared with initial outflow
- The IRR of the revised cash flows is the realized yield

Steps:

- **Step 1:** Compute the normal cash flow of bond. Compound the cash flows to last year with reinvestment rate and re-investment period. Reinvestment rate would be given in question and if the same is not given it would be taken as cost of debt
- **Step 2:** Add up all maturity cash flows and this would give us the maturity cash flow. We will have single outflow on day 0 and a single inflow on maturity. IRR needs to be computed for this cash flow and the same would be called as realized YTM

Note:

- **Reinvested interest:** Maturity value of interest – normal interest earned
- **Intermediate cash flows are not reinvested:** If the intermediate cash flows are not re-invested then the maturity cash flows will be addition of all inflows. Hence maturity cash flows would be significantly less and based on that we should compute realized YTM.

Example:

You have invested in 8.5% bond with face value of Rs.1,000. Reinvestment rate is 10 percent and has 3 years to maturity. What is the reinvested interest on this bond?

- 26.35
- 54.48
- 309.48
- 281.35

Answer:

Year	Cash flow	Reinvestment period	FVF	FCF
1	85	2	1.21	102.85
2	85	1	1.1	93.50
3	1,085	0	1.00	1,085
Total	1,255			1,281.35

Reinvested interest = 1,281.35 – 1,255 = Rs.26.35

Example:

Compute realized YTM for the above example. Use discount rate of 8% and 9% to compute realized YTM.

Example:

Year	Cash flow	PVF @ 8%	DCF	PVF @ 9%	DCF
0	-1,000.00	1	-1,000.00	1	-1,000.00
3	1,281.35	0.794	1,017.39	0.772	989.20
NPV			17.39		-10.80

Computation of realized YTM:

YTM (IRR)	=	$L1 + \left(\frac{NPV \text{ at } L1}{NPV \text{ at } L1 - NPV \text{ at } L2} \right) \times (L2 - L1)$
YTM	=	$8 + \frac{17.39}{17.39 - (-10.80)} \times (9 - 8)$
YTM	=	8 + 0.62
YTM	=	8.62%

76. Relationship between normal YTM and realized YTM

Reinvestment rate = IRR	Realized YTM = Normal YTM
Reinvestment rate > IRR	Realized YTM > Normal YTM
Reinvestment rate < IRR	Realized YTM < Normal YTM

Example:

YTM of a bond instrument is 20% and the re-investment rate is 15%. What is the likely realized Yield of the bond?

- a) 20%
- b) Greater than 20%
- c) Less than 20%

Answer:

Less than 20%. Re-investment has been done at lower than YTM and hence realized YTM would be lower than normal YTM

77. Duration

Duration of a redeemable bond:

- **Step 1:** Compute cash flows of bond till maturity
- **Step 2:** Determine PVF using YTM
- **Step 3:** Market price is sum of present value of cash flow discounted at PVF of step 2
- **Step 4:** Divide each year's cash flow by market price (*step 3 total*) to get weights
- **Step 5:** Sum of (time x weights) is duration

Format for computation of duration (assuming a 5-year bond)

Year	Cash flow	PVF @ YTM	DCF	Weight	Year x Weight
1	Interest				
2	Interest				
3	Interest				
4	Interest				
5	Interest + Principal				
Total					Duration of bond

Duration of a perpetual bond:

$$\text{Duration of a perpetual bond} = \frac{1 + y}{y}$$

Duration of zero-coupon bond = Life of bond

Note:

- In case of half-yearly bond, we should compute the duration in terms of number of half-years and the column for year will be replaced with half-year in above table. Similarly, the YTM would be half-yearly YTM

Example:

YTM of perpetual bond = 8%. What is its duration?

- a) 12.5 years
- b) 8 years
- c) 9 years
- d) 13.5 years

Answer:

$$\text{Duration} = \left(\frac{1 + \text{YTM}}{\text{YTM}} \right) = \left(\frac{1 + 0.08}{0.08} \right) = 13.5 \text{ years}$$

Example:

Face value = Rs.1,000; Coupon Rate = 11.00%; Life = 6 years; Yield to Maturity = 15.00%. Compute duration?

Answer:

Year	Cash flow	PVF @ 15%	DCF	Weight	Product
1	110	0.870	95.70	0.1128	0.1128
2	110	0.756	83.16	0.0980	0.1960
3	110	0.658	72.38	0.0853	0.2559
4	110	0.572	62.92	0.0742	0.2968
5	110	0.497	54.67	0.0644	0.3220
6	1,110	0.432	479.52	0.5652	3.3912
			848.35		4.5747

- Duration = 4.5747 years

78. Impact of change in variables on duration of Bond

- **Time to maturity:** The shorter-maturity bond would have a lower duration and less price risk and vice versa.
- **Coupon rate:** Coupon payment is a key factor in calculation of duration of bonds. The higher the coupon, the lower is the duration and vice versa.
- **Yield-to-Maturity (YTM):** Higher yield-to-maturity means lower duration and hence, lower interest rate risk and vice versa.

Example:

Which of the following points is/are true about duration of bonds?

- (i) The shorter-maturity bond would have a lower duration and vice versa
- (ii) The higher the coupon, the lower is the duration and vice versa
- (iii) Higher YTM would lead to higher duration and lower YTM would lead to lower duration
- a) (i) and (ii) is correct
- b) (i), (ii) and (iii) is correct
- c) (i) and (iii) is correct
- d) (ii) and (iii) is correct

Answer:

(i), (ii) is correct

Explanation: Shorter-maturity bonds have lower life and accordingly lower duration. Higher coupon will lead to higher cash flow during initial years and hence will have lower duration. High discount rate will lead to lower duration and low discount rate will lead to higher duration

79. Volatility or Modified Duration

$$\text{Volatility} = \frac{\text{Duration}}{1 + \text{YTM}}$$

80. Volatility of half-yearly Bond

In case of half-yearly bond, we should use half-yearly YTM in formula for computing volatility. **However, duration should be only in terms of years and the same would be called Annual volatility. This would be later multiplied with Annual change in yield to compute % fall/rise in bond value.**

Example:

Duration of half-yearly bond = 5.85 years; YTM = 10%. What will be the volatility of bond?

- a) 5.32
- b) 5.57
- c) 6.44
- d) 6.14

Answer:

$$\text{Volatility} = \frac{\text{Duration in years}}{1 + \text{Relevant YTM}} = \frac{5.85}{1 + 5\%} = 5.57$$

Bond is paying half-yearly interest and hence we need to use half-yearly YTM to compute volatility

81. Duration and Churning of Portfolio

- If yields are expected to rise, bond prices will decrease. In this scenario, it's advisable to reduce the portfolio's duration, **meaning bonds with higher durations should be replaced by those with lower durations.**
- A shorter duration reduces volatility and minimizes the decline in bond prices.
- Conversely, if yields are expected to decrease, **increasing the portfolio's duration can be beneficial to capture potential price gains.**

Example:

Duration of portfolio is 8 years. Yield is expected to increase in current year. Which action should be taken by the investor?

- a) No action to be taken
- b) Increase investment in lower duration bonds by selling higher duration bonds
- c) Increase investment in higher duration bonds by selling lower duration bonds
- d) Increase investment in both higher and lower duration bonds

Answer:

Yield is expected to increase and hence value of portfolio will decline. We should work on reducing the duration of the portfolio as lower duration will lead to lower volatility. **Hence in this case we should increase investment in lower duration bonds and sell higher duration bonds**

82. Volatility and change in price

- Yield and price of bond is inversely proportional. Price of a bond will fall if Yield increases and vice-versa
- Percentage change in bond price is computed with the help of volatility
- **% change in bond price = Volatility x % change in YTM**

Example:

Volatility = 4.5. Yield is expected to increase by 25 bps. What will be the effect on current market price?

- Price will increase by 4.5%
- Price will increase by 1.125%
- Price will decrease by 4.5%
- Price will decrease by 1.125%

Answer:

Yield is expected to increase and hence price will fall; % Fall in price = $4.5 \times 0.25 = 1.125\%$

83. Immunization

- Immunization happens if the weighted duration of the portfolio is equal to the period for which investment is required to be made. This is a level where price risk and reinvestment risk will offset each other leading to no impact to the investor
- **Investor needs money after xx years:** This should be interpreted as duration of investment should be equal to xx years
- **Fund an outflow after xx years:** This would be interpreted as duration of investment should be equal to xx years

Example:

Duration of Bond A = 4 years; Duration of Bond B = 10 years; Investor needs money after 6 years. What should be the investment in Bond A and Bond B?

- 50% and 50%
- 100% in Bond A
- 66.67% in A and 33.33% in B
- 66.67% in B and 33.33% in A

Answer:

Investment in Bond A = X; Investment in Bond B = $1 - x$

Bond	Duration	Weight	Product
A	4	X	4X
B	10	1-X	10-10X
Total			$4X + 10 - 10X = 6$

Solving we get X as 66.67% and hence 66.67% is investment in Bond A and Balance 33.33% is investment in Bond B

84. Bond Refunding

- **Items related to old Bond:** Floatation cost, Discount on issue of debentures, call premium etc related to old bond has to be written off on day 0 because we are looking at replacing old bond with new bond
- **Items related to new bond:** Floatation cost, discount on issue of new bond would be written off over the life of the new bond
- **In-between cash flow:** After-tax outflow of old bond – after-tax outflow of new bond. We should work as if the old bond is continuing when we analyse the cash flows of old bond
- **Overlapping interest:** This is the extra interest paid because old bond could not be redeemed on time. Overlapping interest outflow on day 0 = Extra interest paid on old bond x (1 – Tax rate)
- **Discount rate:** After-tax cost of debt is to be used as discount rate if given in question. **If problem is silent, then after-tax cost of new debt is to be taken as discount rate.**

Typical cash flow structure of Bond Refunding question:

Step 1: Calculate Initial Outflow

Particulars	Calculation	Amount
Redemption value of old Bond		(XXX)
Call premium on old Bond	Face value of Bonds x Call Premium %	(XXX)
Tax benefit on w/o of call premium	Call premium x Tax Rate	XXX
Tax benefit on w/o of unamortized FC/Discount of old Bond	$\frac{\text{Original FC (or) Discount}}{\text{Original Life}} \times \text{Balance life} \times \text{Tax Rate}$	XXX
Issue value of new bonds		XXX
Overlapping interest on Old Bond	Face value of Old Bonds x Interest rate x $\frac{\text{No of months}}{12}$	(XXX)
Tax Benefit on w/o of overlapping interest	Overlapping interest x Tax Rate	XXX
Initial Outflow		XXX

Step 2: In-between flows

Particulars	Old Bond	New Bond
Interest cost	Face value x Interest Rate	Face value x Interest Rate
Less: Tax on interest	Interest x Tax Rate	Interest x Tax Rate
Less: Tax on floatation cost	$\frac{\text{Original Floatation Cost}}{\text{Original Life}} \times \text{Tax Rate}$	$\frac{\text{Original Floatation Cost}}{\text{Original Life}} \times \text{Tax Rate}$
Less: Tax on discount	$\frac{\text{Original Discount}}{\text{Original Life}} \times \text{Tax Rate}$	$\frac{\text{Original Discount}}{\text{Original Life}} \times \text{Tax Rate}$
Net cash flow	XXX	XXX

Incremental cash inflow = Cash outflow of Old Bond - Cash outflow of New Bond

Step 3: Terminal Flow

Particulars	Old Bond	New Bond
Redemption value	XXX	XXX

- Incremental cash outflow = Cash outflow of old bon - Cash outflow of new bond

Example:

Bond was issued 5 years ago with flotation cost of Rs.30 lacs. It has balance life of 25 years. Tax rate is 30%. Bond is to be replaced with new bond. What will be tax benefit on flotation cost?

- 9 lacs in day 0
- 7.5 lacs in day 0
- 30,000 for year 1 to year 30
- 30,000 for year 1 to year 25

Answer:

Particulars	Calculation	Amount
Total Floatation Cost		30,00,000
Un-amortized Floatation cost	$30,00,000 \times (25/30)$	25,00,000
Tax benefit on write-off	$25,00,000 \times 30\%$	7,50,000

Tax benefit will be taken on day 0 as the old bond will be refunded and closed. Hence all tax benefit of Rs.7.5 lacs will arise in year 0

Example:

Face value of bond = Rs.200 lacs; Call premium = 10%. Balance life = 10 years. Tax rate = 20%. What will be the tax benefit on call premium?

- Rs.4 lacs in day 0
- Rs.40,000 from year 1 to year 10
- Rs.40 lacs in day 0
- Rs.4 lacs from Year 1 to Year 10

Answer:

Call premium = 200 lacs x 10% = 20 lacs; Tax benefit = 20 lacs x 20% = Rs.4 lacs; Tax benefit will be taken immediately as the old bond is redeemed

Example:

A company is making a new issue of equity shares to refund existing bonds. The existing bonds carry interest rate of 15% and current outstanding is 6 million. Life of the bond is 5 years. For early redemption there is prepayment penalty of USD 3,50,000 to be paid. Cost of capital is 10%. How much is the NPV of bond refunding?

- a. USD 11,37,900
- b. USD 7,87,900
- c. USD 4,37,900
- d. NPV is negative

Answer:

Year	Cash flow ('000s)	PVF @ 10%	DCF
0	-6,350	1.000	-6,350.00
1 to 5	900	3.791	3,411.90
5	6,000	0.621	3,726.00
NPV of bond refunding			787.90

- The company will have to pay 6,350 today for bond refunding (6 million + 3,50,000)
- The company will save interest of 900 for a period of 5 years and will save principal payment of 6,000 at end of five years
- **NPV of bond refunding = USD 7,87,900**

85. Forward Rates

Forward rates work in the same manner as that of step-up or step-down discount rates. We will have the following two approaches to compute forward rates

Cash flows are given:

- First take one-year bond and find PVF of year 1 as balancing figure such that NPV of bond is zero. Forward rate of year 1 is computed as under:

$$\text{PVF of year 1} = \frac{1}{1 + \text{Forward rate of year 1}}$$

- Then analyse the 2-year bond and get PVF of year 2 as balancing figure such that NPV of bond is zero. Forward rate of year 2 is computed as under:

$$\text{PVF of year 2} = \frac{\text{PVF of year 1}}{1 + \text{Forward rate of year 2}}$$

Interest rates are given:

- We will use FRA formula to compute forward rates

$$\text{Forward rate for year 1 to year 2} = \frac{\text{FVF for year 2}}{\text{FVF for year 1}} - 1$$

Example:

1 year interest rate = 10 percent; 2-year interest rate = 12 percent; What will be the forward rate of year 1 to 2?

- a) 14%
- b) 11%
- c) 14.04%

Answer:

$$\text{Forward rate of Year 1 to 2} = \left[\frac{\text{FVF of year 2}}{\text{FVF of year 1}} \right] - 1 = \left(\frac{1.2544}{1.10} \right) - 1 = 14.04\%$$

Example:

The six-year spot rate is 7% and the five-year spot rate is 6%. The implied one-year forward rate five years from now is:

- a) 6.50%
- b) 12.14%
- c) 5.00%
- d) 12.00%

Answer:

$$\text{FRA}_{5 \times 6} = \frac{\text{FVF for six years}}{\text{FVF for five years}} - 1 = \frac{(1 + 0.07)^6}{(1 + 0.06)^5} - 1 = 12.14\%$$

86. Relationship between Forward Rate and Spot Rate

$$(1 + \text{Spot rate}_1) = (1 + \text{Forward rate}_1)$$

$$(1 + \text{Spot rate}_2)^2 = (1 + \text{Spot rate}_1) \times (1 + \text{Forward Rate}_2)$$

(or)

$$(1 + \text{Spot rate}_2)^2 = (1 + \text{Forward rate}_1) \times (1 + \text{Forward Rate}_2)$$

$$(1 + \text{Spot rate}_3)^3 = (1 + \text{Spot rate}_2)^2 \times (1 + \text{Forward Rate}_3)$$

(or)

$$(1 + \text{Spot rate}_3)^3 = (1 + \text{Forward rate}_1) \times (1 + \text{Forward Rate}_2) \times (1 + \text{Forward Rate}_3)$$

87. Nature of Yield Curve

- Normal yield curve/upward sloping = Interest rates for long-term instruments is higher than Interest rates for short-term instruments
- Inverted Yield Curve/downward sloping = Interest rates for short-term instruments is higher than Interest rates for long-term instruments. **An inverted yield curve is an indication of upcoming recession.**
- Flat Yield Curve = Interest rates for short-term instruments = Interest rates for long-term instruments

88. Bond Convexity

- Duration can be used to find the new bond price when there are changes in YTM. However, duration assumes a linear relationship and assumes equal percentage change. But the change is not linear and can be adjusted using convexity adjustment **[Convexity adjustment will always be added even if there is an increase/decrease in Yield]**

Computation of convexity:

Δy = Change in Yield

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

V_+ = Price of bond if yield increases by Δy

V_- = Price of bond if yield decreases by Δy

- C = Convexity
- Convexity adjustment (in Rs.) = $C \times (\Delta y^2) \times V_0$

$$\text{Convexity Adjustment (\%)} = \frac{\text{Convexity Adjustment in Rs.}}{V_0} \times 100$$

Example:

Compute Convexity of bond based on the following information:

Fair value of bond at 10% YTM	100.00
Fair value of bond at 9% YTM	103.89
Fair value of bond at 11% YTM	96.30

- 9.50
- 0.095
- 0.19
- 19.00

Answer:

$$\text{Convexity} = \frac{V_+ + V_- - 2V_0}{2V_0(\Delta y^2)} = \frac{96.30 + 103.89 - 2(100)}{2(100)(0.01)(0.01)} = 9.50$$

Example:

Compute Convexity Adjustment for above example:

$$\text{Convexity adjustment (in Rs.)} = C \times (\Delta y^2) \times V_0 = 9.50 \times 0.01 \times 0.01 \times 100 = 0.0950$$

$$\text{Convexity adjustment (in \%.)} = \frac{\text{Convexity Adjustment in Rs.}}{\text{CMP}} \times 100 = \frac{0.0950}{100} \times 100 = 0.0950\%$$

89. Valuation of Preference Shares

- Value of redeemable preference share is the present value of future cash flows (Dividend and Principal) discounted at investor's required rate of return

$$\text{Value of irredeemable preference share} = \frac{\text{Preference Dividend}}{\text{Investor Expectation}}$$

Example:

11% preference shares of Rs.100 is currently quoted at yield of 13%. What should be the current market price?

- 100
- 84.62
- 118.18
- None of the above

Answer:

$$\text{Value of share} = \frac{\text{Dividend}}{\text{Current yield}} = \frac{11}{13\%} = 84.62$$

90. Valuation of Warrants

Value of Warrant = (CMP – Exercise Price) x Number of equity shares convertible with one warrant

Example:

A company has issued a warrant which can be converted into 10 equity shares by paying Rs.50 per share. The current market price of the share is Rs.80. How much is the value of warrant?

- 0
- Rs.800
- Rs.500
- Rs.300

Answer:

$$\text{Value of warrant} = (\text{CMP} - \text{EP}) \times \text{Ratio} = (80 - 50) \times 10 = \text{Rs.300}$$

91. Enterprise Value

- Total Enterprise value = Equity + Debt + Minority Interest – Cash and cash equivalents
- Operating Enterprise value = Total enterprise value – market value of non-operating assets such as investments in associates
- Core Enterprise value = Operating enterprise value – Value of non-core assets

Example:

Book value of equity = 1000; Market value of equity = 2000; Reserves and surplus = 200; Value of debt = 800; Cash and cash equivalents = 400. How much is enterprise value?

- 1600
- 2400
- 2600
- 1800

Answer:

$$\text{EV} = \text{Market value of equity} + \text{Debt} - \text{Cash and cash equivalents}$$

$$\text{EV} = 2000 + 800 - 400 = 2,400$$

Example:

Enterprise value = Rs.40,00,000; Value of debt = Rs.10,00,000; Value of cash and cash equivalents = Rs.5,00,000. How much is the value of equity?

- 45,00,000
- 35,00,000
- 55,00,000
- 25,00,000

Answer:

$$\text{Enterprise value} = \text{Value of equity} + \text{Value of debt} - \text{Amount of cash}$$

$$40,00,000 = \text{Value of equity} + 10,00,000 - 5,00,000$$

$$35,00,000 = \text{Value of equity}$$

92. Valuation based on EV Multiples

- EV to sales and EV to EBITDA are the commonly used multiples for valuing a company
- EV based on sales = Sales x EV to sales multiple
- EV based on EBITDA = EBITDA x EV to EBITDA Multiple

Example:

Enterprise value of Infosys - 1,000 Crores. EBITDA of Infosys - 250 Crores. What should be the enterprise valuation of TCS if EBITDA of TCS is 50 Crores?

- 1000 Crores

- b) 50 Crores
- c) 200 Crores
- d) 250 Crores

Answer:

EV/EBITDA multiple of Infosys = 1000 crores/250 crores = 4 Times;

EV of TCS = EBITDA x 4 times = 50 Cr x 4 = 200 Crores

Example:

EV to sales multiple of industry = 1.5 times; EV to EBITDA multiple of industry = 5 times; Sales of ABC Limited = 5,000; EBITDA of ABC Limited = 2,000; What should be the value of ABC Limited?

- a) 7,500
- b) 10,000
- c) 8,750
- d) None of the above

Answer:

We have data to calculate Enterprise value on the basis of sales and EBITDA. Final enterprise value will be average based on sales and EBITDA

EV based on sales = 5,000 x 1.5 = 7,500

EV based on EBITDA = 2,000 x 5 = 10,000

Average Enterprise value = $\frac{7,500 + 10,000}{2} = 8,750$

93. Cash return on total investment

Cash return on total investment = $\frac{1}{\text{EV to EBITDA Multiple}}$

Example:

EV to EBITDA multiple of Company A is 5 Times. How much is the cash return on total investment?

- a) 5%
- b) 10%
- c) 20%
- d) 25%

Answer:

Cash return on total investment can be computed as inverse of EV to EBITDA multiple and the same in this case would be 20% (1/5)

94. Yield of Treasury Bill (or) Discount of Commercial Bill (or) Yield of Certificate of Deposit (or) Yield of commercial Paper

Annual Yield = $\frac{\text{Maturity Value} - \text{Issue Price}}{\text{Issue Price}} \times \frac{365}{\text{No of days}} \times 100$

Example:

CMP of T-bill on March 31 = 95,000. Maturity date = July 20; Face value = 1,00,000. What is the yield on treasury bill?

- a) 5%
- b) 5.26%
- c) 16.44%
- d) 17.30%

Answer:

95,000 will become 1,00,000 in 111 days (30 + 31 + 30 + 20)

Yield = $\left(\frac{5,000}{95,000} \right) \times \left(\frac{365}{111} \right) \times 100 = 17.30\%$

95. Computation of issue price of money market instrument

Issue price of money market instrument is to be computed based on the formula for annual yield

Example:

RBI Sold 91 days treasury bill of Rs.100 with yield of 12 percent. What is the issue price?

- a) 97.01
- b) 97.10
- c) 98.00
- d) None of the above

Answer:

Let us assume Issue price to be Y

$$12 = \frac{100 - Y}{Y} \times \left(\frac{365}{91}\right) \times 100$$

$$1092Y = 36,50,000 - 36500Y$$

$$Y = \frac{36,50,000}{37,592} = \text{Rs. } 97.10$$

96. Effective Annual Interest of Money Market Instrument

$$\text{EAI} = \left(1 + \frac{\text{Annual rate}}{n}\right)^n - 1$$

Note:

- N = Number of times of compounding in a year = (12/Number of Months) (or) (365/Number of days)

Example:

You want to deposit Rs.10,000 in a bank certificate of deposit (CD). You are considering the following banks:

- Bank A offers 5.85% annual interest compounded annually
- Bank B offers 5.75% annual interest rate compounded monthly
- Bank C offers 5.70% annual interest compounded daily

Which bank offers the highest effective annual interest rate and how much?

- Bank C, 5.87%
- Bank A, 5.85%
- Bank B, 5.90%
- Bank B, 5.80%

Answer:

Answer to this is Bank B and 5.90%

Effective rate of Bank A = 5.85%

$$\text{Effective rate of Bank B} = \left(1 + \frac{5.75\%}{12}\right)^{12} - 1 = 5.90\%$$

$$\text{Effective rate of Bank C} = e^{rt} - 1 = e^{0.057} - 1 = 1.0587 - 1 = 5.87\%$$

Daily compounding would basically mean continuous compounding and the same is computed through e^{rt} tables

97. Effect of compensating balance on cost of commercial paper

Particulars	Calculation	Amount (in lacs)
Interest cost	FV - Amount raised	XXX
Cost of placement		XXX
Stamp Duty		XXX
Issuing and other charges		XXX
Rating Charges		XXX
Total cost		XXX
Net amount raised through CP		
Amount raised		XXX
Less: Line of credit to be maintained		(XXX)
Less: All costs other than interest (note)		(XXX)
Effective amount raised		XXX

Note:

- Interest should also be subtracted in case there is up-front payment of interest

$$\text{Effective cost of CP (pre - tax)} = \frac{\text{Total Cost}}{\text{Effective Amount Raised}} \times \frac{12}{\text{Number of Months}} \times 100 = \text{XX}\%$$

$$\text{Effective cost of CP (post - tax)} = \text{Pre - tax cost of CP} \times (1 - \text{Tax Rate})$$

Example:

Interest cost of CP = 2.5 percent per quarter; Issue period of CP = 6 months; Stamp duty = 0.5 percent of issue size; Rating charges = 1 percent per annum; Other charges = 0.1 percent per month. How much is the overall annual cost of CP issue?

- a) 13.2 percent
- b) 14.2 percent
- c) 8.2 percent
- d) 9.2 percent

Answer:

Particulars	Amount
Interest cost (2.50 x 4)	10.00
Stamp duty (0.5 x 2)	1.00
Rating charges	1.00
Other cost (0.1 x 12)	1.20
Overall cost	13.20

Example:

Face value of CP = 100 lacs; Interest expense on CP (paid up-front) = 4 lacs; The firm is required to keep balance of Rs.5 lacs in line of credit. Issue period of CP = 6 months. What is the annual cost of CP?

- a) 8 percent
- b) 8.33 percent
- c) 8.79 percent
- d) 19.78 percent

Example:

Amount realized on issue of CP = 100 - 4 = 96 lacs; Net amount available = 96 lacs - 5 lacs = 91 lacs

Cost of CP = $\left(\frac{4 \text{ lacs}}{91 \text{ lacs}}\right) \times \left(\frac{12}{6}\right) \times 100 = 8.79 \text{ percent}$

98. Clean Price and Dirty Price

- Dirty Price = Clean Price + Accrued Interest
- Accrued Interest should be computed based on the rate of interest of **original instrument**

Start proceeds = Face value $\times \left(\frac{\text{Dirty Price}}{\text{Face value per instrument}}\right) \times (100 - \text{Margin } \%)$

- Maturity proceeds = Start Proceeds + **Rate of interest as per Repo Rate**

Example:

Bank A entered into repo transaction at the rate of 8% on 12% GOI Bond, 2021. Clean price of the instrument is Rs.95 and face value is Rs.100. 240 days of accrued interest is applicable and number of days in a year is 360. What is the dirty price?

- a) 95
- b) 100
- c) 100.33
- d) 103

Answer:

Accrued interest = Face value of Rs. 100 $\times 12\% \times \left(\frac{240}{360}\right) = \text{Rs. } 8.00$

- Dirty price = Clean price of Rs.95 + Accrued interest of Rs.8 = Rs.103.00

Example:

Amount of face value for repo transaction = 4 crores. Initial margin = 5%. Clean price = Rs.98. Accrued interest = Rs.4. what is the first leg proceeds?

- a) 3.80 crores
- b) 3.724 crores
- c) 3.876 crores
- d) None of the above

Answer:

Dirty price = 98 + 4 = 102

Value of security = $\left(\frac{4 \text{ crores}}{100}\right) \times 102 = 4.08 \text{ crores}$

Initial proceeds = 4.08 crores - 5% margin = Rs.3.876 Crores

Example:

Bank A entered into repo on 12% GOI Bond. Initial proceeds is Rs.7,95,20,000. Repo period was for 14 days and rate of interest on repo is 5%. What is the amount to be repaid?

- a) 7,96,72,504
- b) 7,98,86,010
- c) 7,98,90,093
- d) 7,96,74,622

Answer:

$$\text{Interest on repo} = 7,95,20,000 \times 5\% \times \frac{14}{365} = 1,52,504$$

$$\text{Amount to be repaid} = 7,95,20,000 + 1,52,504 = 7,96,72,504$$

Chapter 6 - Portfolio Management**Overview:**

- How to compute risk and return of individual security?
- How to compute risk and return of portfolio?
- How to compute correlation coefficient and covariance?
- Efficient and inefficient securities
- Beta of security (without probability)
- Beta of security (with probability)
- Beta of Portfolio
- How to alter Beta of Portfolio
- Sharpe approach and Markowitz approach for portfolio risk
- Sharpe approach and Markowitz approach for portfolio risk
- Systematic and unsystematic risk
- Use of co-efficient of determination, random error and Specific SD
- Security market line, capital market line and characteristic line
- Concept of Alpha
- Return under APT = two formulae
- Weights for minimum risk = 2 security (formula), 3 securities (critical line) and more than 3 (Sharpe approach)
- Levered and unlevered Beta (or) Equity beta and asset beta
- Portfolio strategies - Constant mix, Buy and Hold and Constant Proportion portfolio insurance
- Real Estate Valuation

1. Return of Security

- Return of security (in Rs.) = Dividend + Capital appreciation

$$\text{Return of security (in \%)} = \frac{(P_1 - P_0) + D_1}{P_0} \times 100$$

$$\text{Return of security (in \%)} = \frac{(P_1 - P_0)}{P_0} + \text{Dividend Yield}$$

D_1 = Dividend of next year = **Dividend rate is to be applied on face value and Dividend yield is to be applied on market price to get the Dividend Amount**

P_1 = Price of next year

P_0 = Current year price

- If return is given for multiple scenario/years, then **expected return is weighted average of various possible return with probability being the assigned weight.**
- **If probability is not given then we will assume equal probability for each observation.**

- **Different Probabilities for Dividend and Capital Gain:** A question can have a different probability for dividend and different probability for price. Let us assume there are 3 possible dividends and 3 possible prices. This scenario will lead to nine different combinations and joint probability for each combination is to be calculated. **Joint Probability = Probability for Dividend x Probability for Capital Gain**

Example:

You have purchased 5,000 shares of R Limited (Face value of Rs.10) by paying Rs.2,00,000. The company has paid dividend of 20% and the closing price is Rs.50. How much is the return of R Limited?

Answer:

$$\text{Expected return} = \frac{(50 - 40) + 2}{40} \times 100 = 30.00\%$$

Note:

- Dividend is computed on face value of Rs.10 per share
- Opening price = $2,00,000 / 5,000 = \text{Rs.}40$ per share

Example:

From following information compute return of each year:

Year	Share Price	Dividend Yield
Present year	197.00	10%
1 year ago	164.20	12%

2 year ago	155.00	8%
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Answer:
 Let us assume present year to be 2024. Hence present year is 2024 (P₂), one year ago is 2023 (P₁) and two year ago is 2022 (P₀)

Return of 2023 = $\frac{P_1 - P_0}{P_0} + \text{Dividend Yield} = \frac{164.20 - 155}{155} + 0.12 = 0.0594 + 0.12 = 0.1794$ (or) 17.94%

Return of 2024 = $\frac{P_2 - P_1}{P_1} + \text{Dividend Yield} = \frac{197 - 164.20}{164.20} + 0.1 = 0.1998 + 0.1 = 0.2998$ (or) 29.98%

Note: When data is given for 3 years, return can be computed only for two years as we need opening and closing price to compute return.

2. Risk of Security

- Risk of Security is measured through Standard Deviation

Standard Deviation = $\sqrt{pd^2}$

Format for computing Risk and Return [Format 1]

Probability	Return	Product	Deviation	Pd ²

Note:

- Probability = Given in question (or) assumed to be equal
- Return is computed as per concept 1. This would be the most important item in any problem in portfolio management and students should ensure full certainty of the calculation
- Product = Return x Probability
- Return of security = Sum of product
- Deviation = Column 2 - Sum of product
- Pd² = Probability x Deviation x Deviation

Example:

Compute the Standard Deviation of Security from the following information

Probability	Return
0.20	10
0.30	20
0.40	-10
0.10	-20

- 20%
- 10%
- 14.70%
- 16.70%

Example:

Prob	Return	Product	Deviation	Pd ²
0.20	10	2.0	8.0	12.80
0.30	20	6.0	18.0	97.20
0.40	-10	-4.0	-12.0	57.60
0.10	-20	-2.0	-22.0	48.40
		2.0		216

Standard Deviation (%) = $\sqrt{216} = 14.70\%$

3. Computation of Correlation coefficient and Covariance

- Correlation mean relation between two securities. Correlation can range between -1 to +1

Format 2:

Prob	Security A				Security B				Pd _a d _b
	Return	Product	Deviation	Pd ²	Return	Product	Deviation	Pd ²	

- Pd_ad_b = Probability x Deviation of A x Deviation of B

$$\text{COV}_{AB} = \sum \text{Pd}_A \text{d}_B$$

$$\text{COR}_{AB} = \frac{\text{Covariance}_{AB}}{\sigma_A \sigma_B}$$

Co-variance between A and A: Some question can give data on co-variance between security A and Security A. This basically would mean variance of A itself.

Computation of co-variance through Beta:

Covariance of A and B = Beta of A x Beta of B x Variance of Market

Example:

Co-variance of Security A and B = 0.0200; SD of Security A = 0.40 and SD of Security B = 0.20. How much is correlation co-efficient between A and B?

- +0.10
- +0.05
- +0.50
- +0.25

Answer:

$$\text{Correlation coefficient} = \frac{\text{Co - variance of security A and B}}{\text{SD of A x SD of B}} = \frac{0.0200}{0.40 \times 0.20} = +0.25$$

Example:

Compute Co-variance between Security A and B with the help of following information

Year	Return on A (%)	Return on B (%)
2006	10	12
2007	16	18

- 3
- 9
- 36
- 6

Answer:

Year	Prob	Security A			Security B			Pd _a d _b
		Return	Product	Deviation	Return	Product	Deviation	
2006	0.5	10	5	-3	12	6	-3	4.5
2007	0.5	16	8	3	18	9	3	4.5
Total			13			15		9

Co-variance of stocks = Sum of Pd_ad_b = 9

Example:

Beta of Company A = 1.50 Times; Beta of Company B = 2 Times; SD of market = 0.10. How much is covariance between Security A and Security B?

- 0.30
- 0.03
- 0.01

Answer:

Covariance between A and B = Beta of company A x Beta of Company B x Variance of market = 1.50 x 2 x 0.1 x 0.1 = 0.03

Example:

Co-variance between security X and Security X = 4.80; Co-variance between Security X and Security Y = 4.30; Co-variance between Security Y and Security Y = 4.25. How much is the Standard deviation of Security X?

- 4.80
- 4.30
- 2.19
- 2.07

Answer:

Covariance between security X and Security X is basically variance of Security X

$$\text{SD} = \sqrt{4.80} = 2.19$$

4. Portfolio Return and Portfolio Risk

- Portfolio return is the weighted average of return of individual securities.

- Portfolio risk is **not** weighted average of risk of individual securities. This is because of correlation coefficient.

Formula for Portfolio Risk through Markowitz Approach:

$$\text{Two Securities} = \sqrt{(\sigma_a w_a)^2 + (\sigma_b w_b)^2 + 2\sigma_a \sigma_b \text{COR}_{ab}}$$

$$\text{Three Securities} = \sqrt{(\sigma_a w_a)^2 + (\sigma_b w_b)^2 + (\sigma_c w_c)^2 + 2\sigma_a \sigma_b \text{COR}_{ab} + 2\sigma_a \sigma_c \text{COR}_{ac} + 2\sigma_b \sigma_c \text{COR}_{bc}}$$

Note:

- We are basically using the formula of $(A+B)^2$ for two securities and $(A+B+C)^2$ for three securities
- $A = \sigma_a w_a$
- $B = \sigma_b w_b$
- $C = \sigma_c w_c$
- In the above formula COV_{ab} can replace $\sigma_a \sigma_b \text{COR}_{ab}$

Example:

SD of Security A = 10%; Weight of Security A in portfolio = 60%; SD of Security B = 20%; Weight of Security B = 40%; Correlation co-efficient between Security A and B is 0.50. How much is the portfolio SD?

- 14%
- 15%
- 12.17%
- 14.25%

Answer:

$$\text{Variance of Portfolio} = (\sigma_a W_a)^2 + (\sigma_b W_b)^2 + 2\sigma_a W_a \sigma_b W_b \text{COR}_{ab}$$

$$\text{Variance of Portfolio} = (10 \times 0.60)^2 + (20 \times 0.40)^2 + 2(10)(0.60)(20)(0.40)(0.50) = 148$$

$$\text{Variance of Portfolio} = \sqrt{148} = 12.17\%$$

Example:

The rate of return of Market is 8% and risk-free rate of return is 5%. You are currently holding Rs.1,00,000. How much should be the investment in market and risk-free asset to get return of 10%?

- 1,66,667 and 66,667
- 1,66,667 and -66,667
- 66,6667 and 1,66,667
- 66,667 and 1,66,6667

Answer:

Let us assume X to be the proportion of investment in market and (1-X) to be the proportion of investment in Risk-free security

Security	Return	Weight	Product
Market	8	X	8X
Risk-free	5	1-X	5-5X
Total	10	1	8X + 5 -5X = 10

$8X + 5 - 5X = 10$; $3X = 5$; $X = 166.67\%$; Hence investor should invest 166.67% in market portfolio and borrow 66.67% from risk-free security. Investment in market security = Rs.1,66,667; Borrowing from market = Rs.66,667

5. Notion of Dominance

A security is said to dominate another security if

- It generates higher return for lower risk
- It generates higher return for same risk
- It generates same return for lower risk

If a security is dominated by another security, it is called inefficient security. Only efficient securities should form part of portfolio.

Example:

Given the following risky securities

Particulars	A	B	C	D	E	F	G	H
Return %	10	12.5	15	16	17	18	18	20
Risk %	23	21	25	29	29	32	35	45

Identify the inefficient securities in the given list?

- B, C, E and F
- A and D
- A, D, G and H

d. A, D and G

Answer:

- Security A, D and G are inefficient securities
- **Security B dominates Security A** as it generates higher return with lower risk. Hence Security A is inefficient.
- **Security E dominates Security D** as it generates higher return with same risk. Hence Security D is inefficient
- **Security F dominates Security G** as it generates same return with lower risk. Hence Security G is inefficient

6. Compensation for Risk

- Compensation for additional risk undertaken can be computed as Sharpe ratio (undiversified) and Treynor ratio (Diversified)

$$\text{Sharpe Ratio} = \frac{\text{Return} - \text{Risk free rate}}{\text{SD}}$$

$$\text{Treynor Ratio} = \frac{\text{Return} - \text{Risk free rate}}{\text{Beta}}$$

- Increase in Sharpe Ratio/Treynor Ratio would indicate better returns for the risk undertaken by the investor

Example:

An investor is currently earning return of 20% with SD of 16%. Investor has added additional investments to the portfolio which increased its returns to 21% with SD of 15%. Risk-free rate is 6%. Show how well the Fund will be compensated for the risk undertaken due to inclusion of stocks in the portfolio.

Answer:

Sharpe Ratio	=	$\left(\frac{\text{Actual Return} - \text{Risk Free Return}}{\text{Standard Deviation}} \right)$
Existing Sharpe Ratio	=	$\frac{20 - 6}{16} = 0.875 \text{ Times}$
Revised Sharpe Ratio	=	$\frac{21 - 6}{15} = 1.000$

Sharpe Ratio has improved by 0.125 times due to addition of stocks in revised portfolio.

7. Risk-free rate

- Treasury Bond/Government Bond will be taken as risk-free security and risk-free return can be computed using the below formula:

$$\text{Risk - free rate} = \frac{\text{Interest}}{\text{Value of Bond}}$$

- If there are multiple risk-free rates given in the question then we can follow one of the below approaches:
 - **Aggressive approach:** Take risk-free rate as higher rate
 - **Conservative approach:** Take risk-free rate as lower rate
 - **Moderate approach:** Take average as risk-free rates. Follow this approach if problem is silent
- **Hidden risk-free rate of return:** There could be a portfolio of securities given in the question and one of the securities can have a Beta of 0 times. If any security has Beta of 0 time, then the same will be taken as risk-free rate of return

Example:

RBI has closed the latest auction for Rs.2,500 crores of 182 days bills for the lowest bid of 4.3% although there were bidders at a higher rate of 4.6% also for lots less than Rs.10 Crores. What should be taken as risk-free rate if you want to follow an aggressive approach?

- 4.45%
- 4.60%
- 4.30%

Answer:

Aggressive approach is to consider higher rate of 4.60%

8. Risk Premium of Market

- Market risk premium is the difference between market return and risk-free rate

- Return of market should **always be higher than risk-free rate and hence risk premium of market will always be positive**. However, some questions can give a scenario of negative risk premium and we should continue with same figures for solving the question

9. Beta

- Beta measures the performance of a security in relation to market
- Market has Beta of 1 Time and risk-free security has Beta of 0 Times**
- A security can have positive Beta or Negative Beta. Negative Beta indicates negative correlation between security and market
- Sensitivity of returns to market is also known as Beta**

$$\text{Formula 1: Beta} = \frac{(\sum XY - n(\text{Mean of X})(\text{Mean of Y}))}{\sum Y^2 - n(\text{Mean of Y})^2}$$

N = No. of observations; X = Rate of return of stock; Y = Rate of return of market

- This can be used if probability information is not given in question

$$\text{Formula 2: Beta} = \frac{\text{SD of Security}}{\text{SD of Market}} \times \text{Correlation coefficient}$$

- Formula 2 and 3 can be used if data on probability is there

$$\text{Formula 3: Beta} = \frac{\text{Covariance of Security and Market}}{\text{Variance of Market}}$$

Format 3: Format for Formula 1

Return of security (X)	Return of market (Y)	XY	Y ²

- Format 2 is to be used for formula 2 and formula 3
- Observation based on Beta Computation:** We should compute the required return as per CAPM for every year and compare the same with actual return of every year. Based on this, we can advise on whether to buy or sell the security in that year

Beta computation through price change:

The below formula is not an ideal method for calculating Beta, as price changes may not precisely align with market movements. Nevertheless, it is commonly employed to assess the price fluctuation of a security in relation with the overall market (extensively applied in derivative chapter)

$$\text{Beta} = \frac{\% \text{ change in security}}{\% \text{ change in market}}$$

Example:

Correlation co-efficient of security A and Market = 0.80; SD of Security A = 20%; SD of market = 25%. How much is the Beta of Security A?

- 0.80 Times
- 0.64 Times
- 1 Time
- 1.25 Times

Answer:

$$\text{Beta} = \frac{\text{SD of Security}}{\text{SD of Market}} \times \text{Correlation coefficient} = \frac{0.20}{0.25} \times 0.80 = 0.64 \text{ Times}$$

Example:

What is the beta of Hamburg Corp.'s stock if the covariance of the stock with the market portfolio is 0.23, and the standard deviation of the market returns is 32%?

- 1.65
- 0.72
- 1.40
- 2.25

Answer:

$$\text{Beta} = \frac{\text{Co - variance of security and market}}{\text{Variance of market}}$$

$$\text{Beta} = \frac{0.23}{0.32 \times 0.32} = 2.25$$

Example:

A security moved up by 12% when the market moved down by 6%. How much is the beta of the security?

- 2 times
- 2 times
- 0.5 times
- 0.5 times

Answer:

$$\text{Beta} = \frac{\% \text{ change in security}}{\% \text{ change in market}} = \frac{12}{-6} = -2 \text{ Times}$$

Example:

Compute Beta of Security A with the help of following information:

	Year 2007	Year 2008	Year 2009
Market (%)	12.0	11.0	9.0
Company A (%)	13.0	11.5	9.8

- 2 Times
- 1.2536 times
- 0.9250 times
- 1.0836 Times

Answer:

Year	Company A return (X)	Market return (Y)	XY	Y ²
2007	13	12	156	144
2008	11.5	11	126.5	121
2009	9.8	9	88.2	81
Sum	34.3	32	370.7	346
Average	11.43	10.67		

$$\text{Beta} = \frac{(\sum XY - n(\text{Mean of X})(\text{Mean of Y}))}{\sum Y^2 - n(\text{Mean of Y})^2}$$

$$\text{Beta} = \frac{(370.7 - 3(11.43)(10.67))}{346 - 3(10.67^2)} = \frac{4.8257}{4.4533} = 1.0836 \text{ Times}$$

10. Beta (Bullish vs Bearish Market)

- High-beta companies are anticipated to deliver **high returns** accompanied by increased risk. Conversely, low-beta companies are expected to yield **lower returns** with comparatively lower risk
- During a **bull market**, where the market is on an upswing, investing in **high-beta companies** is advisable for the potential of substantial returns. In contrast, during a **bearish market**, characterized by a downturn, it is prudent to consider investments in **low-beta companies** to mitigate potential losses

Example:

Stock market is expected to be in bullish phase. You have shortlisted 5 securities from the market and want to invest in 3 with a minimum of 20% in each of the securities to diversify the risk. Identify the securities and proportion of investment.

Company	Beta
S Limited	1.60
K Limited	1.00
P Limited	-0.30
D Limited	2.00
C Limited	0.60

- S Limited (60%), D Limited (20%) and K Limited (20%)
- D Limited (60%), S Limited (20%) and K Limited (20%)
- D Limited (33.33%), S Limited (33.33%) and K Limited (33.33%)
- D Limited (50%), S Limited (25%) and K Limited (25%)

Answer:

We should invest maximum in securities **having higher Beta to maximize returns** in bull phase. We are required to invest in three securities with minimum investment of 20%. **Hence, we can invest 60% in highest Beta Security, 20% in next security and balance 20% in third security.**

Example:

Particulars	Sec A	Sec B	Sec C
Return	12%	14%	16%

- Construct maximum number of portfolio if each portfolio consists of any two Company's shares in proportion of 65% and 35%
- Which Portfolio would give maximum return

Answer:

- 65% of Sec A and 35% of Sec B
- 65% of Sec B and 35% of Sec A
- 65% of Sec A and 35% of Sec C
- 65% of Sec C and 35% of Sec A
- 65% of Sec B and 35% of Sec C
- 65% of Sec C and 35% of Sec B

Maximum Return:

- We should invest 65% in highest return security (Security C) and 35% in the next highest return security (Security B)

11. Beta vs Standard Deviation

- Beta and Standard Deviation are measures of risk with different utility
- Beta** is useful to assess risk of **diversified portfolio** whereas **Standard Deviation** is useful for assessing risk of **undiversified portfolio**

12. Concept of fair/Equilibrium return and fair/Equilibrium beta

- Fair /Equilibrium Return refers to the return to be earned as per CAPM formula. **This is computed using Actual Beta.**
- Fair/Equilibrium Beta refers to the Beta which a security should possess in alignment with the return it gives. **This is computed using Actual Return**
- To summarize Fair return can be computed with Actual Beta and Fair Beta can be computed with Actual Return**

Example:

Return of Security = 20%; Return of market = 15%; Risk-free rate = 10%; Beta of security = 0.50 Times

Fair Return Analysis:

- Fair return/CAPM Return = $R_f + \text{Beta} \times (R_m - R_f)$
- Fair return/CAPM Return = $10 + 0.50 \times (15 - 10) = 12.50\%$
- Security should generate return of 12.50% whereas it is generating return of 20%. This is a case of undervalued company and hence share must be bought.

Fair Beta Analysis:

- Return = $R_f + \text{Beta} \times (R_m - R_f)$
- $20 = 10 + \text{Beta} \times (15 - 10)$
- Fair Beta = 2 Times
- Security should have Beta of 2 Times whereas it has Beta of 0.5 Times. Hence security carries lower risk and hence we should buy security

13. Risk of Portfolio Relative to Market

- We can comment on riskiness of our portfolio in relation to the market by comparing Actual Beta with Equilibrium Beta

Actual Beta = Equilibrium Beta	Optimum risk
Actual Beta > Equilibrium Beta	High Risk
Actual Beta < Equilibrium Beta	Low Risk

14. Decision on Purchase/Sale of Security

- We can decide on making fresh investments/liquidation of security by computing Beta of security.

- Beta will help us in calculating required return and same can be compared with actual return.

Actual Return = Required Return	Correctly Valued	No Action
Actual Return > Required Return	Under-valued	Buy
Actual Return < Required Return	Over-valued	Sell

Example:

The expected returns and Beta of three stocks are given below

Stock	A	B	C
Expected Return	18	11	15
Beta Factor	1.7	0.6	1.2

If the risk free rate is 9% and the expected rate of return on the market portfolio is 14% which of the above stocks are over, under or correctly valued in the market? What shall be the strategy?

Answer:

Stock	Required Return	Expected Return	Valuation	Decision
A	17.50 $9 + 1.7 \times (14 - 9)$	18.00	Under-valued	Buy
B	12.00 $9 + 0.6 \times (14 - 9)$	11.00	Over-valued	Sell
C	15.00 $9 + 1.2 \times (14 - 9)$	15.00	Correctly valued	Hold

15. Portfolio Beta

- Portfolio Beta is the weighted average of beta of individual securities. The same would be computed using below format

Security	Beta	Weight	Product

- Portfolio Beta can be altered by adding/removing securities. It can also be altered by borrowing/investing in risk-free security
- Replacing security with NIFTY/SENSEX:** An investor can replace a security with NIFTY/SENSEX if the beta of security is 1 time. This would ensure that overall beta would remain same

Example:

M/s. Siri Ltd. Has a surplus amount of Rs. 3 crores to invest and has shortlisted the following equity shares:

Company	Beta
S Limited	1.60
K Limited	1.00
P Limited	-0.30
D Limited	2.00
C Limited	0.60

How much is the portfolio Beta if 50% is invested in highest Beta Security, 20% is invested in lowest Beta Security and balance is distributed equally among balance securities?

Security	Beta	Weight	Product
S Ltd	1.60	0.10	0.16
L Ltd	1.00	0.10	0.10
P Ltd	-0.30	0.20	-0.06
D Ltd	2.00	0.50	1.00
C Ltd	0.60	0.10	0.06
Total			1.26

Portfolio Beta = 1.26 Times

16. Target Portfolio Beta

- An investor can work with a target beta and would want to fix the weights for achieving the target Beta. This can be computed by using the weighted average format.

Example:

An investor is targeting overall Beta of 2 Times. He wants to invest in Security A (Beta of 1.5 Times) and Security B (Beta of 3 Times). What should be the composition to achieve target Beta?

Security	Beta	Weight	Product
Sec A	1.50	A	1.5A
Sec B	3.00	1-A	3-3A
Total	2	1	1.5A + 3 - 3A = 2

- $1.5A + 3 - 3A = 2$
- $-1.5A = -1$

$$\text{Investment in Security A} = \frac{1}{1.5} = 0.6667$$

$$\text{Investment in Security B} = 1 - 0.6667 = 0.3333$$

17. Systematic Risk and Unsystematic Risk

- **Systematic risk/non-diversifiable risk** will impact all companies in the economy and cannot be avoided by diversification. **It arises due to macro factors like GDP growth/unemployment rates etc.**
- **Unsystematic risk/diversifiable risk** will impact a **specific company** and arises due to business and financial risk of specific company. This is also known as **specific SD/residual risk/random error**

Computation of Systematic Risk/Unsystematic Risk:

Systematic Risk = Numerator of F2 of Beta Calculation

$$\text{Beta} = \frac{\text{SD of Security}}{\text{SD of Market}} \times \text{Correlation coefficient}$$

$$\text{Beta} \times \text{SD of Market} = \text{SD of Security} \times \text{Correlation Coefficient}$$

- Either left-hand side or right-hand side of the equation can be used as Correlation Coefficient

Particulars	Variance Approach	SD Approach
Total Risk	Variance of security	SD of security
	(Beta of security x SD of market) ² (or) (SD of security x COR _{sm}) ²	Beta of security x SD of market (or) SD of security x COR _{sm}
Systematic Risk		
Unsystematic Risk	Total risk - Systematic risk	Total risk - Systematic risk

Example:

SD of Security = 20; SD of Market = 10; Correlation of Security and Market = 0.25 Times

Particulars	Variance Approach	SD Approach
Total Risk	20 x 20 = 400	20
Systematic Risk	(SD of Security x Cor _{sm}) ² = (20 x 0.25) ² = 25	SD of Security x Cor _{sm} = 20 x 0.25 = 5
Unsystematic Risk	400 - 25 = 375	20 - 5 = 15

Example:

Total risk of security (SD) = 0.20. Security has perfect positive correlation with market. How much is the unsystematic risk as per SD approach?

- 0.20
- 0
- 0.10

Answer:

- Security has perfect positive correlation and hence has correlation coefficient of +1
- Systematic risk = SD of security x Correlation = 0.20 x 1 = 0.20
- Unsystematic risk = 0.20 - 0.20 = 0

Example:

Ashwin, CA, examines data for two computer stocks, AAA and BBB, and derives the following results: Standard deviation for AAA is 0.50. Standard deviation for BBB is 0.50. Standard deviation for the Nifty is 0.20. Correlation between AAA and the Nifty is 0.60. Beta for BBB is 1.00. Ashwin wants you to identify

the stock with the highest systematic and unsystematic risk. _____ has the highest systematic risk and _____ has the highest unsystematic risk

- AAA and AAA
- AAA and BBB
- BBB and BBB
- BBB and AAA

Answer:

Beta of AAA = $\left(\frac{0.50}{0.20}\right) \times 0.60 = 1.50$. Hence AAA has highest Beta (systematic risk)

- Unsystematic risk of AAA = $0.50 - (1.50 \times 0.20) = 0.20$
- Unsystematic risk of BBB = $0.50 - (1 \times 0.20) = 0.30$
- Hence BBB has highest unsystematic risk. So AAA has highest systematic risk and BBB has highest unsystematic risk**

18. Portfolio risk through Markowitz/Sharpe Approach**Markowitz Approach:**

- Markowitz approach uses correlation between each pair of securities to compute Portfolio Risk
- Formula for the same is provided in the section of Portfolio Return and Portfolio Risk Above

Sharpe Approach:

- Sharpe Approach considers co-movement between securities due to change in the market index
- Total risk (Variance) of portfolio as per Sharpe Index Model = Systematic risk of portfolio + Unsystematic risk of portfolio
 - Systematic risk of portfolio = $(\text{Beta of portfolio} \times \text{SD of market})^2$
 - Unsystematic risk = $(W_1^2 \times \text{Unsystematic risk}) + (W_2^2 \times \text{Unsystematic risk}) + (W_n^2 \times \text{Unsystematic risk})$

Example:

Unsystematic risk as per variance approach of Security A = 0.02; Unsystematic risk as per variance approach of Security B = 0.05; Weight of security A = 80%; Weight of Security B = 20%. How much is portfolio unsystematic risk?

- 0.026
- 0.035
- 0.0148
- None of the above

Answer:

- Unsystematic risk = Weighted average of individual unsystematic risk with weights square being the assigned weights
- Unsystematic risk = $[0.02 \times 0.80 \times 0.80] + [0.05 \times 0.20 \times 0.20] = 0.0148$

Example:

A portfolio has been constructed with the following features:

Security	B	Random Error, $\sigma_{\epsilon i}$	Weight
A	1.50	6	0.50
B	1.10	10	0.50

Find out the unsystematic risk of the portfolio given that the standard deviation of the market index is 20%.

Answer:

- Random error is basically unsystematic risk. $\sigma_{\epsilon i}$ would mean as per SD approach and hence we square the same for variance approach. **[This is not fully logical but lack of information and hence we square SD based unsystematic risk to get variance based unsystematic risk]**

Portfolio unsystematic risk = $[6 \times 6 \times 0.5 \times 0.5] + [10 \times 10 \times 0.50 \times 0.50] = 34$

19. Co-efficient of determination

- Co-efficient of determination measures systematic risk as a percentage of total risk

Coefficient of determination = $\frac{\text{Systematic risk}}{\text{Total Risk}}$

- The coefficient of determination is referred to as "r" when calculated using the SD approach and denoted as "r²" when determined through the variance approach

- Coefficient of determination under SD approach is equal to Correlation coefficient

Example:

Co-efficient of determination (r) = 0.80; Total variance = 400. How much is the unsystematic risk as per variance approach?

- 80
- 320
- 256
- 144

Answer:

- Coefficient of determination as per variance approach (r^2) = $0.80 \times 0.80 = 0.64$
- Systematic risk = $400 \times 0.64 = 256$
- Unsystematic risk = $400 - 256 = 144$

20. Investment with margin of 40%

- This would mean that we have borrowed money to the extent of 40% and made 140% investment in risky portfolio
- Portfolio return = $[140\% \times \text{Return of Risky Portfolio}] - [40\% \times \text{cost of borrowing}]$
- Portfolio risk = 140% of Risk of Risky Portfolio

Example:

Return of risky portfolio = 20%. You have invested with a margin of 50% and cost of borrowing is 10%. How much is the return of investor?

- 20%
- 10%
- 30%
- 25%

Answer:

- Investment in risky portfolio = 1.5 Times; Borrowing = -0.5 times
- Return = $[20\% \times 1.5] + [10\% \times -0.5] = 25\%$

Example:

SD of risky portfolio = 20%. You have invested with a margin of 50% and cost of borrowing is 10%. Risk-free rate is 10%. How much is the risk of investor?

- 30%
- 20%
- 10%
- 25%

Answer:

SD of combination of risky portfolio and risk-free asset = $[\text{SD of risky portfolio} \times \text{weight of risky portfolio}] = [20 \times 1.50] = 30\%$

21. Fully Diversified Portfolio

- A fully diversified portfolio does not carry unsystematic risk. Hence total risk of fully diversified portfolio = Systematic risk of fully diversified portfolio
- Return due to sheer skill of portfolio manager = Alpha = Actual return - required return as per CAPM
- Return due to excess risk taken by Portfolio Manager = Required return as per CAPM for higher Beta - Market return (beta of 1)

Example:

A portfolio has Beta of 1.5 Times. Risk-free rate is 6% and market return is 9%. How much of the portfolio return is attributable to the higher risk assumed by portfolio manager?

- 3%
- 4.50%
- 1.50%
- 9.00%

Answer:

Required return for Beta of 1.5 Times = $6 + 1.50 \times (9 - 6) = 10.50\%$ Return of market is 9% for Beta of 1 Time. Required return of portfolio A is 10.50% for Beta of 1.50 Times **Excess return due to higher risk = $10.50\% - 9.00\% = 1.50\%$**

Example:

SD of Portfolio A = 2.6250; SD of market is 1.0000. Portfolio A is fully diversified. How much is the Beta of Portfolio A?

- 1 Times
- 2 Times
- 2.6250 Times
- 1.62 Times

Answer:

Portfolio is fully diversified and hence total risk is equal to systematic risk

$$2.6250^2 = (\text{Beta} \times \text{SD of market})^2; 2.6250 = \text{Beta} \times 1; \text{Beta of security} = 2.6250 \text{ Times}$$

22. Characteristic Line, CML and SML**Characteristic Line:**

- **Characteristic Line = Alpha + (Beta x Return of market)**
- **Characteristic line is stock specific**
- Alpha = Actual return - required return
- Required return = Beta x return of market

Security Market Line (CAPM Equation)

- SML measures risk through Beta - useful for diversified portfolio
- **SML Equation: $R_f + \text{Beta} \times (R_m - R_f)$**
- Equation is not stock specific and can be used for any company

Capital Market Line (CML)

- CML measures risk through SD - useful for undiversified portfolio

$$\text{CML Equation: } R_f + \frac{\text{SD of Security}}{\text{SD of Market}} \times (R_m - R_f)$$

- Equation is not stock specific and can be used for any company

Example:

Return of Security A = 12%; Beta of Security A = 2 Times; Return of market = 8%; Risk-free rate = 6%. What is the characteristic line of Security A?

- +4% + (2 x Return of market)
- 4% + (2 x Return of Market)
- +2% + (1 x Return of Market)
- 2% + (1 x Return of Market)

Answer:

- Required return as per characteristic line = Beta x Return of Market = 2 x 8% = 16%
- Alpha = Actual return - required return = 12% - 16% = -4.00%
- Characteristic Line = Alpha + (Beta x Return of Market)
- **Characteristic Line = -4.00% + (2 x Rm)**

Example:

SD of Security A = 12%; Beta of Security A = 1.5 Times; SD of market = 6%; Risk-free rate = 6%. Return of Market = 10%. How much is the required return as per Security Market Line and Capital Market Line?

- 14% and 12%
- 12% and 14%
- 10% and 14%
- 14% and 10%

Answer:

$$\text{Required return as per SML} = R_f + \text{Beta} \times (R_m - R_f) = 6 + 1.50 \times (10 - 6) = 12.00\%$$

$$\text{Required return as per CML} = R_f + \frac{\text{SD of Security}}{\text{SD of Market}} \times (R_m - R_f) = 6 + \left(\frac{0.12}{0.06} \times (10 - 6) \right) = 14.00\%$$

Hence answer is 12% and 14%

23. Alpha

- Alpha refers to excess/deficit return earned by security/portfolio. **This is calculated by comparing the actual return with required return**
- **Required return:** Required return can be computed using the following approaches:
 - **Diversified portfolio (CAPM Approach):** $R_f + \text{Beta} \times (R_m - R_f)$
 - **Undiversified portfolio (CML Approach):** Required return using the below formula

$$\text{Capital Market Line} = R_f + \frac{\text{SD of Security}}{\text{SD of Market}} \times (R_m - R_f)$$

- **Characteristic Line Approach:** Beta x Return of Market
- Alpha = Actual return – required return

24. Computation of R_m and R_f using two SML Equations

- If expected return and Beta of 2 securities are given in question, **then we can form two CAPM equations (SML equations).**
- We should solve those 2 equations we will be able to calculate market return and risk-free rate of return.

Example:

Security A has Beta of 1.50 Times and required return of 15.00%. Security B has Beta of 0.50 Times and required return of 10.00%. How much is the risk-free rate and market return?

- 5% and 10%
- 8% and 13%
- 7.5% and 12.50%

Answer:

Required Return = R_f + Beta x (R_m – R_f)

$$15.00\% = R_f + (1.50 \times R_p)$$

$$10.00\% = R_f + (0.50 \times R_p)$$

Solving the equation, we get risk premium as 5.00% and get risk-free rate as 7.50%

Hence risk-free rate is 7.50% and return of market is 12.50%

25. Arbitrage Pricing Theory

- CAPM Model computes the required return based on single factor (Beta). However, a security return can be dependent on **multiple factors such as GDP growth/Unemployment/Interest rates/Income level**. This limitation of CAPM is addressed in APT Model
- **Formula 1:** Required return under APT = R_f + [Factor 1 x Risk (or) Return premium of Factor 1] + [Factor 2 x Risk (or) Return premium of Factor 2] + [Factor 3 x Risk (or) Return Premium of Factor 3]
- **Formula 2:** Required Return = R_f + [(Expected value – Actual Value of Factor 1) x beta of Factor 1] + [(Expected value – Actual value of Factor 2) x Beta of Factor 2] + [(Expected value – Actual value of Factor 3) x Beta of Factor 3]

Note: This is the formula given in ICAI study material. However, for Nov 2023 exam question ICAI has applied the same as Actual value – Expected value. Hence this type of question can become challenging in exam as we are not sure what formula ICAI will use in exam.

Example:

Assume you are attempting to estimate the equilibrium expected return for a portfolio using a two-factor arbitrage pricing theory (APT) model. One factor is changes in the 30-year T-bond rate and the other factor is the percentage growth in gross national product (GNP). Assume that you have estimated the risk premium for the interest rate factor to be 0.02, and the risk premium on the GNP factor to be 0.03. The sensitivity of the portfolio to the interest rate factor is -1.2 and the portfolios sensitivity to the GNP factor is 0.80. Given a risk free rate equal to 0.03, what is the expected return for the asset?

- 5.0%.
- 7.0%
- 2.4%.
- 3.0%.

Answer:

Return under APT = Risk-free rate + [Factor 1 Beta x Risk premium] + [Factor 2 Beta x Risk premium]

$$\text{Return under APT} = 3\% + [-1.20 \times 2\%] + [0.80 \times 3\%] = 3.00\%$$

Example:

Mr. Tamarind intends to invest in equity shares of a company the value of which depends upon various parameters as mentioned below:

Factor	Beta	Expected Value %	Actual Value %
GNP	1.20	7.70	7.70
Inflation	1.75	7.00	5.50

If the risk free rate of interest be 9.25%, how much is the return of the share under Arbitrage Pricing Theory?

- a. 9.25%
- b. 11.88%
- c. 6.63%
- d. 17.40%

Answer:

- Return under APT = Risk free rate + (Factor 1 Beta x (EV - AV)) + (Factor 2 Beta x (EV - AV))
- Return under APT = 9.25 + (1.20 x 0) + (1.75 x 1.50) = 11.88%

26. Beta and Leverages

- A company may invest in multiple business and the weighted average of beta of various business would give the **company beta/Asset Beta**.

Format:

Asset	Beta	Weight	Product

- A company will have multiple liabilities and the weighted average of beta of various liabilities would give the **company beta/Liability Beta**

Format:

Liability	Beta	Weight	Product

- Beta computed as per Point (a)/Point (b) would match. **Hence Liability side Beta = Assets side Beta**
- We can use Asset Beta to compute the equity Beta. Equity Beta will provide us Cost of Equity
- **The overall beta of a firm is constant irrespective of capital structure.** As we introduce more debt in the capital structure the beta of equity will change in such a way that overall beta remains same

Impact of Taxes:

- In case of taxes, **weight of debt will be replaced with Debt x (1 - Tax Rate)** in Beta computation

Proxy Beta:

- Asset beta of a company can be taken as average Beta of Proxy Companies.
- Proxy company beta can be computed from their Assets side/Liabilities side.

Levered vs Unlevered Beta:

- Unlevered beta is the **beta of the assets side ignoring capital structure**. Hence unlevered beta is otherwise Asset beta/overall beta
- Levered Beta **factors the risk due to debt in capital structure**. Hence **levered beta is otherwise known as equity beta/stock beta**

Example:

Affluence Inc. is considering whether to expand its recreational sports division by embarking on a new project. Affluence's capital structure consists of 75% debt and 25% equity and its marginal tax rate is 30%. Aspire Brands is a publicly traded firm that specializes in recreational sports products. Aspire has a debt-to-equity ratio of 1.7, a beta of 0.8, and a marginal tax rate of 35%. Using the pure-play method with Aspire as the comparable firm, the project beta Affluence should use to calculate the cost of equity capital for this project is closest to:

- a. 0.58
- b. 1.18
- c. 0.38
- d. 1.12

Answer:

Computation of Asset Beta of Proxy Entity:

Source	Beta	Weight	Product
Debt	0.00	1.105	0.00

		[1.7 x 65%]	
Equity	0.80	1.00	0.80
Overall	0.38	2.105	0.80

Computation of equity Beta of Affluence:

Source	Beta	Weight	Product
Debt	0.00	52.50 [75 x 70%]	0.00
Equity	1.18	25	29.45
Overall	0.38	77.50	29.45

Equity Beta of Affluence = 1.18 Times

Example:

Two companies are identical in all aspects except capital structure. ABC Limited has a debt-equity ratio of 1:4 and its equity has beta of 1.1. XYZ Limited has a debt-equity ratio of 3:4. Income tax is 30%. Estimate equity beta of XYZ Limited?

- 0.9362 Times
- 1.4277 Times
- 1.10 Times
- 3.30 Times

Answer:**Computation of overall Beta of ABC Limited**

Source	Beta	Weight	Product
Equity	1.10	4	4.40
Debt	0	0.7	0
Overall	0.9362	4.70	4.40

Computation of Equity Beta of XYZ Limited

Let us assume equity beta of XYZ Limited to be A

Source	Beta	Weight	Product
Equity	A	4	4A
Debt	0	2.1	0
Overall	0.9362	6.1	5.7108 [0.9362 x 6.10]

$$4A = 5.7108; A = \frac{5.7108}{4} = 1.4277 \text{ Times}$$

Equity Beta of XYZ Limited = 1.4277 Times

27. Portfolio Strategies

- Buy and Hold Policy - Rebalancing is not done
- Constant mix policy = Rebalancing of debt and equity is done on every event. Event can be defined as fixed period/fixed change in value
- Constant proportion Portfolio Insurance - Rebalancing is done. Refer steps below for more details

Steps for CPPI:

- Step 1: Identify floor value**
 - Floor value would be provided by the investor. This is the maximum drop in investment value acceptable to the investor.
 - Floor value = Total investment - Maximum % fall in Nifty
- Step 2:** Investment in equity = Multiplier x (Total value - Floor Value)
- Step 3:** Investment in debt = Total value - Investment in equity

Example:

You have created a portfolio of Rs.2,00,000 with equal investment in debt and equity. Equity market has declined from 100 to 80 and revived from 80 to 125. How much is the maturity value under buy and hold policy?

- 2,00,000
- 1,80,000
- 2,25,000
- 2,30,625

Answer:

$$\text{Maturity value of equity} = \frac{1,00,000}{100} \times 125 = 1,25,000$$

$$\text{Maturity value of debt} = 1,00,000$$

$$\text{Total maturity value} = 1,25,000 + 1,00,000 = \text{Rs.}2,25,000$$

Example:

You have created a portfolio of Rs.2,00,000 with equal investment in debt and equity. Equity market has declined from 100 to 80 and revived from 80 to 125. How much is the maturity value under constant mix policy?

- 2,00,000
- 1,80,000
- 2,25,000
- 2,30,625

Answer:

Particulars	Day 1	Fall before	Fall after	Maturity
		80,000		1,40,625
Equity	1,00,000	$[1,00,000 \times 80/100]$	90,000	$[90,000 \times 125/80]$
Bond	1,00,000	1,00,000	90,000	90,000
Total Value	2,00,000	1,80,000	1,80,000	2,30,625

Example:

Expected Maximum decline in stock market = 10%; Value of portfolio = 10,00,000. How much can be the investment in equity with a multiplier of '2' as per constant proportion portfolio insurance policy?

- 1,00,000
- 2,00,000
- 9,00,000
- 8,00,000

Answer:

- Floor value = Investment - Maximum decline = 10,00,000 - 10% = Rs.9,00,000
- Investment in equity = $2 \times [\text{Portfolio value} - \text{Floor value}] = 2 \times [10,00,000 - 9,00,000] = 2,00,000$

28. Minimum Risk Portfolio

- Portfolio risk is dependent on following variables
 - Risk of individual securities
 - Correlation coefficient between various securities
- Hence a combination of negative correlation securities can give a portfolio risk which is **lower than minimum risk security**

Optimum weights with 2 securities:

$$\text{Weight of Security 1} = \frac{\text{Variance of Security 2} - \text{Covariance of 1 and 2}}{\text{Variance of security 1} + \text{Variance of Security 2} - 2\text{Covariance of 1 and 2}}$$

$$\text{Weight of security 2} = 1 - \text{weight of security 1}$$

Three Securities:

- We will need two portfolios which are currently having minimum risk. **Using this data, we can identify a third portfolio which has minimum risk**
- We will have to fit a critical line between weights of two securities
- Equation:** Weight of Security 1 = a + b (Weight of Security 2)
- We will have to solve two equations. Get value of A and B
- Find out the optimum weights by Substituting the values in above equation

Example:

Portfolio 1 = Security A = 50%, Security B = 25% and Security C = 25%

Portfolio 2 = Security A = 70%, Security B = 20% and Security C = 10%

Requirement: Identify a portfolio 3 where we want to invest 60% in Security A. How much should be the investment in Security B and C.

Critical line between A and B:

$$\text{Weight of Security A} = a + b \text{ (weight of Security B)}$$

$$0.50 = a + 0.25b \dots\dots\dots \text{(Equation 1)}$$

$$0.70 = a + 0.20b \dots\dots\dots \text{(Equation 2)}$$

Solving equations, we get $b = -4$ and $a = 1.5$

Critical line: Weight of Security A = $1.50 - 4(\text{Weight of Security B})$

Creation of portfolio with Security A, B and C:

- Weight of security A = 0.60
- Weight of Security A = $1.50 - 4(\text{Weight of Security B})$
- $0.60 = 1.50 - 4(\text{Weight of Security B})$
- **Weight of Security B = 0.225 (or) 22.50%**
- **Weight of Security C = $1.00 - 0.60 - 0.225 = 0.175$ (or) 17.50%**

More than Three Securities:

- **Step 1:** Rank the various securities in the order of Treynor Ratio (TR)
- **Step 2:** Rearrange the securities on the basis of ranking
- **Step 3:** Compute cut-off point

Format for Computation:

Sec	TR	Beta	USR	SR	$\frac{SR}{USR}$	$TR \times \left(\frac{SR}{USR}\right)$	$\sum TR \times \left(\frac{SR}{USR}\right)$	$\sum \left(\frac{SR}{USR}\right)$	$1 + \sum \left(\frac{SR}{USR}\right)$	Cur-off

Note:

- TR = Treynor Ratio
- USR = Unsystematic Risk
- SR = Systematic Risk = Beta x Beta x Variance of Market
- **Cut-off Point = Column 8/Column 10**
- **Step 4:** Maximum cut-off value is taken as final cut-off point. Securities with TR > cut-off point will form part of final portfolio
- **Step 5:** Compute Z value and weights (in proportion of Z value)

$$Z \text{ value} = \text{Excess cutoff} \times \left(\frac{\text{Beta}}{USR}\right)$$

$$\text{Excess cutoff} = \text{Treynor Ratio} - \text{Cutoff point}$$

Example:

Variance of Security 1 = 167.75; Variance of security 2 = 126.98; Covariance between Security A and B is -144.25; How much should be the investment in Security 1 to formulate a minimum risk portfolio?

- 0.50
- 0.4650
- 0.5350
- 0.75

Answer:

$$\text{Weight of Security 1} = \frac{\text{Variance of Security 2} - \text{Covariance of 1 \& 2}}{\text{Variance of Security 1} + \text{Variance of Security 2} - 2\text{Covariance of 1 \& 2}}$$

$$\text{Weight of Security 1} = \frac{126.98 + 144.25}{167.75 + 126.98 + 2(144.25)} = \frac{271.23}{583.23} = 0.4650$$

Example:

An investor has found two portfolio which are on minimum risk.

Portfolio	Weight of A	Weight of B	Weight of C
1	0.50	0.25	0.25
2	0.70	0.20	0.10

He has decided to invest 20% of funds in Security A. How much should he invest in B and C to have a minimum risk portfolio?

- 0.475 and 0.325
- 0.325 and 0.475
- 0.40 and 0.40
- 0.25 and 0.55

Answer:

- Weight of Security A = $a + b$ (weight of Security B)
- $0.50 = a + 0.25b \dots\dots\dots \text{(Equation 1)}$
- $0.70 = a + 0.20b \dots\dots\dots \text{(Equation 2)}$

- Solving equations, we get $b = -4$ and $a = 1.5$

Critical line:

- Weight of Security A = $1.50 - 4(\text{Weight of Security B})$
- $0.20 = 1.50 - 4(\text{Weight of Security B})$
- $4(\text{Weight of Security B}) = 1.30$
- **Weight of Security B = $1.30/4 = 0.325$**
- **Weight of Security C = $1 - 0.325 - 0.20 = 0.475$**

29. Real Estate Valuation**Approach 1 (Based on credit side of P&L - Sales Comparison approach)**

- Value of property = Area in square feet x Adjusted selling price per square feet

Approach 2 (Based on debit side of P&L - cost approach):

- Value of property = Area in square feet x (Construction cost and others per square feet)

Approach 3 (Based on income (Credit - debit):

$$\text{Value of property} = \frac{\text{Perpetual income}}{\text{Capitalization rate}}$$

Approach 4 (Based on cash flows)

- Value of property = PV of future cash flows (rent and property price) discounted at investor required rate of return

Example:

Assume that a property has a gross annual income equal to Rs.150,000, and that comparable properties have a gross income multiplier equal to 11.25. The gross income multiplier approach provides a market value for this property that is closest to:

- 16,25,000
- 13,33,333
- 16,87,500
- 20,00,000

Answer:

$$\text{Value of property} = 1,50,000 \times 11.25 = \text{Rs.}16,87,500$$

Example:

A real estate investment is likely to generate cash flows of Rs.70,000, Rs.50,000 and Rs.65,000 over next three years. The terminal value of property at end of year 3 is estimated as Rs.3,00,000. Assuming a required rate of return of 8 percent, determine the fair value of property?

Answer:

Year	Cash flow	PVF @ 8%	DCF
1	70,000	0.926	64,820
2	50,000	0.857	42,850
3	3,65,000	0.794	2,89,810
Fair value of property			3,97,480

Chapter 8 – Mutual Funds

Overview:

- MF Return vs Individual Return
- Holding period return vs Annualized Return
- Dividend Payout Plan vs Dividend Reinvestment Plan
- Computation of Annualized Return – Direct and Reverse Working
- Reverse-working of units – Dividend Reinvestment Plan and Growth Plan
- NAV computation
- Dividend Equalization
- MF – Performance Evaluation
- Tracking Error

1. MF Return vs Individual Return

$$\text{MF return} = \frac{\text{Own return}}{1 - \text{Initial expense ratio}} + \text{Annual expense ratio}$$

Example:

Mr. X can earn return of 12 percent on own. Initial expense ratio is 5% and annual expense ratio is 2%. How much should the MF earn to give investor return of 12%?

- 12.53
- 12
- 14
- 14.63

Answer:

$$\text{MF Return} = \frac{\text{Own return}}{1 - \text{IER}} + \text{AER} = \frac{0.12}{1 - 0.05} + 0.02 = 0.1263 + 0.02 = 0.1463 \text{ or } 14.63\%$$

2. MF Return vs Individual Return – Opportunity Cost

A person is required to spend time while investing on his own. However, investing through mutual fund will save this time and hence the same can give extra income to investor. If a question gives data on this, then we should prepare a cost-benefit analysis of own investing vs MF investing [Formula based calculation will not be possible]

Example:

Mr. X can earn 15 percent on own. The MF will give him return of 13 percent. Mr.X portfolio value is Rs.100 lacs. Mr.X is a chartered accountant and is currently earned professional income of Rs.45 lacs. Mr. X is spending 10 percent of time in managing his portfolio. If he spends this time on profession, his professional income will increase proportionately. What is the net gain/loss in investing in MF?

- Net loss of Rs.2 lacs
- Net gain of Rs.3 lacs
- Net gain of Rs.5 lacs
- Net gain of Rs.2 lacs

Answer:

Particulars	Calculation	Amount
Net loss in MF investment	100 lacs x 2%	(2,00,000)
Increase in professional income	90 = 45 lacs 10 = ?	5,00,000
Net benefit of investing in MF		3,00,000

3. Holding Period Return vs Annual Return

$$\text{Holding period return} = \frac{(\text{NAV}_1 - \text{NAV}_0) + D_1 + \text{CG}_1}{\text{NAV}_0} \times 100$$

$$\text{Annual return} = \frac{(\text{NAV}_1 - \text{NAV}_0) + D_1 + \text{CG}_1}{\text{NAV}_0} \times \frac{12}{m} \times 100$$

Example:

Opening NAV = Rs.20; Closing NAV at end of Month 3 = 21. Dividend paid in month 1 = Rs.2; Dividend paid in Month 2 = 0.50; Dividend declared but not yet paid in month 3 = 0.50. What is annualized return of investor?

- 20%

- b. 80%
- c. 17.5%
- d. 70%

Answer:

$$\text{Annual return} = \frac{\text{NAV}_1 - \text{NAV}_0 + D_1}{\text{NAV}_0} \times \frac{12}{m} \times 100 = \frac{21 - 20 + 3}{20} \times \frac{12}{3} \times 100 = 80\%$$

Note: Investor has earned dividends of Rs.3. It does not matter whether dividend is paid or not as the same would be paid over the near term and it would have impacted the NAV downwards

Example:

Holding period return for 6 months is 8%. How much is annualized return?

- a. 8%
- b. 16%
- c. 4%

Answer:

$$\text{Annual return} = \text{HP Return} \times \left(\frac{12}{m}\right) = 8 \times \left(\frac{12}{6}\right) = 16.00\%$$

4. Return for close-ended Schemes

- A closed-ended fund is an investment fund with a fixed number of units, which are traded on the open market like stocks.
- The Net Asset Value (NAV) of a closed-ended fund may differ from its market price, often trading at a premium or discount to the NAV.
- Therefore, when calculating returns or assessing performance, the opening and closing NAV should be adjusted to account for any premium or discount, as the market price may not directly reflect the NAV.

Example:

NAV as on 1.1.2014 was Rs.10. NAV as on 31.12.2014 is Rs.12. Dividend and capital gain distribution is Rs.0.50 and 1.50. On 31.12.2014 the unit was trading at discount of 2 percent whereas on 1.1.2014 it was trading at premium of 2 percent. How much is the annual return?

- a. 20%
- b. 40%
- c. 35.60%
- d. 34.90%

Answer:

Particulars	Calculation	Amount
Unit price as on 1.1.2014	10 + 2%	10.20
Unit price as on 31.12.2014	12 - 2%	11.76
Dividend and capital gain		2.00
Annual return	$\frac{(11.76 - 10.20) + 2.00}{10.20} \times 100$	34.90%

5. Return computation – Days vs Months

- If a question specifies that a **year consists of 365 or 360 days**, use this figure in the numerator to annualize the return based on the exact number of investment days (*Basically use days to compute annual return*). In cases without such information, calculate the return based on the investment period in months.
- The number of investment days is calculated as the difference between the redemption date and the investment date. The investment date itself may be included or excluded in the count, depending on your chosen assumption. [ICAI hasn't been consistent in including/excluding date of investment]

6. Total Yield of Investor

An MF investor can invest in different schemes and returns for each investment can be computed using the above formula. For total yield we should consider the below formula:

$$\text{Total Yield} = \frac{\text{Capital Gain} + \text{Dividend}}{\text{Total Amount invested}} \times 100$$

Example:

Compute total yield of investor from following information:

Particulars	MF 'X'	MF 'Y'	MF 'Z'
Initial investment	2,00,000	5,00,000	4,00,000
Capital gain	10,000	-44,000	16,000
Dividends	6,000	25,000	16,000

Answer:

$$\text{Total Yield} = \frac{(10,000 - 44,000 + 16,000) + (6,000 + 25,000 + 16,000)}{(2,00,000 + 5,00,000 + 4,00,000)} \times 100 = 2.64\%$$

7. Period of holding

Period of holding can be computed using annual return and holding period return

$$\text{Period of Holding} = \frac{\text{Holding Period Return}}{\text{Annual Return}} \times 365 \text{ days (or) 12 months}$$

Example:

Holding period return = 2.5%. Annual return = 12%. No of days in year = 365; What is the period of holding of investment?

- 76 days
- 75 days
- 1,752 days
- None of the above

Answer:

$$\text{Period of Holding} = \frac{\text{Holding Period Return}}{\text{Annual Return}} \times 365 = \frac{2.5}{12} \times 365 = 76 \text{ days}$$

8. Dividend Payout vs Dividend Reinvestment Plan

In a dividend payout plan, the investor will get dividend in Rupees and in case of dividend reinvestment plan dividend will get reinvested and we will get additional units (**Dividend Amount/Re-investment NAV**). Return for dividend payout plan would be computed as per the above formula. Return for dividend re-investment plan would be computed as per the below formula:

$$\text{Holding Period Return} = \frac{\text{Closing value} - \text{Opening investment}}{\text{Opening investment}} \times 100$$

$$\text{Annual Return} = \frac{\text{Closing value} - \text{Opening investment}}{\text{Opening investment}} \times \frac{12}{m} \times 100$$

Note:

Dividend rate is to be applied on face value of units to calculate dividend earned by the investor. This will also help in computing the number of units re-invested in dividend reinvestment plan

Example:

Mr. X invested Rs.1,00,000 when NAV was Rs.10 per unit. The fund declared income distribution of Rs.2 per unit and capital gain distribution of Rs.3 per unit. These amounts were re-invested at NAV of Rs.20 per unit. Closing NAV was Rs.30. What is the rate of return earned by the investor?

- 250%
- 275%
- 200%
- 100%

Answer:

Particulars	Calculation	Amount
Units purchased on day 0	1,00,000/10	10,000
Amount of dividend	5 × 10,000	50,000
Re-investment NAV		20.00
Dividend in units	50,000/20	2,500
Closing units	10,000 + 2,500	12,500
Closing value	12,500 × 30	3,75,000
Less: Investment		-1,00,000
Return in Rs.		2,75,000
Return in %	$\frac{2,75,000}{1,00,000} \times 100$	275.00%

9. Computation of closing units

Closing units of MF investor will not be equal to opening units in case of dividend re-investment or bonus issue. Following formats can be used for computing closing units:

Dividend Reinvestment Plan:

Date	Unit held (A)	Dividend		Reinvestment NAV (C)	New units (D = B/C)	Total units (A + D)
		%	Amount (B) (A x Face value x Dividend %)			

Bonus Plan:

Date	Unit held (A)	Bonus ratio	Bonus units (B = A x Bonus Ratio)	Total units (A + B)

Example:

Mr.X invested Rs.1,00,000 on 1.4.2010 (NAV of Rs.20; Face value of Rs.10). MF declared dividend of 20% on 1.4.2011 (NAV of Rs.25) and it declared dividend of 50% on 1.3.2012 (NAV of Rs.50). How many units will be allotted on 1.3.2012 due to dividend reinvestment?

- 400 units
- 500 units
- 540 units
- 1000 units

Answer:

Date	Unit held	Dividend		Reinvestment NAV	New units	Total units
		%	Amount			
1.4.2011	5,000 [1,00,000/20]	20%	10,000 [5,000 x 10 x 20%]	25.00	400.00 [10,000/25]	5,400 [5,000 + 400]
1.3.2012	5,400	50%	27,000 [5,400 x 10 x 50%]	50.00	540.00 [27,000/50]	5,940 [5,400 + 540]

Example:

Mr.X invested Rs.1,00,000 on 1.4.2015 when NAV was Rs.25 per unit. Bonus ratio was 1:4 on 1.10.2015, 1:5 on 1.4.2017, 2:5 on 1.4.2018. How many units will the investor have on 1.4.2018?

- 4,000 units
- 6,000 units
- 8,400 units
- 10,000 units

Answer:

Date	Unit held	Bonus ratio	Bonus units	Total units
1.10.2015	4,000 [1,00,000/25]	1:4	1,000 [4,000 x 1/4]	5,000
1.4.2017	5,000	1:5	1,000 [5,000 x 1/5]	6,000
1.4.2018	6,000	2:5	2,400 [6,000 x 2/5]	8,400

10. Taxation Impact

Cost of acquisition of bonus units will be taken as zero. Securities Transaction Tax is not allowed as tax deductible expense while computing long-term capital gain and short-term capital gain

11. Effective Yield

Effective yield is normally computed using the below formula:

$$\text{Annual Return} = \frac{\text{Closing value} - \text{Opening investment}}{\text{Opening investment}} \times \frac{12}{m} \times 100$$

However, the same can also be computed using IRR method if there is a single inflow and single outflow scenario and number of years map to a whole number.

Example:

Compute effective yield using annual return method and IRR method from following information:

- Amount invested on day 0 = Rs.2,00,000
- Amount received at end of year 5 = Rs.2,39,003

Return under Annual Return Method:

Particulars	Calculation	Amount
Amount received on maturity	5,915.93 x 40.40	2,39,003
Less: Amount invested		(2,00,000)
Return in Rs. for 5 years		39,003
Return per year	39,003/5	7,800.60
Return in %	$\left(\frac{7800.60}{2,00,000} \times 100 \right)$	3.90%

Return under IRR Method:

Year	Cash flow	PVF@3%	DCF	PVF@4%	DCF
0	-2,00,000	1	(2,00,000)	1	(2,00,000)
5	2,39,003	0.863	2,06,260	0.822	1,96,461
NPV			6,260		(3,539)

IRR	=	$L1 + \left(\frac{\text{NPV at L1}}{\text{NPV at L1} - \text{NPV at L2}} \right) \times (L2 - L1)$
IRR	=	$3 + \frac{6,260}{6,260 - (-3,539)} \times (4 - 3)$
IRR	=	3 + 0.64
IRR	=	3.64%

12. Front-end Load and Back-end Load**Formula for calculating front-end load:**

$$\text{Front - end Load} = \frac{\text{Public offer price} - \text{NAV}}{\text{NAV}}$$

Formula for calculating back-end load:

$$\text{Back - end Load} = \frac{\text{NAV} - \text{Redemption Price}}{\text{NAV}}$$

Note:

- Front-end load is otherwise called as entry load and is added to opening NAV
- Back-end load is otherwise called as exit load and is deducted from closing NAV

Example:

Unit price of MF is Rs.20. The public offer price is Rs.21. How much is the front-end load percent?

- 1 percent
- 5 percent
- 10 percent
- None of the above

Answer:

Front-end load (in Rs.) = Public offer price - NAV = 21 - 20 = 1.00

$$\text{Front - end Load (in \%)} = \frac{\text{Public offer price} - \text{NAV}}{\text{NAV}} = \frac{21 - 20}{20} \times 100 = 5.00\%$$

13. Exit Load vs Lower return from MF

An individual invested in a mutual fund (MF) might come across a fresh purchasing opportunity that promises improved returns. **Nonetheless, the MF investor could potentially incur an exit load if they choose to exit their current investment prematurely.** In this particular situation, it becomes essential to

evaluate the cost of the exit load in comparison to the potential loss in returns. Based on this assessment, a decision can be made regarding whether it's prudent to sell the mutual fund investment.

Example:

MF X has given annualized return of 9.733%, MF Y has given annualized return of -11.185% and MF Z has given annualized return of 15%. Period of holding in MF X, MF Y and MFZ is 300 days, 124 days and 195 days respectively. Past returns are likely to continue in future. Mutual fund is charging an exit load of 5% for redemption within one year. What action should investor take in MF X and MF Y?

- Redeem both MF X and MF Y
- Redeem MF X and don't redeem MF Y
- Redeem MF Y and don't redeem MF X
- Continue with both MF X and MF Y

Answer:**Decision on MF X:**

- Redemption of MF X would be invested in MF Z and this would give additional annualized return of 5.27% (15 – 9.733). The investor has currently held this for 300 days and holding this for another 65 days can help investor in saving exit load of 5%.
- Return loss in 65 days = $5.27 \times (65/365) = 0.94\%$.
- Investor will loss return of only 0.94% and save exit load of 5% and hence he should continue holding this for another 65 days. Hence MF X is not to be redeemed.

Decision on MF Y:

- Redemption of MF Y would be invested in MF Z and this would give additional annualized return of 26.19% (15 – (-11.185)). The investor has currently held this for 195 days and holding this for another 170 days can help investor in saving exit load of 5%.
- Return loss in 170 days = $26.19 \times (170/365) = 12.20\%$.
- Investor will loss return of 12.20% and save exit load of 5% and hence he should redeem MF Y immediately

Final answer:

- Redeem MF Y and don't redeem MF X

14. Net Asset Value

Net Asset Value (NAV) is the fair value per unit of Mutual Fund (MF). It basically signifies the realizable value that the investor will get for each unit.

$$\text{NAV} = \frac{\text{Market value of assets} - \text{Value of liabilities}}{\text{Number of units}}$$

- Assets of mutual fund include equity investment, debt investment, money market instrument, cash balance, receivables and other assets
- Liabilities of mutual fund include outstanding expenses, amount payable on shares and other payables

15. Computation of NAV when Opening net assets details are given and detailed break-up of assets and liabilities are not available:

In some questions, detailed information on assets and liabilities may not be provided, but the opening net assets will be available. Net assets will increase due to factors like portfolio appreciation, dividends received, income earned, and fresh inflows. Conversely, net assets will decrease due to portfolio depreciation, expenses, and redemptions. NAV will be computed in this manner:

$$\text{Closing NAV} = \frac{\text{Opening Network} + \text{Items increasing network} - \text{Items reducing network}}{\text{Opening units} + \text{New units issued} - \text{Redemptions}}$$

Example:

Total number of units on day 0 - 1,00,000; NAV on day 0 - 50; New units allotted on day 60 - 20,000 @ NAV of Rs.60; Portfolio appreciation for full year = 60 lacs; Units redeemed on day 120 - 10,000 @ NAV of Rs.120. What will be the closing NAV on day 365 post dividend payout of Rs.1 per unit?

- 100
- 120
- 99
- 119

Answer:

Particulars	Calculation	Amount
-------------	-------------	--------

Opening net assets	1,00,000 x 50	50,00,000
Add: Fresh Allotment	20,000 x 60	12,00,000
Add: Portfolio appreciation		60,00,000
Less: Redemption	10,000 x 120	-12,00,000
Closing net assets		1,10,00,000
Closing units	1,00,000 + 20,000 - 10,000	1,10,000
Closing NAV before dividend		100.00
Less: Dividend		-1.00
Closing NAV post dividend		99.00

16. Impact of fresh unit purchase/redemption on NAV

NAV of mutual fund does not change due to fresh inflow/redemption. This is because units change proportionately with change in Networth. NAV will change if there is a change in value of underlying assets of Mutual Fund

17. Impact of Dividend Declaration on NAV

NAV will fall by the amount of dividend once the same is declared by Mutual Fund

18. Cash Balance Computation to value NAV

If it is possible to track inflows and outflows of a mutual fund then we are required to compute closing cash balance by adding inflows and deducting outflows from opening cash balance. Closing cash balance will form part of assets for computing NAV.

Particulars	Amount
Opening Cash Balance (A)	XXX
Add: Receipts:	
Inflow from unit holders	XXX
Sale of shares	XXX
Dividend received	XXX
Interest received	XXX
Other income	XXX
Total Receipts (B)	XXX
Less: Payments:	
Purchase of shares	XXX
Expenses paid	XXX
Redemption of units	XXX
Dividends paid	XXX
Total Payments (C)	XXX
Closing Cash Balance (A+B-C)	XXX

19. Valuation of equity shares and bonds for NAV computation

Valuation of equity shares: Closing value of equity investments can be computed based on index value. It is computed using below formula:

$$\text{Closing value of equity} = \text{Amount invested} \times \frac{\text{Closing index value}}{\text{Index value on date of investment}}$$

Valuation of bonds: We can use the formula of current yield to value the bond if the interest rate on bond and investor expectation (yield) is given in question

$$\text{Current yield} = \frac{\text{Interest of bond}}{\text{Value of bond}}$$

Example:

Equity shares were purchased when index was 1,000. Amount of shares purchased is Rs.20 lacs. Index value on NAV valuation date is 1,500. What will be the value of shares if underlying shares have appreciated at double the rate of index appreciation?

- 30 lacs
- 60 lacs
- 20 lacs
- 40 lacs

Answer:

Index is 1,000 on purchase date and the same has appreciated by 50 percent as the closing index is 1,500. Shares will appreciate at double the rate and hence shares will appreciate by 100 percent. Closing shares value = 20 lacs + 100% = 40 lacs

Example:

Value of 14 percent listed bonds = 20 crores (Face value is Rs.15 crores whereas acquisition cost is Rs.20 crores). Market expectation on listed bonds is 7 percent. What will be the value of listed bonds for computation of NAV?

- 30 Crores
- 20 crores
- 15 crores
- 40 crores

Answer:

Particulars	Calculation	Amount (in cr)
Interest on listed bonds	15 crores x 14%	2.10
Value of bonds	$\frac{\text{Interest}}{\text{Investor expectation}} = \frac{2.10}{7\%}$	30.00

20. Dividends out of realized earnings

An MF may declare dividend as a proportion of realized earnings. Realized earnings = Interest earned + Dividends earned + Realized capital gain

Example:

A mutual fund sold shares worth Rs.80 lacs for Rs.88 lacs. It also sold another lot of shares worth Rs.75 lacs for Rs.72 lacs. It earned dividend income of Rs.4 lacs. It has decided to distribute 60% of realized earnings. How much is the overall dividend paid?

- 9 lacs
- 8 lacs
- 7.2 lacs
- 5.4 lacs

Answer:

Particulars	Calculation	Amount
Total Capital gain	8 lacs on lot 1 - 3 lacs on lot 2	5,00,000
Total realized gain	5,00,000 + 4,00,000	9,00,000
Dividends paid	9,00,000 x 60%	5,40,000

21. Dividend income on equity shares

- Mutual Funds allocate investments across a range of equity shares, and any dividends declared by these companies contribute to the mutual fund's earnings.
- When a company issues bonus shares, additional shares are granted to the mutual fund if such an event occurs. **However, in the event of a dividend declaration prior to the bonus record date,** the dividend income will be applicable only on the original shares held by the mutual fund and not the newly allotted bonus shares.

Example:

A mutual fund has invested in 10,000 shares (FV of Rs.10 and CMP of Rs.20) of XYZ Limited. XYZ Ltd., on 15th December 2021 in its AGM declared the interim dividend of 10% and bonus shares at 1:10 with the record date of 28th December 2021. How much is the dividend received by MF from XYZ Limited?

- Rs.10,000
- Rs.11,000
- Rs.20,000
- Rs.22,000

Answer:

Dividend per share = 10 x 10% = Rs.1.00. Interim dividend will be received only on original shares as the bonus shares are allotted post dividend declaration. Hence Dividend received is equal to Rs.10,000 (10,000 shares x Rs.1.00)

22. Mutual Fund NAV Computation - Cash and equity component

Cash component of MF will decline by expense per unit whereas equity component will change based on movement of market. Beta can be used to find the percentage change in equity component when NIFTY change is given.

$\% \text{ change in equity} = \text{Beta} \times \% \text{ change in market}$

Example:

ABC Mutual Fund has NAV of Rs.25 (consisting 90% equity and remaining cash). Annual expense is Rs.4 per unit. The share market declined by 8% over next three months. Beta of ABC Mutual Fund is 1.5 Times. How much is the NAV of ABC Mutual Fund at end of three months?

Answer:

Particulars	Amount
1. Opening NAV	25.00
Represented by equity	22.50 [25.00 x 90%]
Represented by cash	2.50 [25.00 x 10%]
2. Closing NAV	21.30 [19.80 +1.50]
Represented by equity	19.80 [22.50 - 12%]
Represented by cash	1.50 [2.50 - 1.00]

Note:

- Annual expense is Rs.4 per unit and hence proportionate expense for 3 months is Rs.1 per unit
- $\% \text{ change in equity} = \text{Beta} \times \% \text{ change in market} = 1.50 \times 8 = 12.00\%$

23. Impact of Dividend Equalization

- A mutual fund earns income periodically. However, if the NAV is not computed periodically, then there will be a need to adjust NAV to the extent of Dividend equalization.

$$\text{Dividend equalization per unit} = \frac{\text{Total income earned}}{\text{Number of units}}$$

- **Adjustment in issue price:** An investor entering into a mutual fund will have to pay issue price.
Issue price = Opening NAV + Dividend equalization adjustment + Entry load
- **Adjustment in re-purchase Price:** An investor exiting mutual fund will be paid re-purchase price.
Re-purchase price = Opening NAV + Dividend equalization - Exit Load.
- Equalization amount received from MF investor on purchase is added to income of MF. Similarly, equalization amount paid to MF investor on redemption is deducted from income of MF

Example:

Opening NAV in April = Rs.20. Dividend equalization for the month of April = Rs.1.00. An investor invested in MF on May 1 at opening NAV (April) + 2% and adjusted for dividend equalization. What is the purchase price of the investor?

- Rs.20.40
- Rs.21.40
- Rs.19.40
- Rs.21.00

Answer:

Purchase price = Opening NAV + 2% + Dividend equalization

Purchase price = $(20 + 2\%) + 1 = \text{Rs.21.40}$

Example:

Opening NAV in April = Rs.20. Dividend equalization for the month of April and May = Rs.1.00 and Rs.2.00 respectively. An investor exited in MF on June 1 at opening NAV (April) - 3% and adjusted for dividend equalization. What is the redemption price of the investor?

- Rs.19.40
- Rs.16.40
- Rs.22.40
- Rs.17.00

Answer:

Redemption price = Opening NAV - 3% + Dividend equalization

Redemption price = $(20 - 3\%) + 3.00 = \text{Rs.}22.40$

24. Income available for distribution

Dividends paid by a mutual fund should be from the income available for distribution and the same is computed using the following format:

Particulars	No of units (lacs)	Per unit	Amount (in lacs)
Income of Month 1	Opening units	XXX	XXX
Add: Inflow from MF buyers (Dividend equalization received on MF issue)	Units issued	XXX	XXX
Total income till Month 1	XXX	XXX	XXX
Income of Month 2	XXX	XXX	XXX
Total income till Month 2	XXX	XXX	XXX
Less: Redemption in Month 2 (Dividend equalization paid on MF redemption)	(XXX)	XXX	(XXX)
Revised income till Month 2	XXX	XXX	XXX
Income of Month 3	XXX	XXX	XXX
Income available for distribution	XXX	XXX	XXX
Less: Dividend distributed	XXX	XXX	XXX
	XXX	XXX	XXX

25. Expense Ratio

Expense ratio (based on closing NAV) = $\frac{\text{Annual expense per unit}}{\text{Closing NAV}} \times 100$

Expense ratio (based on opening NAV) = $\frac{\text{Annual expense per unit}}{\text{Opening NAV}} \times 100$

Expense ratio (based on average NAV) = $\frac{\text{Annual expense per unit}}{\text{Average NAV}} \times 100$

Example:

Annual expenses = 20 lacs; No of units = 1 crore; NAV on closing date = 20. What is the annual expense ratio?

- 1%
- 0.2%
- 10%

Answer:

Particulars	Calculation	Amount
Expenses per unit	20 lacs/1 crore	0.20
Closing NAV		20
Expense ratio	$0.20/20 \times 100$	1.00%

26. MF Performance Evaluation - Sharpe Ratio (or) Reward to Variability Ratio

This is used for undiversified portfolio. Higher Sharpe Ratio is better.

Sharpe Ratio = $\frac{\text{Expected return} - \text{Risk free}}{\text{Standard Deviation}}$

27. MF Performance Evaluation - Treynor Ratio (or) Reward to Volatility Ratio

This is used for diversified portfolio. Higher Treynor Ratio is better.

Treynor Ratio = $\frac{\text{Expected return} - \text{Risk free}}{\text{Beta}}$

Example:

Sharpe Ratio of A = 1.5; Sharpe Ratio of B = 1.65; Sharpe Ratio of C = 1.25; Treynor ratio of A = 8; Treynor Ratio of B = 9; Treynor Ratio of C = 10; The above funds are undiversified. Rank the above three funds in terms of preference?

- C, A and B
- B, A and C

- c. A, B and C
d. C, A and B

Answer:

The funds are undiversified and hence we should do ranking as per Sharpe Ratio. It is better to have higher Sharpe Ratio. Hence the ranking as per Sharpe Ratio is B, A and C

28. MF Performance Evaluation – Jensen's Alpha

Alpha = Actual return – Required return as per CAPM. Higher positive Alpha is better

Example:

Risk-free rate of return = 10%; Beta of MF (A) = 1 Times; Jensen's Alpha of MF (A) = 4%; Market return = 14%; SD of MF (A) = 10%. What is reward to volatility ratio of MF (A)?

- a. 8
b. 0.80
c. 18
d. 14

Answer:

Particulars	Amount
Required return of MF 'A' $[10 + 1 \times [14 - 10]]$	14.00
Jensen's Alpha	4.00
Actual return of MF 'A' $[14 + 4]$	18.00
Excess return of MF 'A' $[18.00 - 10.00]$	8.00
Beta of MF 'A'	1.00
Reward to Volatility Ratio [Treynor Ratio]	8.00

29. MF Performance Evaluation – Negative Values

Sharpe/Treynor/Alpha can be negative if the return of security is lower than risk-free return

30. Tracking error

Tracking error is the deviation of security return as compared to a benchmark return. Standard deviation of differential return is called tracking error. **Differential return = MF return – Benchmark return**

$$\text{Variance} = \frac{\text{Total of deviation column}}{n - 1}$$

Example:

Compute tracking error from this information.

Month	XYZ Nifty Index Fund Return	Nifty 50 return
1	4%	3.7%
2	2%	2.5%
3	-4%	-3.2%
4	1%	1.8%
5	6%	7.2%

- a. 0.315
b. 0.5652
c. 1.26
d. -0.6

Answer:**Computation of tracking error:**

Month	XYZ Nifty Index Fund Return	Nifty 50 return	Differential return	Deviation	Deviation ²
1	4	3.7	0.3	0.9	0.81
2	2	2.5	-0.5	0.1	0.01
3	-4	-3.2	-0.8	-0.2	0.04
4	1	1.8	-0.8	-0.2	0.04
5	6	7.2	-1.2	-0.6	0.36
Total/ Average			-0.6		1.26

Variance					0.315
SD					0.5612

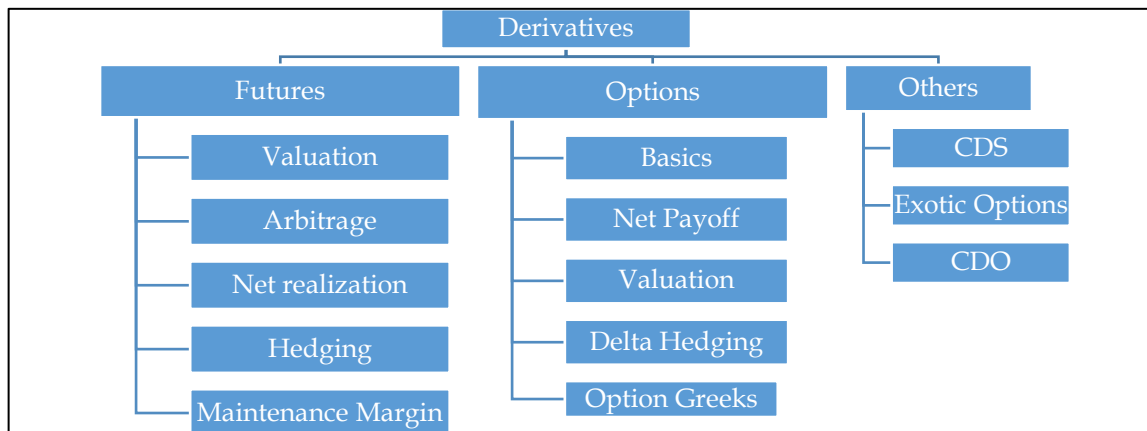
Note:

- Differential return = Index fund return – benchmark return
- Deviation = Differential return – average differential return

$$\text{Variance} = \frac{\text{Total of deviation column}}{n - 1} = \frac{1.26}{5 - 1} = 0.315$$

Standard deviation (Tracking error) = $\sqrt{0.315} = 0.5612\%$

Chapter 9 - Derivatives Analysis and Valuation



1. Futures Price vs Spot Price

- Fair futures price can be understood as the price at which **futures should quote in futures market**.
- Spot market (Cash Market) and futures market:** A share will be quoted in **both cash market and futures market**. Cash market will give us spot price and futures market will give different futures price based on expiry dates.
- FFP and AFP:** Futures market will give us actual futures price. Spot market will give us spot price and the same would be used to compute fair futures price (using a formula). We can compare FFP and AFP and based on that we can decide whether futures are overvalued/undervalued or correctly valued.
- Transaction Price** Any transaction in futures market will always happen at Actual Futures Price. **In absence of information, Fair Futures Price can be taken as Actual Futures Price.**

2. Valuation of Futures

- Formula 1:** Fair futures price = Spot price $\times (1 + r)^n$
- Formula 2:** Fair futures price = Spot price $\times e^{rt}$ (Continuous compounding)

Example:

Computation of Future Value Factor: Future value factor is basically $(1+r)^n$ or e^{rt}

- Rate of interest = 12% per annum (or) 6% per HY (or) 3% per qtr (or) 1% per month
- Time period = 6 months (or) 1 half year (or) 0.5 year (or) 2 quarters
- Spot price = 20,000
- We should ensure that rate of interest and time period is taken for same periodicity**

Compounding frequency	Calculation	Future value factor	FFP [20,000 $\times$ FVF]
Daily	$e^{rt} = e^{(0.12 \times 0.5)}$	1.061837	21236.7
Monthly	$(1 + 1\%)^6$	1.0615	21230
Quarterly	$(1 + 3\%)^2$	1.0609	21218
Half-yearly	$(1 + 6\%)^1$	1.06	21200
Annual	$(1 + 12\%)^{0.5}$	1.0583	21166
Simple interest	$(1 + 6\%)$	1.06	21200

3. How to compute e^{rt} values

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots + \frac{x^n}{n!}$$

Example:

$$e^{0.06} = 1 + \frac{0.06}{1!} + \frac{0.06^2}{2!} + \frac{0.06^3}{3!} + \dots + \frac{0.06^n}{n!}$$

Note:

- The above formula can be used to compute e power values. We can do calculation till 3! and the same would provide approximately the final answer

4. Formula Adjustments

- During the futures contract's term, underlying assets may **declare dividends**, or there might be associated **storage costs** for assets like gold.
- **The spot price of the share is influenced by these dividend incomes or storage costs, which is not the case for futures**
- Dividend and Storage cost will impact the formula used for computation of Fair Futures Price.
- **Dividend in Rupees:** If Dividend is given in rupees, then we need to substitute Spot Price with Adjusted Spot Price. **Adjusted Spot Price = Spot Price - PV of Dividend Income**
- **Dividend yield (y) in percentage:** If Dividend is given in percentage (*and it is continuous and not one-time*), then we need to substitute r with $(r-y)$
- **Storage cost in Rupees:** If storage cost is given in rupees, then we need to substitute Spot Price with Adjusted Spot Price. **Adjusted Spot Price = Spot Price + PV of Storage Costs**
- **Storage Cost (s) in percentage:** If storage cost is given in percentage, then we need to substitute r with $(r+s)$

Example [Dividend in Rupees Adjustment]

A stock is currently trading at Rs.100. It will pay dividend of Rs.1 in one month. Interest rate = 12 percent per annum. Time period = 3 months. What is fair futures price? $e^{0.01} = 1.01005$; $e^{0.02} = 1.02020$; $e^{0.03} = 1.03045$

- Rs.102.02
- Rs.103.05
- Rs.104.09
- Rs.101.00

Answer:

$$\text{PV of dividend income} = \frac{1}{e^{0.01}} = 0.99$$

$$\text{Adjusted spot price} = \text{Spot price} - \text{PV of dividend income} = 100 - 0.99 = \text{Rs.99.01}$$

$$\text{Fair futures price} = \text{Adjusted spot price} \times e^{rt} = 99.01 \times e^{0.03} = 99.01 \times 1.03045 = 102.02$$

Example [Storage Cost in Rupees Adjustment]

Spot price of Gold is Rs.800. Interest rate is 12% per annum. What is the fair price of 3 month futures if storage cost of Rs.5 is to be paid in month 3?

- Rs.805
- Rs.824
- Rs.829
- Rs.819

Answer:

$$\text{Adjusted spot price} = \text{Spot price} + \text{PV of storage costs}$$

$$\text{PV of storage costs} = \frac{5}{1 + 3\%} = \text{Rs.4.85}$$

$$\text{Adjusted spot price} = 800 + 4.85 = \text{Rs.804.85}$$

$$\text{Fair futures price} = 804.85 \times (1 + 3\%) = \text{Rs.829}$$

Example [Dividend Yield in % Adjustment]

On 15th September, the index closed at 1195, and December futures (last trading day December 15) were trading at 1225. The historical dividend yield on the index has been 3% per annum and the borrowing rate was 9.5% per annum. How much is the fair futures price assuming one year consists of 365 days?

- Rs.1,225
- Rs.1,195
- Rs.1,214.37
- Rs.1,223.30

Answer:

$$\text{No of days} = 15 \text{ days of Sep} + 31 \text{ days} + 30 \text{ days} + 15 \text{ days} = 91 \text{ days}$$

$$\text{Rate of interest} = 9.5\% \text{ per year (or) } 2.3685\% \text{ per 91 days}$$

$$\text{Dividend Yield} = 3\% \text{ per year (or) } 0.7479\% \text{ per 91 days}$$

$$\text{FFP} = \text{Spot Price} \times (1 + (r - y)) = 1195 \times (1 + (2.3685\% - 0.7479\%)) = 1,214.37$$

5. Dividend Yield computation

Dividend yield can be different for different months of a year. In such a situation, Dividend yield for futures valuation is the average dividend yield of the life of the contract

$$\text{PV of Dividend Income} = \frac{\text{Dividend Income}}{e^{rt}} \quad (\text{or}) \quad \frac{\text{Dividend Income}}{(1+r)^t}$$

$$\text{PV of Storage costs} = \frac{\text{Storage costs}}{e^{rt}} \quad (\text{or}) \quad \frac{\text{Storage costs}}{(1+r)^t}$$

Example:

Dividend yield for different months is as under: Jan = 2%; Feb = 4%; Mar = 6%; Apr = 4%; May = 5%; June = 9%; July = 4%; Aug = 2%; Sep = 1%; Oct = 7%; Nov = 9%; Dec = 10%; What should be taken as dividend yield for valuing a 4-month futures which expired on Nov 30?

- 5.25%
- 8%
- 4.75%

Answer:

$$\text{Dividend yield} = \text{Average dividend yield of 4 months ending Nov 30} = \frac{2 + 1 + 7 + 9}{4} = 4.75\%$$

6. Format for computation of Fair Futures Price**Example:**

Spot price	Rs.1,800
Time period	6 Months (or) 2 quarters (or) 1 half-year (or) 0.5 years
Rate of interest	10% per annum (or) 5% per 6 months (or) 2.5% per quarter (or) 0.833% per month
Dividend	Nil
Storage cost	Nil
Compounding frequency	Once in 6 months/Simple

Note:

- Same format can be used for reverse-working to get spot price

Example [Reverse working of Spot Price]

BSE sensx on 1st Jan 2022 (Anticipated on 1st Sep 2021) = 58,580; Dividend Yield of index = 6% per annum; 181 days treasury bill rate = 9% per annum; How much is the present value of sensx as on 1st Sep 2021?

- 58,580
- 58,000
- 59,160
- 60,000

Answer:

Present value of sensx as on 1 st Sep 2021 (Spot price)	??
BSE sensx on 1 st Jan 2022 (anticipated on 1 st Sep 2021) [Futures price]	58,580
Time period	4 months
Risk-free rate	9% p.a. (or) 3% per 4M
Dividend Yield	6% p.a. (or) 2% per 4M

$$\text{Fair Futures Price} = \text{Spot Price} \times (1 + (r - y))^t$$

$$58,580 = \text{Spot price} \times (1 + (0.03 - 0.02))^1$$

$$\text{Spot price} = \frac{58,580}{1.01} = 58,000$$

7. What Compounding Frequency to take?

Word used in question	Compounding frequency
Continuous compounded risk-free rate of interest (CCRFI)	Continuous
Daily compounding	Continuous
e power value given in question	Continuous
One-month interest rate = 12% p.a.	Monthly compounding
Interest rate = 0.9% per month	Monthly compounding
Interest rate = 2.4% per quarter	Quarterly compounding

Two-month interest rate = 12.5% per annum	Every two months
Other situations	Simple interest/ Compounding once

Example:
 Stock is currently trading at Rs.100. One-month interest rate is 12% per annum. What is the fair futures price for 3-month expiry?
 a. Rs.103
 b. Rs.103.03
 c. Rs.103.05

Answer:
 We will do monthly compounding as the monthly interest rates are given in question
 $FFP = 100 \times (1.01)^3 = \text{Rs. } 103.03$

8. Arbitrage Gain computation and Strategy					
Relationship	Valuation	Futures	Spot	Action in debt market	
AFP > FFP	Over-valued	Sell	Buy	Borrow to buy share	
AFP < FFP	Under-valued	Buy	Sell	Create FD with sale proceeds	
AFP = 2,000; FFP = 2,200; Spot price = 1,900			AFP = 2,350; FFP = 2,200; Spot price = 1,900		
AFP < FFP			AFP > FFP		
Futures is undervalued			Futures are overvalued		
Buy in futures market; sell in spot market			Sell in futures market and buy in spot market		
Arbitrage gain = Difference between FFP and AFP			Arbitrage gain = Difference between FFP and AFP		
Arbitrage gain = Rs.200			Arbitrage gain = Rs.150		

Example:
 Spot price = Rs.1,000; Life of futures = 6 months; Rate of interest = 6% per half year; Actual futures price = Rs.1,100; How much is the possible arbitrage gain?
 a. Rs.40
 b. Rs.20
 c. Rs.70
 d. Arbitrage not possible

Answer:
 Fair futures price = Spot price $\times (1 + r)^n = 1,000 \times (1 + 6\%) = \text{Rs. } 1,060$
 Arbitrage gain = Difference between AFP and FFP = $1,100 - 1,060 = \text{Rs. } 40$

Example:
 Fair futures price = Rs.1,000; Actual futures price = Rs.1,010; What strategy can help in exploiting arbitrage opportunity and how much will be arbitrage gain/loss?
 a. Buy spot and sell futures; Profit of Rs.10
 b. Buy spot and sell futures; loss of Rs.10
 c. Sell spot and buy futures; Profit of Rs.10
 d. Sell spot and buy futures; Loss of Rs.10

Answer:
 Buy spot and sell futures; Profit of Rs.10

9. Implied risk-free rate
Engaging in arbitrage within the market creates an implied return surpassing the standard risk-free rate. This is attributed to the generation of extraordinary profits without assuming any associated risks during the arbitrage process
$\text{Implied risk free rate} = \text{Normal risk free rate} + \left(\frac{\text{Arbitrage Gain}}{\text{Spot Price}} \times 100 \times \frac{12}{m} \right)$
Example: Spot price = Rs.20,000; Fair Futures Price = Rs.24,000; Actual Futures Price = Rs.25,000; Life of futures = 6 months. How much is the implied risk-free rate assuming no dividend on futures contract? a. 20% b. 25% c. 40% d. 50%

Answer:

Fair Futures Price = Spot price $\times (1 + r)$

$24,000 = 20,000 \times (1 + r)$; $r = 20\%$ per 6 months (or) 40% per year

Actual risk-free rate is Rs.20,000. However, the implied risk-free rate is more than actual risk-free rate due to arbitrage gain. Investor will earn arbitrage gain of Rs.1,000 (Difference between FFP and AFP) and the same would translate into gain of 5% per half year (or) 10% per year.

Hence implied risk-free rate = $40\% + 10\% = 50\%$ per annum

10. Cost to Carry

- Cost to carry refers to the total expenses or costs associated with holding an underlying asset until expiration of futures contracts. It includes various components such as interest costs, dividends (for financial instruments like stocks), and storage costs (for commodities)
- Cost to Carry = FFP as per Formula - Spot Price

Example:

- Spot Price = Rs.1,000; Adjusted Spot Price = Rs.975.51 (adjusted for dividends) and Fair futures price = Rs.1,005.22
- **Cost to Carry = $1,005.22 - 1,000 = \text{Rs.}5.22$**

11. Convenience Yield

- Convenience yield is the **benefit of holding the inventory/product/shares** in physical form as compared to holding in futures.
- **Fair futures price = Spot price + Cost to carry - Convenience Yield**
- FFP as per question = (FFP as per formula) - CY
- **Future value of CY = FFP as per formula - FFP as per question**
- Present value of CY = Future value of CY discounted at risk-free rate

Example:

Spot price = Rs.800; Cost to carry = Rs.20; You need to consider Rs.810 as the fair futures price. How much is the convenience Yield?

- No convenience yield
- Rs.20
- Rs.10

Answer:

- Convenience yield = FFP as per formula - FFP as per question
- FFP as per formula = Spot price + Cost to carry = $800 + 20 = 820$
- Convenience yield = $820 - 810 = \text{Rs.}10$

12. Contango and Backwardation Market

- Normal scenario = Spot price = 2,000; Futures price = 2,050; Market type = Contango market (upward sloping market). In a normal market, the futures price would be higher than spot price
- Reverse scenario = Spot price = 2,100; Futures price = 2,050; Market type = Backwardation market (downward sloping market)
- Basis = Spot price - Futures price; **Negative Basis = Contango Market; Positive Basis = Backwardation Market**

Example:

Spot price = 2,400; Fair futures price = 2,300; How much is contango/backwardation?

- Contango of 100
- Backwardation of 100
- Neither contango nor backwardation

Answer:

- Futures is lower than spot and hence it is backwardation market
- Backwardation = Difference between FFP and Spot = 100

13. Computation of Beta (Hedge Ratio)

$$\text{Beta} = \frac{\text{SD of Spot Price}}{\text{SD of futures Price}} \times \text{Correlation coefficient}$$

Example:

The variance of spot and futures is 144 and 324. The correlation co-efficient is 0.75. What is the hedge ratio?

- a. 0.66
- b. 0.50
- c. 0.33
- d. 1.125

Answer:

Hedge ratio is also known as Beta.

$$\text{Beta} = \frac{\text{SD of spot price}}{\text{SD of future price}} \times \text{Correlation co-efficient}$$

$$\text{Beta} = \left(\frac{12}{18}\right) \times 0.75 = 0.50 \text{ Times}$$

14. Beta (Hedge Ratio) and Change in Price

- Beta measures the risk of a share in relation to market. Beta > 1 indicates it is riskier than market. Beta < 1 indicates it is less risky as compared to market
- Beta of 1.5 Times would mean that if market (nifty) increases by 10% then share will increase by 15%. Conversely if market falls by 10% then share will fall by 15%
- **% change in share = Beta of share x % change in market**

Example:

Beta of share = 2 Times. Share has increased by 20 percent. How much would be the change in market?

- a. Increase of 40 percent
- b. Decrease of 40 percent
- c. Increase of 10 percent
- d. Decrease of 10 percent

Answer:

Change in share = Change in market x Beta

20 percent = Change in market x 2

$$\text{Change in market} = \frac{20}{2} = 10 \text{ percent (increase)}$$

15. Physical Settlement and Net Settlement

- **Example:** You have entered into a contract to buy Gold at Rs.5,000 per gram. Contract was entered today and has to be executed after 1 year. Price of Gold after one year is 5,600 per gram.

Physical settlement:

- We will pay Rs.5,000 per gram and the shopkeeper will give us Gold

Net settlement/cash settlement:

- Shopkeeper will give a net settlement of **Rs.600 per Gram (5,600 - 5,000)**. This can be understood as Shopkeeper giving Gold at **contracted price of Rs.5,000 per Gram** and buying back Gold from us at CMP of **Rs.5,600 per Gram**.

Format for computing net settlement:

- Contract to buy Gold at 5,000; Price after 12 months = Rs.5,600

Date	Position	Action	Ref date	Rate
01-Feb-24	Original Position	Buy	10-Sep-24	-5,000
10-Sep-24	Opposite Position	Sell	10-Sep-24	5,600
Total				600

Example:

Contract to sell TCS at Rs.3,200 after 3 months; Price after 3 months = 3,400

Date	Position	Action	Ref date	Rate
01-Feb-24	Original Position	Sell	10-Dec-23	3,200
10-Dec-23	Opposite Position	Buy	10-Dec-23	-3,400
				-200

Note:

- Date = Date on which contract is entered/cancelled/executed
- Position = Original position and opposite position
- Action = Buy (long) and sell (short)
- Reference date = Expiry date of futures contract/ Execution date of futures contract
- Price = Positive if position is Sell and negative if position is Buy

Example:

A stock is currently trading at Rs.125 and is likely to pay annual dividend of Rs.4 after one year. Risk-free interest rate is 8% per annum. Lot size of contract is 2,000 shares. An investor took short position on futures and the spot price fell by 6%. How much is the profit or loss on the position taken by the investor?

- Rs.15,000 (profit)
- Rs.15,000 (loss)
- Rs.16,200 (profit)
- Rs.16,200 (loss)

Answer:**Original futures price:**

$$\text{PV of dividend} = \frac{4}{1.08} = 3.70$$

$$\text{Adjusted spot price} = 125 - 3.70 = 121.30$$

$$\text{Fair futures price} = 121.30 \times 1.08 = \text{Rs. 131 (or) Rs. 2,62,000 per contract}$$

Revised futures price:

$$\text{Revised spot price} = 125 - 6\% = \text{Rs. 117.50}$$

$$\text{Adjusted spot price} = 117.50 - 3.70 = 113.80$$

$$\text{Fair futures price} = 113.80 \times 1.08 = \text{Rs. 122.90 (or) Rs. 2,45,800 per contract}$$

Profit/loss:

Investor originally sold futures for Rs.2,62,000. Now the opposite position (purchase) will be at Rs.2,45,800. Hence profit = 2,62,000 - 2,45,800 = Rs.16,200

Example:

Mr. X purchased Nifty futures of Rs.2,00,000 on Jan 1. Lot size of Nifty = 10. Nifty spot on expiry was 20,800 whereas futures was 20,805. How much is the profit/loss?

- Profit of Rs.8,000
- Loss of Rs.8,000
- Profit of Rs.8,050
- Loss of Rs.8,050

Answer:

Profit/loss will be computed using futures price on expiry date

Particulars	Calculation	Amount
Purchase price	2,00,000/10	20,000
Opposite cancellation rate (SP)		20,805
Profit	10 x (20,805 - 20,000)	8,050

16. Hedging - Perfect Hedge

- Hedging means protection **against fall/increase in prices.**
- Under hedging the hedger will have an underlying transaction/motive.
- Some of the **shares/commodities/metals** will not be available in futures market. Hence hedging can be done through Index futures.
- **Index has Beta of 1 whereas underlying asset can have different beta (>1 (or) <1 (or) negative)**
- In order to account for changes in risk, the amount to be hedged is adjusted.
- A portfolio will be called as fully hedged if Beta of Portfolio is zero.

Format for computation of amount to be hedged:

Security	Beta	Weight	Product
Shares of A Limited	0.50	20,00,000	10,00,000
Shares of C Limited	1.20	-25,00,000	-30,00,000
Nifty futures	1.00	20,00,000	20,00,000
Overall Beta	0.00	-5,00,000	0

Note:

- Beta = Risk of security/Market; beta of market = 1 Time
- Weight = Amount of purchase/sales of shares (or) futures. Purchase will be written as positive weight and sales will be written as negative weight
- Total of weights = Total of Position in spot market; **Futures purchase/sale will not be considered in weights total. This is because no inflow/outflow happens for futures purchase/sale**
- Product = Weight x Beta

Number of contracts:

$$\text{Number of contracts} = \frac{\text{Amount to be hedged (weight of BSE futures)}}{\text{Size of one contract}}$$

Example:

You have purchased 2000 shares of ABC Limited. ABC has a beta of 1.1 with the sensex. You have sold one contract of sensex worth Rs.2,20,000. You have done a perfect hedge with above transactions. What is the current market price of ABC Limited?

- 100
- 110

Answer:

Security	Beta	Weight	Product
ABC Limited	1.10	2,00,000 [2,20,000/1.10]	2,20,000
Sensex	1.00	-2,20,000	-2,20,000
Total	0.00	2,00,000	0

$$\text{Value of one share} = \frac{2,00,000}{2,000} = 100$$

Example:

Value of portfolio held = 20,20,000; Beta of portfolio = 2; BSE futures = 10,100; Lot size = 10; How many contracts should be bought/sold for perfect hedge?

- Buy 40 contracts
- Sell 40 contracts
- Buy 20 contracts
- Sell 20 contracts

Answer:

We need to sell futures to hedge as we have a long position in spot market

$$\text{No of contracts to be sold} = \frac{\text{Exposure value} \times \text{Beta}}{\text{Value of one contract}} = \frac{20,20,000 \times 2}{10,100 \times 10} = 40 \text{ contracts}$$

Example:

You buy 10,000 shares of ABC Limited at a price of Rs.20 per share. You got a perfect hedge with position in Nifty futures. Nifty fell by 2% and shares of ABC Limited increased by 5%. You made overall profit of Rs.12,000. How much is the Beta of ABC Limited?

- 2.50 Times
- 2.50 Times
- 0.50 Times
- 2 Times

Answer

Particulars	Amount
Profit in ABC Limited [2,00,000 x 5%]	10,000
Profit in Nifty futures [12,000 - 10,000]	2,000
Position in nifty futures [2,000/-2%]	-1,00,000

Beta computation:

Security	Beta	Weight	Product
ABC Limited	0.50	2,00,000	1,00,00
Nifty Futures	1.00	-1,00,00	-1,00,00
Total	0	2,00,000	0

Nifty of ABC Limited = 0.50 Times

17. Hedging - Target Beta

If the question specifies a target Beta, then the same can be used in the format and accordingly the amount to be hedged will change

Example:

Value of portfolio held = 10,00,000; Beta of portfolio = 2 times; Size of one futures contract (index) = Rs.2,00,000; How many contracts to be bought/sold if we want to reduce Beta to 0.6 Times?

- Sell 7 Contracts
- Buy 10 contracts
- Sell 10 contracts
- Buy 7 contracts

Answer:

Security	Beta	Weight	Product
Portfolio	2.00	10,00,000	20,00,000
Index futures	1.00	-14,00,000	-14,00,000
Total	0.60	10,00,000	6,00,000

$$\text{No of contracts to be sold} = \frac{14,00,000}{2,00,000} = 7 \text{ contracts}$$

18. Hedging - Protection of Specified %

- If question specifies a protection % (60% for example), then the target Beta would be existing Beta - 60%.
- Use this target Beta in the format and compute the amount to be hedged

Example:

Beta of portfolio of investor = 2 Times. He is targeting 120% protection of his portfolio through Nifty Futures. How much is the target beta of the investor post protection?

- 4.40 Times
- 0 Time
- 2.4 Times
- 0.40 Times

Answer:

$$\text{Target Beta} = \text{Existing Beta} - \text{Protection \%} = 2 - (120\% \text{ of } 2) = -0.40 \text{ Times}$$

Example:

Sale of shares of A Limited = Rs.2,00,000; Beta of A Limited = 1.5 times; The investor wants 50 percent hedge and hence wants to position to be taken in index futures?

- Purchase index futures of Rs.1,50,000
- Purchase index futures of Rs.1,00,000
- Sell index futures of Rs.1,50,000
- Sell index futures of Rs.1,00,000

Answer:

Security	Beta	Weight	Product
A Limited	1.50	-2,00,000	-3,00,000
Nifty Futures	1.00	1,50,000	1,50,000
Total	0.75	-2,00,000	-1,50,000

- Purchase index futures of Rs.1,50,000

19. Hedging - Size of one contract

Size of one contract = Actual Futures Price x Lot size. **We should ensure that actual futures price is used for finding size of one contract. Fair futures price should not be used. FFP can be used as proxy for AFP only if data on AFP is not available**

Example:

Fair futures price of Nifty = 20,000; Actual Futures price of Nifty = 19,800; Lot size = 100. How much is the value of one futures contract?

- 20,00,000
- 19,80,000

Answer:

$$\text{Value of one contract} = \text{Actual Futures price} \times \text{Lot size}$$

$$\text{Value of one contract} = 19,800 \times 100 = \text{Rs.19,80,000}$$

Note: We will use fair futures price as actual futures price if there is no information on AFP in question

20. Modification of Portfolio Beta through Risk-Free Investment/Borrowing

- Increase in beta will happen through borrowing and decrease in beta can happen through risk-free investment.
- We can use the below format to decide the quantum of investment/borrowing:

Security	Beta	Weight	Product
Risky Portfolio	0.80	25,00,000	20,00,000
Risk-free investment	0.00	15,00,000	0.00
Total	0.50	40,00,000	20,00,000

- In this example we had an existing Beta of 0.80 Times and we have brought the same down to 0.50 times by making a risk-free investment

Example:

Value of portfolio = 20,00,000; Beta of portfolio = 2 Times; How much fresh risk-free investment can be brought in if you want to reduce risk to 0.5 Times? Note: You are not planning to sell shares and bring in additional money

- Buy Risk-free investment of Rs.40,00,000
- Buy Risk-free investment of Rs.60,00,000
- Buy Risk-free investment of Rs.20,00,000

Answer:

Security	Beta	Weight	Product
Portfolio	2.00	20,00,000	40,00,000
Risk-free investment	0.00	60,00,000	0
Total	0.50	80,00,000	40,00,000

Hence the investor needs to have a portfolio value of Rs.80,00,000 to reduce beta to 0.5 Times. This will be possible by having share portfolio of Rs.20,00,000 and balance risk-free investment of Rs.60,00,000

21. Normal Rate and CCRFI Rate

- Normal rate can be converted into CCRFI rate using Natural log tables.
- **Example:** Normal rate = 12%; $\text{Natural log}(1.12) = 0.1133$ or 11.33%
- CCRFI rate can be converted into normal rate using e^{rt} tables
- **Example:** CCRFI = 11.33%; $e^{11.33\%} = 1.12$; Normal rate = 12%

Example:

Normal cost of capital is 10.5%; Natural log (1.1050) = 0.0998; What will be the CCRFI rate of interest for normal cost of capital of 10.5%?

- Cannot be calculated with given information
- 10.5%
- 9.98%

Answer:

Natural log can help in converting the normal rate to CCRFI. In this case Natural log (1.105) is 0.0998. Hence, we can say that normal rate of 10.5% is equivalent of CCRFI 9.98%

22. Profit/Loss on different Positions

Original Position	Price	Profit/Loss
Buy (+)	Increase (+)	Profit
Buy (+)	Decrease (-)	Loss
Sell (-)	Increase (+)	Loss
Sell (-)	Decrease (-)	Profit

Example:

Investor has entered into a long position of Rs.100 lacs in Nifty futures. He also has a share portfolio which has Beta of 1.5 times. His share portfolio declined by 4.5 percent. How much would be the profit/loss only in Nifty futures?

- Loss of 4.5 lacs
- Profit of 4.5 lacs
- Loss of 3 lacs
- Profit of 3 lacs

Answer:

Share has beta of 1.5 times and has declined by 4.5 percent. Hence market would have fallen by 3 percent. We are holding Nifty futures of 100 lacs and Nifty has fallen by 3 percent. Hence loss in Nifty futures is Rs.3 lacs

23. Effective realization/payment in futures

- Effective realization = Realization as per spot rate $\pm$ Net settlement in futures

Net settlement can be computed as under:

Date	Position	Action	Reference Date	Rate
Day 0	Original Position	Sell	Day 180	XX
Day 180	Opposite Position	Buy	Day 180	XX
Net profit/loss per Kg in futures market				XX

Note:

Realization/payment will always happen as per spot rate in cash market on maturity rate. Futures rate will be used for computing net settlement in futures

Example:

Spot position of wheat = Rs.20; You have entered into futures contract to sell wheat at Rs.21. What will be the net realization if wheat price on maturity date is 25 in spot market and 25.10 in futures market?

- 25.10
- 21.00
- 20.90
- 21.10

Answer:

Date	Position	Action	Reference Date	Rate
Day 0	Original Position	Sell	Maturity	21.00
Maturity	Opposite Position	Buy	Maturity	-25.10
Loss in futures				-4.10

Net realization = Spot realization (25) - Loss of Rs.4.10 = 20.90

24. Initial and Maintenance Margin

- Initial margin is the amount to be deposited by buyer/seller of futures with the broker for entering into futures position. **This is like refundable deposit** and will ensure that both parties do not default on their obligations.
- Maintenance margin will be lower than initial margin and we should ensure that balance in margin account **do not go below maintenance margin**.
- Margin Call:** If the balance in margin account falls short of maintenance margin, **then broker will make a margin call** and we should replenish the margin account **to the level of initial margin**.
- We are also allowed to withdraw money from margin account if the balance in margin account is more than initial margin.
- Amount withdrawable = Balance in margin account - Initial margin**
- Initial margin = Specific % of futures position (or) Daily average change + 3 Times of Standard Deviation.**

Example

You have purchased one lot of Nifty at 10,000. Lot size = 100 units. Initial margin = 8% of contract value. Nifty has moved to 9,800 on next day. What will be the balance in margin account post profit/loss?

- 80,000
- 1,00,000
- 60,000
- 40,000

Answer:

- Initial margin = 8 % of contract value = 8% of (100 x 10,000) = 80,000
- Profit/loss = 100 x (9800 - 10,000) = Loss of Rs.20,000
- Margin balance post loss = 80,000 - 20,000 = Rs.60,000

Example:

The average daily absolute change in the value of the contract is Rs.8,000 and standard deviation of these changes is Rs.4,000. How much should the initial margin be?

- a. 12,000
- b. 8,000
- c. 20,000
- d. 16,000

Answer:

- Initial margin = Daily absolute change + (3 x Standard Deviation)
- Initial Margin = 8,000 + (3 x 4,000) = Rs.20,000

Example:

Initial margin = 50,000; Maintenance margin = 40,000; Margin account reached balance of Rs.38,000. How much would be the margin replenishment needed?

- a. No replenishment needed
- b. Rs.2,000
- c. Rs.12,000

Answer:

Margin account has fallen below the maintenance margin and hence we are required to replenish this back to the level of initial margin (50,000). Replenishment needed = 50,000 - 38,000 = 12,000

Example:

Initial margin = 50,000; Maintenance margin = 40,000; Margin account reached balance of Rs.43,000. How much would be the margin replenishment needed?

- a. No replenishment needed
- b. Rs.3,000
- c. Rs.7,000

Answer:

Margin balance has not gone below maintenance margin and hence no replenishment is needed

Example:

Initial margin = 50,000; Maintenance margin = 40,000; Margin balance post profit/loss = 70,000; Investor withdraws 60% of maximum allowed withdrawal. How much was the withdrawal?

- a. 18,000
- b. 12,000
- c. 20,000
- d. 30,000

Answer:

- Maximum allowed withdrawal = Margin balance - Initial margin = 70,000 - 50,000 = Rs.20,000
- Amount withdrawn = 60% of 20,000 = Rs.12,000

25. Return on investment in futures

- Investment made = Margin deposited + Brokerage (or) commission;
- Profit = Profit on futures position - Opportunity cost (dividend income) - brokerage expense.
- ROI is computed using below formula:

$$\text{ROI} = \frac{\text{Profit}}{\text{Investment}} \times 100$$

Example:

You deposited a margin of Rs.10,000 for entering a futures contract. You also paid a commission of Rs.1,000 to broker. You made a gross profit of Rs.5,000 on futures and paid a commission of Rs.1,000 for exit. How much is the rate of return earned?

- a. 50%
- b. 30%
- c. 33.33%
- d. 27.27%

Answer:

- Initial outflow (investment) = 10,000 + 1,000 = Rs.11,000
- Net Profit = 5,000 - entry commission (1,000) - exit commission (1,000) = 3,000

$$\text{Rate of return} = \frac{3,000}{11,000} \times 100 = 27.27\%$$

26. Asset Swap

- It is like a normal swap wherein returns from a security is swapped with variable return of another security/fixed interest of debt instrument

Example:

ABC Limited has entered into a swap agreement on notional principal of Rs.200 crores. ABC Limited would pay 1% per quarter and receive the quarterly return of sensex. Sensex value on day 0 and day 90 is 20,000 and 21,000. How much is the net cash flow of ABC Limited?

- Receive Rs.10 crores
- Receive Rs.8 crores
- Pay Rs.10 Crores
- Pay Rs.8 Crores

Answer:

Amount payable [200 crores x 1%]	2 crores
Change in sensex	$\frac{21,000 - 20,000}{20,000} \times 100 = 5.00\%$
Amount receivable [20 crores x 5%]	10 crores
Net receipt	8 crores

27. Option Contract - Basics

- An option contract is one where one person gets a right to buy/sell a product /share/index at a specified price but not an obligation to do the same. **In short, the option exercising is not mandatory.**

Type of Option:

- Call option = Right to buy but not an obligation to buy
- Put option = Right to sell but not an obligation to sell

Parties to option contract:

- Holder/Buyer = Person who gets the right = Premium has to be paid
- Seller/Writer = Person who gives the right = Premium will be received

Different Players:

- Call holder = Person who buys the right to buy
- Call writer = Person who sells the right to buy
- Put holder = Person who buys the right to sell
- Put writer = Person who sells the right to sell

28. Who can exercise an option

- Option will always be exercised **by the holder.**
- If an option is exercised, there will be a net settlement. **Net settlement will always be positive for holder and negative for writer**
- Holder = Limited loss (premium) but unlimited profit
- Writer = Limited profit (premium) but unlimited loss

Example:

Purchased one 3-month call option with a premium of Rs. 30 and an exercise price of Rs. 550. Purchased one 3-month put option with a premium of Rs. 5 and an exercise price of Rs. 450. Price on expiry date is Rs.600. How much is the profit/loss if lot size is 100 shares?

- Profit of Rs.5,000
- Loss of Rs.3,500
- Profit of Rs.1,500
- Loss of Rs.1,500

Answer:

- Premium paid on call option = 3,000 [30 x 100]
- Premium paid on put option = 500 [5 x 100]
- Put option will not be exercised. Call option will be exercised and will have GPO of Rs.50 and we will receive Rs.5,000
- Net payoff = 5,000 - 3,500 = Profit of Rs.1,500**

Example:

Exercise price of put option = 1,000; Price of underlying asset on expiry date = 800; Premium received/paid on put option = 45; How much is the net pay-off of Put writer?

- Profit of Rs.45
- Loss of Rs.200
- Loss of Rs.155
- Profit of Rs.155

Answer:

Put option will be exercised and hence gross payoff is negative 200; Premium received is Rs.45; Net payoff = Negative 200 + 45 = Negative 155

29. American vs European Option

- European option - Option can be exercised only on expiry date
- American option - Option can be exercised at any time on or before expiry date

30. What is exercise price?

- Exercise price/strike price = Price at which we want to buy/sell

31. Status of Option

- In the money option = Option which will be exercised
- At the money = Indifferent (CMP = Strike price)
- Out of the money option = Option will lapse

Example:

CMP of underlying asset = 400; Exercise price of call option = 450; What is the status of call option?

- In the money
- At the money
- Out the money

Answer:

OTM options are those which won't be exercised. Exercise price of call option is Rs.450 whereas CMP is Rs.400. Hence this option won't be exercised currently and so this is an out the money options

32. What action to be taken in Options Market?

- Prices are expected to increase = Long call (or) short Put
- Prices are expected to decrease = Long put (or) short call

33. Intrinsic value vs Time Value

- Intrinsic value is the real value of option. **This is basically the net settlement if the option was to be exercised today**
- Premium paid = Intrinsic value + Time value
- Time value is directly proportional with expiry period.

Example:

Exercise price = 1,000; CMP = 1,200. What is the intrinsic value of call option and Put option?

- 200 & 0
- 0 & 200
- 200 & - 200
- 200 & 200

Answer:

Call option is exercised when actual market price is higher than exercise price. In the given situation it would be exercised and has intrinsic value of Rs.200. Put option will not be exercised and hence intrinsic value of 0

Example:

Exercise price of option = 1,000 and 1,100; Premium of above option = 200 and 175; What will be the nature of above options?

- Call option
- Put option
- Cannot be said with given information

Answer:

Premium for call option will reduce with the increase in exercise price (purchase price is going up). This is because increased exercised price would reduce the probability of exercising call option. In the given question, premium reduces with increase in exercise price and hence the same is a call option

Example:

Exercise price of put option = 100; CMP of underlying asset = 80; CMP of put option = 45; How much is the time value of option?

- 20
- 25
- 45
- 0

Answer:

Time value = Option price - Intrinsic value = 45 - 20 = 25

34. Call option vs Put option utility

- A call option restricts maximum purchase price and a put option provides minimum selling price

Example:

You plan to buy shares of TCS Limited. CMP of TCS is Rs.1,000. You currently don't have money and also intend to pay a maximum of 5 percent more than CMP. What action can be taken in option market to achieve this?

- Buy Put option of Exercise price of Rs.1,050
- Buy call option of Exercise price of Rs.1,050
- Buy Put option of Exercise price of Rs.950
- Buy call option of Exercise price of Rs.950

Answer:

Maximum purchase price = 1,000 + 5% = 1,050; We can cap the maximum purchase price by taking a call option. **Exercise price of call option would be Rs.1,050**

35. Payoff of option and Break-even Price**Payoff:**

- Payoff of option holder = Gross pay-off - Premium Paid
- Payoff of Option writer = Premium received - Gross pay-off paid

Break-even Price:

- Break-even price for call option = Strike Price + Premium
- Break-even price for put option = Strike Price - Premium

Example:

Exercise price of call option = 200; Exercise price of Put option = 220; Premium paid/received on call and put option = Rs.6 and Rs.4; You have bought one call option and sold one put option. How much will be the net profit/loss if actual price is Rs.240 on expiry date?

- Profit of Rs.40
- Profit of Rs.38
- Profit of Rs.42
- Loss of Rs.42

Answer:

Call option will be exercised and GPO will be Rs.40; Put option will not be exercised; Total GPO = Rs.40; Net premium paid = Rs.2; Final Profit = 40 - 2 = Rs.38

Example:

You have bought a call option with exercise price of Rs.100. You have sold a call option with exercise price of Rs.80. Premium on Rs.100 option was Rs.10 and Premium on Rs.80 option was Rs.25. What will be the break-even price?

- 100
- 80
- 115
- 95

Answer:

Break-even price is where premium is equal to gross payoff; Net premium received = 25 - 10 = 15. Hence at break-even gross payoff should be negative Rs.15. This would mean we would lose money on option written and don't earn anything on option bought

We will lose Rs.15 on Rs.80 option if the actual market price is Rs.95. **At Rs.95, EP of Rs.100 option would not get exercised and hence we will lose Rs.15 at GPO level**

Example:

Exercise price of call option = Rs.100; Premium paid/received = Rs.10; What will be the break-even price?

- 100
- 110
- 90

Answer:

Call option will get exercised if actual price is higher than exercise price. Break-even will happen when Gross pay-off is equal to premium and hence GPO should be Rs.10. GPO would be Rs.10 if the actual market price on expiry date is Rs.110

Example:

A stock is trading at Rs.18 per share. An investor believes that the stock will move either up or down. He buys a call option on the stock with an exercise price of Rs.20. He also buys two put options on the same stock each with an exercise price of Rs.25. The call option costs Rs.2 and the put options cost Rs.9 each. The stock falls to Rs.17 per share at the expiration date and the investor closes his entire position. The investor's net gain or loss is:

- Rs.4 (Loss)
- Rs.3 (Loss)
- Rs.4 (Gain)
- Rs.3 (Gain)

Answer:

Premium paid = $2 + (9 \times 2) = \text{Rs.20}$. Call option will not be exercised and put option will be exercised on maturity date. Gross payoff from put option will be Rs.16 (8×2) and hence the investor will have a net loss of Rs.4.00

36. Exercise price prevails on maturity date

- Exercise price will prevail on maturity date would mean that market price on expiry date will be equal to exercise price. This will make the option at the money and the same will lapse. Value of such option will be zero on maturity date

Example:

You as an investor had purchased a 3 month call option on the equity shares of X Ltd. of Rs.30, of which the current market price is Rs. 560 and the exercise price Rs. 590. You expect the price to range between Rs.540 to Rs.640. The expected share price of X Ltd. and related probability is given below:

Expected Price	540	560	580	600	620	640
Probability	0.10	0.15	0.05	0.35	0.20	0.15

How much is the likely value of call option after three months if the exercise price prevails?

- Rs.17.00
- Rs.7.00
- Rs.50.00
- Rs.0.00

Answer:

Exercise price prevails would mean that market price on maturity would be equal to exercise price. The option will lapse and hence the likely value of call option on maturity is 0.

37. Methods of option valuation

- Objective = To determine fair price of option

Methods:

- Put call parity theory
- Replication approach [Sub-part of Binomial Model]
- Risk Neutral Model
- Binomial Model
- Black Scholes Model

38. Put Call Parity Theory [Can be used when 3 out of 4 items of equation is available]

- PCPT Equation:** Share + Put = Call + PV of EP

Note:

- Share = Share price (or) Adjusted Share price [Share price - PV of Dividend] (or) Adjusted share price = Share price $\times e^{-yt}$ (or) $\frac{\text{Share price}}{(1+y)^n}$
- Put = Actual/Fair price of Put
- Call = Actual/fair price of call
- PV of EP = EP discounted at risk-free rate

Example:

Spot price of shares = Rs.100; CCRFI = 12% per annum; Dividend of Rs.2 would be paid in 2 months; Life of option = 3 Months. Value of Put of an in-the-money option is Rs.10. How much is the value of an in-the-money Call option?

- Rs.8.04
- Rs.12.96
- Rs.11.00
- Rs.13.00

Answer:

Share + Put = Call + PV of EP

Adjusted share price = Share price - PV of dividend = $100 - \frac{2}{e^{0.02}} = 100 - 1.96 = 98.04$

$98.04 + 10 = \text{Call} + \frac{100}{e^{0.03}}$; $108.04 = \text{Call} + 97.04$; Call = 11.00

39. Risk-Neutral Model

- This model can be used only when we have **two judgement prices** for maturity date.
- Two JP does not mean **probability is 50/50**
- We should compute upside and downside probability using weighted average format
- Value of call/put = Weighted average of Intrinsic value with probability being the assigned weight
- Above value needs to be discounted to get today's price.

Formula to compute Probability (We don't use formula for computation of probability)

$$\text{Upside Probability} = \frac{e^{rt} - d}{u - d}$$

Where

r = rate of interest per annum; t = time period in years

$$d = \frac{JP_1}{\text{Current Price}}$$

$$u = \frac{JP_2}{\text{Current Price}}$$

Example:

Spot Price = Rs.100; Time period of call option = 1 year; Risk-free rate = 10% (normal rate); Judgement price = 75 and 125; Exercise price of option = 90

Computation of Probability:

Expected Price of share at end of year 1 = $100 \times 1.10 = 110$

Price	Prob	Product
75	P	75P
125	1-P	125-125P
Total		75P+125-125P = 110

$$75P + 125 - 125P = 110; -50P = -15; P = 0.30$$

- Hence probability of price reaching Rs.75 is 0.30 and probability of price reaching 125 is 0.70

Price	IV	Prob	Product
75	0	0.3	0
125	35	0.7	24.5
Future value of call			24.5
Present value of call			$\frac{24.50}{1.10} = 22.27$

Example:

The current price of a flat is Rs.100 lacs. The price can either go up to Rs.110 lacs or Rs.95 lacs by end of one year. Expected annual rental income of flat is 2 lacs. Risk-free rate of return is 8% per annum. What is the probability of price increasing to Rs.110 lacs?

- a. 86.67%
- b. 73.33%
- c. 50.00%
- d. 80.00%

Answer:

Expected price of flat = $100 \times (1 + 8\%) - 2 \text{ lacs} = 106 \text{ lacs}$

Price	Probability	Product
110	P	110P
95	1-P	95-95P
Total		110P + 95 - 95P = 106

$$15P = 11; P = \frac{11}{15} = 0.7333 \text{ (or) } 73.33\%$$

40. Binomial Model

- Under this model we work with 2 judgement prices and compute their upside and downside probability (**Follow RN model approach to get probability**)
- Under this model the change can happen multiple times within the expiry date. For example: Call option with life of 1 year. In this case change can happen every quarter and **accordingly there will be 4 price change in a year.**
- Draw a path diagram (decision tree) reflecting the various prices and then do the valuation in the reverse order

Steps in case of American Option:

- The value of each previous node in decision tree valuation would be higher of the following:
 - Value of immediate exercise
 - Value of later exercise

Example:

A stock is currently priced at Rs.50. It is known that in the first 6 months of current year from now prices will either rise by 20% or go down by 20%, further in the later half of the year prices may again up by 20% or go down by 20%. Suppose risk free rate is 5% continuous compounded and strike rate is Rs.52. How much is the downside probability?

- a. 45.00%
- b. 56.35%
- c. 43.65%
- d. 50.00%

Answer:

Let us assume P to be the probability of price increase by 20% and 1-P to be the probability of price fall by 20%. Risk-free rate of interest is 5% per annum CCRFI

Expected price at end of month 6 = $50 \times e^{(0.05)(0.5)} = 50 \times e^{0.025} = 50 \times 1.0253 = 51.27$

Price	Probability	Product
60	P	60P
40	1-P	40-40P
Total		60P+40-40P=51.27

$$60P + 40 - 40P = 51.27; 20P = 11.27; P = \frac{11.27}{20} = 0.5635$$

Hence probability of price raise is 56.35% and **probability of price fall is 43.65%**

41. Black Scholes Model

- This can be used to value only European options
- It considers the value of option can change due to the various parameters as mentioned below:

Parameter	Call Option	Put Option
Spot Price	Direct	Inverse
Time to expiry	Direct	Direct
Volatility (SD)	Direct	Direct
Risk-free Rate	Direct	Inverse

Exercise price (Never changes) - - Direct relationship would mean an increase in the parameter would lead to increase in option premium and inverse relationship would mean an increase in the parameter would lead to decrease in option premium
Formula: Value of call option = $(S_0 \times N(d_1)) - (PV_{EP} \times N(d_2))$ Where: $d_1 = \frac{(\text{Naturallog}(\frac{S_0}{E}) + rt + 0.5\sigma^2t)}{\sigma\sqrt{t}}$ $d_2 = \frac{(\text{Naturallog}(\frac{S_0}{E}) + rt - 0.5\sigma^2t)}{\sigma\sqrt{t}} \text{ (or) } d_2 = d_1 - \sigma\sqrt{t}$ Note: S_0 = CMP; r = risk free rate per year; t = time in years and E = Exercise Price $N(d_1)$ and $N(d_2)$ are normal distribution values for the computed d_1 and d_2
Valuation of Put: Value of Put can be arrived through PCPT
Dividend in Rupees: - Replace spot price with Adjusted Spot price and use the same for computation of call option value as well as D_1 - Adjusted Spot Price = Spot Price - PV of Dividend
Dividend Yield in percentage: - Spot price cannot be taken directly in question as the given spot price is cum-dividend price Adjusted Spot Price = $\frac{\text{Spot Price}}{e^{yt}}$ - For computation of D_1 we can do one of the two items: - Use Adjusted Spot Price in the formula (OR) - Replace 'r' with '$r-y$' in the formula and use the given spot price as it is. - Approach 1 or 2 depends on what Natural log value is given in question by ICAI Present value of exercise price will always use 'r' only even if dividend is given, we shouldn't use '$r-y$'. This is because exercise price is on an option and the same does not have dividend component
Dividend Yield in case of fixed life assets such as patents/Gold mines: Dividend Yield = $\frac{1}{\text{Life}}$
Example: ABC Ltd. is a pharmaceutical company possessing a patent of a drug called 'Aidrex', a medicine for aids patient. Being an approach drug ABC Ltd. holds the right of production of drugs and its marketing. The period of patent is 15 years after which any other pharmaceutical company produce the drug with same formula. It is estimated that company shall require to incur \$ 12.5 million for development and market of the drug. As per a survey conducted the expected present value of cashflows from the sale of drug during the period of 15 years shall be \$ 16.7 million. Cash flow from the previous similar type of drug have exhibited a variance of 26.8% of the present value of cashflows. The current yield on Treasury Bonds of similar duration (15 years) is 7.8%. How much is the dividend yield in black scholes model for valuation of option? - No dividend 15% 6.67% 10.00%
Answer: Benefit of patent will be earned over 15 years and hence annual cash inflow / dividend yield is 6.67% (1/15 years)
Example: Current market price of share is Rs.930; Exercise price of share is Rs.900; Present value of exercise price as per BS Model is Rs.888.08; $N(d_1) = 0.7069$; $N(d_2) = 0.6783$; Dividend yield on index is 3% per annum and life of option is 2 months. How much is the value of call option as per BS model?

- a. Rs.55.03
- b. Rs.51.78
- c. Rs.43.69
- d. Rs.46.95

Answer:

$$N(d1) \times e^{-yt} = 0.7069 \times e^{-0.03 \times (\frac{2}{12})} = 0.7034$$

$$\text{Value of call} = (S_0 \times N(d1) \times e^{-yt}) - (PV_{EP} \times N(d2))$$

$$\text{Value of call} = (930 \times 0.7034) - (888.08 \times 0.6783) = \text{Rs. 51.78}$$

Example:

Current market price of Share = Rs.415; Exercise price of share = Rs.400; Present value of exercise price = Rs.395.03; $N(d1) = 0.6926$; $N(d2) = 0.6529$. How much is the value of call option?

- a. Rs.26.27
- b. Rs.29.51
- c. Rs.19.12
- d. Rs.15.00

Answer:

$$\text{Value of call} = (S_0 \times N(d1)) - (PV_{EP} \times N(d2)) = (415 \times 0.6926) - (395.03 \times 0.6529) = \text{Rs. 29.51}$$

42. How to compute $N(d1)$ and $N(d2)$ values

- A normal distribution consists of two tails with each of them having a probability of 50%. Left-side tail is for negative values and right-side tail is for positive values
- We need to use cumulative left-side values for computing $N(d1)$ and $N(d2)$
- Cumulative would mean two tail values for Positive Z and one-tail value for negative Z
- If $d1$ is positive, N of $d1$ will be greater than 0.5

Probability values will be given in question and the same could fall in the following categories:

- **Value given is cumulative left-side values:** Directly use the same to compute $N(d1)$ and $N(d2)$
- **Single tail left side values are given:** Add 0.50 for positive Z value and nothing for negative Z values
- **Single tail right side values are given:** Probability is decreasing with an increase in Z value. This would mean they are right side single tail values - **Positive Z value (1 - Given Value) and Negative Z values (0.5 - Given Value)**

43. Delta Hedging

- Portfolio is hedged to arrive at riskless portfolio. We hedge the portfolio either through:
 - Futures = It uses Beta which doesn't change frequently
 - Options = It uses Delta which changes frequently
- Delta measures **absolute change** in option premium for change in value of underlying asset

$$\text{Delta} = \frac{\text{Change in option price}}{\text{Change in underlying asset}}$$

- **Call Delta:** Calls have positive Delta. A deep in the money call option will have delta closer to +1 and deep out the money call option will have delta closer to 0
- **Call Delta = $N(d1)$ of Black Scholes Model**
- **Put delta:** Put will have negative delta. A deep in the money put option will have delta closer to -1 and deep out the money put option will have delta closer to 0.
- **Put Delta = Call Delta - 1**

Example:

An investor expects two prices Rs.100 and Rs.80 for shares of TCS Limited. The exercise price of the call option is Rs.90. How much is the delta of the put option?

- a. 1 time
- b. 0.50 time
- c. -1 time
- d. 0 time

Answer:

$$\text{Delta of call option} = \frac{\text{Spread in IV}}{\text{Spread in Stock price}} = \frac{10 - 0}{100 - 80} = 0.50 \text{ Times}$$

$$\text{Delta of Put option} = \text{Call delta} - 1 = 0.50 - 1 = -0.50 \text{ Times}$$

44. Replication Approach of Option Valuation [Sub-part of Binomial Model]**Replication Approach of Option Valuation:**

- Concept of delta can be used for valuation of an option using replication approach. Call delta of 0.4 times would mean that one option is equivalent to 0.40 shares
- Hence buying 0.40 shares and writing 1.0 call option is equivalent to risk-less portfolio and would provide same results for the two judgement prices given. This will help us in arriving at the value of option today.

Equation:

- $0.40 \text{ shares} - 1 \text{ call option} = \text{Risk-free investment}$
- $0.40 \text{ shares} = \text{Risk-free investment} + 1 \text{ call option}$
- Make two equations for the given judgement prices and get the answer for risk-free investment

Valuation:

- Substitute the risk-free investment value on day 0 in the same equation and get the fair value of call option

Example:

Delta of call option = 0.3333 Times. What should be the combination of option and share to create risk-less hedge portfolio?

- Buy 1 share and Buy 3 call options
- Buy 3 shares and Buy 1 call options
- Buy 1 share and Sell 3 call options
- Buy 3 shares and Sell 1 call options

Answer:

Security	Delta	Weight	Product
Shares	1.00	1.00	1.00
Call option	0.3333	-3.00	-1.00
Total			0.00

Risk-less hedge portfolio would mean overall delta of 0. We should buy 1 shares and sell 3 call options to create risk-less hedge portfolio

45. Credit Default Swaps

- A CDS is a type of financial derivative that allows investors to **protect themselves** against the risk of a borrower defaulting on a loan or bond
- **Parties Involved:** Protection Buyer (The one seeking to protect against the risk of default) and Protection Seller (The one agreeing to compensate the buyer if the default occurs)
- $\text{Premium} = \text{Notional Amount} \times \text{CDS spread}$. **This is the amount to be paid by protection buyer to protection seller.** Any increase in CDS spread would indicate deterioration in credit quality of underlying bonds
- $\text{Cash settlement on default} = \text{Notional Amount} \times (1 - \text{Recovery rate}\%)$
- **Index CDS:** Index CDS consist of multiple securities and the notional amount of the swap would decline in case of default made by the constituents of index CDS
- $\text{Profit/loss of credit protection buyer} = \text{Notional Amount} \times \text{Change in spread} \times \text{Duration}$
- **CDS spread = Probability of default x (1 - Recovery rate)**
- $\text{Probability of survival} = 1 - \text{Probability of default (hazard rate)}$

Example:

You bought a CDS contract from Axis Bank on bonds of A Limited by paying annual premium of 1%. The annual premium has now increased to 3%. What inference does this have on credit quality of Bonds of A Limited?

- No change in credit quality
- Improvement in credit quality
- Deterioration in credit quality

Answer:

Premium percentage has increased from 1% to 3.00%. Higher premium basically indicates **deterioration in credit quality** of underlying asset (Bonds of Company A)

Example:

Company A has issued 10% bonds of Rs.50,00,000. Investor A has purchased bonds worth Rs.10,00,000 but is worried about the risk of default. He therefore wants protection against the risk of default and hence has purchased protection from Axis Bank in terms of CDS contract. Company A has defaulted and the recovery rate is 25%. How much is the cash settlement amount to be paid by Axis Bank to Investor A?

- Rs.37,50,000
- Rs.10,00,000
- Rs.50,00,000
- Rs.7,50,000

Answer:

Amount paid by Axis Bank = Default amount $\times$ (1 - Recovery rate)

Amount paid by Axis Bank = 10,00,000 $\times$ (1 - 25%) = Rs.7,50,000

Example:

You have bought protection using a 2-year CDS on CDX-IG (125 constituent) index. The notional is Rs.200 crores. Company X, an index constituent defaults and trades at 25% of par. Compute the payoff on the CDS on account of default of X?

- 1.6 crores
- 150 crores
- 1.2 crores
- 200 crores

Answer:

Notional principal of company X = 200 crores / 125 = Rs.1.6 crores

Settlement amount = 1.6 crores - 25% = Rs.1.2 crores

Example:

A CDS has balance duration of 10 years. The original premium was 500 bps and now the premium has widened to 700 bps. Notional amount of principal of Rs.10,00,000. How much is the gain/loss to protection buyer?

- Rs.20,000 (Profit)
- Rs.20,000 (loss)
- Rs.2,00,000 (Profit)
- Rs.2,00,000 (loss)

Answer:

CDS spread has widened and hence the same indicates deterioration in credit quality. Deterioration in credit quality will lead to profit for the protection buyer.

Profit of protection buyer = 10,00,000 $\times$ 2% $\times$ 10 years = Rs.2,00,000

Example:

A company issues one-year bond and the same has a probability of default of 2%. The expected recovery rate is 20%. How much would the CDS spread for this bond?

- 2.00%
- 1.60%
- 4.00%
- 3.20%

Answer:

CDS spread = Probability of default $\times$ (1 - Recovery rate)

CDS spread = 2% $\times$ (1 - 20%) = 1.60%

46. Option Greeks

Term	Meaning
Delta	It is the degree to which an option price will move given a small change in the underlying stock price. For example, an option with a delta of 0.5 will move half a rupee for every full rupee movement in the underlying stock.
Gamma	It measures how fast the delta changes for small changes in the underlying stock price. i.e. the delta of the delta. If you are hedging a portfolio using the delta-hedge technique described under "Delta", then you will want to keep gamma as small as possible, the smaller it is the less often you will have to adjust the hedge to maintain a delta neutral position
Theta	The change in option price given a one day decrease in time to expiration. Basically it is a measure of time decay

Rho	The change in option price given a one percentage point change in the risk-free interest rate. It is sensitivity of option value to change in interest rate. Rho indicates the absolute change in option value for a one percent change in the interest rate.
Vega	Sensitivity of option value to change in volatility. Vega indicates an absolute change in option value for a one percent change in volatility

Example:

Option Vega is 8.02. Current call and put premium is Rs.88.53 and Rs.253.67. How much would be the revised premium if there is 1 percent increase in volatility?

- Rs.80.51 and Rs.245.65
- Rs.96.55 and Rs.245.65
- Rs.80.51 and Rs.261.69
- Rs.96.55 and Rs.261.69

Answer:

Volatility has increased and hence both call and put premium will increase. Option Vega is 8.02 and hence both call and put premium will increase

New call premium = Rs.88.53 + 8.02 = Rs.96.55

New put premium = Rs.253.67 + 8.02 = Rs.261.69

Example:

Put option Rho is -3.86 and current put premium is Rs.20. Risk-free interest rate has decreased by 1 percent. What would be the new put price post revision in risk-free rate?

- Rs.20.00
- Rs.23.86
- Rs.16.14

Answer:

Put Rho is -3.86. This would mean that put premium will decrease if there is an increase in interest rate and vice versa. Risk-free interest rate has declined by 1 percent and hence put premium will increase. New Put premium = 20 + 3.86 = Rs.23.86

Example:

Call option Delta = 0.60 Times; Option Gamma is 0.0010. How much would be the new Put Delta if the price of the underlying asset decline by Rs.1?

- 0.3990 Times
- 0.6010 Times
- 0.5990 Times
- 0.4010 Times

Answer:

Original Call Delta = 0.60 Times; Option Gamma is 0.0010 and this would mean that call delta will increase by 0.0010 for Rs.1 increase in share price and will decline by 0.0010 for Rs.1 decline in share price.

New call delta with Rs.1 decrease in price = 0.60 Times - 0.0010 Time = 0.5990 Times

Put delta = Call delta - 1 = 0.5990 - 1 = -0.401 Times

Example:

Call option Theta is -3.45. Value of call option today is Rs.100. What would be the value of call option next day assuming other things remain constant?

- Rs.103.45
- Rs.100.00
- Rs.96.55

Answer:

Call theta of -3.45 would mean decline in call option price by 3.45 for one day decrease in time to expiration. In this case other things have remained constant and hence the new call option price is Rs.96.55 (100 - 3.45)

47. Exotic Options

- Chooser Options:** This option provides a right to the buyer of option after a specified period of time to decide whether purchased option is a call option or put option. It is to be noted that the decision can be made within a specified period prior to the expiration of contracts
- Compound Options:** Also called split fee option or 'option on option'. As the name suggests this option provides a right or choice not an obligation to buy another option at specific price on the expiry of first maturity date. Thus, it can be said in this option the underlying is an option. Further the payoff depends on the strike price of second option.

- **Barrier options:** Though it is similar to plain vanilla call and put options, but unique feature of this option is that contract will become activated only if the price of the underlying reaches a certain price during a predetermined period
- **Binary Options:** Also known as 'Digital Option', this option contract guarantees the pay-off based on the happening of a specific event. If the event has occurred, the pay-off shall be pre-decided amount and if event it has not occurred then there will be no pay-off
- **Asian Options:** These are the option contracts whose pay off are determined by the average of the prices of the underlying over a predetermined period during the lifetime of the option.
- **Bermuda Option:** It is somewhat a compromise between a European and American options. Contrary to American option where it can be exercised at any point of time, the exercise of this option is restricted to certain dates or on expiration like European option.
- **Basket Options:** In this type of contracts the value of option instead of one underlying depends on the value of a portfolio i.e., a basket. Generally, this value is computed based on the weighted average of underlying constituting the basket.
- **Spread Options:** As the name suggests the payoff of these type of options depend on difference between prices of two underlying.
- **Look back options:** Unlike other type of options whose exercise prices are pre-decided, in this option on maturity date the holder of the option is given a choice to choose a most favourable strike price (or) actual market price depending on the minimum and maximum price of an underlying achieved during the life time of option.

Example:

A binary option has a fixed payout of Rs.1000 if it finishes "in the money" and a premium of Rs.200. The option has a 70% chance of finishing "in the money" based on market conditions. If a trader buys 10 binary options, what is the expected payoff?

- Rs.3,000
- 2,000
- Rs.10,000
- Rs.5,000

Answer:

The expected payoff is calculated as the probability of finishing "in the money" multiplied by the fixed payout, minus the premium. Expected payoff = $(0.70 \times \text{Rs.1,000}) - \text{Rs.200} = \text{Rs.700} - \text{Rs.200} = \text{Rs.500}$. Total payoff = $500 \times 10 \text{ options} = \text{Rs.5,000}$

Example:

An Asian call option has a strike price of Rs.50 and is based on the average price of the underlying asset over the last three months. The average asset price in the first month is Rs.48, in the second month is Rs.52, and in the third month is Rs.55. How much is the gross payoff to the option buyer on expiration date?

- Rs.5.00
- Nil
- Rs.1.67
- Rs.2

Answer:

We need to compare strike price with average closing price in case of an Asian option. The average price is Rs.51.67. Current market price is higher than strike price and hence option will be exercised and the gross pay-off to option buyer is Rs.1.67

Example:

A lookback call option has a strike price of Rs.80, and the underlying asset's prices during the option's life are as follows: Rs.75, Rs.82, Rs.78 and Rs.85. The closing price on expiration is Rs.80. What is the profit for the option holder?

- Nil
- Rs.5
- Rs.2
- Rs.3.50

Answer:

Under a lookback option the option holder can choose the most favorable price for deciding on exercise. Hence the exercise price of Rs.80 can be compared with most favorable price of Rs.85 (highest price) and the option holder will have a pay-off of Rs.5.00

48. CDO**Introduction:**

- CDOs typically **pool together various debt instruments**, such as bonds, loans, and other fixed-income assets, to create a diversified portfolio of assets. The cash flows generated from these assets are used to pay **interest and principal to the investors** of different tranches.

Types of CDOs:

- **Cash Flow Collateralized Debt Obligations (Cash CDOs):** Cash CDO is CDO which is backed by cash market debt or securities which normally **have low risk weight**. This structure mainly relies on the collateral's risk weight and collateral's ability to generate sufficient cash to pay off the securities issued by SPV
- **Synthetic Collateralized Debt Obligations:** Synthetic CDOs **do not typically hold actual debt instruments as collateral**. Instead, they use credit derivatives, **such as credit default swaps (CDS)**, to replicate the performance of a portfolio of reference assets. Accordingly, this structure is mainly **used to hedge the risk rather than balance sheet funding**. Further, for banks, this structure also allows **the customer's relations to be unaffected**. This was started mainly by banks who want to **hedge the credit risk but not interested in taking administrative burden of sale of** assets through securitization. Synthetic CDOs can also be categorized as follows:
 - **Unfunded:** It will be comprised only CDs.
 - **Fully Funded:** It will be through issue of Credit Linked Notes (CLN)
 - **Partially Funded:** It will be partially through issue of CLN and partially through CDs
- **Arbitrage CDOs:** Basically, in Arbitrage CDOs, the issuer **captures the spread between the return realized collateral underlying the CDO and cost of borrowing to purchase these collaterals**. In addition to this issuer also collects the fee for the management of CDOs. This arbitrage arises due to acquisition of relatively high yielding securities with large spread from open market.

Chapter 10 – Foreign Exchange Exposure and Risk Management**Overview:**

- Forex Basics
- Premium/discount and appreciation/depreciation
- IRPT and PPT
- Arbitrage
- Currency Invoicing
- Leading and Lagging
- Netting
- Forward Contract
- Money Market Hedge
- Exchange Position and Cash Position
- Currency Futures and Options
- Currency Swaps
- Multiple Forex Hedging Strategies

1. Price Currency and Product Currency

- Exchange rate is the rate at which one currency is exchanged for another. Hence it always involves 2 currencies.
- **Example:** INR 82 per USD; In this quote first currency (INR) is the price currency and second currency (USD) is the product currency
- **Example:** USD 0.0122 per INR; In this quote first currency (USD) is the price currency and second currency (INR) is the product currency

2. Direct Quote and Indirect Quote

- Direct quote expressed quote as home currency per unit of foreign currency. In short, price currency will be home currency and product currency will be foreign currency
- **Example:** INR 82 per USD is a direct quote in India and the same is an indirect quote in USA

Conversion of direct quote into Indirect:

$$\text{Direct Quote} = \frac{1}{\text{Indirect Quote}}$$

Example:

Following are the quotes given by a Mumbai Banker:

- INR 8.8438 per DKR
- AUD 0.03038 per INR

Answer:

Given Quote	Nature	Calculations	Other Quote
INR 8.8438/DKR	Direct	$\frac{1}{8.8438}$	DKR 0.1131/INR
AUD 0.03038/INR	Indirect	$\frac{1}{0.03038}$	INR 32.9164/AUD

3. Two-way Quotes

- This would mean that there will be 2 rates in every quote – Bid rate and Ask Rate
- **Bid Rate:** Banker's Buying Rate. The rate at which the bank buys the product currency
- **Ask Rate or Offer Rate:** Banker's selling Rate. The rate at which the bank sells the product currency.
- **Example:** INR 82.50/83.00 per USD. This would mean 82.50 is the bid rate and 83.00 is the Ask Rate
- **Ask Rate > Bid Rate:** Ask Rate can never be less than the Bid rate. This is because banker will always maintain profit margin

Middle Rate:

- Simple average of Bid rate and Ask Rate
- There is no utility of this in practical world and the same is primarily used for statistical purposes

Spread:

- Difference between the Bid rate and Ask Rate. This will be the profit margin for the banker

$$\text{Spread \% of offer price} = \frac{\text{Spread}}{\text{Ask Rate}} \times 100$$

$$\text{Spread \% of Bid price} = \frac{\text{Spread}}{\text{Bid Rate}} \times 100$$

Example:

- INR per GBP = 82.50/84.50

Identify various rates:

- Bid Rate = INR 82.50 per GBP (Rate at which bank buys GBP)
- Ask Rate = INR 84.50 per GBP (Rate at which bank sells GBP)
- Middle Rate = INR 83.50 per GBP (Average Rate)
- Spread = INR 2.00 per GBP

4. PIPS

- The numbers after the decimal in quote are called as PIPS
- If the numbers before the decimal in bid and ask is identical then while quoting the ASK portion of the two-way quote only the PIP is quoted. **Example: Rs.67.80 - 67.90 per USD is quoted as Rs.67.80-90.**
- If the numbers in the PIP are same those numbers are not quoted in the two-way quote in case of ASK. **Example Rs.12.315-70 / rand mean 12.315-12.370.**

Example:

Spot rate is USD 1.5606 - 950/GBP. What will be the Ask rate for USD/GBP?

- 1.9500
- 1.5695
- 1.5950
- 950

Answer:

950 will be the last three digits of PIPS portion of the ask rate. Hence Ask rate will be 1.5950.

5. Direct to Indirect Quote conversion in two-way quotes

$$\text{Bid (Direct Quote)} = \frac{1}{\text{Ask (Indirect Quote)}}$$

$$\text{Ask (Direct Quote)} = \frac{1}{\text{Bid (Indirect Quote)}}$$

Example:

Spot rate INR/USD = 65.20/80. What will be BID rate for USD/INR?

- 0.015337
- 0.015198
- 0.0125

Answer:

$$\text{BID} \left(\frac{\text{USD}}{\text{INR}} \right) = \frac{1}{\text{ASK} \left(\frac{\text{INR}}{\text{USD}} \right)}$$

$$\text{BID} \left(\frac{\text{USD}}{\text{INR}} \right) = \frac{1}{65.80} = 0.015198$$

6. Return in Foreign Currency - One way Quote

$(1 + \text{Home currency return}) = (1 + \text{Foreign currency return}) \times (1 \pm \text{Appreciation (or) Depreciation of FC})$

Note: In the formula, the appreciation percentage of the foreign currency should be added, while the depreciation percentage of the foreign currency should be deducted. It is important to consider the percentages of the foreign currency and not those of the home currency.

Example:

Investment on day 0 = USD 100; Interest earned = USD 10; Value on day 365 = USD 105; USD has depreciated by 5 percent. What is the return in terms of home currency?

- 15%
- 10%
- 20.75%
- 9.25%

Answer:

$$\text{USD Return} = \frac{105 - 100 + 10}{100} \times 100 = 15.00\%$$

USD has depreciated by 5 percent

$$(1 + \text{HCR}) = (1 + \text{FCR}) \times (1 - \text{Depreciation percentage of FC})$$

$$(1 + \text{HCR}) = (1 + 15\%) \times (1 - 5\%);$$

$$(1 + \text{HCR}) = 1.15 \times 0.95;$$

$$(1 + \text{HCR}) = 1.0925$$

Home currency return = 9.25%

Example:

USD return = 6.00%; Appreciation of INR = 5%. How much is the INR return?

- a. 11.00%
- b. 1.00%
- c. 11.30%
- d. 0.95%

Answer:

$$(1 + \text{USD return}) = (1 + \text{INR return}) \times (1 + \text{INR Appreciation \%})$$

$$(1 + 0.06) = (1 + \text{INR return}) \times (1 + 0.05); (1 + \text{INR return}) = \frac{1.06}{1.05}; \text{INR return} = 0.95\%$$

7. Return in Foreign Currency - Two-way Quotes

- We have the option to calculate returns in both the home currency and the foreign currency separately [**Formula based approach will not work**]
- This involves converting all data into a single currency (foreign currency) to determine the foreign currency return. Likewise, we can convert all data into the home currency to ascertain the home currency return

8. Commonly used currencies in questions

- INR per JPY = INR 0.5515
- INR per NZD = INR 50.23
- INR per AUD = INR 55.50
- INR per CAD = INR 60.51
- INR per SGD = INR 63.57
- INR per USD = Rs.84.08
- INR per EURO = Rs.90.91
- INR per CHF = Rs. 96.93
- INR per GBP = Rs.109.07

- The above all currencies are costlier than INR except JPY. Costliest currency in the above list is GBP. This would help in interpretation of quote given in the question

9. Cross Rates

- Two or more different exchange rates are given and we have to find some other exchange rate by the process of cross-multiplication

$$\text{Bid} \left(\frac{A}{C} \right) = \text{Bid} \left(\frac{A}{B} \right) \times \text{Bid} \left(\frac{B}{C} \right)$$

$$\text{Ask} \left(\frac{A}{C} \right) = \text{Ask} \left(\frac{A}{B} \right) \times \text{Ask} \left(\frac{B}{C} \right)$$

Example:

USD/GBP rate = 1.5606 - 50; USD/EURO rate = 1.2456 - 600; What will be the bid Euro/GBP rate?

- a. 1.2386
- b. 1.9439
- c. 1.9719
- d. 0.7959

Answer:

$$\left(\frac{\text{EURO}}{\text{GBP}} \right) = \left(\frac{\text{EURO}}{\text{USD}} \right) \times \left(\frac{\text{USD}}{\text{GBP}} \right)$$

$$\text{BID} \left(\frac{\text{EURO}}{\text{GBP}} \right) = \text{BID} \left(\frac{\text{EURO}}{\text{USD}} \right) \times \text{BID} \left(\frac{\text{USD}}{\text{GBP}} \right)$$

$$\text{BID} \left(\frac{\text{EURO}}{\text{GBP}} \right) = \left(\frac{1}{1.2600} \right) \times (1.5606)$$

$$\text{BID} \left(\frac{\text{EURO}}{\text{GBP}} \right) = 1.2386$$

10. Steps to solve basic problems

- **Step 1:** Find known and unknown component
- **Step 2:** Identify the base formula: Unknown component = Known Component x ?
- **Step 3:** Find what the bank is doing with denominator currency in step 2. If Bank is buying denominator currency, then we should use Bid rate and if Bank is selling denominator currency, then we should use Ask rate
- **Step 4:** Expand the formula with usage of common connecting currency

Example:

You have following quotes from Bank A and Bank B:

	Bank A	Bank B
SPOT	CHF/USD 1.4650/55	CHF/USD 1.4653/60
SPOT	USD/GBP 1.7645/60	USD/GBP 1.7640/50

How much minimum CHF amount you have to pay for 1 Million GBP spot?

- CHF 25,88,073
- CHF 25,87,490
- CHF 25,86,608
- CHF 25,88,956

Answer:

$$\text{CHF} = \text{GBP} \times \text{ASK} \left(\frac{\text{CHF}}{\text{GBP}} \right)$$

$$\text{CHF} = \text{GBP} \times \text{ASK} \left(\frac{\text{CHF}}{\text{USD}} \times \frac{\text{USD}}{\text{GBP}} \right)$$

$$\text{CHF} = 10,00,000 \times (1.4655 \times 1.7650)$$

$$\text{CHF outflow} = \text{CHF } 25,86,608$$

Note:

- Since there are two banks, the customer can choose either of the two banks. The customer should choose a bank which leads to lower outflow and higher inflow
- For CHF/USD we are using Bank A as it has lower ASK rate and for USD/GBP we are using Bank B as it has lower ASK rate

Example:

Quote 1: EUR 1.24-1.40 per GBP; Quote 2: INR 75.25-35 per GBP. How many GBP can be purchased with INR 1,20,000?

- 1,977.41
- 1,974.78
- 2,232.56
- 2,229.60

Answer:

Known component = Rs.1,20,000; Unknown component = ? EUR

$$\text{Euro} = \text{INR} \times \left(\frac{\text{Euro}}{\text{INR}} \right)$$

$$\text{Euro} = \text{INR} \times \text{BID} \left(\frac{\text{Euro}}{\text{INR}} \right)$$

$$\text{Euro} = \text{INR} \times \text{BID} \left(\frac{\text{Euro}}{\text{GBP}} \right) \times \text{BID} \left(\frac{\text{GBP}}{\text{INR}} \right)$$

$$\text{Euro} = 1,20,000 \times 1.24 \times \frac{1}{75.35} = \text{EUR } 1,974.78$$

11. Exchange Margin (EM)

- Exchange margin is extra profit for the bank. It is used to increase the spread.
- EM is deducted from bid rate and added to ask rate.

- **Merchant Rate vs Inter-Bank Rate:** Merchant rate (rate for customers) = Inter-bank rate (rate for banks) $\pm$ Exchange margin

Application of exchange margin in case of cross rates:

Exchange margin can be considered in following two ways

- Apply it directly on final exchange rate (OR)
- Apply it in one of the quotes used in cross-multiplication (Preferably one which has INR in quote)
- **Exchange margin on buying rate and selling rate:** When the question specifies that the exchange margin is xx on the buying rate and xx on the selling rate, it may not be explicitly clear whether it pertains to the banker's buying rate (bid rate) or the customer's buying rate (ask rate). In such instances, an assumption may be necessary to proceed. The ICAI solution has addressed this by considering **the buying rate as the banker's buying rate (BID Rate) and the selling rate as the banker's selling rate (ASK rate)**.
- **Exchange margin to be taken on direct quote/indirect quote:** Sometimes, the direct quote might not be readily available, and we resort to using (1/Ask rate) to derive the bid rate and (1/Bid rate) to calculate the ask rate. **In such a situation, the application of exchange margin can occur either after conversion or before conversion.** However, there has been inconsistency in the application of this approach by ICAI, resulting in slight variations in the answers
- **We should always add the exchange margin to the Ask rate and subtract the exchange margin from the Bid rate.** For example, if we are computing the Ask rate as (1/Bid rate) and intend to apply the exchange margin before the quote conversion, **then the exchange margin should be deducted from the Bid rate for the denominator currency.**

Example:

Spot INR/USD = 65 - 66; Spot INR/GBP = 80 - 81. Exchange margin is 0.5% for BID rate and 1% for Ask Rate. What will be Bid and Ask rate for USD/GBP?

- 1.2061 - 1.2587
- 1.2109 - 1.2399
- 1.2133 - 1.2399
- 1.2109 - 1.2524

Answer:

$$\text{BID} \left(\frac{\text{USD}}{\text{GBP}} \right) = \text{BID} \left(\frac{\text{USD}}{\text{INR}} \right) \times \text{BID} \left(\frac{\text{INR}}{\text{GBP}} \right) = \left(\frac{1}{66} \right) \times 80 = 1.2121$$

Exchange margin needs to be deducted and 0.5% is 0.0061 and revised bid rate will be 1.2061

$$\text{ASK} \left(\frac{\text{USD}}{\text{GBP}} \right) = \left(\frac{1}{65} \right) \times 81 = 1.2462$$

Exchange margin needs to be added and 1% is 0.0125. Revised ask rate will be 1.2587

12. Cover Rate

- Cover transaction refers **to the opposite of original transaction**. Example: If a forex dealer of a bank has sold USD, then the cover transaction is buying USD
- Rate at which cover transaction is executed is called cover rate.
- **Squaring up of position:** Squaring up of position would mean taking an opposite transaction or taking a cover position. **If there is a loss/profit in non-INR currency, then the same can be converted into INR losses if the INR exchange rates are there in question. If there is a loss we need to buy foreign currency and if there is a profit we will sell foreign currency**
- **Whenever a bank deals with some other bank, all transactions will get executed at inter-bank rate.**
- In case of inter-bank dealing, bid/ask rate identification would depend on which bank is initiating the transaction. **Bank which initiates the transaction is like customer and the other bank is the banker.**

Example:

A bank sold HKD 10,00,000 at the rate of Rs.6.5/HKD. He closes the position on the same day when rates are: INR/USD = 62 - 65; HKD/USD = 7.80 - 8; What will be the profit/loss in this transaction?

- Loss of Rs.18,33,333
- Loss of Rs.12,50,000
- Loss of Rs.13,68,020
- None of the above

Answer:

KC = 10,00,000 HKD; UKC = ? INR

$$\text{INR} = \text{HKD} \times \left(\frac{\text{INR}}{\text{HKD}} \right)$$

$$\text{INR} = \text{HKD} \times \text{ASK} \left(\frac{\text{INR}}{\text{HKD}} \right)$$

$$\text{INR} = \text{HKD} \times \text{ASK} \left(\frac{\text{INR}}{\text{USD}} \right) \times \text{ASK} \left(\frac{\text{USD}}{\text{HKD}} \right)$$

$$\text{INR} = 10,00,000 \times 65 \times \left(\frac{1}{7.80} \right)$$

$$\text{INR} = 83,33,333$$

$$\text{Profit} = \text{Sales proceeds} - \text{purchase cost} = 65,00,000 - 83,33,333 = \text{Loss of } 18,33,333$$

Example:

You have sold 10,00,000 USD at the rate of Rs.65/USD. You plan to cover the same and the rates are as under: JPY/INR = 2.05 - 10; JPY/USD = 130.50 - 132.50; How much is the profit/loss?

- Profit of Rs.13.41 lacs
- Profit of Rs.28.57 lacs
- Profit of Rs.19.05 lacs
- Profit of Rs.3.66 lacs

Answer:

Known component = 10,00,000 USD; Unknown component = ? INR

$$\text{INR} = \text{USD} \times \left(\frac{\text{INR}}{\text{USD}} \right)$$

We are going to buy USD and banker would sell it. Banker will sell the same at Ask rate

$$\text{INR} = \text{USD} \times \text{ASK} \left(\frac{\text{INR}}{\text{JPY}} \right) \times \text{ASK} \left(\frac{\text{JPY}}{\text{USD}} \right);$$

$$\text{INR} = 10 \text{ lacs} \times \left(\frac{1}{2.05} \right) \times 132.50 = \text{INR } 646.34 \text{ lacs}$$

$$\text{Sell proceeds} = 10 \text{ lacs} \times 65 = 650 \text{ lacs}$$

$$\text{Profit} = 650 \text{ lacs} - 646.34 \text{ lacs} = 3.66 \text{ lacs}$$

13. Likely rate of one currency against another currency

- Likely rate of Apple would mean Apple is the product
- For instance, **likely rate of YEN against USD** would mean YEN is the product and hence we should find (USD/YEN) Quote

14. Interpretation of Quotes [Most critical]

- In the real-world context, currency exchange rates for the Indian Rupee against the US Dollar (INR/USD) are **commonly denoted as USD-INR**, with the USD preceding the hyphen. However, it's important to note that in exam questions, the representation may switch to INR/USD. **In such cases, it is generally acceptable to interpret them as INR per USD.**
- Nevertheless, there might be instances where the given quotes seem illogical. In such situations, it becomes imperative to analyze and interpret the quotes based on the prevailing exchange rates. During exams, it is crucial to explicitly state if you have interpreted the quote according to the current exchange rates, deviating from the format provided in the question.
- For instance:** USD/INR 80 - 81 would be interpreted as INR 80-81 per USD

Example:

USD/INR rate = 70.85/73; We plan to buy 1,000 USD. Exchange margin is 0.5%; How much will be the INR outflow?

- INR 73,365
- INR 71,084
- INR 14.07
- INR 13.63

Answer:

The given rate has been interpreted as INR/USD based on current exchange rates

$$\text{INR outflow} = \text{USD} \times \left(\frac{\text{INR}}{\text{USD}} \right)$$

$$\text{INR Outflow} = \text{USD} \times \text{Ask} \left(\frac{\text{INR}}{\text{USD}} \right)$$

Ask rate given in question is 73.00. We cannot take 73 as pips as the same will make the ask rate lower than bid rate. That scenario is not possible and hence given 73 is taken as outright rate

- Relevant ask rate = 73 + 0.5% = INR 73.365/USD
- Total outflow = 1,000 x 73.365 = INR 73,365

15. Swap Points

- **Meaning:** The difference between spot and forward rate is called swap points
- **Utility:** Forward rate is the rate contracted today to exchange currencies at specified future date. This rate can be expressed either as:
 - Outright Forward Rate
 - Swap Rate/Points
- If the swap points are in ascending order, we add them to spot rate and calculate forward rate
- If the swap points are in descending order, we deduct them from spot rate and get forward rate
- **Swap premium in descending order:** If the question uses the word swap premium, then the same needs to be added to spot rate. This is despite the fact that given points are in descending order. **This is because the word used in question is swap premium.**

Example:

Spot rate for INR/USD = 66.50/90. Swap points = 140/120. What will be forward ask rate for INR/USD?

- 65.70
- 210
- 91.20
- 68.10

Answer:

Spot Ask rate = 66.90. Swap points are in descending order and same needs to be deducted. Swap points are 1.40/1.20. Forward ask rate = 66.90 - 1.20 = 65.70

16. Swap Points for Broken Period through Interpolation Technique

- **Swap points for broken period:** If swap points for 1 month and 3 months is given, then we can identify swap points for 1.5 months, 2 months, 2.5 months or any other period between 1 month and 3 months using interpolation technique

Example:

Swap points for 1 month is 100/150; Swap points for 3 months is 300/400; How much will be the swap points for 2.5 months?

- 200/275
- 250/337.50
- 150/212.50
- 250/350

Answer:

Particulars	Bid rate	Ask rate
Swap points for 1 month	100	150
Swap points for 3 months	300	400
Differential points for 2 months	200	250
Proportionate points for 1.5 months	150 [200 x 1.5/2]	187.50 [250 x 1.5/2]
Swap points for 2.5 months [1 month + Proportionate of 1.5 month]	250	337.50

17. Appreciation/Depreciation of Price Currency and Product Currency

- Currency which is appreciating is said to be at a premium and which is depreciating is said to be at a discount
- Appreciating currency is one which becomes more expensive
- Appreciation or depreciation percentage is computed with the help of below formula:

$$\text{For the product currency} = \frac{\text{Forward rate} - \text{Spot rate}}{\text{Spot rate}} \times \frac{12}{m} \times 100$$

- For the other currency, we need to convert the quote and then compute the same using the formula given above.
- Appreciation/depreciation percentage is to be separately computed for bid rate and ask rate. **If the answer of the formula is negative, it would mean currency is depreciating and if the answer is positive, it would mean currency is appreciating**
- Appreciation/depreciation percentage for average rate:** In this case also we have to separately compute bid and ask percentage. However, the denominator in this case will be **average of spot and forward rate**.

Example:

Spot rate is Rs.50/USD. 3-month forward rate is Rs.52/USD. How much is the appreciation/depreciation of INR?

- Appreciation of 4%
- Appreciation of 16%
- Depreciation of 3.85%
- Depreciation of 15.40%

Answer:

- Spot rate = INR 50/USD (or) USD 0.02/INR
- Forward rate = INR 52/USD (or) USD 0.019231/INR

$$\text{Appreciation (or) Depreciation of INR} = \frac{\text{FR} - \text{SR}}{\text{SR}} \times \left(\frac{12}{m}\right) \times 100$$

$$\text{INR change} = \frac{0.019231 - 0.02}{0.02} \times \left(\frac{12}{3}\right) \times 100 = -15.38\% \text{ rounded off to } 15.40\% \text{ (depreciation)}$$

We are getting negative answer and hence INR has depreciated by 15.40%

Example:

The spot rate for INR/ AUD is 29.45 – 29.90 and the three-month forward rate is 29.36 – 29.80. How much is the appreciation/depreciation of INR bid rate?

- Appreciation of 2.40%
- Depreciation of 2.12%
- Appreciation of 0.60%
- Depreciation of 0.60%

Answer:

Spot Rate	INR 29.45 – 29.90 per AUD	AUD 0.0334-0.0340/INR
Forward Rate	INR 29.36 – 29.80 per AUD	AUD 0.0336 – 0.0341/INR

Premium or discount %	$\frac{\text{FR} - \text{SR}}{\text{SR}} \times \frac{12}{m} \times 100$	
Using BID Rate	$\frac{0.0336 - 0.0334}{0.0334} \times \frac{12}{3} \times 100$	2.40% (appreciation)

Example:

An Indian company has imported goods from Japan for 36 lacs YEN. The amount is equivalent to INR 10 lacs today. It is anticipated that exchange rate will change by 10 percent over the medium term. Indian company promises to take appropriate action in foreign exchange market in order to protect YEN payments. What is the expected exchange rate after 3 months?

- YEN 3.60/INR
- YEN 3.24/INR
- YEN 3.96/INR

Answer:

$$\text{Current spot rate} = \frac{\text{YEN 108 lacs}}{\text{INR 30 lacs}} = \text{YEN 3.60/INR}$$

- Exchange rate will change by 10 percent and an Indian importer would be worried about depreciation of INR. Hence exchange rate change of 10 percent will be interpreted as depreciation of INR. New exchange rate = YEN 3.60/INR - 10% = YEN 3.24/INR

18. Appreciation/Depreciation percentage direct application for Product Currency

- Any appreciation or depreciation percentage provided in the question should be directly applied to the product currency. If the percentages are given for the price currency, **it is necessary to convert the quote and then apply the appreciation or depreciation percentage accordingly.**

- **Interpretation of Discount/Premium %:** USD premium on a six month forward is 3% will be interpreted as premium of 3% for the six-month period directly. This is not like interest rate and we should not make the same as proportionate premium. We can make it proportionate if the question specifically mentions USD premium on a six month forward is 3% **per annum**.

Example:

The spot exchange rate is USD 2 per GBP. USD has appreciated by 10 percent. What will be the 6-month forward rate?

- USD 2.2 per GBP
- USD 1.8 per GBP
- USD 1.82 per GBP

Answer:

Any appreciation or depreciation can be added or subtracted to the product. Current quote is USD 2 per GBP. The quote will be converted as GBP 0.5 per USD. Appreciation of 10 percent will make it GBP 0.55 per USD. This quote will be converted back and it will become USD 1.82 per GBP

Example:

Spot exchange rate EUR 0.8006 per USD. Forward discount on EURO is 4 percent per year. What is the expected 6-month forward rate of EUR/USD?

- EUR 0.8166 per USD
- EUR 0.8326 per USD
- EUR 0.8169 per USD
- EUR 0.8339 per USD

Answer:

Spot exchange rate = 0.8006 EURO per USD; Forward discount on EURO is 4% per year and the same would be 2% for 6 months. Forward discount/premium can be applied only to the product only to get the forward rate. In the above quote USD is the product and hence we should convert this into the other quote; 0.8006 EURO per USD = 1.2491 USD/EURO

Forward rate = 1.2491 - 2% = 1.2241 USD/EURO (or) 0.8169 EURO/USD

19. Appreciation of One currency > Depreciation of other currency

- The appreciation percentage of one currency will always be higher than the depreciation percentage of the other currency.

Example:

USD has appreciated by 10% against INR. How much is the likely depreciation of INR?

- Equal to 10%
- Greater than 10%
- Less than 10%

Answer:

Less than 10%

Example:

- Spot rate = USD 0.20 per INR (or) Rs.5 per USD
- Forward rate = USD 0.22 per INR [0.20 + 10%] (or) Rs.4.55 per USD

Depreciation of INR = $\frac{4.55 - 5}{5} \times 100 = -9.00\%$

21. IRPT**IRPT:**

Formula	$\frac{1 + R_h}{1 + R_f} = \frac{F_1}{e_0}$
R _h = Risk free rate of home country	
R _f = Risk free rate of foreign country	
F ₁ = Forward rate	
e ₀ = Spot rate	

Note:

- **Home and Foreign Currency:** Home currency is always the first currency in the quote and foreign currency is always the second currency in the quote. Hence in this area INR can become foreign currency if the given quote is like USD 0.0122/INR [This is very critical whenever we are solving an IRPT problem]

- **Proportionate interest rate:** Interest rate should be for the time period of forward rate. If we are calculating 6-month forward rate, then we should **compute interest rate for 6-month period**

Example:

Spot rate is Rs.50/USD. 6-month interest rate in India = 12%; 6-month interest rate in USA = 4%. What will be the forward rate after 6 months?

- Rs.46.43/USD
- Rs.48.11/USD
- Rs.53.85/USD
- Rs.51.96/USD

Answer:

Spot rate = Rs.50/USD; Risk free rate in home country = 12% per annum (or) 6% per half year; Risk free rate in foreign country = 4% per annum (or) 2% per half year

$$\frac{1 + R_h}{1 + R_f} = \frac{F_1}{e_0}; \frac{1 + 0.06}{1 + 0.02} = \frac{F_1}{50}$$

$$\text{Forward rate} = 50 \times \frac{1.06}{1.02} = \text{Rs. 51.96}$$

Example:

Spot rate is 1.40 USD/GBP. Interest rate in USA = 5% per annum. Interest rate in London = 10% per annum. What will be the forward rate of year 2?

- 1.5273 USD/GBP
- 1.2833 USD/GBP
- 1.2756 USD/GBP
- 1.5365 USD/GBP

Answer:

Spot rate = 1.40 USD per GBP; R_h (USA rate) = 5% per annum; R_f (UK rate) = 10% per annum

$$\frac{1 + R_h}{1 + R_f} = \frac{F_1}{e_0}; \frac{(1 + 0.05)^2}{(1 + 0.10)^2} = \frac{F_1}{1.40}$$

$$\text{Forward rate} = \frac{1.40 \times 1.05 \times 1.05}{(1.10 \times 1.10)} = 1.2756 \text{ USD/GBP}$$

22. IRPT - Link with interest rates

- **Interest rate impact:** A currency will depreciate if the interest rates in the country is higher and a currency will appreciate if the interest rates in country is lower
- **Implied difference in interest rates:** Implied differential in interest rates would basically mean the appreciation/depreciation percentage of the currencies. **We can compute the percentage for the product currency and mention the same as implied differential in interest rates**

Example:

USD is likely to depreciate by 2.50% against DM (German Currency). Which of the following information is true about interest rates?

- Interest rates in USA and Germany is same
- Interest rates in Germany is 2.50% more than that of USA
- Interest rates in Germany is 2.50% lower than that of USA
- We cannot conclude about interest rates based on the given information

Answer:

USD currency has depreciated and this would mean interest rates in USA is more than that of Germany. Hence, we can conclude that interest rates in Germany is 2.50% lower than that of USA

23. PPT/Law of One price**PPT/Law of one price:**

Formula	$\frac{1 + I_h}{1 + I_f} = \frac{F_1}{e_0}$
I_h = Inflation rate of home country	
I_f = Inflation rate of foreign country	
F_1 = Forward rate	
e_0 = Spot rate	

Note:

- **Law of one Price:** Exchange rate can be computed by comparing the price of a product in one country with another country.

Example:

Spot rate = Rs.60 per GBP. Inflation in India = 10% per annum; Inflation in UK = 3% per half year. What will be the forward rate for 3 months?

- Rs.60 per GBP
- Rs.64.08 per GBP
- Rs.60.59 per GBP
- Rs.61.17 per GBP

Answer:

Spot rate = Rs.60 per GBP; Inflation for 3 months in India = 2.5%; Inflation in UK for 3 months = 1.5%

$$\text{Forward rate} = 60 \times \frac{1.025}{1.015} = \text{Rs. 60.59 per GBP}$$

24. Space Arbitrage [Buy in one Market and Sell in another Market]

- Space arbitrage means buying and selling at **the same time in two different** markets (bank A and bank B) (or) (futures market and forward market)
- We should buy at lowest ask rate and sell at highest bid rate and see if we are able to make gain. **This would be called as arbitrage gain**

Example:

A pen is available at following markets:

- Market A = Rs.9-10 (Shop keeper's Purchase price of Rs.9 and selling price of 10)
- Market B = Rs.10 -11
- Market C = Rs.11-12

Strategy:

To make profits we can buy the product at Rs.10 from market A (lowest Ask rate) and sell it in Market C at Rs.11 (lowest Bid rate) and make arbitrage gain of Rs.1

Example:

INR/USD in bank A = 65.40 - 67.40; INR/USD in bank B = 68.40 - 70.00; How much will be the arbitrage gain if the investor can buy/sell 1,00,000 USD?

- INR 4,60,000
- INR 1,00,000
- INR 3,00,000
- INR 2,60,000

Answer:

Investor can buy 1,00,000 at lower ask rate of 67.40 from Bank A. Investor can sell 1,00,000 USD to Bank B at higher bid rate of 68.40. Investor will make gain of Rs.1,00,000 (68,40,000 - 67,40,000)

25. Space Arbitrage [Direct Quote and Indirect Quote]

- **Different Exchange rates:** If one bank gives exchange rate as (A/B) and another gives exchange rate as (B/A), we should convert the quotes into common mode (either A/B or B/A) and then check for arbitrage opportunities

Example:

Citi Bank quotes JPY/ USD 105.00 -106.50 and Honk Kong Bank quotes USD/JPY 0.0090 - 0.0093. How much is the arbitrage gain if you have USD 1,000.

- Arbitrage is not possible
- USD 11.67
- USD 9.67
- USD 8.00

Answer:

Quote in Citi bank = JPY 105.00 - 106.50 per USD

Quote in Hong Kong Bank:

BID $\left(\frac{\text{JPY}}{\text{USD}}\right)$	$= \frac{1}{0.0093}$	JPY 107.53/USD
BID $\left(\frac{\text{USD}}{\text{JPY}}\right)$	$= \frac{1}{0.0090}$	JPY 111.11/USD

Arbitrage opportunity can arise if we sell USD at higher bid rate of JPY 107.53/USD and buy USD at lower ask rate of JPY 106.50 per USD

Particulars	Calculation	Amount
Sell 1,000 USD in Hong Kong Market	1,000 x 107.53	JPY 1,07,530
Sell JPY 1,07,530 in Citi Bank	$\frac{1,07,530}{106.50}$	USD 1,009.67
Arbitrage gain	1,009.67 - 1,000	USD 9.67

26. Covered Interest Rate Arbitrage

- **Step 1:** Compute fair forward using IRPT formula.
- **Step 2:** Identify whether arbitrage exists and record the flow of money as per the following details:

Fair FR > Actual FR	Borrow in foreign currency and invest in home currency
Fair FR = Actual FR	No arbitrage
Fair FR < Actual FR	Borrow in home currency and invest in foreign currency

❖ Show how arbitrage gain works

- Borrow in the currency of the country from which money flow in
- Convert @ spot rate into the other currency
- Invest the converted amount
- Take forward cover
- Realize the investment along with the interest thereon
- Reconvert @ the forward rate
- Repay the principal along with the interest thereon
- Compute arbitrage gain

Note:

- **Arbitrage strategy with BID and ASK Rate:** We cannot find arbitrage opportunity by calculating fair forward rate. In this case, we have to follow trial and error method. We should check if arbitrage is possible if we borrow in currency one and then check the same if we borrow in other currency

Example:

Spot rate = INR 40/USD; 6-month borrowing rate in India = 10%; 6-month borrowing rate in USA = 4%; Forward rate = INR 41.50/USD; What will be the arbitrage strategy?

- Borrow in India and invest in USA
- Borrow in USA and invest in India
- Arbitrage is not possible

Answer:

Spot rate = Rs.40/USD; Actual R_h (India) = 10% per annum or 5% per half year; Actual R_f (USA) = 4% per annum or 2% per half year

Fair Forward Rate calculation

$$\frac{1 + 5\%}{1 + 2\%} = \frac{F_1}{40}; F_1 = \text{Rs. 41.17 per USD}$$

- Actual Forward Rate is costlier than Fair Forward Rate. Hence USD is costlier than what fair rate suggests and hence **we should invest in USA by borrowing in India**

27. Triangular Arbitrage

- It is an arbitrage strategy to gain by converting currencies and getting back the original currency again. **If we get back more than what we started with, then arbitrage exists**
- **Example:** We have USD in hand. We can convert the same into different currencies in different markets and reconvert the same to USD
- We have the following quotes in question (INR per USD, INR per GBP and USD per GBP). In this case we can follow following two routes (trial and error) to check for arbitrage gain
 - USD to INR to GBP to USD
 - USD to GBP to INR to USD
- **Exchange Margin:** When the exchange transaction takes place in different markets or banks, Exchange margin is to be applied on each of the individual quotes (*exception to the normal rule on*

exchange margin where we have mentioned that EM is to be applied on either the final cross rate or one of the quotes)

Example:

INR/USD = 48.30; INR/GBP = 77.52; USD/GBP = 1.6231; How much arbitrage gain be made if investor has 1,00,000 USD?

- No arbitrage gain
- Gain of 1,129.70
- Gain of 1,054.70
- Gain of 2,154.34
- None of the above

Answer:

1,00,000 USD can be converted into INR and the same will be Rs.48,30,000. Rs.48,30,000 will be converted into GBP and the same will be GBP 62,306.50. GBP 62,306.50 will be converted into USD and the same will be USD 1,01,129.70. Arbitrage gain = 1,01,129.70 - 1,00,000 = 1,129.70 USD

28. Forex Risk Management Techniques

- Currency Invoicing
- Netting
- Leading and Lagging
- Forward Contract
- Money Market Hedge
- Currency Futures and Options
- Currency Swaps

29. Currency Invoicing - Elimination of Exchange Risk

- The importer or the exporter shall eliminate the exchange rate risk **by invoicing in home currency**
- Currency invoicing actually does not eliminate the risk **but transfers the risk to the counterparty**
- However, this is not always possible if counterparty is unwilling to accept the invoicing strategy. And in such a case if we don't take forex risk, **there is a possibility of loss of business**

Example:

An Indian firm is exporting goods to USA. What should be the billing currency if the firm opts for currency invoicing technique to hedge transaction?

- INR
- USD
- GBP
- EURO

Answer:

Indian firm should opt for home currency invoicing to hedge transaction. Hence export should be billed in INR

30. Currency Invoicing - Non-elimination but deciding on the currency

- If the company wants to take exchange rate risk, **then we should bill in appreciating currency if you are exporter and should accept billing in depreciating currency if you are importer**
- The basic logic is select a currency **which leads to highest inflow of INR in case of exports** and select a currency which **leads to lowest outflow of INR in case of imports**

Swap points and billing currency:

- If the question has only swap points and then based on that we can decide on billing currency.
- If the swap points are in ascending order and hence currency will appreciate and if the swap points in descending order and hence currency will depreciate

Example:

INR is going to depreciate 5 percent against USD. INR is going to depreciate 3 percent against GBP. Counterparty is willing to have the billing either in USD or GBP. What should be the billing currency in case of Indian importer?

- GBP
- USD
- INR

Answer:

Import of goods will lead to foreign currency liability. We should go for billing in depreciating currency. Hence INR is preferable. However, counterparty will prefer either in USD or GBP. We should therefore accept a currency which will have lower appreciation and hence we should prefer GBP

Example:

Gupta Garments exports goods to US. It can elect to bill either in Dollars or in Euro. Payment terms are 90 days. The 90 dollar swap is 1 – 0.5 and for Euro is 1.5 – 2. Which option is advisable?

- Billing in USD
- Billing in Euros
- Indifferent between billing in USD and Euros

Answer:

Gupta Garments should choose a currency which is expected to appreciate (assets should appreciate). The 90-day dollar swap is in descending order and hence dollar is expected to depreciate. Similarly, 90-day euro swap is in ascending order and hence Euro is expected to appreciate. **The company should opt for billing in Euros (appreciating currency)**

31. Currency Invoicing – Conversion of Quote from one currency to another currency

- Question can ask for converting the foreign currency exposure into home currency exposure and bill the same in home currency. **Under this scenario the exposure needs to be converted and the same can happen at bid rate, ask rate or middle rate.** This would depend on negotiation between the parties.

32. Leading and Lagging

- Lead transaction will happen on **day 0** and Lag transaction will happen on due date (For example, day 90)
- Outflow/inflow under both options cannot be compared due to time value of money and **hence we should add interest to Lead amount.**
- Interest rate will be taken as borrowing rate if we have cash deficit and will be taken as investment rate if we have cash surplus**
- Early receipt:** Early receipt of receivables is not in exporter's hands and hence there can be some discounting charges for early receipt of receivables
- Commission charges for Letter of Credit:** This is an extra expense if the company has to give letter of credit. Commission has to be paid on day zero and there will be interest expense on commission to take the same to maturity date

Interest income vs opportunity cost:

- A firm is considering whether to lag receivables beyond normal credit period. Let us assume normal credit period is 2 months but we are planning to extend the same to 3 months.
- When we are comparing both options either we can consider interest income in option 1 (interest income from month 2 receipt for 1 month) or consider opportunity cost in option 2 (loss of same interest income).
- But we should never consider both as the same will lead to double counting of same adjustment**

Example:

A company has payable of YEN 10,00,000 after three months. YEN is likely to appreciate by 5% against INR over next three months. The company is thinking whether to pay this money today or after three months. It is having cash deficit and borrowing rate in bank is 10 percent per annum. Should the company make the payment now or wait for three months?

- Make payment today
- Make payment after three months
- Indifferent between two choices

Answer:

Yen (liability) will appreciate by 5 percent over three months. The same would correspond to 20 percent for a year. Interest rate for borrowing is 10 percent per annum. **Hence it is beneficial to borrow money at 10 percent and pay liability today.** Else liability will appreciate by 20 percent leading to higher INR outflow.

Example:

In case of cash surplus appreciation percentage is to be compared with _____ and in case of cash deficit appreciation percentage is to be compared with _____ for deciding lead/lag?

- a. Investment rate and Investment rate
- b. Borrowing rate and Investment rate
- c. Investment rate and borrowing rate
- d. Borrowing rate and borrowing rate

Answer:

Investment rate and borrowing rate

Example:

Spot rate: Rs.46.00/46.25 per USD; Assume the firm has USD 69,000 in current account earning no interest. ROI on rupee investment is 12% p.a. What should be the forward rate (INR/USD) for the firm to be indifferent between converting 69,000 USD into INR today or wait and convert after two months?

- a. Rs.47.175 per USD
- b. Rs.46 per USD
- c. Rs.46.92 per USD
- d. Rs.47 per USD

Answer:

Particulars	Redeem today	Redeem after 2 months
INR receipt today on conversion	31,74,000 (69,000 × 46)	-
Interest income for 2 months	63,480 (31,74,000 × 12% × 2/12)	-
INR receipt on conversion in M2	-	32,37,480 (69,000 × 46.92)
Total inflow in INR	32,37,480	32,37,480

Hence the indifferent forward rate is Rs.46.92 per USD as the same would lead to same inflow in INR whether we convert today or wait and convert after two months.

33. Netting

- Netting refers to the process by which dues receivable and dues payable between two parties are set off against each other
- This helps in reducing forex risk as receivables and payables are netted off against each other
- Net exposure = Inflow - Outflow
- Net exposure can be multiplied with spot, forward rate and spread for computing the final exposure in INR

Types of Netting:

- Bilateral Netting - Involves two parties
- Multilateral Netting - Involves more than two parties

Utility of Netting in Cash Management:

- **Centralized Cash Management:** Convert cash surplus/deficit of each subsidiary into common currency and use the concept of netting - Make single investment on day 0
- **Independent Cash Management:** Make decentralized cash investment and find the maturity value in different currencies - convert into single currency and use the concept of netting to find the maturity value
- **Benefit of centralized cash management = Cash balance as per option 1 - Cash balance as per option 2**

34. Forward Contract

- **Meaning:** Forward Contract is a contract entered to buy or sell at specific rate on future rate

Decision on taking forward Contract:

- The decision whether to enter into a forward contract or not depends on company's expectations

Receivable	Take a forward contract if INR inflow in forward contract is higher than expected inflow if hedging was not done
Payable	Take a forward contract if INR outflow in forward contract is lower than expected outflow if hedging was not done

Example:

Forward rate = USD 1.43/GBP; Expected spot rate = USD 1.41/GBP. Should we take a forward cover for dollar receivables?

- We should take forward contract
- We should leave it open
- Indifferent

Answer:

Let us assume that we have receivable of 100 USD

GBP realization if we cover through Forward Contract = $\frac{100}{1.43} = \text{GBP } 69.93$

GBP Realization if we keep it open = $\frac{100}{1.41} = \text{GBP } 70.92$

We have higher realization if the exposure is open and hence we should keep the exposure open

Example:

A company has imported goods worth 1,00,000 USD. Spot rate is INR 74/USD and forward rate is INR 73.50/USD. Current interest rates in India are higher than USA. What is your advise to the company on taking forward contract?

- We should take forward contract
- We should keep the exposure open
- We are indifferent on taking forward cover

Answer:

Interest rates in India are higher than USA and hence INR will depreciate and USD will appreciate. So as per IRPT we expected USD liability to appreciate. However, the current exchange rates are indicating USD depreciation and **hence we should go ahead and take forward cover**. Outflow under forward contract = Rs.73,50,000. Expected outflow if exposure is kept open = >74,00,000 (as USD will appreciate)

35. Cover Rate and Profit/loss computation of forward contract

- Cover rate refers to the rate at which a forward contract was entered
- Cover rate for payable = Hedging rate + Upfront premium + Interest on premium
- Cover rate for receivable = Hedging rate - Upfront premium - interest on premium

Profit/Loss:

- Profit/loss in payable = [FC exposure x Spot rate on maturity date] - [FC exposure x cover rate]
- Profit/loss in receivable = [FC exposure x cover rate] - [FC exposure x spot rate on maturity date]
- Profit/loss is computed by comparing the actual cash flow with the notional cash flow (What could have been)**

Example:

Spot rate = Rs.40/USD; Forward rate = Rs.45/USD Upfront premium to be paid for hedging = 2%. Tenor of contract = 6 months. Rate of interest = 12% per annum. How much is the effective cover rate for an importer?

- Rs.40.80
- Rs.45.90
- Rs.40.848
- Rs.45.954
- Rs.45.948

Answer:

Cover rate = Forward rate + Premium + Interest on premium

Cover rate = $45 + 0.90 + \left[0.90 \times 12\% \times \frac{6}{12}\right] = 45.90 + 0.054 = \text{Rs. } 45.954/\text{USD}$

Example:

Cover rate of USD receivable = Rs.45/USD; Actual spot rate on maturity date = Rs.46/USD; Transaction amount = USD 1,00,000.; How much is the profit/loss by taking forward contract?

- Loss of 1,00,000
- Profit of 1,00,000
- No profit/loss

Answer:

- Realization if FC was not taken = $1,00,000 \times 46 = \text{Rs. } 46,00,000$
- Realization by taking FC = $1,00,000 \times 45 = \text{Rs. } 45,00,000$

- Loss of Rs.1,00,000 due to forward contract as the net realization is on lower side

Example:

Cover rate of USD payable = Rs.45/USD; Actual spot rate on maturity date = Rs.46/USD; Transaction amount = USD 1,00,000.; How much is the profit/loss by taking forward contract?

- Profit of Rs.1,00,000
- Loss of Rs.1,00,000
- No profit/loss

Answer:

- INR outflow under FC = 45,00,000
- INR outflow if cover was not taken = 46,00,000
- Net saving/profit by taking FC = 1,00,000

Example:

Current spot rate is INR 50/USD. 6-month Forward rate is INR 55/USD. The company took a forward contract for 1,00,000 USD payable. Compute the amount of profit/loss if INR depreciated by 4 percent? (Please work with four decimals)

- Profit of Rs.3,00,000
- Loss of Rs.3,00,000
- Profit of Rs.2,91,667
- Loss of Rs.2,91,667

Answer:

- Outflow under forward contract = $1,00,000 \times 55 = \text{Rs.}55,00,000$
- Outflow if forward contract was not taken:
 - Spot rate = INR 50/USD (or) USD 0.02 per INR
 - INR depreciation = 4%; Actual spot rate = $0.02 - 4\% = \text{USD } 0.0192/\text{INR}$ (or) INR 52.0833/USD
- Outflow if forward contract was not taken = $1,00,000 \times 52.0833 = \text{Rs.}52,08,333$
- We have paid more by taking forward contract and hence there is a loss. Amount of loss = $55,00,000 - 52,08,333 = \text{Rs.}2,91,667$

36. Expected loss with and without Hedging**Expected Loss:**

- Expected loss if hedging is not done = Compare cash flow at billed rate (or spot rate) with cash flow at expected spot rate
- Expected loss if hedging is done = Compare cash flow at billed rate (or spot rate) with cash flow at forward rate

Example:

You have sold goods worth 1,00,000 USD and the same was priced at an exchange rate of Rs.70 per USD. Current spot rate is Rs.68 per USD and the bankers have indicated a forward rate of Rs.67 per USD. How much is the profit/loss in operating profit if forward sale is agreed to?

- INR 1,00,000 (Loss)
- INR 3,00,000 (Loss)
- INR 1,00,000 (Profit)
- INR 3,00,000 (Profit)

Answer:

Loss/gain in operating profit is computed by comparing the billed rate with realization rate. Billed rate is Rs.70 per USD and the realization rate will be Rs.67 per USD if the forward sale is agreed to. Hence overall impact in operating profit = $1,00,000 \times (70 - 67) = \text{Rs.}3,00,000$ (loss)

37. Relevant Forward Contract Rate

- A company gets 60 days bill from customer. Transit period is 20 days. This would mean realization will happen after 80 days. Question gives data on 2 and 3-month period. Relevant period is 2.67 months and the same would be rounded-off to lower period and 2-month forward rate would be taken for realization. [This point is not logical but ICAI has done this in one exam question]

- Interest calculation on the borrowing in the above example would be for 80 days as the amount would be repaid after 80 days (**The company would have taken a loan against the receivables amount**)

Example:

M/s. Sky products Ltd., of Mumbai, an exporter of sea foods has submitted a 60 days bill for EUR 5,00,000 drawn under an irrevocable Letter of Credit for negotiation. The company has desired to keep 50% of the bill amount under the Exchange Earners Foreign Currency Account (EEFC). Transit period is 20 days. Interest on post shipment credit is 8% per annum. The inflow will be realized at an effective rate of INR 80/USD. How much would be the interest paid by the company? Assume 360 days in a year for computing interest

- Rs.3,55,556
- Rs.2,66,667
- Rs.7,11,111
- Rs.5,33,333

Answer:

The company would have taken post-shipment credit at 8% for a period of 80 days as the realization will happen after 80 days (60 days credit + 20 days transit). Company plans to keep 50% funds in EEFC account and hence balance 50% it will convert in INR and repay the loan. Hence loan taken by the company will be equal to the planned realization in INR.

Loan taken = 2,50,000 x 80 = Rs.2,00,00,000

Interest to be paid = 2,00,00,000 x 8% x $\frac{80}{360}$ = Rs. 3,55,556

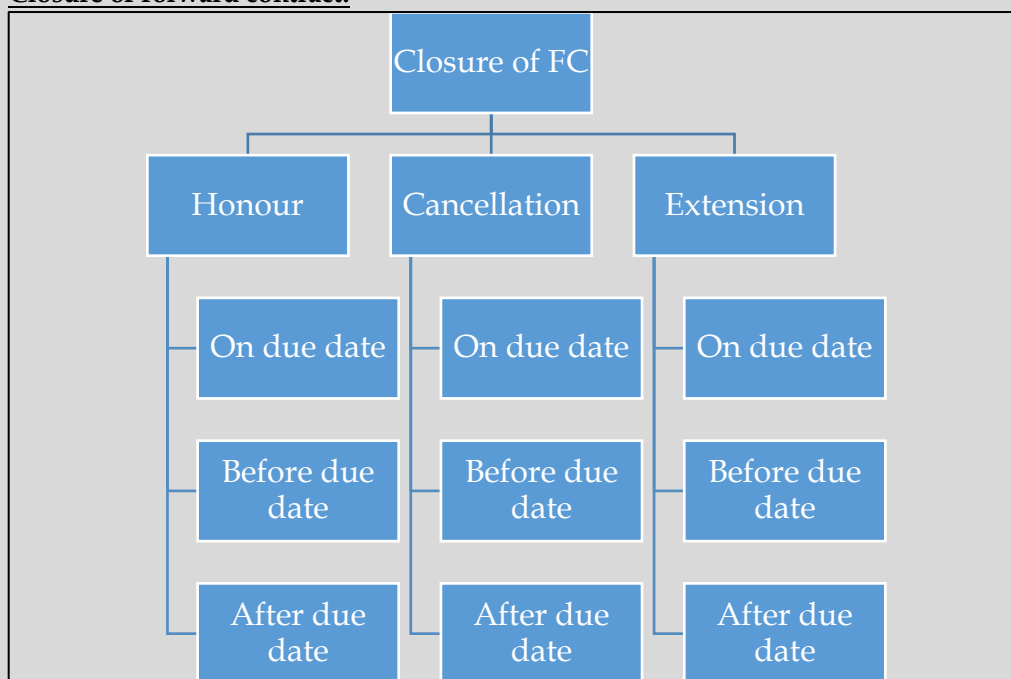
Example:

The company has submitted a 60 days bill of USD 5,00,000 to bank. Transit period of shipment is of 20 days. Forward rates available with the bank are of 1,2 and 3 months. What is the relevant exchange rate for clearance of bill?

- 1 month forward rate
- 2 month forward rate
- 3 month forward rate

Answer:

The money will be realized in 80 days (60 days bill + 20 days transit period). It will have to be rounded off to the lower of months (2.67 months) and hence 2 months forward rate is to be taken

38. Closure of Forward Contract**Closure of forward contract:**

- A forward contract can either be honoured, cancelled or extended. This can be done on due date, before date and after due date. Therefore, there are 9 possible scenarios to close a forward contract. 8 out of these 9 scenarios will involve cancellation of a forward contract and honour on due date is the only way of honouring the commitment

1. Honour on due date	No extra computation
2. Honour before due date	• Cancel the contract • Pay swap loss • Pay/receive interest
3. Honour after due date	• Pay cancellation loss of customer • Pay effective loss of bank • Pay/receive interest
4. Cancel on due date	• Pay cancellation loss
5. Cancel before due date	• Pay cancellation loss
6. Cancel after due date	• Pay cancellation loss of customer • Pay effective loss of bank • Pay/receive interest
7. Roll-over on due date	• Pay cancellation loss • Enter into new contract (effective loss can also be computed)
8. Roll-over before due date	• Pay cancellation loss • Enter into new contract (effective loss can also be computed)
9. Roll-over after due date	• Pay cancellation loss of customer • Pay effective loss of bank • Pay/receive interest • Enter into new contract (effective loss can also be computed)

Format for computation of Cancellation gain/loss:

Date	Position	Action	Reference Date	Rate
Original date	Original Position	Buy (ASK)	December 31	-68.00
December 31	Opposite Position	Sell (BID)	December 31	66.50
December 31	New Position	Buy (ASK)	March 31	-66.00
Effective rate (Addition of three rates)				-67.50
Loss on cancellation per USD (compare 1 with 2)			-68.00 + 66.50	-1.50
Total loss on cancellation			-1.50 x 1,00,000	-1,50,000
Effective gain per USD (Compare 1 with 4)			-67.50 - (-68.00)	0.50
Total effective gain/loss			0.50 x 1,00,000	50,000

Note:

- Original Position would mean - What action the company want to take on reference date. An importer will enter into a buy contract and exporter will enter into a sell contract
- Rate will be written as negative if the action is Buy and same will be taken as positive if the action is Sell
- We should ensure reference date remain same as that of original position date for cancellation of forward contract
- We should be careful while reading the question. For instance, A customer with whom the bank had entered into a forward purchase contract. This would mean the original position of the customer is sell as the bank has entered into purchase contract and customer has entered into a sell contract
- There are two types of losses in forward contract:
 - Cancellation gain/loss = Comparison of original rate with cancellation rate
 - Effective gain/loss = Comparison of original rate with effective rate
- **Cost to company in respect of extension:** We should preferably answer both above losses as ICAI solution at few places have mentioned cancellation loss and at other places it is effective loss. We can answer like this "**Cost to the importer in respect of extension of forward contract = Rs.17,000 (Loss on cancellation). However, the effective loss for the importer is Rs.9,800**"

- **Flat cancellation charges:** Question can state some flat cancellation charges. This would be taken as outflow for customer irrespective of whether he is exporter or importer

Example:

A has imported goods worth 1 lac euros payable on 31st December and entered into forward contract when exchange rate was INR 66-68/EURO. Today is November 30 and the importer wants to honor contract today. Spot rate is INR 65.50-66.50/EURO and one month forward contract is INR 67.50-68/EURO. How much would be the total outflow by the importer?

- Rs.69,00,000
- Rs.68,00,000
- Rs.66,50,000
- Rs.67,00,000

Answer:

Date	Position	Action	Reference Date	Rate
Original date	Original Position	Buy (ASK)	December 31	-68.00
November 30	Opposite Position	Sell (BID)	December 31	67.50
November 30	New Position	Buy (ASK)	November 30	-66.50
Effective rate				-67.00
Loss on cancellation per USD			-68.00 + 67.50	-0.50
Total loss on cancellation			-0.50 x 1,00,000	-50,000
Effective gain per USD			-67.00 - (-68.00)	1.00
Total effective gain			1.00 x 1,00,000	1,00,000

- Contract will get honored at spot ASK rate of November 30. Outflow towards honor of contract = $1,00,000 \times 66.50 = \text{Rs.}66,50,000$
- **Cancellation gain/loss:** Original contract was taken at ASK rate of Rs.68 and opposite cancellation rate is 67.50. Net loss on cancellation = 0.50/USD (or) Rs.50,000
- Total outflow = $66,50,000 + 50,000 = \text{Rs.}67,00,000$

Example:

A customer with whom the Bank had entered into 3 months' forward purchase contract for Swiss France 10,000 at the rate of Rs. 27.25 comes to the bank after 2 months and request cancellation of the contract. One-month forward rate on date of cancellation is INR 27.45-27.52 per swiss franc. How much is the cancellation gain/loss?

- Loss of Rs.2700
- Profit of Rs.2700
- Loss of Rs.2000
- Profit of Rs.2000

Answer:

Date	Position	Action	Reference Date	Rate
Original date	Original Position	Sell (BID)	Month 3	27.25
Month 2	Opposite Position	Buy (ASK)	Month 3	-27.52
Loss on cancellation per USD			27.25 - 27.52	-0.27
Total loss on cancellation			-0.27 x 10,000	2,700

Original contracted rate = INR 27.25/Swiss franc. The bank has entered into forward purchase and hence the customer has entered into sale contract. Hence contract will get cancelled at opposite Ask rate of Rs.27.52/Swiss franc. Loss on cancellation = INR 0.27/Swiss franc (or) Rs.2,700

39. Honour before due date**Example:**

On 1 October 2015 Mr. X an exporter enters into a forward contract with a BNP Bank to sell US\$ 1,00,000 on 31 December 2015 at Rs.65.40/\$. However, due to the request of the importer, Mr. X received amount on 28 November 2015. Mr. X requested the bank to take delivery of the remittance on 30 November 2015 i.e., before due date. The inter-banking rates on 28 November 2015 was as follows:

- ❖ Spot rate = Rs.65.22/65.27
- ❖ One month premium = 10/15

If bank agrees to take early delivery then what will be net inflow to Mr. X assuming that the prevailing prime lending rate is 18%

Answer:

Computation of swap/cancellation gain/loss:

Date	Position	Action	Reference Date	Rate
Oct 1	Original Position	Sell (BID)	December 31	65.40
Nov 30	Opposite Position	Buy (ASK)	December 31	-65.42
Nov 30	New position	Sell (BID)	Nov 30	65.22
Effective rate			65.40 – 65.42 + 65.22	65.20
Swap loss per USD			65.40 – 65.20	0.20
Total Swap loss			0.20 x 1,00,000	20,000

Computation of Interest cost/income:

Particulars	Amount
Nov 28 – Bank will buy from customer at original contracted rate	-65.40
Nov 28 – Bank will sell at spot rate to some other Bank	65.22
Outflow for banker	0.18
Total outflow for banker (1,00,000 x 0.18)	18,000
Interest cost to be recovered (18,000 x 18% x 31/365)	275

Note:

- Final outflow/inflow = Inflow/outflow as per original contracted rate $\pm$ swap loss $\pm$ Interest cost
- Interest cost computation will not be done if the question does not give interest rate in the question and answer will be completed as per table 1 itself

Net realization for customer:

Particulars	Amount
Sale of 1,00,000 USD at original rate (1,00,000 x 65.40)	65,40,000
Less: Charges (20,000 + 275)	(20,275)
Net realization from customer	65,19,725

Lead vs Lag Analysis in relation with honour before due date:

- We can compare the option of honouring on due date vs honouring before due date by comparing the overall INR cash flow
- In case of honour before due date we need to add interest saving which will arise due to early honour and then compare the two options. **We will select option having higher INR inflow**

Example:

On 1st October, 2020 Mr. Guru, an exporter, enters into a forward contract with the Bank to sell USD 1,00,000 on 31st December 2020 at INR/USD 75.40. However, at the request of the importer, Mr. Guru received the amount on 30th November, 2020. Mr. Guru requested the bank take delivery of the remittance on 30th November, 2020 i.e. before due date. The inter-bank rate on 30th November 2020 was as follows:

- Spot INR/USD 75.22-75.27
- One Month Premium 10/15

Assume 365 days in a year.

How much would be the interest charged/paid by the bank for early remittance?

- Rs.197 (customer will pay bank)
- Rs.197 (bank will pay customer)
- Rs.275 (Customer will pay bank)
- Rs.275 (Bank will pay customer)

Answer:

Particulars	Amount
Nov 30 – Bank will buy from customer	-75.40
Nov 30 – Bank will sell at spot rate to some other Bank	75.22
Outflow for banker	0.18
Total outflow for banker (1,00,000 x 0.18)	18,000
Interest cost to be recovered (18,000 x 18% x 31/365)	275

Hence customer will pay Rs.275 to Bank

40. Forward Contract – Customer does not appear on Due Date

- A customer is allowed **three working days of grace period** for execution of forward contract.

- If the customer does not give instruction in three days, then the contract will get auto-cancelled.
- Even if the customer gives instruction, there will be a cancellation and the customer will have to pay cancellation loss

Following needs to be paid by the customer

Cancellation Rate	Spot rate + margin on the date on which customer appears for cancellation (Contract will be automatically cancelled 3 days post expiry if the customer does not appear for cancellation)
Amount payable by the customer	Difference between customer's original customer rate and cancellation rate as calculated above
Swap loss	As per FEDAI norms, banker has to cancel the original contract (taken with some other bank) and swap it with next available contract. Exchange margin should not be considered in banker analysis
Interest on outlay of funds	Bank will charge interest to the customer on the cancellation charges paid by bank by cancelling contract on due date. It is calculated on banks original covered rate and the reverse rate on the maturity date. Interest is calculated till the date of cancellation of contract or 3 days whichever is later
Total cost to customer	Cancellation charges + Swap loss + Interest on outlay of funds

Note: In any of the above cases, if there is a profit for the bank, the same may not be passed on to the customer by the bank.

Format for computing cancellation rate and amount payable by customer:**Example:**

An importer booked a forward contract with his bank on 10th April for USD 2,00,000 due on 10th June @ Rs. 64.4000. The bank covered its position in the market at Rs. 64.2800.

The exchange rates for dollar in the interbank market on 10th June and 13th June were:

	June 10	June 13
Spot USD 1	63.8000/8200	63.6800/7200
Spot/June	63.9200/9500	63.8000/8500
July	64.0500/0900	63.9300/9900
August	64.3000/3500	64.1800/2500
September	64.6000/6600	64.4800/5600

Exchange Margin 0.10% and interest on outlay of funds @ 12%. The importer requested on 13th June for extension of contract with due date on 10th August. Rates rounded to 4 decimal in multiples of 0.0025. On 10th June, Bank Swaps by selling spot and buying one month forward.

Answer:**Evaluation from importer point of view:**

Date	Position	Action	Reference Date	Rate
Apr 10	Original Position	Buy (ASK)	June 10	-64.4000
June 13	Opposite Position	Sell (BID)	June 13	63.6175
June 20	New Position	Buy (ASK)	Aug 10	-64.3150
Effective rate			-64.40+63.6175-64.3150	-65.0975
Loss on cancellation per USD			-64.40+63.6175	-0.7825
Total loss on cancellation			-0.7825 x 2,00,000	-1,56,500
Effective loss per USD			-65.0975 - (-64.40)	-0.6975
Total effective loss			-0.6975 x 2,00,000	-1,39,500

Note:**BID rate on June 13 (Spot rate):**

- BID rate = 63.6800 - 0.10% = 63.6163 ~ 63.6175 (multiples of 0.0025)

ASK rate on June 13 for August 10:

- Ask rate without exchange rate = 64.2500
- Final Ask rate = 64.25 + 0.10% = 64.31425 ~ 64.3150

Format for computing swap loss (evaluation from banker point of view):

Date	Position	Action	Reference Date	Rate
Apr 10	Original Position	Buy (ASK)	June 10	-64.28

June 10	Opposite Position	Sell (BID)	June 10	63.80
June 10	New Position	Buy (ASK)	June 30	-63.95
Effective rate			-64.28+63.80-63.95	-64.43
Loss on cancellation per USD			-64.28+63.80	-0.48
Total loss on cancellation			-0.48 x 2,00,000	-96,000
Effective loss per USD			-64.43 - (-64.28)	-0.15
Total effective loss			-0.15 x 2,00,000	-30,000

- Swap loss = Effective loss
- Interest cost = Cancellation loss x (No of days / 365) x Rate of interest

Final Solution:

Particulars	Calculation	Amount
Cancellation rate	WN 1	63.6175
Amount payable on USD 2,00,000 (Loss on cancellation)	WN 1	1,56,500
Swap loss (Swap loss of banker)	WN 2	30,000
Interest on outlay of funds (This is banker outflow on cancellation due to non-receipt of instructions from customer)	$96,000 \times 12\% \times \left(\frac{3}{365}\right)$	95
New Contract rate	WN 1	64.3150
Total cost	$1,56,500 + 30,000 + 95$	1,86,595

Example:

An importer booked a forward contract on 10th April with delivery being on 10th June. The customer appears on June 17 and asks for extension of contract to August 10. What will be the date of cancellation of contract?

- June 10
- June 17
- June 13

Answer:

Due date of forward contract = June 10; Grace period of honoring the contract = 3 days; Date of cancellation of contract = Date on which customer appears or 3 days whichever is earlier and hence contract will get cancelled on June 13

41. Decision on hedging based on average contribution to sales ratio

- We should compute average contribution to sales ratio **for all currencies together** and compute this ratio.
- We will have one ratio if hedging is done and another ratio if hedging is not done. Based on this analysis we can decide whether to go for hedging or not

42. Time Value and Currency Fluctuation Component

- Time value of money component is the discount a company can get by making early payment.
- 2/10 net 30 would mean we will get 2 percent discount if payment is done in 10 days. Otherwise, payment should be done in 30 days.
- Currency Fluctuation component is the extra/lesser payment due to appreciation/depreciation of currency
- **Time value of money component = Amount of cash discount x Exchange rate on due date**
- **Currency fluctuation component = (Payment post discount in FC) x appreciation/depreciation of FC**

Example:

India Imports co., purchased USD 100,000 worth of machines from a firm in New York, USA. The value of the rupee in terms of the Dollar has been decreasing. The firm in New York offers 2/10, net 90 terms. The spot rate for the USD is Rs. 55; the 90 days forward rate is Rs. 56. How much is time value of money component (discount for prepayment) and protection from currency fluctuation if the company decides to make payment today?

- Rs.1,10,000 and Rs.1,00,000

- b. Rs.1,12,000 and Rs.98,000
- c. Rs.1,00,000 and Rs.1,10,000

Answer:

- 2/10 net 90 would mean that the company will get 2 percent discount if the payment is done in 10 days. Hence the company will be making a payment of only 98,000 USD
- Rupee cost of paying the account within 10 days = 98,000 USD x Rs.55 = Rs.53,90,000
- Rupee cost of paying in 90 days = 1,00,000 USD x 56 = Rs.56,00,000
- Saving in payment if early payment is made = 56,00,000 - 53,90,000 = Rs.2,10,000
- Time value of money component = $[1,00,000 - 98,000] \times \text{Rs.}56.00 = \text{Rs.}1,12,000$
- Currency value fluctuation component = $98,000 \times [56 - 55] = \text{Rs.}98,000$

43. Money Market Hedge

- MMH is a strategy where we create matching asset for a future payable and matching liability for a future receivable. Hence the asset/liability will be set-off against each other so that forex risk is eliminated.

Steps in case of exporter:

Particulars	Calculation	Amount
Day 0:		
Identify a foreign currency asset/liability - Foreign currency Asset		USD 3,50,000.00
Create a matching liability - we will take a USD loan which will mature to USD 3,50,000	$\frac{3,50,000}{1 + 2.25\%}$	USD 3,42,298.29
Convert USD 3,42,298.29 into GBP at spot rate	$3,42,298.29 \times \left(\frac{1}{1.5905}\right)$	GBP 2,15,214.27
Invest GBP 2,15,214.27 for three months at the rate of 5%		GBP 2,15,214.27
Day 90:		
Receive USD 3,50,000 from customer and repay USD Loan		USD 3,50,000.00
Redeem GBP deposit along with interest	$2,15,214.27 + 1.25\%$	GBP 2,17,904.45

Steps in case of importer:

Particulars	Calculation	Amount
Day 0:		
Identify a foreign currency asset/liability - Foreign currency Liability		EUR 25,00,000
Create a matching asset- we need to create a EUR deposit which will mature to EUR 25,00,000 Deposit rate = 2.5% per quarter	$\frac{25,00,000}{1 + 2.50\%}$	EUR 24,39,024
Take a GBP loan at 2% per 3 months which will help in buying EUR 24,39,024	$24,39,024 \times \left(\frac{1}{1.25}\right)$	GBP 19,51,219
Convert GBP 19,51,219 into Euros and create Euro deposit		EUR 24,39,024
Day 90:		
Redeem Euro deposit along with interest	$24,39,024 + 2.5\%$	EUR 25,00,000
Pay supplier with deposit proceeds		EUR 25,00,000
Repay GBP loan along with interest of 2%	$19,51,219 + 2\%$	GBP 19,90,243

Note:

- Question does not specify the hedging mechanism and has data on interest rates. In this case the approach to hedging would be through money market hedge
- **Interpretation of 180 days deposit/borrowing rate:** In practical world, interest rates are normally expressed for a year and we have 7 days FD rate, 14 days FD rate, 30 days FD rate, 180 days FD rate and so on. So normally the given interest rate is taken for a year and based on that we compute proportionate rate for MMH. However, in few places ICAI has directly used the given rate as the rate for the specific period and not for a year. Therefore, it is necessary for us to write our assumption on how we are interpreting the interest rates

Example:

ABC Limited based out of India has exported goods to USA. It is going to receive 3,50,000 USD in 6 months. It plans to hedge exposure through money market. Interest rates in USA are 6%/8% per annum. Compute the deposit/borrowing in USD?

- Loan of USD 3,24,074
- Deposit of USD 3,24,074
- Loan of USD 3,36,539
- Deposit of USD 3,36,539

Answer:

We have foreign currency asset (receivable) and hence we need to create a matching liability. We will take a loan in USD. Proportionate borrowing rate for 6 months is 4%

$$\text{Loan to be taken} = \frac{3,50,000}{1 + 4\%} = \text{USD } 3,36,539$$

Example:

ABC Limited of India has imported goods worth USD 10,00,000 payable in 6 months. Interest rates in USA are 4%/6% per annum. The spot exchange rate is Rs.81.20-60 per USD. How much is the loan to be taken to cover this transaction in MMH?

- USD 9,70,874
- INR 7.96 crores
- INR 8.00 Crores
- None of the above

Answer:

We have USD liability and hence we need to create matching USD asset

$$\text{Amount of USD deposit to be created} = \frac{10,00,000}{1 + 2\%} = \text{USD } 9,80,392$$

$$\text{INR needed to purchase } 9,80,392 \text{ USD} = 9,80,392 \times 81.60 = \text{INR } 8.00 \text{ Crores}$$

Example:

A UK Company owes a German Company 25 lakhs Euros payable in 3 months. The spot rate EURO/GBP is 1.25-1.27. The company can borrow pounds @ 8% and deposit pounds @6%. It can borrow Euro @12% and deposit Euro@10%. How much is the deposit to be created today?

- EUR 25,00,000
- EUR 24,39,024
- GBP 19,51,219
- EUR 24,27,184

Answer:

We have a foreign currency liability of EUR 25,00,000 and we should create a matching deposit that will mature to EUR 25,00,000

$$\text{Amount of deposit to be created} = \frac{25,00,000}{1 + 2.5\%} = \text{EUR } 24,39,024$$

Example:

A Limited of India has sold goods to USA. It wants to hedge the exposure through Money market hedge. It should borrow in _____ and create a deposit in _____ to complete MMH.

- INR and USD
- INR and INR
- USD and INR
- USD and USD

Answer:

It has exported goods and hence has foreign currency asset (USD). It should create a matching liability and hence **borrow in USD**. The borrowed amount should be **converted into INR and deposited**

Example:

A company has a payable exposure of EUR 25,00,000. The final amount paid under MMH is GBP 20,00,000. The forward contract today is EUR 1.20 - 1.22 per GBP. What should the company do for hedging?

- Go ahead with MMH
- Go ahead with forward contract
- Indifferent between MMH and FC
- Do not hedge the exposure

Answer:

Payable under forward contract:

$$\text{GBP} = \text{EUR} \times \text{ASK} \left(\frac{\text{GBP}}{\text{EUR}} \right)$$

$$\text{GBP} = 25,00,000 \times \left(\frac{1}{1.20} \right) = \text{GBP } 20,83,333$$

Outflow under forward contract is higher and hence the company should go for MMH to cover the exposure

44. Transaction Exposure and Operating Exposure

Transaction Exposure:

- Transaction exposure measures the impact on profits due to variation in exchange rates
- **Profit impact due to transaction exposure = Profit as per Spot rate - Profit as per expected spot/forward rate**

Operating Exposure:

- Operating exposure measures the change in profits due to changes in operating conditions (Selling price/units sold/purchase price etc)
- Gain/loss due to transaction exposure = Existing profit as per spot rates – revised profits as per spot rates [**Basically no change in exchange rates**]

Note:

- Price elasticity of demand measures the percentage change in units sold for a percentage change in price. If price elasticity of demand is 1.5, then 1 percent increase in selling price will lead to 1.5 percent fall in units sold

Example:

A company can make a profit of Rs.10,00,000 if exports and import settlement is done as per spot rates. However, the same would decline to Rs.4,00,000 if they are realized and paid as per the due date. How much is the transaction exposure?

- 10,00,000
- 14,00,000
- 6,00,000
- 4,00,000

Answer:

Transaction exposure = Profit as per spot rates – Profit as per forward rates

Transaction exposure = 10,00,000 – 4,00,000 = Rs.6,00,000

45. Types of Bank Accounts

Types of Bank Accounts:

- **Nostro Account (Our Account with you):** An Indian Bank having a Bank Account in Foreign country in the home currency of foreign Bank. **Example: ICICI Bank having USD account with CITI Bank USA**
- **Vostro Account (Your Account with us):** A foreign bank having Bank Account in India with an Indian Bank in INR currency. **Example: CITI Bank USA having INR account with ICICI Bank**
- **Loro Account:** An account where a bank remits fund in foreign currency to another bank for credit to third bank

46. Exchange Position vs Cash Position

- This analysis is from banker point of view as banker will be having multiple forex transactions daily and hence the forex risk needs to be covered

Cash Position vs Exchange Position:

- **Cash Position:** This means the actual forex balance and is impacted only when cash flow happens for a transaction
- **Exchange Position:** It refers to the extent of overbought/oversold position of a foreign currency by a bank. This book will record all purchase and sale of foreign currency transactions irrespective of cash flow

Transaction affecting Exchange position and cash position:

Transaction	Exchange position	Cash position
-------------	-------------------	---------------

Immediate cash flow (Telegraphic transfer)	Yes	Yes
Demand draft	Yes – Sale Transaction	No. Will be impacted only when the draft is realized
Bills purchase	Yes – Buy Transaction	No. Will be impacted only when the bill is realized
Forward purchase/sale	Yes	No. Will be impacted only on delivery

Format for recording exchange position:

Particulars	Purchase/ Inflow	Sales/ Outflow

- Exchange Position is more like stores ledger. It will record all inflows as purchases and record all outflows as sales

Format for recording cash position:

Particulars	Receipt/ Inflow	Payment/ Outflow

- Cash position is a cash book. It will record all cash inflows and cash outflows

Note:

- **Purchase in exchange position:** Purchase of bill, Cancellation of demand draft, spot purchase, DD Purchase, Purchase of cheques not credited to account, outstanding forward purchases, bills purchased in hand but not due for
- **Sales in exchange position:** Forward sales, cancellation of forward purchase, Remittance by TT, Sold forward TT, outstanding forward sales, DD issued but not yet presented for payment
- **Inflow in cash position:** Spot purchase
- **Outflow in cash position:** Remittance by TT

Example:

Cancellation of DD issued is recorded as _____

- Purchase in exchange position
- Sale in exchange position
- Outflow in cash position
- Inflow in cash position

Answer:

Draft issue is recorded as sale transaction in exchange position. Cancellation of same will reverse the transaction and the same would be recorded as purchase in exchange position

Example:

Spot sale of foreign currency is recorded as _____

- Sale in Exchange position and inflow in cash position
- Sale in Exchange position and outflow in cash position
- Purchase in Exchange position and outflow in cash position
- Purchase in Exchange position and inflow in cash position

Answer:

Sale in Exchange position and outflow in cash position

Example:

How is forward purchase recorded in cash position?

- Inflow
- Outflow
- Not recorded

Answer:

Not recorded

47. Exchange Position vs Cash Position – Maintenance of Desired Balance

- **Cash Position:** If we want to increase/decrease cash balance then we should do spot purchase/sales. This will also impact the exchange position.
- **Exchange Position:** If we also want to change the overbought and oversold position then we can go for forward purchase/sales. Forward purchase/sales will only impact exchange position
- **In short, we should first do the adjustment of cash position and then the exchange position**

Example:

A bank has an overbought position of USD 1,00,000 and cash balance of USD 25,000. It wants a cash balance of USD 80,000 and overbought position of USD 1,50,000. What action should be taken?

- Spot purchase of USD 55,000 and forward sell of USD 5,000
- Spot purchase of USD 55,000 and forward purchase of USD 50,000
- Forward purchase of USD 50,000
- Spot purchase of USD 55,000 and forward purchase of USD 5,000

Answer:

First we should adjust the cash balance and hence we will do spot purchase of USD 55,000. This will increase the cash balance to USD 80,000. This transaction will also increase overbought position as USD 1,55,000. We need an over-bought position of USD 1,55,000 and hence we should do forward sell of USD 5,000 to make the final position as USD 1,50,000

Example:

A bank has an overbought position of USD 1,00,000 and cash balance of USD 25,000. It wants a cash balance of USD 40,000. What action should be taken?

- Buy USD 15,000 in spot market
- Sell USD 15,000 in spot market
- Buy USD 15,000 in forward market
- Sell USD 15,000 in forward market

Answer:

It has balance of USD 25,000 and should do a spot purchase of USD 15,000 to make the balance USD 40,000

48. Currency Futures

- Currency futures operate similarly to regular futures contracts, but with the distinction of **involving two currencies in the quoted exchange rate**. This differs from standard futures, where the Indian Rupee (INR) is typically paired with another commodity or share.

Format for computing number of futures contract:

Particulars	Amount
Amount of Exposure	
Size of one contract	
Number of contracts	
Action Taken	

- **Exposure currency vs contract currency:** We should ensure that exposure currency and contract currency is same for computing the number of contracts for both options and futures. In case they are not same, we should convert the exposure into the other currency **by using futures rate or strike rate of options**
- We should take the closest available contract for hedging in case the contract for the exact due date is not available

Format for computing futures settlement:

Date	Position	Action	Reference Date	Rate
Day 0	Original Position	Buy	Jan 31	(1.50 USD/GBP)
Jan 31	Opposite Position	Sell	Jan 31	1.47 USD/GBP
Profit per GBP				0.02 USD/GBP
Profit for 16,000 contracts (0.02 x 62.50 x 16,000)				USD 20,000

- **Final Cash flow = Amount paid/realized at spot rate + Net Settlement**
- **Non-deliverable forward (NDF) contract would also work as similar to futures while computing realization/settlement. This is because NDF is also net-settled.**

- **Margin money in futures:** Margin money does not constitute an expenditure for the company. However, it is initially deposited on day 0 and subsequently returned upon maturity. **Therefore, it is important to factor in the interest cost associated with margin money.**

Example:

XYZ Ltd. is an export-oriented business house based in Mumbai. The Company invoices in customers' currency. Its receipt of US \$ 1,00,000 is due on September 1, 2009. Contract size of currency futures is Rs.4,72,000 and September futures rate is USD0.02118 per INR. On September 1, 2009 the spot rate US\$/Re. is 0.02133 and currency future rate is 0.02134. How much would be the futures profit/loss on maturity date?

- INR 755.20 (Profit)
- USD 755.20 (Profit)
- INR 755.20 (Loss)
- USD 755.20 (Loss)

Answer:**Number of contracts:**

Particulars	Amount
Amount of exposure	USD 1,00,000
Amount of exposure in INR (1,00,000/0.02118)	INR 47,21,435
Size of one contract	INR 4,72,000
No of contracts	10

Note:

- In this case we will enter into buy contract as we are planning to sell USD and buy INR. INR is the product currency and hence it will be buy contract.

Futures settlement:

Date	Position	Action	Reference Date	Rate
June 1	Original Position	Buy	Sep 01	(USD 0.02118/INR)
Sep 1	Opposite Position	Sell	Sep 01	USD 0.02134/INR
Profit per INR				USD 0.00016/INR
Total Profit (0.00016 x 10 x 4,72,000)				USD 755.20

Example:

On January 5, an Indian firm exported goods to an US firm for a consideration of USD 4,00,000 receivable on 15th of February. The spot exchange rate is Rs.44/USD and a March dollar future is trading at Rs.45/USD. You have taken march futures for hedging the receivable. On 15th February if the exchange rate in cash market drops to Rs.39/USD and in the futures markets it is trading at Rs.41/USD. How much is the futures profit/loss?

- Rs.16,00,000 (loss)
- Rs.16,00,000 (profit)
- Rs.20,00,000 (loss)
- Rs.20,00,000 (profit)

Answer:

Date	Position	Action	Reference Date	Rate
Jan 5	Original Position	Sell	March 31	Rs.45/USD
Feb 15	Opposite Position	Buy	March 31	(Rs.41/USD)
Profit per USD				Rs.4/USD
Profit for USD 4,00,000 [4,00,000 x 4]				Rs.16,00,000

Example:

The corporate treasurer of a US multinational receives a fax on 21st February from its European subsidiary. The subsidiary will transfer Euro 10 million to the parent company on 16th August. If the corporate treasurer plans to hedge through futures in the dollar market, will he buy or sell dollar futures?

- Long in USD futures
- Short in USD futures

Answer:

The company plans to sell EUROS and hence it would be buying USD. Hence, we should go long (buy) USD futures for hedging.

49. Forex Options**Deciding Call Option vs Put Option:**

- In a standard options scenario, a call option is typically employed for buying, while a put option is used for selling. However, in the context of currency options, one must exercise caution and consider the nature of the transaction in the product currency. **It is not always straightforward to assume that an importer will utilize a call option and an exporter will opt for a put option.**
- For example, let's consider an Indian exporter aiming to hedge USD receivables with a strike rate of USD 0.0122/INR. In this case, INR is the product currency. Therefore, the exporter can buy INR using a call option and sell INR using a put option. **Given that the exporter is selling USD and buying INR, the appropriate hedging strategy would involve the use of a call option.**

Call option and Put option:

- Maximum purchase price in call option = Strike Price + Premium + Interest on Premium
- Minimum selling price in put option = Strike price - Premium - Interest on Premium
- **Interest on option premium:** Option premium is paid on day 0. We should consider interest cost on option premium in case interest rate is available in question. If we are having cash deficit then interest will be considered as per borrowing rates and if we are having cash surplus then interest would be computed as per investment rates
- **Unhedged exposure in options:** Example: A company needs 17.40 Contracts to hedge full exposure. However, we need to round off and this will become 17 contracts. So, there will be some unhedged exposure. Unhedged exposure can be paid/realized at forward rate/future spot rate depending on information in question

Example:

XYZ an Indian firm, will need to pay JAPANESE YEN (JY) 5, 00,000 on 30th June. Spot JPY/INR is 1.9516/1.9711. The prices for forex currency option on purchase are as follows:

Strike Price	=	JY 2.125
Call option (June)	=	JY 0.047
Put option (June)	=	JY 0.098

How much is the premium to be paid on hedging the exposure through option route?

- INR 23,059
- INR 11,815
- INR 11,699
- JPY 11,699

Answer:

- Amount of exposure = JPY 5,00,000 (or) Rs.2,35,294 (5,00,000/2.125)
- Relevant strike price = JPY 2.125/INR. Product currency is INR and this is a contract to buy/sell INR. **The company has to sell INR and hence we should go for put option**
- Premium amount = INR 2,35,294 × JPY 0.098 = JPY 23,059
- **Premium in INR = 23,059/1.9516 = INR 11,815**

Example:

A Ltd. of U.K. has imported some chemical worth of USD 3,64,897 from one of the U.S. suppliers. The amount is payable in six months time. Currency options are available under which one option contract is for GBP 12,500. The option premium for GBP at a strike price of USD 1.70/GBP is USD 0.037 (call option) and USD 0.096 (put option) for 6 months period. Which type of option should we take for hedging?

- Call option
- Put option

Answer:

The strike price of option is USD 1.70/GBP. Product currency is GBP and hence we can buy/sell GBP with option contract. The company needs to buy USD. This can also be considered as selling GBP. **The company plans to sell GBP and hence we should opt for Put option**

Example:

An Indian Company buys a 6 month put on 10 lakh USD with a strike price of Rs. 55/\$ and a premium of Re. 2/\$. The opportunity cost of money is 6% p.a. If the forward rate when the option was bought was Rs. 55 under what future spots rates would this have proved better than the option contract?

- <Rs.57.06 per USD
- >Rs.57.06 per USD
- <Rs.55.00 per USD
- >Rs.55.00 per USD

Answer:

- Premium of put option = $\text{Rs.}2.00 + (2 \times 6\% \times 6/12) = \text{Rs.}2.06$; Minimum inflow under option contract = $\text{Rs.}55.00 - 2.06 = \text{Rs.}52.94$ per USD. Under option contract the minimum selling price will be $\text{Rs.}52.94/\text{USD}$. **However, if the future spot rate is higher than $\text{Rs.}55/\text{USD}$, then inflow will be Spot rate - 2.06.**
- Under forward option, the company will receive $\text{Rs.}55/\text{USD}$ irrespective of future spot rates. Hence option contract can be beneficial if the inflow under option contract is higher than $\text{Rs.}55/\text{USD}$. Inflow will be $\text{Rs.}55/\text{USD}$ if spot rate is $\text{Rs.}57.06/\text{USD}$ ($57.06 - 2.06 = 55$). **Hence option contract will be beneficial if future spot rates are higher than $\text{Rs.}57.06/\text{USD}$**

Example:

An Indian Company buys a 6 month call on 10 lakh USD with a strike price of $\text{Rs. } 50/\text{\$}$ and a premium of $\text{Re. } 1/\text{\$}$. The opportunity cost of money is 12% p.a. At what spot rate on the date of maturity of options contract would the Indian Company gain?

- > $\text{Rs.}50$ per USD
- < $\text{Rs.}50$ per USD
- > $\text{Rs.}51.06$ per USD
- < $\text{Rs.}51.06$ per USD

Answer:

- Maximum outflow under option contract = $50 + (50 \times 2\%) + (1 \times 12\% \times 6/12) = \text{Rs.}51.06/\text{USD}$
- Any spot rates above $\text{Rs.}51.06/\text{USD}$, the outflow under option contract will be lower than that of spot contract. Hence option contract is beneficial above $\text{Rs.}51.06/\text{USD}$ while comparing option and spot alternative

50. Investment Decision**Selection of investment Centre:**

- The question will specify the currency in which the net gain is to be computed. The following steps should be followed:
 - Invest the specified amount in different currencies and determine the maturity amount for each.
 - **Calculate how much of each currency is needed to repay the initial investment plus the cost of funds.**
 - The remaining amount after repaying the investment and costs represents the net gain.
 - **Convert the net gain into the specified currency. Select the currency that results in the maximum gain.**

Selection of investment option: Sometimes multiple options may give almost the same result and hence we can be indifferent between two options. We should opt for investment in fixed income security (less risky) as compared to investment in equity option (riskier)

Example:

CFO of a company has surplus funds and he can invest the same either in index fund of Japan or USA treasury bills. The maturity amount in INR would remain same for both investments. Where should the investment be done?

- Invest in Japan
- Invest in USA
- Indifferent between investment in Japan and USA
- 50% in Japan and 50% in USA

Answer:

Return is same for both options. However, from risk perspective, the investment in fixed income desk of US is more beneficial as the chance of variation in fixed income securities is less as compared to Equity Desk. Hence investment should be done in USA.

Example:

ICL an Indian MNC is executing a plant in Sri Lanka. It has raised $\text{Rs. } 400$ billion. 60% of the amount will be required after six months' time. ICL is looking an opportunity to invest this amount on 1st April, 2020 for a period of six months. How much is the investible amount as of now?

- $\text{Rs.}400$ billion
- $\text{Rs.}160$ billion
- $\text{Rs.}240$ billion
- $\text{Rs.}200$ billion

Answer:

Amount that can be invested today is the money which is not needed now. Hence 60% of Rs.400 billion can be invested today.

Example:

US entity has cash surplus of USD 200 million. Interest rates are 1.7%/1.5%. How much cash will it have in hand after one month?

- USD 200 million
- USD 200.25 million
- USD 200.2833 million

Answer:

Entity has cash surplus and hence investment will be done. The same would be done at lower rate of 1.5%

Interest earned = $200 \text{ million} \times 1.5\% \times \frac{1}{12} = 0.25 \text{ million}$

Surplus after one month = USD 200 million + USD 0.25 million = USD 200.25 million

Example:

Indian entity has deficit of Rs.1,000 lacs. Rate of interest in India is 6%/9%. How much will be the Indian entity deficit after 2 months with financing operations?

- INR 1,000 lacs
- INR 1,010 lacs
- INR 1,015 lacs
- INR 1,007.50 lacs

Answer:

There is a deficit and hence the amount is to be borrowed. Borrowing will happen at 9%

Interest expense for two months = $1000 \text{ lacs} \times 9\% \times \left(\frac{2}{12}\right) = \text{Rs. } 15 \text{ lacs}$

Balance at end of month 2 = 1,000 lacs + 15 lacs = 1,015 lacs

51. Financing Decision**Indifferent Borrowing Rate:**

- Rate of interest after 3-months to make the company indifferent between 3-months borrowing and 6-months borrowing: This would basically mean computing a 3 x 6 FRA. The formula for the same is as under:

$$3 \times 6 \text{ FRA} = \frac{\text{FVF for 6 months}}{\text{FVF for 3 months}} - 1$$

52. Summary of Hedging Strategies**Available hedging tools:**

- Forward contract
- Futures contract [Two types of questions will be there - One in which exposure and contract currency matches and second in which currencies do not match]
- Options contract [Two types of questions will be there - One in which exposure and contract currency matches and second in which currencies do not match]
- Money market hedge [For a payable and a receivable]
- Currency invoicing
- No hedge

Other Key Points in Forex Hedging:

- Spot rate (€ per £): 1.998 ± 0.002 . This needs to be read as bid rate equal to 1.996 [$1.998 - 0.002$] and ask rate equal to 2.000 [$1.998 + 0.002$]
- Exchange exposure risk = Realization using actual spot rates - Realization using expected spot rates [Forward rate]

Example:

Spot rate (€ per £) = 1.998 ± 0.002 ; Forward rate (€ per £) = 1.979 ± 0.004 . You need to pay EUR 2,50,000 in six months. How much would be the GBP outflow if you take forward contract?

- GBP 1,26,326
- GBP 1,26,839
- GBP 1,26,072

d. GBP 1,26,582

Answer:

$$\text{GBP} = \text{EURO} \times \text{ASK} \left(\frac{\text{GBP}}{\text{EUR}} \right); \text{GBP} = 2,50,000 \times \left(\frac{1}{\text{BID} \left(\frac{\text{EUR}}{\text{GBP}} \right)} \right) = \frac{2,50,000}{1.975} = \text{GBP } 1,26,582$$

BID rate = 1.979 - 0.004 = 1.975

Example:

H Ltd. anticipates the spot exchange rate in 3-months time to be equal to the current 3-months forward rate (72.95/73.40). After 3-months the spot exchange rate turned out to be Rs./\$: 73/73.42. What is the foreign exchange exposure and risk of H Ltd. if exposure is 50,000 USD?

Answer:

Particulars	Calculation
Expected realization considering future spot rate (50,000 x 72.95)	36,47,500
Actual realization considering actual spot rate (50,000 x 73)	36,50,000
Gain due to foreign exchange risk	2,500

Chapter 11 – International Financial Management**1. Issue 1 in International Capital Budgeting****Some cash flows in INR and some are in non-INR:**

- We will have to forecast future exchange rates using IRPT/PPT
- Forecasted exchange rates can be used to convert cash flows into a single currency.

2. Issue 2 in International Capital Budgeting**INR discount rate vs Non-INR discount rate:**

- $(1 + \text{Risky rate}) = (1 + \text{Risk-free rate}) \times (1 + \text{Risk premium})$
- Risk-premium would remain same for INR currency as well as non-INR currency

Example:

Particulars	INR	USD
Risk-free rate	10.00	4.00
Risky rate	16.00	??

For INR:

$$(1 + \text{Risky rate}) = (1 + \text{Risk-free rate}) \times (1 + \text{Risk premium})$$

$$(1 + 0.16) = (1 + 0.10) \times (1 + \text{Risk-premium})$$

$$\text{Risk-premium} = 5.45\%$$

For USD:

$$(1 + \text{Risky rate}) = (1 + \text{Risk-free rate}) \times (1 + \text{Risk premium})$$

$$(1 + \text{Risky rate}) = (1 + 0.04) \times (1 + 0.0545)$$

$$\text{Risky rate (USD)} = 9.67\%$$

Example:

Required return in INR is 12% per annum. Risk-free rate in India and USA is 8% and 4%. How much is the required rate of return in USD?

- e. 8.00%
- f. 16.00%
- g. 7.86%
- h. 16.31%

Answer:**INR rate analysis:**

$$(1 + R_f) \times (1 + \text{risk premium}) = (1 + \text{risky rate})$$

$$(1 + 0.08) \times (1 + \text{risk premium}) = (1 + 0.12); \text{Risk Premium} = 3.71\%$$

USD discount rate:

$$(1 + R_f) \times (1 + \text{risk premium}) = (1 + \text{risky rate})$$

$$(1 + 0.04) \times (1 + 0.0371) = (1 + 0.12); \text{Risky Rate} = 7.86\%$$

3. Issue 3 in International Capital Budgeting**With-holding tax**

- With-holding tax is an extra expenditure and the same would reduce the PV of inflows
- Total cost = Cost incurred in host country + Tax paid in host country + Withholding tax paid in host country. Withholding tax will be taken at lower of DTAA rate and normal tax rate [OR] **Net inflow = CFAT earned - withholding tax**
- **Withholding tax eligible for credit:** In this case this will not be an extra tax and the company would first pay withholding tax on PBT. Additionally, the company will pay normal tax on PBT (however withholding tax will be eligible for tax credit and hence there will be lower tax payment). In short withholding tax will not be an extra expense and will not impact the cash flows.

Example:

PBT of the project = Rs.100 crores; Tax rates in India = 30% corporate tax and 10% with-holding tax. Taxes paid in India will not be eligible for tax credit in USA. How much is the repatriable amount?

- a. Rs.70 crores
- b. Rs.60 Crores
- c. Rs.63 crores

d. Rs.77 crores

Answer:

Particulars	Calculation	Amount (in Crores)
Profit before tax		100.00
Less: Tax @ 30%	$100.00 \times 30\%$	-30.00
Profit after tax		70.00
Less: Withholding tax @ 10%	$70.00 \times 10\%$	-7.00
Amount repatriated		63.00

Example:

PBT of the project = Rs.100 crores; The US based company will be subjected to corporate tax of 30 per cent and with - holding tax of 10% in India and will be eligible for tax credit in India. How much is the repatriable amount?

- a. Rs.70 crores
- b. Rs.60 Crores
- c. Rs.63 crores
- d. Rs.77 crores

Answer:

Particulars	Calculation	Amount (in Crores)
Profit before tax		100.00
Less: Withholding tax @ 10%	$100.00 \times 10\%$	-10.00
Earnings after withholding tax		90.00
Less: Tax @ 30%	$100 \times 30\% - 10$ (with-holding tax eligible for tax credit)	-20.00
Amount repatriated		70.00

4. Withholding tax rate

- Tax rate for withholding should be **lower of**
 - Applicable withholding tax rate and
 - Tax as per DTAA

Example:

An MNC company in USA has surplus funds to the tune of USD 10 million for six months. The finance director of the company is interested in investing in EURO for higher returns. There is DTAA in force between USA and Germany. Following are the details of the investment

Particulars	Amount
EURO/USD Spot	0.4040/41
6 months forward	67/65
Rate of interest for 6 months (p.a.)	5.95%-6.15%
Withholding tax applicable for interest income	22%
Tax as per DTAA	10%

How much would be the withholding tax on interest income?

- a. EUR 12,019.00
- b. EUR 26,441.80
- c. EUR 12,120.00
- d. EUR 26,664.00

Answer:

Particulars	Calculation	Amount
Surplus in USD		1,00,00,000 USD
Euro investment	$1,00,00,000 \times 0.4040$	40,40,000 EUR
Interest earned	$40,40,000 \times 5.95\% \times 6/12$	1,20,190 EUR
Withholding tax as per DTAA	$1,20,190 \times 10\%$ [DTAA or normal tax whichever Is lower]	12,109 EUR

5. Home currency NPV and Foreign Currency NPV

- Home currency NPV = Foreign currency NPV x Spot Exchange Rate

Example:

NPV of project is Rs.10,00,000. Spot exchange rate is Rs.50 per USD. How much would be the NPV in USD?

- Cannot be calculated with given information
- USD 5 crores
- USD 20,000
- USD 10,000

Answer:

NPV in INR = NPV in USD x Spot rate

10,00,000 = NPV in USD x 50; NPV in USD = 10,00,000/50 = USD 20,000

6. Impact of Exchange Restrictions

- Exchange restrictions can impact repatriated cash flows and we should compute NPV based on repatriated cash flows.
- Cash flows which are not repatriated will normally be repatriated at end of the life of the project. These cash flows may have extra interest income if the same is mentioned in question.

Example:

An Indian company is setting up a project in USA. It currently has operations in USA which has surplus funds of USD 20,00,000. These funds cannot be repatriated to India due to restrictions. New project will cost USD 50,00,000 and the company would partly fund the investment project with the available surplus of USD 20,00,000. How much should be the initial outflow for evaluating the project?

- USD 50,00,000
- USD 70,00,000
- USD 30,00,000

Answer:

USD 30,00,000

Explanation: Blocked funds will be used for setting up the project and these blocked funds should be reduced from the initial outlay to find the real outflow towards the project

Example:

A project will generate cash flows of USD 20,00,000 in year 1, USD 40,00,000 in year 2 and USD 60,00,000 in year 3. Initial investment is USD 80,00,000. There are restrictions on repatriation of funds and only 50% of profits can be repatriated in each year and the balance cash flows can be repatriated on completion of project. Non-repatriated amount can be invested in fixed deposit giving return of 2%. Cost of capital is 10%. How much is the NPV of the project?

- USD 16,28,000 (Positive)
- USD 13,20,000 (Positive)
- USD 13,80,380 (Positive)
- Negative NPV

Answer:

Year	Cash flow	PVF @ 10%	DCF
0	-80,00,000	1.000	-80,00,000
1	10,00,000	0.909	9,09,000
2	20,00,000	0.826	16,52,000
3	90,80,400	0.751	68,19,380
NPV			13,80,380

- Cash flow of year 1 = 20,00,000 x 50% = 10,00,000
- Cash flow of year 2 = 40,00,000 x 50% = 20,00,000
- Cash flow of year 3 = [10,00,000 x 1.02 x 1.02] + [20,00,000 x 1.02] + 60,00,000 = 90,80,400

7. Concept of Average Loan Maturity

- The average loan maturity is determined as the weighted average of the duration outstanding for the loan. It is computed by taking a weighted average of the period outstanding, where the weights correspond to the amount outstanding. This calculation is similar to computing the average due date.
- Interest cost for entire Loan Duration = Loan Taken x Rate of Interest x Average Loan Maturity

Example:

K Ltd. currently operates from 4 different buildings and wants to consolidate its operations into one building which is expected to cost Rs. 90 crores. The Board of K Ltd. had approved the above plan and to fund the above cost, agreed to avail an External Commercial Borrowing (ECB) of GBP 10 m from G Bank Ltd. Interest Cost is GBP 6 months LIBOR + Margin of 2.50%. The 6-month LIBOR is expected to be 1.05%. Average Loan Maturity life will be 3.4 years with an overall tenure of 5 years. How much is the expected interest cost assuming LIBOR remains at 1.05%?

- GBP 0.8875 million
- GBP 1.775 million
- GBP 1.207 million
- GBP 0.6035 million

Answer:

Interest cost = 10 million $\times$ 3.55% $\times$ 3.4 years = GBP 1.207 million

8. Project Beta vs Equity Beta

- The concept of levered and unlevered Beta was addressed in the Portfolio Chapter, where the **weight of debt is calculated as Debt $\times$ (1 - Tax Rate)**.
- In International capital budgeting involving two countries, it's possible for the tax rates to differ between them. This can lead to confusion regarding which tax rate should be used in computing the weight of debt.
- To address this issue, it is recommended to use **the tax rate of the country in which the loan is taken**. This approach ensures consistency and accuracy in determining the weight of debt.

Example:

An Indian company is planning to do a project in Nepal. The company can raise loan for theme park in Nepal @ 9%. The tax rate in India is 30% and in Nepal it is 20%. The current WACC of the company is 12%. The company's current equity beta is 0.45. The company's funding ratio for the Water Park would be 55% equity and 45% debt. The company has gathered the relevant information about its nearest competitor in Nepal. The competitor's market value of the equity is NPR 1850 crores and the debt is NPR 510 crores and the equity beta is 1.35. How much is the asset beta and equity beta of the project?

- 1.132 Times and 1.873 Times
- 1.132 Times and 1.780 Times
- 1.106 Times and 1.830 Times
- 1.106 Times and 1.739 Times

Answer:

Computation of Asset Beta of project based on Competitor:

Security	Beta	Weight	Product
Equity	1.35	1850	2,497.50
Debt	0	408 [510 $\times$ 0.80]	0
Firm	1.106	2,258	2,497.50

Note: We have used tax rate of Nepal for computing weight of debt in Nepal. This is because the competitor is based out of Nepal

Computation of Equity Beta:

Security	Beta	Weight	Product
Equity	1.83	0.55	1.006
Debt	0	0.36 [0.45 $\times$ 0.80]	0
Firm	1.106	0.910	1.006

Note: Weight for Debt is taken as Debt $\times$ (1 - Tax rate of Nepal). This is because we are taking loan in Nepalese currency and hence get tax benefits in Nepal.

Final answer is 1.106 Times and 1.830 Times

9. Examples on Cash flow computation

Example:

A proposed foreign investment involves creation of a plant with an annual output of 1 million units. The entire production will be exported at a selling price of USD 10 per unit. The plant at the current rate of exchange will have a depreciation of USD 1 million annually. There is a likely decline in value of USD by 10 percent. How much would be the selling price and depreciation in USD post decline in value of USD?

- a. USD 10 and USD 0.9 million
- b. USD 10 and USD 1 million
- c. USD 9 and USD 0.9 million
- d. USD 9 and USD 1 million

Answer:

- Current selling price is in USD and hence there will be no impact on selling price with decline in value of USD. Selling price will continue to be USD 10
- Depreciation is USD 1 million as per the current rate of exchange. Decline in value of USD will lead to lower equivalent depreciation of USD 0.9 million [1 million – 10%]
- Hence answer is USD 10 and USD 0.9 million

Example:

A US based company is setting up a subsidiary in USA. The project will involve Additional cash fixed cost of US \$ 30 million p.a. and project's share of allocated fixed cost will be US \$ 3 million p.a. based on principle of ability to share. How much should be taken as fixed cost while evaluating the capital budgeting decision?

- a. USD 30 million
- b. USD 33 million
- c. USD 27 million

Answer:

USD 30 million. Project's share of allocated fixed cost is irrelevant as the same is not related to the project.

Chapter 12 – Interest Rate Risk Management**Overview:**

- Interest rate options
- Interest rate futures
- Forward Rate Agreement
- Interest rate swaps

1. Interest Rate Risk

- Variation in my cashflows or profits **due to change in interest rates** is known as Interest rate Risk
- The risk of change in price of stocks, currency and commodities is hedged through futures/options (Chapter 9). Similarly, the risk of changes in interest rates is hedged in this chapter.

Tools Available for Hedging:

- Interest Rate Options
- Interest Rate Futures
- Forward Rate Agreements
- Interest Rate Swaps

2. Interest rate options

- **Cap option (Call option)** = Cap option restricts the **maximum interest outflow**. This option will be exercised if actual interest rate is higher than strike price(rate) - Useful for borrowers
- **Floor option (Put option)** = Floor options provides for **minimum interest inflow**. This option will be exercised if actual interest rate is lower than strike price (Rate) - Useful for Lender
- Collar option = Buying a cap + Selling a floor
- **Interest rate guarantee:** Interest rate guarantee is either a cap or floor option depending on whether we are borrower or lender

3. Normal options vs Interest Rate Options

Particulars	Call/Put Option	Cap/Floor Option
Strike Price	Normal Price	Interest Rate
Call/Cap	If price in market is more than exercise price, we would exercise it. Otherwise, it will lapse and we will buy at lower market price	If actual interest rate in market is more than strike rate, we would exercise it. Otherwise, it will lapse and we will pay lower interest rate
Put/Floor	If price in market is less than exercise price, we would exercise it. Otherwise, it will lapse and we will sell at higher market price	If actual interest rate in market is lower than strike rate, we would exercise it. Otherwise, it will lapse and we will receive higher interest rate

4. Interest Rate Option (Settlement)

- Payoff of call option = Notional Amount x (Time period/12) x (Actual Rate – Strike Rate)
- Payoff of Floor option = Notional Amount x (Time period/12) x (Strike Rate – Actual Rate)
- Just like a normal option, net settlement will be inflow for holder and outflow for writer

Example:

You have purchased one year cap on notional amount of Rs.100 crores. The strike rate of cap option is 8%. Interest rate for first quarter is 8.5% and second quarter is 7.5%. How much is the payoff for first and second quarter?

- 50,00,000 and 50,00,000
- 12,50,000 and 12,50,000
- 12,50,000 and 0
- 50,00,000 and 0

Answer:

Option will get exercised in the first quarter as the actual interest is higher than cap rate. Payoff of first quarter = $100 \text{ crores} \times 0.5\% \times 3/12 = \text{Rs.}12,50,000$. Option will not be exercised in second quarter and hence payoff for second quarter is 0

Example:

You have purchased one year floor on notional amount of Rs.100 crores. The strike rate of floor option is 8%. Interest rate for first quarter is 8.5% and second quarter is 7.5%. How much is the payoff for first and second quarter?

- 50,00,000 and 50,00,000
- 12,50,000 and 12,50,000
- 0 and 50,00,000
- 0 and 12,50,000

Answer:

Option will not get exercised in the first quarter as the actual interest is higher than floor rate. Hence payoff for first quarter is 0. Option will be exercised in second quarter as the actual rate is lower than strike rate. Payoff for second quarter is 12,50,000 [$100 \text{ crores} \times 0.5\% \times 3/12$]

5. Terms Associated with Interest Rate Options

- **Notional Amount:** Notional Amount is the amount that we intend to lend or borrow
- **Reset Period:** It refers to the frequency with which interest rates of a loan can be revised. Floating rate of interest is on a benchmark and the same would get reset periodically. We can assume the reset rate to be applicable for the next period/previous period depending on assumption

Format for computation of total Interest Outflow:

Reset Date	LIBOR	No of days	Our Borrowing rate	Interest paid	Premium Paid	Cap Receipt	Floor Payment	Total Interest

$$\text{Effective Interest Rate} = \frac{\text{Total Interest Paid}}{\text{Loan Amount}} \times \frac{365}{\text{Number of days of loan}} \times 100$$

Example:

XYZ Limited issues a GBP 10 million floating rate loan with resetting of coupon rate every 6 months equal to LIBOR + 0.50%. XYZ is interested in a collar strategy by selling a floor and buying a cap. Strike rate for cap is 7.00% and floor is 4%. How much is the effective interest cost if LIBOR is 3% on reset date?

- GBP 3,50,000
- GBP 1,75,000
- GBP 4,50,000
- GBP 2,25,000

Answer:

- Interest paid on base loan = $1,00,00,000 \times 3.5\% \times 6/12 = \text{GBP } 1,75,000$
- No receipt on cap option as the same would not be exercised
- Floor payment = $1,00,00,000 \times 1\% \times 6/12 = \text{GBP } 50,000$
- Total outflow = $1,75,000 - 0 + 50,000 = \text{GBP } 2,25,000$

Example:

XYZ Limited issues a GBP 10 million floating rate loan with resetting of coupon rate every 6 months equal to LIBOR + 0.50%. XYZ is interested in a collar strategy by selling a floor and buying a cap. Strike rate for cap is 7.00% and floor is 4%. How much is the cap receipt and floor payment if Libor is 10% on reset date?

- Cap receipt of GBP 3,00,000 and floor payment of GBP 6,00,000
- Cap receipt of GBP 3,00,000 and no floor payment
- Cap receipt of GBP 1,50,000 and floor payment of GBP 3,00,000
- Cap receipt of GBP 1,50,000 and no floor payment

Answer:

Strike rate of cap option is 7% and actual LIBOR is more than 7%. Hence cap option will be exercised and there will be a receipt of GBP 1,50,000 [$1,00,00,000 \times 3\% \times 6/12$]. There will be no payment on floor option as the same won't be exercised

6. Option Premium

$$\text{Lumpsum Premium} = \text{Notional Amount} \times \text{Lumpsum Premium\%}$$

$$\text{Premium Amortization} = \frac{\text{Lumpsum Premium}}{\text{PVAF (Fixed rate of interest, no of reset periods)}}$$

Example:

XYZ Limited borrows £15 Million of six months LIBOR + 10.00% for a period of 24 months. The company anticipates a rise in LIBOR, hence it proposes to buy a Cap Option from its Bankers at the strike rate of 8.00%. The lumpsum premium is 1.00% for the entire reset periods and the fixed rate of interest is 7.00% per annum. How much would be the amortized premium per reset period?

- GBP 1,50,000
- GBP 40,839
- GBP 37,500
- GBP 41,323

Answer:

$$\text{Lump-sum Premium} = 1,50,00,000 \times 1\% = \text{GBP } 1,50,000$$

$$\text{Premium per reset period} = \frac{\text{Total premium}}{\text{PVAF (r, n)}} = \frac{1,50,000}{\text{PVAF (3.5\%, 4)}} = \frac{1,50,000}{3.673} = 40,839$$

Note:

- Premium will be amortized based on the fixed rate of interest. Fixed rate of interest is 7% per annum and the same will be 3.5% per half-year (reset period). Reset period is taken as six months as the borrowing is at six-month LIBOR
- Option is for a period of 24 months and hence the same will have 4 reset periods of 6 months

7. Interest Rate Futures

- Interest rate futures can be used to fix the future interest rates. It is similar to normal futures
- Following issues are there in interest rate futures:**
 - No of contracts in decimals
 - Basis risk - Difference between spot interest rate and futures interest rate on expiry date
 - Mismatch on loan duration and futures settlement factor

Example:

- A company wants to borrow 100 Crores for 6-month period. Borrowing will be in December. **December 3-month futures are quoted at 94.**
- December 3 month futures would mean settlement will be multiplied with (3/12)
- Futures of 94 would mean interest rate is 6% (100 - 94)**
- 100 Crore x 6 months = _____ x 3 months
- 100 Crore x 6 months = 200 Crore x 3 months**
- Hence for hedging 100 crores borrowing of 6 months we will enter into 3-month futures contract for Rs.200 Crores

Example:

Three-month futures are currently quoted at 95. How much is the interest rate indicated by the futures?

- 95.00%
- 5.00%
- 5.00%
- 20.00%

Answer:

Futures of 95 would mean interest rate of 5.00% (100 - 95)

Example:

ABC Limited wants to borrow Rs.30 lacs for a period of 5 months after 2 months. Three-month futures are currently quoted at 93 and value of one contract is 5 lacs. How many contracts are needed for hedging?

- Buy 6 contracts
- Sell 6 contracts
- Buy 10 contracts
- Sell 10 contracts

Answer:

Borrowing 30 lacs for 5 months = Borrowing _____ lacs for 3 months

30 lacs x 5 months = 50 lacs x 3 months

ABC Limited wants to borrow and hence they should sell interest rate futures

No of contracts = $\frac{50 \text{ lacs}}{5 \text{ lacs}} = 10 \text{ Contracts}$
Hence, we should sell 10 contracts for hedging

8. Steps in Interest Rate Futures

Step 1: Identify amount to be hedged:

Amount to be hedged = Loan Amount $\times \frac{\text{Borrowing Period}}{\text{Futures Settlement Period}}$

Step 2: Number of contracts to be entered:

Number of Contracts = $\frac{\text{Amount to be hedged}}{\text{Size of one contract}}$

Step 3: Computation of Interest Income/Expense:

Particulars	Calculation	Amount
Actual interest earned or paid	Amount $\times$ Actual Rate $\times \left(\frac{M}{12}\right)$	XXX
Net Settlement	Step 4	XXX
Effective interest earned/paid		XXX
Effective Interest Rate	$\frac{\text{Interest Paid}}{\text{Loan}} \times \frac{12}{m} \times 100$	XXX%

Step 4: Computation of Net Settlement:

Date	Position	Action	Reference Date	Rate
Day 0	Original Position	Borrow	Day 90	XX
Day 90	Opposite Position	Invest	Day 90	XX
Profit/Loss in %				XX
Profit (or) Loss in Rupees $\left(\text{No of contracts} \times \text{Contract size} \times \% \times \frac{M}{12} \right)$				XXX

Futures settlement period:

- Futures settlement period is the most important number to compute profit/loss of futures.
- The futures settlement period pertains to the duration considered for settlement, distinct from the contract's expiration period**

Example:

- Presently in February, a 3-month futures contract for December would have an expiration 11 months away. However, in the computation for settlement (as outlined in step 4 of the table), **the relevant timeframe would be the 3-month period**

Example:

ABC Limited will receive Rs.50,00,000 in two months and the same should be deposited for a period of three months. Three-month futures are currently priced at 93 and the size of one contract is Rs.5,00,000. If after two months, the futures are priced at 90.75 and interest rate increases to 10.5%, what would be the effective interest income earned by ABC Limited due to adoption of this strategy?

- Rs.1,31,250
- Rs.1,59,375
- Rs.1,03,125
- Rs.5,25,000

Answer:

No of contracts = $\frac{50,00,000}{5,00,000} = 10 \text{ Contracts}$

Futures settlement:

Date	Position	Action	Ref date	Rate
Day 0	Original	Lend	Day 60	7.00% [100 - 93]
Day 60	Opposite	Borrow	Day 60	-9.25% [100 - 90.75]
Loss in %				-2.25%

Loss in rupees $(5,00,000 \times 10 \times 2.25\% \times 3/12)$		-28,125
Effective interest income:		
Particulars	Calculation	Amount
Interest income	$50,00,000 \times 10.5\% \times (3/12)$	1,31,250
Loss in futures		-28,125
Effective interest income		1,03,125

9. Cheapest to Deliver Bond

- Typically, futures transactions involve net settlement. However, in cases where physical settlement is preferred, specific bonds mentioned in the contract must be delivered.
- In practical scenarios, **the exact bonds specified may not be available in the market**. In such instances, the contract writer may purchase an alternative bond at its quoted market price and provide it to the contract holder.
- To determine the value of the newly delivered bond, the holder uses a conversion factor.
- Payment made by the holder to the writer = Futures settlement price multiplied by the conversion factor.**
- Cheapest to deliver bond is the one which leads to maximum profit/minimum loss for the seller of IRF
- Profit = [Inflow - outflow] = [Futures settlement price x Conversion factor] - Quoted price of the bond**

Example:

In March 2020, XYZ Bank sold some 7% Interest Rate Futures underlying Notional 7.50% Coupon Bonds. 6.80 GOI 2029 is an eligible security whose quoted price is 877.50 and conversion factor is 0.9195. Futures settlement price is 1,000. How much is the profit/loss of XYZ Bank?

- Rs.122.50 (Profit)
- Rs.42.00 (Profit)
- Rs.122.50 (Loss)
- Rs.42.00 (Loss)

Answer:

We have sold 7.50% coupon bonds but are not able to deliver the same. Hence futures settlement price will be adjusted based on conversion factor. Final inflow for XYZ Bank = $1,000 \times 0.9195 = \text{Rs.}919.50$. Outflow to buy 6.80 GOI 2029 is 877.50 and hence net profit of XYZ Bank = $919.50 - 877.50 = \text{Rs.}42.00$

10. Forward Rate Agreement (FRA)

- FRA is used to freeze future interest rate for borrowing/investment
- Example:** Company A wants to borrow **after 6 months. Borrowing period = Start of Month 7 till Month 9**. We can enter into FRA agreement to freeze the interest rate for this borrowing. This rate is technically called as **FRA 6 x 9 (End of month 6 till End of Month 9)**
- Discounted Net Settlement:** FRA's are **net settled** for the difference in contracted rate and actual rate. FRA would be settled in Month 6 end (for above example) whereas actual loan outflow will happen in Month 9. **Hence, we are required to discount the FRA settlement amount**

$$\text{FRA (undiscounted settlement)} = (\text{Contracted rate} - \text{Actual rate}) \times \text{Notional Amount} \times \left(\frac{\text{Month}}{12}\right)$$

$$\text{FRA (Discounted settlement)} = \frac{\text{Undiscounted Settlement}}{1 + \left(\text{AR} \times \frac{\text{Month}}{12}\right)}$$

Steps:

Step 1: Format for Net Settlement:

Particulars	Calculation	Amount
Actual Rate		XXX
Contracted Rate		XXX
Difference		XXX
Nature of settlement	Pay/Receive	
Amount of settlement	$(\text{Notional Amount} \times \text{Difference} \times \text{M}/12)$	XXX

(Undiscounted)		
Discounted Settlement	$\frac{\text{Undiscounted Settlement}}{1 + \left(AR \times \frac{\text{Month}}{12}\right)}$	XXX
Step 2: Effective Rate of Interest Cost:		
Particulars	Calculation	Amount
Actual Interest Paid	Amount x Actual Rate x (M/12)	XXX
Discounted Net settlement	Step 1	XXX
Effective interest outflow		XXX
Interest cost (%)	$\frac{\text{Effective Interest Outflow}}{\text{Loan Amount}} \times \frac{12}{m} \times 100$	XXX%
Example:		
ABC Limited plans to borrow Rs.50 Crores for a period of 3 months after 6 months. The Bank has quoted FRA rate as follows:		
3 x 6 FRA Rate	8.20%	
3 x 9 FRA Rate	8.50%	
6 x 9 FRA Rate	8.00%	
6 x 12 FRA Rate	8.60%	
The actual interest rate on borrowing date turns out to be 10.00%. How much would be the FRA Settlement?		
a. Rs.25,00,000 (Receipt for ABC Limited) b. Rs.24,39,024 (Receipt for ABC Limited) c. Rs.25,00,000 (Payment by ABC Limited) d. Rs.24,39,024 (Payment by ABC Limited)		
Answer:		
The company plans to borrow for 3 months after a period of six months. Hence the borrowing period is month 6 to month 9 and hence ABC Limited would have entered into 6X9 FRA (8.00%) for hedging. Interest rates have increased to 10.00% and hence ABC Limited will receive FRA settlement		
$\text{FRA Settlement receipt} = \frac{50 \text{ crores} \times 2\% \times \frac{3}{12}}{1 + \left(\frac{0.10}{4}\right)} = \text{Rs. } 24,39,024$		

11. Computation of FRA Rate

- Typically, market interest rates are quoted for immediate borrowing arrangements, known as spot borrowing. **For example**, a 3-month interest rate might be quoted at 4.5% per annum, while a 6-month interest rate could be quoted at 5% per annum.
- However, if our intention is to borrow a loan three months from now for a subsequent three-month period, we need to ascertain the interest rate applicable from the end of month 3 to the end of month 6. This financial arrangement is formally referred to as FRA_{3x6}

$$\text{FRA}_{3x6} = \frac{\text{FVF for 6 months}}{\text{FVF for 3 months}} - 1$$

Example:

3-month interest rate is 4.50% per annum and 6-month interest rate is 5.00% per annum. What should be the 3 months FRA rate at 3 months forward?

- 8.00%
- 1.36%
- 5.44%
- 2.72%

Answer:

The company wants 3 months FRA rate at 3 months forward. This would technically mean 3x6 FRA

$$3x6 \text{ FRA} = \frac{\text{Future value factor for 6 months}}{\text{Future value factor for 3 months}} - 1$$

$$3x6 \text{ FRA} = \frac{1 + 2.50\%}{1 + 1.125\%} - 1 = 1.0136 - 1 = 1.36\% \text{ per 3 months (or) } 5.44\% \text{ per annum}$$

12. FRA and Arbitrage

- Banks typically provide bid and ask rates for FRA, a practice similar to the Forex market. For instance, an FRA rate range of 6.50 to 6.75 implies that customers have the option to borrow from the bank at a rate of 6.75% or deposit funds with the bank at a rate of 6.50%.
- Arbitrage is possible only in the following situations:
 - Deposit Rate > Fair FRA Rate
 - Borrowing Rate < Fair FRA Rate

Arbitrage steps:

- Let us assume we are analyzing 6 x 12 FRA.
 - **Actual borrowing rate is lower:** If actual borrowing rate is lower than fair FRA rate, then we should borrow for first 6 months at spot borrowing, next 6 months at actual FRA rate and invest for 12 months at spot investment rate
 - **Actual investment rate is higher:** If actual investment rate is higher than fair FRA rate, then we should invest for first 6 months at spot investment, next 6 months at actual FRA rate and borrow for 12 months at spot borrowing rate

Example:

The 6-month and 12-month LIBOR is 9.60% per annum and 9% per annum. Fair FRA rate for month 6 to 12 is 8.00% per annum and actual FRA rate for month 6 to 12 is 10.50%-11.00%. How can you exploit the arbitrage opportunity?

- Borrow for 12 months at 9% per annum and invest for 6 months at 9.60% and balance 6 months at actual FRA rate of 11.00%
- Borrow for 12 months at 9% per annum and invest for 6 months at 9.60% and balance 6 months at actual FRA rate of 10.50%
- Invest for 12 months at 9% per annum and borrow for 6 months at 9.60% and balance 6 months at actual FRA rate of 11.00%
- Invest for 12 months at 9% per annum and borrow for 6 months at 9.60% and balance 6 months at actual FRA rate of 10.50%

Answer:

Fair FRA rate is 8.00%. This would mean that arbitrage is possible if we can borrow at rate lower than 8.00% (or) invest at rate higher than 8.00%. In this case we will be able to invest at FRA rate of 10.50%. Hence Arbitrage is possible by doing the following:

Borrow for 12 months at 9% per annum and invest for 6 months at 9.60% and balance 6 months at actual FRA rate of 10.50%

13. Borrower/Investor Action

Particulars	Interest rate futures	Forward Rate agreement	
Borrower	Sell	Buy	
Investor/Lender	Buy	Sell	

Example:

The treasurer of a company expects to receive a cash inflow of \$15,000,000 in 90 days. The treasurer expects short-term interest rates to fall during the next 90 days. What action should he take in FRA to hedge interest rate risk?

- Take long position in FRA
- Take short position in FRA

Answer:

The company needs to invest money and hence they should take a short position in FRA.

Note: FRA should not be confused with IRF. In case of FRA we buy FRA if we are borrowing and sell FRA if we are investing. On the contrary the action taken is buy IRF if we are investors and sell IRF if we are borrowers.

Example:

You are planning to borrow Rs.100 crores after 3 months. Which of these actions can help in hedging interest rate risk?

- Buy interest rate futures
- Sell Interest Rate futures

Answer:

A borrower has to sell interest rate futures whereas lender would buy interest rate futures

14. Types of Loans

- **Fixed loan:** Interest rates remain same for entire duration of loan - Preferable if interest rates are likely to increase - Preferable if we don't want to take interest rate risk
- **Floating loan:** Interest rates will vary based on benchmark (LIBOR/MIBOR/MCLR) - Preferable if interest rates are likely to decrease

Example:

ABC Limited has taken a floating rate loan. They have used interest rate swaps and converted the same into a fixed rate loan. What is the view of ABC Limited on interest rates?

- No view on interest rates
- Interest rates will increase
- Interest rates will decrease

Answer:

A company will convert a floating loan into fixed loan if they expect interest rates to increase. Conversion of loan will ensure that they are not affected by increase in interest rates

15. Interest rate swap

- An interest rate swap can help a borrower in converting a floating loan to a fixed loan and vice versa

Structuring of swap arrangement:

- Find the total interest of both combinations and find the ideal combination. An ideal combination is one which has lower combined cost
- **Companies opting for ideal combination:** Swap is not possible and no extra calculations to be done
- **Companies opting for other combination:** Swap is possible
- Swap gain = Different in total interest of combination 1 and combination 2. Swap gain would be shared between 2 parties based on the given ratio after paying intermediary charges if any.

IRS Structuring without swap intermediary:

Particulars	M Limited	S Limited
1. Pay to banker as per ideal rate	8%	T + 1.2%
2. S Limited to M Limited Receive from S Limited what was paid by M Limited	(8%)	8%
3. M Limited to S Limited Pay our effective borrowing rate to the other company	T + 0.3%	(T + 0.3%)
4. Effective borrowing rate	T + 0.3%	8.9%

- Effective borrowing rate = Original borrowing rate - share of swap gain

IRS structuring with swap intermediary:

Particulars	Company 1	Company 2
1. Pay to banker as per ideal rate	8%	T + 1.20%
2. Swap intermediary to Bank (Receive what was paid to Bank)	(8%)	(T+1.20%)
3. Company to swap intermediary (Pay our effective borrowing rate to intermediary)	T + 0.35%	8.95%
4. Effective borrowing rate	T + 0.35%	8.95%

- Effective borrowing rate = Original borrowing rate - share of swap gain

Example:

M Limited and S Limited are looking at borrowing a loan and given below is the interest rate offered to them.

Particulars	Fixed rate	Floating rate	Preference
M Limited	8%	T+0.6%	Floating
S Limited	9.2%	T+1.2%	Fixed

There is no swap intermediary in the transaction. Swap gains will be shared equally between two parties. How much would be the effective borrowing rate of Madagascar Limited?

- T + 0.60%

- b. $T + 0.90\%$
- c. $T + 0.30\%$
- d. T

Answer:

- Total interest rate of combination 1 [M limited (fixed) & S Limited (Floating)] = $8\% + T + 1.2\% = T + 9.2\%$
- Total interest rate of combination 2 [M limited (floating) & S Limited (fixed)] = $T + 0.6\% + 9.2\% = T + 9.8\%$
- Ideal combination = Combination 1; This would mean that M Limited should borrow at fixed rate and S Limited should borrow at floating rate
- **Actual scenario:** M Limited plans to borrow at floating rate and S Limited plans to borrow at fixed rate
- Scope for Interest rate swap exist as the ideal and actual scenario does not match
- Swap gain = Difference in total interest of combination 1 & 2 = $(T + 9.8\%) - (T + 9.2\%) = 0.6\%$
- Share of Gain for M Limited = $0.6/2 = 0.3\%$
- **Effective borrowing rate** = $T + 0.6\% - 0.3\% = T + 0.3\%$

Example:

The following is the interest rates at which ABC Limited and DEF Limited can borrow in two currencies:

Company	USD	AUD
ABC Limited	5%	12.6%
DEF Limited	7%	13%

ABC Limited wants to borrow in AUD and DEF wants to borrow in USD. A financial institution has offered to arrange for a currency swap with dealers margin of 0.2% and has agreed to bear exchange risk. How much would be the effective borrowing rate of ABC Limited through IRS?

- a. AUD 12.60%
- b. AUD 11.90%
- c. USD 5.00%
- d. USD 4.30%

Answer:**Structure of interest rates:**

Particulars	USD	AUD
ABC Limited	5%	12.6%
DEF Limited	7%	13%

- Total interest rate of combination 1 [ABC Limited (USD) & DEF Limited (AUD)] = $5\% + 13\% = 18\%$
- Total interest rate of combination 2 [ABC Limited (AUD) & DEF Limited (USD)] = $12.6\% + 7\% = 19.6\%$
- **Ideal combination:** Combination 1 – ABC Limited should borrow in USD and DEF Limited should borrow in AUD
- **Actual scenario:** Combination 2 – ABC Limited wants to borrow in AUD and DEF Limited wants to borrow in USD
- Scope for Currency cum interest rate swap exist as the actual scenario does not match with ideal scenario
- **Amount of swap gain** = $19.6\% - 18\% = 1.6\%$
- **Share of swap gain:**
 - Dealer's margin (Share) = 0.2%
 - ABC Limited's share = 0.7%
 - DEF Limited's share = 0.7%
- **Effective borrowing rate of ABC Limited** = Original rate – share of swap gain = $12.60\% - 0.70\% = 11.90\%$

16. Hardening and Softening of interest rates

- If interest rates are expected to harden, then it would mean interest rates will go up and we will go for fixed rate funding. If interest rates are expected to soften, then it would mean interest rates will come down and we will go for floating rate funding

17. Expectation Theory

- Expectation theory holds good would mean computation of forward rates with the help of interest rates of different maturities. We can use FRA formula to compute forward rates

18. Locked in spread with IRS

- A company might have a fixed income liability paired with a floating income asset, or vice versa, exposing them to interest rate risk. To mitigate this risk, they can employ interest rate swaps
- Through this mechanism, both the asset and liability can be transformed into either fixed or floating, providing a means to effectively lock in the overall spread and manage interest rate fluctuations

Example:

Firm A has invested Rs.100 million in fixed rate bonds yielding 8.5 percent. Firm A has raised its loan for funding its assets through floating rate loan from bank at an interest rate of LIBOR + 0.50%. There is a big bank which offers interest rate swap. It has quoted rate of 6.40%-6.50% against LIBOR. How much would be the locked in spread of Firm A if it enters into interest rate swap?

- 1.50%
- 1.60%
- 2.10%
- 2.00%

Answer:

Particulars	Amount
Investment rate	8.5%
Borrowing Rate	(LIBOR + 0.50%)
Firm to Big Bank	(6.5%)
Big Bank to Firm	LIBOR
Locked in spread	1.50%

The company can lock in spread by receiving LIBOR from Big Bank. This will help them in offsetting the floating LIBOR being paid by them. Big Bank will pay LIBOR to Firm A and against higher rate of 6.50% from Firm A.

19. Fixed Payment vs Floating Payment

- Fixed payment would be same for every reset period whereas interest under floating rate would be computed using the below formula:

$$\text{Interest under Floating leg} = \text{Notional Principal} \times \text{Floating rate} \times \frac{\text{Effective days}}{360 \text{ or } 365}$$

- If the Generic swap is valued on 30/360 days basis then the denominator for computation of interest would be **360 days**
- **Fixed Payment vs Floating Payment:** Fixed rate of interest is computed on original principal whereas **floating rate of interest can have an element of interest on interest**. This is because in case of change in interest rate we will be computing the interest amount on opening principal which is equal to notional principal + Interest charged.

Example:

Suppose a dealer quotes 'All-in-cost' for a generic swap at 8% against six months LIBOR flat. If the notional principal amount of swap is Rs.50,00,000. The six-month period from the effective date of swap to the settlement date comprise of 181 days and that the corresponding LIBOR was 6% on the effective date of swap. Generic swap is valued based on 30/360 days basis. How much is the semi-annual fixed payment and floating payment?

- Rs.4,00,000 and 3,00,000
- Rs.3,00,000 and 1,50,000
- Rs.2,00,000 and 1,50,833
- Rs.1,50,000 and 3,01,666

Answer:

$$\text{Semi – annual fixed payment} = 50,00,000 \times 8\% \times \left(\frac{1}{2}\right) = 2,00,000$$

$$\text{Floating payment} = 50,00,000 \times 6\% \times \left(\frac{181}{360}\right) = 1,50,833$$

20. IRS for a hybrid bond

- A hybrid bond combines fixed interest payments for a certain period with floating interest payments for another period.
- In some cases, an investor or borrower may desire to **convert the entire bond into a fully fixed-rate or fully floating-rate bond** for the entire duration.
- To achieve this, the process involves initially categorizing all years of interest rates as either fixed or floating based on the relevant data
- **Subsequently, a swap is applied for each year, facilitating the conversion of the bond's terms in accordance with the desired fixed or floating structure.**

Chapter 13 – Business Valuation**Overview:**

- Economic Value Added
- Market Value Added
- Valuation of strategy
- Cash flow based valuation
- Relative valuation
- Break-up approach of valuation
- FMP valuation
- Net assets and earnings capitalization
- Internal reconstruction
- WACC and Valuation
- Distress company valuation
- Start-up company valuation

1. Economic Value Added

- Economic Value Added (EVA), serves as a key metric for evaluating a company's financial performance. It gauges the company's ability to generate wealth beyond the cost of its capital by taking into account its operating profit after adjusting for taxes.
- Often referred to as economic profit, EVA strives to provide a comprehensive view of a company's genuine economic success.
- The primary objective of EVA is to evaluate both the company's overall performance and the effectiveness of its management. It underscores the notion that a business can be deemed truly profitable only when it consistently generates returns that surpass the cost of capital, thereby creating value for its shareholders.
- **Formula:** Economic Value Added = {EBIT × (1-Tax rate)} – {Invested capital × WACC} [OR] NOPAT – {Invested capital × WACC}

Important note:

- Capital Employed = Long-term money = Debt + Equity + Preference; Equity = Share capital + Reserves – Fictitious Assets [OR]
- Capital Employed = Total Assets – Current Liabilities
- Capital employed should be based on economic value of assets. This would mean that we can go ahead and do revaluation of assets/liability. This can also be called as capital employed on replacement cost basis

Example:

EBIT = Rs.25,00,000; Tax Rate = 40%; Invested Capital = Rs.50 lacs; WACC = 12%; How much is the Economic Value Added?

- a. Rs.19,00,000
- b. Rs.9,00,000
- c. Rs.11,40,000
- d. Rs.6,00,000

Answer:

- $EVA = [EBIT \times (1 - \text{Tax Rate})] - [\text{Invested capital} \times WACC]$
- $EVA = [25,00,000 \times (1 - 0.40)] - [50,00,000 \times 12\%] = \text{Rs.}9,00,000$

Example:

Fragrance Ltd. has reported a Net Operating Profit after Tax (NOPAT) to Capital Employed as 2.5% plus Weighted Average Cost of Capital (WACC) for the year 31st March 2021. Economic Value added is Rs. 4 crore as on 31st March 2021. How much is the NOPAT if WACC is 7.5%?

- a. Rs.12 crores
- b. Rs.8 crores
- c. Rs.16 crores
- d. Rs.40 crores

Answer:

$EVA = 2.5\% \text{ of capital employed; } 4 \text{ crores} = 2.5\% \text{ of CE; } CE = \frac{4 \text{ crores}}{2.50\%} = 160 \text{ crores}$

WACC = 7.50%; Hence NOPAT = 10% of CE = 10% x 160 crores = 16 Crores

Example:

Book value of assets = 2,000 lacs; Replacement cost of assets = 6,000 lacs. What is capital employed for the purpose of EVA computation?

- 6,000 lacs
- 2,000 lacs
- 4,000 lacs

Answer:

Capital employed has to be on the basis of economic value of assets and the same would be equal to replacement cost of assets of 6,000 lacs

2. EVA Adjustments

Item	Impact on EBIT (Profit)	Impact on Capital Employed
Advertising, Research and Development expenses, Staff Training	Increase current year profit and deduct economic depreciation on these items	Increase capital employed for the amount added back net of economic depreciation
Depreciation	Add accounting depreciation and deduct economic depreciation	Adjust capital employed by adding back cumulative accounting depreciation and deduct cumulative economic depreciation
Non-cash expenses	Add back to Profit	Add cumulative non-cash expenses to capital employed
Tax Charge	We need to add-back provision for tax debited in P&L and deduct only cash taxes	-

Example:

The company reported EBIT of 2,000 lacs. The same has been after writing off training expense of 500 lacs. The benefit of training will be there for five years. What is the adjusted EBIT for computing EVA?

- 2000 lacs
- 2500 lacs
- 2400 lacs
- 1900 lacs

Answer:

Adjusted EBIT = 2,000 lacs + 500 lacs (Training added back as the same is an asset) - 100 (economic depreciation as the life is 5 years) = 2,400 lacs

3. Format for computation of WACC

Source	Cost	Weight	Product
Debt	10%	200	20
Equity	15%	400	60
Total		600	80

$$\text{WACC} = \frac{\text{Sum of Product}}{\text{Sum of weights}} = \frac{80}{600} \times 100 = 13.33\%$$

Note:

- Cost of debt is to be taken as post-tax cost of debt. The same can be computed as **Interest rate x (1 - Tax Rate)**. Alternatively, it can be computed using below formula:

$$K_d = \frac{\text{Interest} \times (1 - \text{Tax})}{\text{Value of debt}} \times 100$$

Assumption on cost of debt:

- Cost of debt given in question can be taken as pre-tax (or) post-tax depending on assumption if clarity is not there in question.
- We should do one check before making assumption. We need to compute (Interest/Debt) and compare the same with the cost of debt given in question. If the computed number is close to**

cost of debt given in question, it would be assumed that the given number is pre-tax cost of debt.

Example:

Pre-tax cost of debt = 12%; Cost of equity = 16%; Debt/assets ratio = 0.4 Times. Compute WACC if tax rate is 25%?

- a. 14.40 percent
- b. 13.20 percent
- c. 14.86 percent
- d. 14 percent

Answer:

Cost of debt = $12 \times (1 - 25\%) = 9\%$; Cost of equity = 16%

WACC = $[9\% \times 40\%] + [16\% \times 60\%] = 13.20\%$

Example:

Pre-tax cost of debt = 12%; Cost of equity = 16%; Debt/equity ratio = 0.4 Times. Compute WACC if tax rate is 25%?

- a. 14.40 percent
- b. 13.20 percent
- c. 14 percent
- d. 14.86 percent

Answer:

Cost of debt = 9 percent; Cost of equity = 16 percent

WACC = $\frac{[9 \times 0.4] + [16 \times 1]}{0.4 + 1} = 14 \text{ percent}$

Example:

The company has equity share capital of Rs.100 lacs. It has debt of Rs.200 lacs. The company has patent of Rs.100 which is not recorded in books. Cost of debt after tax is 8% and cost of equity is 14%. how much is WACC?

- a. 11%
- b. 14%
- c. 10%
- d. 8%

Answer:

The company has equity capital of Rs.100 lacs. Value of equity will go up by Rs.100 lacs as the patent hasn't been recorded in books and hence revised equity value is Rs.200 lacs. The company has debt of Rs.200 lacs

WACC = $\frac{8\% \times 200 + 14\% \times 200}{200 + 200} = 11\%$

4. Operating Income vs Net Income

- Operating income would mean EBIT and Net income would mean PAT

5. EVA Dividend

- EVA is excess generation and same can be paid to equity shareholders without any impact on company valuation
- If the company does not pay EVA dividend, then value will go up by the amount of EVA

EVA Dividend per share = $\frac{\text{Total EVA}}{\text{Number of equity shares}}$

Example:

The company has reported EVA of Rs.20,00,000 and has 5,00,000 equity shares. How much the company can declare as dividend per share before the value of the company would start to decrease?

- a. Company cannot declare any extra dividend
- b. Rs.2 per share
- c. Rs.8 per share
- d. Rs.4 per share

Answer:

EVA amount can be declared as dividend without any impact on the valuation of the company

EVA Dividend = $\frac{20,00,000}{5,00,000 \text{ shares}} = \text{Rs. 4 per share}$

6. Computation of EBIT using Financial Leverage

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{EBT} - \left(\frac{\text{Preference Dividend}}{1 - \text{Tax}} \right)}$$

Example:

Financial Leverage = 3 Times; The company has 11% debentures of Rs.400 lacs. How much is the EBIT of the company?

- 44 lacs
- 132 lacs
- 66 lacs
- 88 lacs

Answer:

$$\text{Financial leverage} = \frac{\text{EBIT}}{\text{EBT}}$$

EBIT is taken as X; Interest = 400 × 11% = 44 lacs; EBT = X - 44 lacs

$$3 \text{ Times} = \frac{X}{X - 44}; 3X - 132 = X; 2X = 132; X = 66 \text{ lacs. Hence EBIT is equal to 66 lacs}$$

7. Tax Adjustment on EVA computation

- We should deduct cash taxes actually paid while computing NOPAT. However, cash taxes are on the lower side due to tax benefit on interest
- NOPAT does not deduct interest and hence tax saving on interest should not be considered. Hence, we should deduct tax saving lost on interest while computing NOPAT
- Approach 1:** NOPAT = EBIT × (1 - Tax Rate)
- Approach 2:** NOPAT = EBIT - Cash taxes - Tax saving lost on interest
- Approach 3:** NOPAT = PAT + Interest net of taxes

Note:

- Any other adjustments having no tax impact shall be added after computing NOPAT

8. PE Multiple Adjustment based on risk

The Price-to-Earnings (PE) Multiple for companies within the same industry is typically expected to align closely with the industry's average PE Multiple. **However, adjustments to the PE Multiple can be made to account for the varying levels of risk associated with individual companies.** Companies with higher risk profiles tend to exhibit lower PE Multiples, while those with lower risk profiles may command higher PE Multiples.

Example:

Company A has Debt/ Assets ratio of 0.80 Times whereas company B has Debt/ Assets ratio of 0.20 Times. Both companies are identical except for capital structure. Industry PE Multiple is 15 Times. What should be the likely PE Multiple of Company A and Company P?

- Both companies can have same PE Multiple
- PE Multiple of A Limited will be higher than PE Multiple of B Limited
- PE Multiple of B Limited will be higher than PE Multiple of A Limited

Answer:

Company A carries more risk as reflected in higher debt. Company B carries less risk and hence PE Multiple of B Limited will be higher than PE Multiple of A Limited

9. Valuation of firm on basis of EVA

- EVA represent excess earning of the company and hence the same would increase the value of firm
- Value of firm = Present invested capital + Present value of future EVA

Example:

Current invested capital = Rs.80,00,000. Present value of future EVA = Rs.1,20,00,000. What is the value of the firm?

- 80 lacs
- 120 lacs
- 200 lacs

d. 40 lacs

Answer:

Value of firm = Invested capital + Present value of future EVA = 80 lacs + 120 lacs = 200 lacs

10. Market Value Added

- Market Value Added = Market Value of Firm – Book Value of Firm
- Market value of Firm = Market value of equity + Market value of Debt + Market value of Preference
- Book value of firm = Book value of equity (SC + Reserves – Fictitious assets) + Book value of debt + Book value of preference

Example:

Market value of equity = 10,000 lacs; Book value of equity = 4,000 lacs; Book value of debt = 2,000 lacs. How much is market value added?

- a. 4,000 lacs
- b. 6,000 lacs
- c. 2,000 lacs
- d. 16,000 lacs

Answer:

- Market value added = Market value of firm - Book value of firm
- Market value of firm = Market value of equity (1,000 lacs) + Market value of debt (2,000 lacs) = 12,000 lacs
- Book value of firm = Book value of equity (4,000 lacs) + Book value of debt (2,000 lacs) = 6,000 lacs
- **Market value added = 12,000 lacs - 6,000 lacs = Rs.6,000 lacs**

Example:

Equity share capital = Rs.10,00,000 (1,00,000 shares of Rs.10); Reserves and surplus = Rs.40,00,000; Share is quoted in the market at Rs.80. How much is market value added?

- a. 70,00,000
- b. 30,00,000
- c. 1,30,00,000
- d. 40,00,000

Answer:

Book value of firm = 10,00,000 + 40,00,000 = Rs.50,00,000

Market value of firm = 1,00,000 shares × 80 = Rs.80,00,000

Market value added = 80,00,000 - 50,00,000 = Rs.30,00,000

Example:

Book value of equity capital = 200 lacs; Reserves and surplus = 400 lacs; Amount of debt = 150 lacs. Face value of each share is Rs.10 and MPS is Rs.50. How much is market value added?

- a. 750 lacs
- b. 400 lacs
- c. 800 lacs
- d. 650 lacs

Answer:

- Market value added = Market value of firm - Book value of firm
- Market value of firm = $(200/10 \times 50) + 150 = 1,150$ lacs
- Book value of firm = 200 + 400 + 150 = 750 lacs
- Market value added = 1,150 lacs - 750 lacs = 400 lacs

11. Cash flow-based approach of valuation

- **Free Cash flow to Firm:** FCFE represents the cash flow that a firm generates from its operations that is available to all of its capital providers, including both equity and debt holders.
- **Free Cash flow to equity shareholders:** FCFE represents the cash flow that is available to the equity shareholders of a company after covering operating expenses, taxes, interest on debt, repayment of loans and reinvestment needs, such as capital expenditures and working capital change

Different Approach:

Type of Cash flow	Discount Rate	Resulting Value	Useful for
Free Cash flow to Firm (FCFF)	WACC	Value of Firm	Equity shareholders and Debt Holders
Free Cash flow to Equity (FCFE)	Cost of Equity	Value of Equity	Equity Shareholders

Preferred approach: We should always adopt FCFF approach for valuation of firm. Post valuation of firm, value of equity is computed as Value of Firm – Amount of debt

Formulae for computation of FCFF and FCFE:

FCFF Computation:

From PAT	Net Income + Non-cash charges + Interest x (1 – Tax rate) – Fixed capital investment – working capital investment
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FCFE Computation:

From FCFF	FCFF – Interest x (1- Tax rate) ± Net borrowing
From PAT	Net Income + Non-cash charges – Fixed capital investment – working capital investment ± Net borrowing

Example:

EBIT of Year 1 = 200 lacs; Interest of Year 1 = 40 lacs; Tax rate = 30%; Depreciation of year 1 = 20 lacs; Capital expenditure of year 1 is 40 lacs and year 2 is 50 lacs; Decrease in working capital in year 1 is 20 lacs. Capital expenditure is incurred at the start of the year. How much is the FCFF of year 1?

- 140 lacs
- 130 lacs
- 90 lacs
- 100 lacs

Answer:

Computation of FCFE:

Particulars	Amount (in lacs)
EBIT/EBT	200.00
Less: Tax @ 30%	-60.00
EAT	140.00
Add: Depreciation	20.00
Less: Capital expenditure (Beginning of year 2 is end of year 1)	-50.00
Add: Decrease in working capital	20.00
FCFF	130.00

Example:

A Limited plans to acquire B Limited. Both are into same industry. B Limited earned a profit of Rs.13,00,000 in last year and had depreciation of Rs.6,00,000. B Limited is no longer required to maintain its own production facilities and hence it can be assumed that only a minimal amount of cash will have to be reinvested to keep its equipment current and for future growth. This amount is estimated at Rs. 1,00,000 per year. The acquisition has synergy gain (post-tax) of Rs.6,00,000. Determine the annual cash flow expected by A Limited from B Limited if the acquisition is made

- Rs.19,00,000
- Rs.18,00,000
- Rs.25,00,000
- Rs.24,00,000

Answer:

Particulars	Amount
Profit after tax	13,00,000
Add: Depreciation	6,00,000
Add: Synergy gain	6,00,000
Less: Capital expenditure	(1,00,000)
Annual cash flow	24,00,000

Example:

EPS = Rs.10 per share; Capital expenditure = Rs.5 per share; Depreciation = Rs.4 per share; Working capital = Rs.4 per share. Debt ratio = 30%. How much is FCFF per share?

- a. 10 per share
- b. 5 per share
- c. 7.2 per share
- d. 8 per share

Answer:

FCFF = EPS + Depreciation - Capital expenditure - Working capital

FCFF = 10 + 4 - 5 - 4 = 5 per share

Example:

PAT = 10,000 lacs; Interest paid = 4,000 lacs; Tax rate = 40%; Capital expenditure is offset by depreciation and there is no change in working capital. Debt repayment = 2,000 lacs. How much is FCFE?

- a. 8,000 lacs
- b. 10,000 lacs
- c. 12,400 lacs
- d. 10,400 lacs

Answer:

FCFE = PAT + Depreciation - Capex - working capital - repayment of loan

FCFE = 10,000 + 0 - 0 - 0 - 2,000 = 8,000 lacs

Example:

Earning after tax = Rs.600 lacs; One-time incomes after tax = Rs.200 lacs; One-time expenses = Rs.100 lacs; Depreciation = Rs.50 lacs. How much is the free cash flow for valuation under cash flow-based approach of valuation?

- a. Rs.650 lacs
- b. Rs.450 lacs
- c. Rs.550 lacs
- d. Rs.750 lacs

Answer:

Free cash flow needs to adjusted for one-off items which are not likely to recur in future

Free cash flow = 600 lacs - 200 lacs + 100 lacs + 50 lacs = Rs.550 lacs

12. Gross Capex and Net Capex

- Gross Capex = Capital expenditure done by the company which is reflected as Additions in fixed assets schedule
- Net capex = Increase in net fixed assets wherein gross capex is adjusted for depreciation
- **For cash flow computation we can directly deduct net capex (or) we can deduct gross capex and add back depreciation**

Example:

Opening fixed assets = 10,000 lacs. Revenues will increase by 20 percent and fixed asset turnover ratio is maintained. The depreciation is 10% of opening WDV. How much is the gross capital expenditure of the year?

- a. 2,000 lacs
- b. 1,000 lacs
- c. 3,000 lacs

Answer:

Fixed asset turnover ratio is maintained and hence if revenues go up by 20 percent, then fixed assets will also increase by 20 percent; Closing fixed assets = 10,000 lacs + 20% = 12,000 lacs; Gross capex = 12,000 lacs - 9,000 lacs (opening WDV - Depreciation) = 3,000 lacs

13. Working capital

- Increase in working capital is an outflow and decrease in working capital is an inflow
- We need to be cautious in computation of change in working capital in case there is a change in growth rate.

Example:

Revenues of the company = 4,000 lacs. Working capital is 25 percent of revenues. Revenues will increase by 20 percent for 2 years and thereafter by 10 percent from third year. What is the change in working capital for year 3?

- a. 200 lacs
- b. 144 lacs

- c. 264 lacs
- d. 120 lacs

Answer:

- Revenues of year 1, 2 and 3 = Rs.4800, Rs.5760 and Rs.6336 lacs.
- Working capital of year 1, 2 and 3 = Rs.1200, Rs.1440 and Rs.1584 lacs [25% of revenues];
- Increase in working capital of year 3 = 1584 lacs - 1440 lacs = 144 lacs

14. Relative Approach of Valuation

- Relative Valuation is a method employed to determine the value of a company by conducting a comparative analysis against its peers or similar entities
- Relative valuation, often referred to as "Valuation by multiples," relies on financial ratios to calculate a specific metric, known as the "multiple." This multiple is taken as average of multiples of proxy entities

Example:

What should be the value of C Limited based on Market to sales approach? Company A - Market value = 400; Sales = 500; Company B - Market value = 450; sales = 600; Sales of Company C = 800

- a. 620
- b. 640
- c. 600
- d. 680

Answer:

Market value to sales ratio for Company A = $\frac{400}{500} = 0.80$ Times

Market value to sales ratio for company B = $\frac{450}{600} = 0.75$ Times

Market value to sales ratio for company C = $\frac{0.80 \text{ and } 0.75}{2} = 0.775$ Times

Market value of company C = $800 \times 0.775 = 620$

15. Break-up Value Approach

- Value the firm using different capitalization basis given in question. Possible capitalization basis are sales, assets and operating income
- Final value of firm = Average value of firm using multiple basis

Example:

Reliance Limited has three Divisions. Division A is to be valued based on capitalization/sales, Division B is to be valued based on capitalization/EBITDA and Division C is to be valued based on capitalization/operating income. Data of three division is as under:

Particulars	Division A	Division B	Division C
Sales	4,00,000	5,00,000	6,00,000
EBITDA	2,00,000	1,50,000	3,00,000
Operating income	1,00,000	1,20,000	2,00,000

Capitalization/sales multiple for industry is 10 times, Capitalization/EBITDA multiple for industry is 20 times and capitalization/operating income for industry is 25 times. How much is the fair value of Reliance Limited?

- a. 1,50,00,000
- b. 1,10,00,000
- c. 1,20,00,000
- d. 92,50,000

Answer:

Particulars	Division A	Division B	Division C
Sales/EBITDA/OI	4,00,000	1,50,000	2,00,000
Relevant multiple	10.00	20.00	25.00
Value of Division	40,00,000	30,00,000	50,00,000

Value of Reliance Limited = $40,00,000 + 30,00,000 + 50,00,000 = \text{Rs.}1,20,00,000$

16. Future Maintainable Profits approach of valuation

- FMP = Profit adjusted for extraordinary incomes/expenses and profit/loss from new product

Computation of FMP:

Particulars	Calculation	Amount
Existing PBT		XXX
Less: Extra-ordinary income		(XXX)
Add: Extra-ordinary expenses		XXX
Profit from new product		XXX
Future Maintainable PBT		XXX
Less: Tax		(XXX)
Future Maintainable PAT		XXX

- Value of business is computed using below formula:

$$\text{Value of business} = \frac{\text{Future maintainable PAT}}{\text{Capitalization factor}}$$

- Value of share based on PE Multiple approach with future maintainable PAT:

Particulars	Calculation	Amount (in lacs)
Future maintainable PAT		98
Less: Preference dividend	1,00,000 x 13	(13)
Earnings available to equity shareholders		85
No of shares		50
EPS		1.7
P/E Multiple		10
Market price per equity share		17

Example:

Eagle Limited reported a profit of Rs.77 lacs after 30% tax for the financial year 2011-12. An analysis of the accounts revealed that the income included extraordinary items of Rs.8 lacs and an extraordinary loss of Rs.10 lacs. New product will lead to profit of Rs.28 lacs. How much is the future maintainable PAT?

- Rs.140 lacs
- Rs.98 lacs
- Rs.107 lacs
- Rs.136 lacs

Answer:

Particulars	Calculation	Amount (in lacs)
Existing PAT		77
Existing PBT	77 lacs / (1-0.3)	110
Less: Extraordinary income		(8)
Add: Extraordinary loss		10
Profit from new product	70 - 20 - 12 - 10	28
Future maintainable PBT		140
Future maintainable PAT	140 x 70%	98

Example:

Existing PAT of company = 10,00,000; Tax rate = 50%; Extraordinary income included in profit computation = 5,00,000; Profit of new product = 20,00,000; How much is the future maintainable profit after tax?

- 20,00,000
- 22,50,000
- 17,50,000
- 15,00,000

Answer:

$$\text{Existing PBT} = \frac{10,00,000}{50\%} = 20,00,000$$

Extraordinary income will not continue and hence the same is removed. Revised PBT is Rs.15,00,000. New product will make profits of Rs.20,00,000 and hence FMP (before tax) is Rs.35,00,000. Future maintainable profit (after tax) = Rs.17,50,000

17. Net Assets and Earnings capitalization method

$$\text{Value as per net assets method} = \frac{\text{Realizable value of assets} - \text{Settlement value of liabilities}}{\text{Number of shares}}$$

$$\text{Value as per earnings capitalization method} = \frac{\left(\frac{\text{FMP}}{\text{Capitalization}} \right)}{\text{Number of shares}}$$

Capitalization rate will be given in question. If problem is silent, the same can be computed as under

$$\text{Capitalization rate} = \frac{\text{EPS}}{\text{Share Price}}$$

Note:

- **Contingent liabilities:** We will have to assume whether these will crystallize or not and consider the same in net assets method of valuation

Example:

Total Assets of the company = Rs.25,00,000; P&L debit balance (part of total assets) = Rs.5,00,000; Sundry creditors = Rs.2,00,000; Short-term debt = Rs.1,00,000; Long-term debt = Rs.2,00,000; Preference capital = Rs.4,00,000; No of equity shares = 1,00,000. How much is the net asset value per share?

- Rs.16.00
- Rs.11.00
- Rs.15.00
- Rs.20.00

Answer:

- Networth = Total assets – Fictitious assets – Sundry creditors – Short-term debt – long-term debt – Preference capital
- Networth = 25,00,000 – 5,00,000 – 2,00,000 – 1,00,000 – 2,00,000 – 4,00,000 = Rs.11,00,000

$$\text{Net asset value per share} = \frac{\text{Networth}}{\text{Number of shares}} = \frac{11,00,000}{1,00,000} = \text{Rs. 11.00 per share}$$

Example:

H Limited has total assets of Rs.1,000 Crores. It has preference capital of Rs.100 crores, Long-term debt of Rs.200 crores and current liabilities of Rs.300 crores. Contingent liability of Rs.200 crores is likely to crystallize to the extent of 25%. Land is 20% of total assets and its current value is 4 times of book value. How much is the value of equity as per net assets method?

- Rs.400 crores
- Rs.350 crores
- Rs.950 Crores
- Rs.1,000 Crores

Answer:

Particulars	Calculation	Amount
Land (20% of assets)	200 × 4	800.00
Other assets (80%)		800.00
Less: Preference capital		-100.00
Less: Long-term debt		-200.00
Less: Current liabilities		-300.00
Less: Contingent liability	200 × 25%	-50.00
Value of equity as per net assets method		950.00

Example:

A company has total assets of Rs.20,00,000 and outside liabilities of Rs.4,00,000. Assets have realizable value equivalent to 80% of the book value and there will also be liquidation expenses of Rs.1,00,000. How much is the net realizable value per share?

- Rs.16.00 per share
- Rs.15.00 per share
- Rs.12.00 per share
- Rs.11.00 per share

Answer:

$$\text{Value per share} = \frac{\text{Realizable value of assets} - \text{liquidation expenses} - \text{liabilities}}{\text{Number of shares}}$$

$$\text{Value per share} = \frac{16,00,000 - 1,00,000 - 4,00,000}{1,00,000} = 11.00 \text{ per share}$$

Example:

ABC Limited has automobile division whose value of business is Rs.1,000 Crores. It has liabilities of Rs.500 Crores. The settlement value of liabilities is 20% more than book value. The company plans to sell this division and has received a quote of Rs.450 Crores to acquire the division. The buyer of the division will take over all liabilities. What should be the decision of ABC Limited?

- It can sell automobile division
- It should not sell automobile division

Answer:

Value of equity of automobile division = 1,000 crores – 500 crores = Rs.500 crores. The company is receiving consideration of Rs.450 crores and **hence ABC Limited can go ahead with automobile division.**

Example:

Compute the value of company under capitalization of earning method using the following information: EPS = Rs.10.00 per share; Share price = Rs.100 per share; Expected annual maintainable profit = Rs.20,00,000

- Rs.2,00,000
- Rs.2,00,00,000
- Rs.20,00,000
- Rs.20,00,00,000

Answer:

$$\text{Capitalization rate} = \frac{\text{EPS}}{\text{Share price}} = \frac{10}{100} = 10.00\%$$

$$\text{Value of business} = \frac{\text{Expected Annual Maintainable Profit}}{\text{Capitalization rate}} = \frac{20,00,000}{10\%} = \mathbf{2,00,00,000}$$

Example:

T Ltd. Recently made a profit of Rs. 50 crore and paid out Rs. 40 crore (slightly higher than the average paid in the industry to which it pertains). The average PE ratio of this industry is 9. As per Balance Sheet of T Ltd., the shareholder's fund is Rs. 225 crore and number of shares is 10 crore. In case company is liquidated, building would fetch Rs. 100 crore more than book value and stock would realize Rs. 25 crore less. What would be the value of company as per Net realizable value method?

- Rs.225 Crores
- Rs.350 Crores
- Rs.325 Crores
- Rs.300 Crores

Answer:

Net realizable value = Rs.225 Crores + 100 Crores – 25 Crores = Rs.300 Crores

18. Net Cash Flow and Book value Approach with Floor Value

$$\text{Value as per net cash flow approach} = \frac{\text{Residual Net Cash flow}}{K_e - \text{Growth}}$$

$$\text{Value as per book value approach} = \text{Equity capital} + \text{Reserves and Surplus}$$

Minimum and maximum price:

- Minimum price per share = Lower of value as per above two approaches
- Maximum Price is computed using below formula:

$$\text{Maximum Price} = \frac{\text{Value of merged firm} - \text{Value of AC before merger}}{\text{No of shares of target company}}$$
- Floor value = CMP per share of target company

Example:

R Limited and S Limited are operating in same industry. S Limited is planning to acquire R Limited. How much should be the maximum consideration payable?

Particulars	R Limited	S Limited	Combined Entity
Profit after tax	86,50,000	49,72,000	1,21,85,000
Residual net cash flows per year	90,10,000	54,87,000	1,85,00,000
Required return on equity	13.75%	13.05%	12.50%

- Rs.14.80 crores
- Rs.10.60 crores
- Rs.8.25 crores
- Rs.6.55 crores

Answer:

Particulars	R Limited	S Limited	Combined entity
Residual net cash flow	90,10,000	54,87,000	1,85,00,000
Cost of equity	13.75%	13.05%	12.50%
Growth rate	0%	0%	0%
Value of company $\left[\frac{\text{Net cash flow}}{K_e - G} \right]$	6.55 cr	4.20 cr	14.80 cr

Consideration payable = Post-merger value of merged firm - Pre-merger value of S Limited

Consideration payable = 14.80 crores - 4.20 crores = Rs.10.60 Crores

19. Internal Reconstruction**Step 1: Computation of capital reserve:**

- Capital reserve = Items increasing Network - Items reducing Network

Step 2: Prepare Balance Sheet giving effect to changes in various assets and liabilities

20. Wrong WACC and Valuation

- Compute wrong WACC by using value of firm and free cash flow
- Find wrong weights used with WACC format
- Find correct weights and get correct WACC
- Get right value of firm with correct WACC and Free cash flow to firm

Example:

The cost of equity is 20 percent and cost of debt is 10 percent. WACC based on book value weights is 12 percent. The value of equity is thrice its book value, whereas the market value of its debt is nine-tenths of its book value. What is WACC based on market value weights?

- 12 percent
- 15 percent
- 14.55 percent
- 16 percent

Answer:**Identification of book value weights:**

Source	cost	Weight	Product
Equity	20	X	20X
Debt	10	1-X	10-10X
Total	12	1	20X+10-10X = 12

$$20X + 10 - 10X = 12; 10X = 2; X = 0.2 \text{ Times}$$

- Hence the weight of equity is 20% and weight of debt is 80%

Computation of WACC with market value weights:

- Weight of equity = $0.20 \times 3 = 0.60$ Times
- Weight of debt = $0.80 \times (9/10) = 0.72$ Times

Source	cost	Weight	Product
Equity	20	0.60	12.00
Debt	10	0.72	7.20
Total		1.32	19.20

$$\text{WACC} = \frac{19.20}{1.32} = 14.55\%$$

21. Computation of per share earning value [Not a logical item]

$$\text{Earning value of company} = \frac{\text{EBITDA}}{\text{Capitalization rate}}$$

$$\text{Per share earning value} = \frac{\text{Earning value of company}}{\text{No of equity shares}}$$

Example:

A Limited made a gross profit of Rs.10,00,000 and incurred indirect expenses of Rs.4,00,000. The number of issued equity shares is 1,00,000. The company has a debt of Rs.3,00,000 and Reserves to the tune of Rs.5,00,000. Capitalization rate is 11.25%. Compute the per share earning value of company?

- Rs.53.33 per share
- Rs.50.33 per share
- Rs.55.33 per share
- Rs.6.00 per share

Answer:

Particulars	Amount
Gross profit	10,00,000
Less: Indirect expenses	-4,00,000
EBITDA	6,00,000
Earning value of company (6,00,000/11.25%)	53,33,333
Number of shares	1,00,000
Earning value per share	53.33

22. Initial outflow on Acquisition [Cost of Acquisition]

- Cost of acquisition would include consideration given in cash or other than cash such as shares, debentures issued

Particulars	Amount
Market Value of Equity Shares issued	XXX
Add: Debentures, Preference capital issued	XXX
Add: Loan taken-over or repaid	XXX
Add: Other liabilities repaid or taken over	XXX
Less: Realizable value of current assets	(XXX)
Less: Cash	(XXX)
Initial outflow	XXX

Example:

A Limited has acquired business of B Limited. It has issued 40,000 equity shares at Rs.20 each. It has issued 12% debentures of Rs.4,00,000 to debenture holders. It has made payment of Rs.6,00,000 to creditors. How much is the initial outflow for the purpose of computing merger NPV?

- 8,00,000
- 6,00,000
- 12,00,000
- 18,00,000

Answer:

Initial outflow = Share issued + debentures issued + cash paid = 8,00,000 + 4,00,000 + 6,00,000 = Rs.18,00,000

23. Funding required for growth

- Typically, an organization seeks **additional funding** to accommodate growth. This is because as revenue increases, there is a corresponding rise in fixed assets and working capital.
- Funding required = Increase in capital employed
- Capital employed = Total Assets - Current Liabilities (or) Fixed Assets + Working Capital
- Short-term debt (financial liability) will not be part of current liability in the above computation as the same will not change proportionately with increase in revenues.

Example:

Total assets = 4,000 lacs; Current liabilities = 1,000 lacs; Revenues of the company will grow at 20 percent. How much would be the overall funding requirement to finance growth?

- 800 lacs
- 1,000 lacs
- 600 lacs
- 1,200 lacs

Answer:

Revenue increased by 20 percent and hence company will need additional assets to fund growth. Capital employed of company will increase by 20 percent to fund this growth. Capital employed = 4,000 lacs - 1,000 lacs = 3,000 lacs; Fund required = Increase in capital employed = 3,000 lacs x 20% = Rs.600 lacs

24. Intrinsic value of Equity (Using SVA Approach)

Intrinsic value of equity = Intrinsic value of Firm + Market value of non-core assets - Value of debt

Example:

Value of firm arrived by discounting cash flows of core operations = Rs.1,000 lacs; Value of debt = Rs.200 lacs; Market value of non-core assets = Rs.100 lacs. How much is the intrinsic value of equity?

- Rs.900 lacs
- Rs.700 lacs
- Rs.800 lacs
- Rs.1,100 lacs

Answer:

Intrinsic value of equity = Value of firm - value of debt + Value of non-core assets

Intrinsic value of equity = 1,000 - 200 + 100 = Rs.900 lacs

25. Valuation of Distress Companies

- Distress company is one which is not able to meet its fixed commitments (Fixed cost/Fixed interest)
- Distress can be because of operating leverage (fixed cost in cost structure) or financial leverage (fixed capital in capital structure) or combination of both
- Going concern assumption may not work for a distress company and hence value of distress company will be lower than normal firm
- We will have to adjust cash flows **due to probability of default** as well the discount rate due to high risk in such companies

Method 1: Modified Discounted Cash Flow Approach:**Scenario based valuation:**

- Arrive at various possible scenarios - Do valuation of each scenario -Derive probability for each situation- Value of firm = **Weighted average of various possible values with probability being the assigned weight**

Example:

- Optimistic scenario (20% chance) = Value of 100 crores
- Base case scenario (40% chance) = Value of 50 crores
- Pessimistic scenario (40% chance) = Value of 10 crores
- Value of distress company = (100 cr x 20%) + (50 cr x 40%) + (10 cr x 40%) = 44 Cr

Scenario not possible:

- If Scenario analysis is not possible, then compute only one stream of cash flow. Cash flows needs to be adjusted for probability of distress
- Expected cash flow = Normal cash flow x (1 - Probability of distress%)
- Probability of distress = 1 - Probability of survival

Method 2: Liquidation value + Going concern value (or) DCF valuation + Distress value:

- Liquidation value is arrived assuming company may get liquidated over the near term. Liquidation value be lower than Going concern value. This is normally arrived through net realizable value approach of asset valuation.
- Going concern value (DCF value) is the present value of future cash flows discounted at required return. We assume company to continue till perpetuity and hence perpetuity valuation is needed.
- Value of distress company = [Liquidation value x Prob of Distress] + [Going concern value x Prob of survival]**

Example:

Value of Going Concern = Rs.100 Crores. Distress value = Rs.50 Crores. The probability of survival is 40%. How much is the fair value of the company?

- Rs.150 Crores
- Rs.75 Crores
- Rs.70 crores
- Rs.80 crores

Answer:

Value = [Going concern value x Probability of survival] + [Distress value x Probability of default]

Value = [100 x 40%] + [50 x 60%] = Rs. 70 crores

Method 3: Adjusted Present Value Approach:

- Do valuation of unlevered firm - Discounting of future cash flows at unlevered cost of equity
- **Compute tax benefits of debt:**
 - **Perpetual debt:** Tax benefit = Amount of debt x Tax rate
 - **Redeemable debt:** Compute tax benefit of every year and discount the same at pre-tax cost of debt. Pre-tax cost of debt is used as discount rate because the same is proxy for risk of cash flows related to tax saving.
- **Compute bankruptcy cost = [Going concern value - Liquidation Value] x Probability of Default**
- **Value of firm = Value of unlevered firm + Tax Benefits - Bankruptcy cost**

Example:

- Value of unlevered firm = Rs.150 crores
- Amount of debt = 50 crores; Tax rate = 30%
- Liquidation value = 75 crores
- Probability of distress = 40%

Answer:**Formula 1:**

- Value of unlevered firm = 150 crores
- Tax benefit on debt = Debt x Tax rate = 50 crores x 30% = 15 crores
- Bankruptcy cost = [Going concern value - Liquidation value] x POD = [150 crores - 75 crores] x 40% = 30 crores
- Value = 150 crores + 15 crores - 30 crores = 135 crores

Formula 2:

- Value = [Going concern value x Probability of Survival] + [Liquidation value x Probability of Distress] + Tax benefit on debt
- Value = [150 crores x 60%] + [75 crores x 40%] + Tax benefits (50 cr x 30%) = 135 crores

Example:

ABC Limited is currently going through financial distress. Value of ABC Limited (if it was unlevered) = Rs.100 crores; Amount of debt = Rs.50 crores; Tax rate = 30%; Distress sale value = Rs.40 crores; Probability of distress = 40%. How much is the fair value of equity of ABC Limited using APV approach?

- Rs.91 crores
- Rs.41 crores
- Rs.76 crores
- Rs.26 crores

Answer:

Expected bankruptcy cost = [100 crores - 40 crores] x 40% = Rs.24 crores

Value of ABC Limited = Unlevered firm + Tax benefit on debt - Bankruptcy cost

Value of ABC Limited = 100 crores + (50 crores x 30%) - 24 Crores = Rs.91 Crores

Value of equity = 91 crores - 50 crores = Rs.41 Crores

Method 4: Relative Valuation Method

- Value of firm = Defined base x Multiple
- Defined base can be EBITDA/Sales/Assets etc. Multiple may have to be **adjusted downwards** to factor in risk of bankruptcy

26. Valuation of Start-ups**Method 1: Berkus Approach:**

- Valuation based on five key success factors such as Basic value, Technology, Execution, Strategic relationships in its core market and Production and Consequent sales
- A detailed assessment is carried out evaluating how much value the five critical success factors in **quantitative measure add up to the total value of the enterprise**. Based on these numbers, the startup is valued.
- This method **caps pre-revenue valuations at \$2 million and post-revenue valuations at \$2.5 million**.

Method 2: Cost-to-duplicate Approach:

- The Cost-to-Duplicate Approach **involves taking into account all costs and expenses associated with the startup and its product development**, including the purchase of its physical assets.

- All such expenses are considered determine the startup's fair market value based on all the expenses.
- This approach is often criticized for not focusing on the future revenue projections or the assets of the startup.

Method 3: Comparable Transactions Method:

- Under this method the valuation is done on the basis of valuation of similar start-ups in past.
- With any comparison model, one needs to factor in ratios or multipliers for anything that is a differentiating factor. Examples would be proprietary technologies, intangibles, industry penetration, locational advantages, etc. Depending on the same, the multiplier may be adjusted.

Example:

Monika is trying to value ChatApp, a Chat messaging app that currently has 16 million users but does not generate any revenues. She has identified that WhatsApp was recently valued at USD 450 Billion while having 450 million users. Considering the difference in size, Monika believes that a size discount of 95 percent should be applied while valuing ChatApp.

- USD 800 million
- USD 16 Billion
- USD 15.2 Billion
- USD 450 Billion

Answer:

Value of one user of whatsapp = $\frac{450 \text{ billion}}{450 \text{ million}} = \text{USD } 1,000 \text{ per user}$

Relevant multiple for chatapp = $1,000 - 95\% = \text{USD } 50 \text{ per user}$

Value of chatapp = 16 million x 50 = USD 800 million

Method 4: Scorecard Valuation Method

- Scorecard Method is another option for pre-revenue businesses. It also works by comparing the startup to others already funded but with added criteria
- First, we find the average pre-money valuation of comparable companies. Then, we consider how the business stacks up according to the following qualities:
 - Strength of the team
 - Size of the opportunity
 - Product or service
 - Competitive environment
 - Marketing, sales channels and partnerships
 - Need for additional investment
 - Others
- Then we assign each quality a comparison percentage. Essentially, it can be on par (100%), below average (<100%), or above average (>100%) for each quality compared to competitors/ industry. For example, the marketing team has a 150% score because it is thoroughly trained and has tested a customer base that has positively responded. You'd multiply 10% by 150% to get a factor of .15.
- This exercise is undertaken for each startup quality and the sum of all factors is computed. Finally, that sum is multiplied by the average valuation in the business sector to get a pre-revenue valuation

Method 5: First Chicago Method

- This method combines a Discounted Cash Flow approach and a market approach to give a fair estimate of startup value. It works out: Worst-case scenario, Normal case scenario and Best-case scenario
- Valuation is done for each of these situations and multiplied with a probability factor to arrive at a weighted average value.

Method 6: Venture Capital Method:

- This approach is commonly used by early-stage investors and involves estimating the start-up's future value at the point of an exit event, such as an acquisition or initial public offering (IPO).
- The valuation is based on the expected return on investment that investors seek. For example, if an investor expects a 10x return on investment within five years, they would estimate the start-up's value at the time of exit to achieve that target return.
- The above value is discounted at the rate representing an investor's expected or required rate of return.

Example:

The founders of a small technology firm are seeking a \$3 million venture capital investment from prospective investors. The founders project that their firm could be sold for \$25 million in 4 years. The private equity investors deem a discount rate of 25% to be appropriate, but believe there is a 20% chance of failure in any year. The adjusted pre-money valuation (PRE) of the technology firm is closest to (in millions):

- 7.24 million
- 1.19 million
- 4.19 million
- 7.19 million

Answer:

Expected cash flow in year 4 = 25 million $\times 0.8^4$ = 10.24 million

Current post – money valuation = $\frac{10.24}{1.25^4}$ = 4.19 million

Pre – money valuation = 4.19 million – 3 million = 1.19 million

Example:

A private equity investor makes a \$5 million investment in a venture capital firm today. The investor expects to sell the firm in four years. He believes there are three equally possible scenarios at termination:

Expected earnings will be \$20 million, and the expected P/E will be 10.

Expected earnings will be \$7 million, and the expected P/E will be 6

Expected earnings will be zero if the firm fails.

The investor believes an IRR of 25% is appropriate. The expected terminal value and the investor's pre-money valuation, respectively, are closest to (in \$ million):

- 80.67 and 33.04
- 80.67 and 28.04
- 9.00 and 3.67
- 80.67 and 38.04

Answer:

Terminal value = $\frac{(20 \times 10) + (7 \times 6) + 0}{3}$ = 80.67

Post – money value = $\frac{80.67}{1.25^4}$ = 33.04

Pre-money value = 33.04 – 5.00 = 28.04

Hence answer is 80.67 million and 28.04 million

Example:

A private equity firm is guaranteed to receive 80% of the residual value of a leveraged buyout investment, with the remaining 20% owing to management. The initial investment is Rs.500 crores, and the deal is financed with 70% debt and 30% equity. The projected multiple is 2.0. The equity component consists of: Rs.120 crores preference shares. Rs.25 crores private equity firm equity and Rs.5 crores management equity. At exit in 5 years the value of debt is Rs.150 crores and the value of preference shares is Rs.300 crores. The payoff multiple for the private equity firm and for management, respectively, is closest to:

- 3.03 and 11
- 6.34 and 46
- 4.23 and 24
- 5.10 and 22

Answer:

Answer is 5.10 and 22.0

Particulars	Amount
Expected exit value (500 crores $\times$ 2)	1,000.00
Less: Payment of debt	-150.00
Less: Payment of preference	-300.00
Balance amount for management and PE	550.00
Amount payable to PE [550.00 $\times$ 80%]	440.00
Amount payable to management [550 $\times$ 20%]	110.00
Total consideration to PE [440 + 300 preference)	740.00
Amount contributed by PE [25 + 120]	145.00
Exit Multiple for PE [740/145]	5.10
Exit multiple for management [110/5]	22.00

Example:

A private equity firm is considering an investment of Rs.17 crores in ABC Limited. ABC Limited's owners firmly believe that with PE investment they could develop their "wonder" drug and sell the firm in six years for Rs.120 crores. Given the project's risk, P&H believes a discount rate of 30% is reasonable. The pre-money valuation and PE's ownership is equal to:

- a. Rs.7.86 crores and 68%
- b. Rs.24.86 crores and 68%
- c. Rs.7.86 crores and 14%
- d. Rs.24.86 crores and 14%

Answer:

Answer is Rs.7.86 Crores and 68%

Post – money valuation of ABC Limited = $\frac{120 \text{ crores}}{(1 + 30\%)^6}$ = Rs. 24.86 Crores

Pre-money valuation = 24.86 crores – 17 crores = Rs.7.86 Crores

% stake acquired = $\frac{17}{24.86} \times 100 = 68.00\%$

Chapter 14 – Mergers, Acquisitions and Corporate Restructuring**Overview:**

- Gain from merger
- Cost of merger
- NPV of merger
- Exchange ratio – Simple
- Weighted average Exchange Ratio
- Minimum and Maximum Exchange Ratio
- Free float market capitalization
- Exchange ratio based on adverse parameters
- Bank merger
- Decision on sale of shares

1. Format for doing Merger Analysis

Particulars	ABC Limited	DEF Limited	Merged company
PAT/EAES	2,00,000	5,00,000	7,00,000
No of equity shares	1,00,000	2,00,000	2,62,172
EPS [PAT/ No of shares]	2	2.50	2.67
PE Multiple	20	10	20
MPS [PAT x PE Multiple]	40	25	53.40
No of equity shares	1,00,000	2,00,000	2,62,172
Market value of firm [MPS x No of shares]	40,00,000	50,00,000	1,40,00,000

2. Gain from Merger

- Gain from merger = Value of merged entity – (Pre-merger Value of entity A + Value of entity B)
- This gain will materialize under the following conditions:
 - The post-merger price-to-earnings (PE) multiple is superior to the weighted average PE multiple, OR
 - The post-merger cost of capital is better than the weighted average cost of capital, OR
 - The earnings of the merged firm surpass the sum of the individual earnings of Entity A and Entity B, OR
 - The cash flows generated by the merged firm exceed the combined cash flows of Entity A and Entity B.

Example:

Cash flows of Company A = 25 lacs; Cash flows of company B = 20 lacs; Merged firm will have annual cash flows of 60 lacs due to synergy gain. Pre-merger cost of capital of A Limited = 10%; Pre-merger cost of capital of B Limited = 20%; Post-merger cost of Capital of merged entity = 8%. How much is the gain from merger?

- e. 400 lacs
- f. 750 lacs
- g. 75 lacs
- h. 150 lacs

Answer:

$$\text{Value of A Limited before merger} = \frac{25 \text{ lacs}}{10\%} = \text{Rs. 250 lacs}$$

$$\text{Value of B Limited before merger} = \frac{20 \text{ lacs}}{20\%} = \text{Rs. 100 lacs}$$

$$\text{Value of merged entity} = \frac{60 \text{ lacs}}{8\%} = \text{Rs. 750 lacs}$$

$$\text{Merger gain} = 750 \text{ lacs} - 350 \text{ lacs} = 400 \text{ lacs}$$

Example:

Cash flows of Company A = 25 lacs; Cash flows of company B = 20 lacs; Merged firm will have annual cash flows of 60 lacs due to synergy gain. Pre-merger cost of capital of A Limited = 10%; Pre-merger cost of capital of B Limited = 20%; Post-merger cost of Capital of merged entity = 8%. A Limited has acquired B Limited. Consideration paid for acquisition is Rs.150 lacs. How much is the gain for shareholders of B Limited?

- a. 150 lacs
- b. 130 lacs
- c. 50 lacs
- d. 80 lacs

Answer:

$$\text{Value of B Limited before merger} = \frac{20 \text{ lacs}}{20\%} = \text{Rs. 100 lacs}$$

Consideration paid in merger = Rs.150 lacs

Gain to shareholders of B Limited = 150 lacs - 100 lacs = Rs.50 lacs

3. Cost of Merger

- Gross cost of cash offer/Consideration paid = No of shares of target company x Cash paid per share
- Gross cost of stock offer/Consideration paid = No of shares allotted in merger x Post-merger MPS
- True/Net cost of merger = Gross cost of merger - Pre-merger value of target company; **This is also known as Gain of target company shareholders**

Example:

A Limited is acquiring B Limited. B Limited currently has 10 crores shares of Rs.50 each. A Limited plans to pay cash consideration of Rs.60 per share. How much is the gross cost and net cost of merger?

- a. Rs.500 crores and 0
- b. Rs.600 crores and 0
- c. Rs.600 crores and Rs.100 crores
- d. Rs.500 crores and Rs.100 crores

Answer:

Gross cost of merger = 10 crores x 60 = Rs.600 crores

Net cost of merger = 600 crores - 500 crores = Rs.100 Crores

Example:

Value of A Limited = 1000 lacs; Value of B Limited = 500 lacs; Synergy gain = 500 lacs; A is acquiring B Limited and exchange ratio agreed is 1:3. No of shares in both companies are same before merger. How much is the gross cost and net cost of merger?

- a. 500 lacs and 0
- b. 1000 lacs and 0
- c. 1500 lacs and 1,000 lacs
- d. 2000 lacs and 1,500 lacs

Answer:

Post-merger value = 1000 lacs + 500 lacs + 500 lacs = 2,000 lacs

Let us assume no of shares in both companies are 300. Exchange ratio agreed is 1:3 and hence we would have issued 100 shares for merger; No of shares post-merger = 400

$$\text{Gross cost of merger} = 2,000 \text{ lacs} \times \left(\frac{100}{400}\right) = \text{Rs. 500 lacs}$$

$$\text{Net cost of merger} = 500 \text{ lacs} - 500 \text{ lacs} = 0$$

Example:

Net cost of merger = 300 lacs; Pre-merger value of Acquiring company = 1500 lacs; Pre-merger value of Target company = 700 lacs. Number of shares both acquiring and target before merger is same. Synergy gain from merger is 300 lacs. What is the swap ratio agreed during merger?

- a. 0.8:1
- b. 1:1
- c. 0.67:1
- d. 2:1

Answer:

Consideration paid = Net cost of merger + pre-merger value = 300 lacs + 700 lacs = 1,000 lacs

Value of merged entity = 1500 lacs + 700 lacs + 300 lacs = 2500 lacs; Let us assume that both company had 60 shares each before merger.

$$\% \text{ of company held by target company shareholders} = \frac{1,000 \text{ lacs}}{2,500 \text{ lacs}} = 40\%$$

So, acquiring company shareholders hold 60 percent of company and they have 60 shares. Target company shareholders would have been given 40 shares for 40 percent holding; Exchange ratio = 40:60 (or) 2:3 (or) 0.67:1

Example:

Value of Acquiring Company (A Limited) = Rs.540 lacs; Value of Target Company (B Limited) = Rs.90 lacs. Synergy gain from merger = Rs.45 lacs; No of shares of A Limited = 30 lacs; No of shares of B Limited = 18 lacs; Exchange ratio = 1:3. How much is the consideration paid?

- Rs.180 lacs
- Rs.225 lacs
- Rs.112.50 lacs
- Rs.90 lacs

Answer:

Value of merged firm = 540 lacs + 90 lacs + 45 lacs = Rs.675 lacs

Post – merger price = $\frac{675 \text{ lacs}}{30 \text{ lacs} + 6 \text{ lacs}} = \text{Rs. } 18.75 \text{ per share}$

Consideration paid = 6 lacs x 18.75 = Rs. 112.50 lacs

4. NPV of merger (or) Gain for acquiring company shareholders

NPV of merger = Gain from merger – True cost of merger

Example:

Value of acquiring company = Rs.1,000 lacs; Value of target company = Rs.600 lacs. Value of merged entity = Rs.2,000 lacs. The number of shares in both companies are same and exchange ratio offered is 1:2. How much is the NPV of stock offer?

- Rs.666.67 lacs
- Rs.400 lacs
- Rs.333.33 lacs
- Rs.66.67 lacs

Answer:

Let us assume both companies are having 100 shares and hence the number of shares offered to target company is 50 (100 x ½).

Consideration paid = 2,000 lacs x $\left(\frac{50}{150}\right) = \text{Rs. } 666.67 \text{ lacs}$

True cost of merger = 666.67 lacs – 600 lacs = Rs. 66.67 lacs

Gain from merger = 2,000 – (1,000 + 600) = Rs. 400 lacs

NPV of merger = 400 – 66.67 = Rs. 333.33 lacs

5. Post-merger EPS (Stock offer)

Post merger EPS = $\frac{\text{PAT of AC} + \text{PAT of TC} + \text{Synergy Gain}}{\text{Pre – merger shares of AC} + \text{Shares issued to TC}}$

Example:

Existing MPS of A Limited = Rs.40; PE Multiple of A Limited = 20 Times; No of shares of A Limited = 1,00,000; Existing EPS of B Limited = Rs.10; No of shares of B Limited = 40,000. A Limited is acquiring B Limited by issue of shares and wants to report post-merger EPS of Rs.4. How many shares must A Limited issue to B Limited.

- 40,000 shares
- 50,000 shares
- 1,50,000 shares
- 70,000 shares

Answer:

Current EPS of A Limited = $\frac{\text{MPS}}{\text{PE Multiple}} = \frac{40}{20} = \text{Rs. } 2 \text{ per share}$

Current PAT of A Limited = 2 per share x 1,00,000 = Rs.2,00,000

Current PAT of B Limited = 10 x 40,000 = Rs.4,00,000

Post-merger PAT = 2,00,000 + 4,00,000 = Rs.6,00,000

Maximum shares for EPS of Rs. 4 = $\frac{6,00,000}{4} = 1,50,000$

Shares that can be issued in merger = 1,50,000 - 1,00,000 = 50,000 shares

6. Post-merger EPS (Cash offer)

$$\text{Post merger EPS} = \frac{\text{PAT of AC} + \text{PAT of TC} - \text{After tax interest cost on borrowing}}{\text{Pre - merger shares of AC}}$$

Example:

Earnings of Target Company = Rs.75,00,000. Acquiring company plans to give cash consideration which will be funded with 15% loan. Tax rate is 30%. How much is the maximum consideration payable so the overall EPS of acquiring company is maintained?

- 500 lacs
- 714.29 lacs
- 1000 lacs
- 250 lacs

Answer:

The company can maintain EPS if the post-tax interest cost on bank borrowing is equal to total earnings of target company; After-tax cost of debt = $15 \times 70\% = 10.50\%$

$$\text{Maximum borrowing} = \frac{75 \text{ lacs}}{10.5\%} = \text{Rs. 714.29 lacs}$$

7. How Exchange Ratio is determined?

- Write the base values in the order of acquiring company: Target company (based on which exchange ratio is computed). Switch it around.
- If the company wants to pay some premium then the same needs to be adjusted in base values before computation of exchange ratio

Example:

MPS of company A = 50; MPS of Company B = 20. Company A wants to acquire company B by paying premium of 25%. What is swap ratio based on market prices?

- 50:20
- 20:50
- 25:50
- 20:62.50

Answer:

Base values = 50:20. The company wants to pay a premium of 25 percent and hence the base value for company B changes as 25. **Swap ratio = 25:50**

8. PE Multiple of Merged Firm/Weighted Average PE Multiple/Combined PE Multiple to justify merger

- In case the problem is silent, post-merger PE Multiple would be equal to pre-merger PE Multiple of acquiring company

$$\text{Weighted average PE Multiple} = \frac{(\text{PAT of AC} \times \text{AC PE Multiple}) + (\text{PAT of TC} \times \text{TC PE Multiple})}{\text{PAT of AC} + \text{PAT of TC}}$$

- A merger is justified if there is no negative gain from merger. A merger will not have merger loss if Value of merged entity $\geq$ (Pre-merger Value of AC + Pre-merger Value of TC). This equation can be used to compute combined PE Multiple to justify merger

$$\text{Combined PE Multiple} = \frac{\text{Pre merger value of A Limited} + \text{Pre merger value of B Limited}}{\text{Post merger earnings}}$$

Value of merged firm:

- Approach 1:** Value of merged firm = PAT of Merged firm $\times$ PE Multiple of Merged firm
- Approach 2:** Value of merged firm = Value of AC + Value of TC + Valuation gain given in question or computed

Example:

PE Multiple of A Limited = 20 Times; No of shares of A Limited = 1,00,000; PAT of A Limited = 25,00,000. PE Multiple of B Limited = 40 Times; No of shares of B Limited = 50,000; PAT of B Limited = 50,00,000. What is the weighted average PE Multiple if these two entities merge together?

- 30 Times
- 26.67 Times
- 33.33 Times

Answer:

Weighted average PE Multiple is to be computed on the basis of PAT of company

$$\text{Weighted average PE Multiple} = \frac{[20 \times 25,00,000 + 40 \times 50,00,000]}{[25,00,000 + 50,00,000]} = 33.33 \text{ Times}$$

Earnings of A Limited = 20,00,000; PE Multiple of A Limited = 10 Times; Earnings of B Limited = 40,00,000; PE Multiple of B Limited = 7.5 Times; Combined earnings will increase by 2,50,000 due to synergy gain benefits. What should be the minimum combined PE Multiple to justify the merger?

- 10 Times
- 8.75 Times
- 8.33 Times
- 8 Times

Answer:

Pre-merger value of A Limited = 20 lacs x 10 = 200 lacs; Pre-merger value of B Limited = 40 lacs x 7.5 = 300 lacs; Hence combined firm should have minimum value of 500 lacs

Earnings of combined firm = 20 lacs + 40 lacs + 2.5 lacs = 62.50 lacs

$$\text{PE Multiple to justify merger} = \frac{500 \text{ lacs}}{62.50 \text{ lacs}} = 8 \text{ Times}$$

9. Equivalent EPS/MPS

Equivalent EPS (or) MPS for target company shareholders = Post – merger EPS (or) MPS x Exchange Ratio

Example:

A Limited has acquired B Limited with a swap ratio of 1:2. Post-merger EPS is likely to be Rs.40. What is the equivalent EPS for shareholders of B Limited?

- Rs.20
- Rs.40
- Rs.80

Answer:

$$\text{Equivalent EPS} = \text{Post – merger EPS} \times \text{Exchange ratio} = 40 \times \left(\frac{1}{2}\right) = \text{Rs. 20 per share}$$

10. Gain/loss per share (or) Impact of merger on EPS/MPS:

Particulars	Acquiring company shareholders	Target company shareholders
Post-merger MPS/EPS	Normal Value	Equivalent Value
Less: Pre-merger MPS/EPS	Normal value	Normal value
Gain/loss per share (A)	XXX	XXX
Pre-merger number of shares (B)	XXX	XXX
Total Gain (A x B)	XXX	XXX

Example:

A is acquiring B Limited. Pre-merger EPS of B Limited is Rs.10. Post-merger EPS of combined entity is Rs.25. The merger was done by issuing 4,00,000 shares to B Limited shareholders. Existing shares of B Limited is 10,00,000. What is the impact of merger on EPS for B Limited shareholders?

- Gain of Rs.15 per share
- No gain or no loss
- Gain of Rs.52.50 per share
- Loss of Rs.15 per share

Answer:

$$\text{Equivalent EPS} = 25 \times \left(\frac{4,00,000}{10,00,000}\right) = \text{Rs. 10 per share}$$

Pre-merger EPS = Rs.10 per share

Impact of merger on EPS = No gain or no loss

Example:

Pre-merger MPS of A Limited = Rs.100; Pre-merger MPS of B Limited = Rs.200; A is acquiring B Limited and the expected post-merger MPS is Rs.150. Exchange ratio agreed is 2:1. What is the gain/loss per share for A Limited and B Limited shareholder?

- Gain of Rs.50 and Gain of Rs.100
- Gain of Rs.50 and loss of Rs.50
- Gain of Rs.50 and loss of Rs.100
- Gain of Rs.100 and Gain of Rs.50

Answer:

Gain for A Limited = Post-merger MPS - Pre-merger MPS = 150 - 100 = Rs.50

Gain for B Limited = Equivalent MPS - Pre-merger MPS = 300 - 200 = Rs.100

11. Exchange ratio to maintain EPS/MPS/BVPS

- In case there is no synergy gain, then exchange ratio can be on the basis of the parameter which needs to be maintained.
- EPS to be maintained = No PAT level gain
- MPS to be maintained = No valuation gain
- BVPS to be maintained = No revaluation of assets/liabilities
- **Caution Note:** If the company wants to maintain MPS, we should always try under table approach as the company may have valuation gain due to maintenance of PE Multiple. In short, we can use same parameter only if there is no gain in that parameter

Example:

EPS of company A = Rs.10; MPS of company A = Rs.100; EPS of company B = Rs.20; MPS of Company B = Rs.100; Company A plans to acquire company B and wants to maintain its EPS. What should be the exchange ratio.

- 1:1
- 1:2
- 2:1

Answer:

Exchange ratio should be on the basis of EPS if the company wants to maintain EPS; Base values = 10:20; Exchange ratio = 20:10 (or) 2:1

12. Maximum/Minimum Exchange Ratio

- Maximum ER is from point of view of acquiring company. This should lead to acquiring company making no profit at MPS level.
- Minimum ER is from point of view of Target company. This should lead to target company making no profit at MPS level
- Maximum consideration = Post-merger value of merged firm - Pre-merger value of acquiring company
- Minimum consideration = Pre-merger value of target company
- Maximum Exchange ratio should ensure pre-merger MPS of acquiring company is equal to post-merger MPS
- **Valuation gain:** If a merger has valuation gain, then one of the parties/both parties can gain from merger. **Operating synergies (PAT gain) + Financial Synergies (PE Multiple gain) = Valuation gain**
- Merger is justified when there is no valuation gain or the valuation gain is positive. We should not have negative valuation gain in merger

Example:

Value of Acquiring Company = 1,000 lacs (10 lac shares x 100); Value of Target company = 500 lacs (50 lac shares x 10); Merger gain = 500 lacs. What is acceptable minimum and maximum exchange ratio?

- 0.0667:1 and 0.2000:1
- 5:1 and 10:1
- 0.5:1 and 1:1

Answer:

Value of merged firm = 1000 lacs + 500 lacs + 500 lacs = 2,000 lacs

Minimum exchange ratio:

Particulars	Value	No of shares
Value of acquiring company	1,500 lacs	10,00,000
Value of target company (Consideration paid)	500 lacs	3,33,333 $\left(10,00,000 \times \frac{500}{1500}\right)$
Value of merged entity	2,000 lacs	13,33,333

- Minimum exchange ratio is based on minimum consideration of Rs.500 lacs (Pre-merger value of target company)

- ER = 3,33,333:50,00,000 (or) 0.0667:1

Maximum Exchange ratio:

Particulars	Value	No of shares
Value of acquiring company	1,000 lacs	10,00,000
Value of target company (Consideration paid)	1,000 lacs	10,00,000
Value of merged entity	2,000 lacs	20,00,000

- Maximum exchange ratio is based on maximum consideration of Rs.1,000 lacs.
- Maximum consideration = Post-merger value - pre-merger value = 2,000 lacs - 1,000 lacs = Rs.1,000 lacs

ER = 10,00,000:50,00,000 (or) 0.20:1

13. Value of Original Company Shareholders

- Value of original shareholders is computed with the logic that there is no gain from merger and hence what value will both shareholders get if the synergies don't work out.

Value of TC shareholders = $\left(\frac{\text{Pre merger value of AC + TC}}{\text{Pre merger shares of AC + Shares issued to TC}} \right) \times \text{Shares issued to TC shareholders}$

Value of AC shareholders = $\left(\frac{\text{Pre merger value of AC + TC}}{\text{Pre merger shares of AC + Shares issued to TC}} \right) \times \text{Shares held by AC shareholders}$

Example:

No of shares of A Limited = 20,00,000; No of shares issued to B Limited shareholders in merger = 10,00,000; Value of A Limited (pre-merger) = Rs.250 lacs; Value of B Limited (pre-merger) = Rs.50 lacs What are the value of original shareholders of A Limited and B Limited?

- 150 lacs and 150 lacs
- 200 lacs and 100 lacs
- 100 lacs and 200 lacs

Answer:

Value of TC shareholders = $\left(\frac{\text{Pre merger value of AC + TC}}{\text{Pre merger shares of AC + Shares issued to TC}} \right) \times \text{Shares issued to TC shareholders}$

Value of TC shareholders = $\left(\frac{250 + 50}{20 + 10} \right) \times 10 = 100 \text{ lacs}$

Value of AC shareholders = $\left(\frac{\text{Pre merger value of AC + TC}}{\text{Pre merger shares of AC + Shares issued to TC}} \right) \times \text{Shares held by AC shareholders}$

Value of AC shareholders = $\left(\frac{250 + 50}{20 + 10} \right) \times 20 = 200 \text{ lacs}$

Value of A Limited shareholders is Rs.200 lacs and B Limited shareholders is Rs.100 lacs

14. Free-Float Market Capitalization

- Free float market capitalization refers to the total market value of a publicly traded company's outstanding shares that are available for trading by investors in the open market. It excludes shares held by promoters
- Free-float market capitalization = Overall market capitalization x non-Promoter shareholding

Example:

Free float market cap = Rs.400 lacs. Promoters hold 80% of the company. There are total 10,00,000 shares in company. What will be the MPS?

- Rs.40
- Rs.32
- Rs.200
- Rs.100

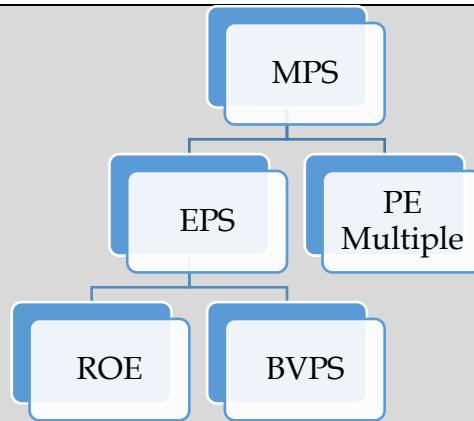
Answer:

Free float market cap = 400 lacs; Shareholding by public = 20%

Total market cap of company = $\frac{400 \text{ lacs}}{20\%} = \text{Rs. 2,000 lacs}$

MPS = $\frac{2,000 \text{ lacs}}{10 \text{ lacs}} = \text{Rs. 200 per share}$

15. Decomposing of Share price



- $MPS = EPS \times PE \text{ Multiple}$
- $EPS = ROE \times BVPS$

16. Book Value Per Share

Book value per share (BVPS) is a financial metric that represents the value of a company's common equity on a per-share basis. It is calculated by dividing the total common **shareholders' equity (also known as net assets)** by the number of outstanding common shares.

$$\text{Book value per share} = \frac{\text{SC} + \text{Reserves} - \text{Fictitious Assets}}{\text{Number of shares}} \quad (\text{OR})$$

$$BVPS = \frac{\text{Total Assets (excl Fictitious Assets)} - \text{Current liabilities} - \text{Long term debt} - \text{Preference}}{\text{Number of shares}}$$

Example:

Fixed Assets = 20,00,000; Current Assets = 30,00,000; 10% Loan = 2,00,000; Current liabilities = 8,00,000; P&L Debit Balance = 5,00,000; No of shares = 2,00,000. What is book value per share?

- 20
- 17.50
- 25.00
- 22.50

Answer:

Value of equity = Total assets - Outside liabilities

Value of equity = 50,00,000 - 10,00,000 = 40,00,000

$$\text{Book value per share} = \frac{40,00,000}{2,00,000} = 20 \text{ per share}$$

Note: P&L debit balance is not considered as part of total assets in above computation and hence the same is not required to be deducted

Example:

Total Assets of the company = Rs.25,00,000; P&L debit balance (part of total assets) = Rs.5,00,000; Sundry creditors = Rs.2,00,000; Short-term debt = Rs.1,00,000; Long-term debt = Rs.2,00,000; Preference capital = Rs.4,00,000; No of equity shares = 1,00,000. How much is the book value per share?

- Rs.16.00
- Rs.11.00
- Rs.15.00
- Rs.20.00

Answer:

- Networth = Total assets - Fictitious assets - Sundry creditors - Short-term debt - long-term debt - Preference capital
- Networth = 25,00,000 - 5,00,000 - 2,00,000 - 1,00,000 - 2,00,000 - 4,00,000 = Rs.11,00,000

$$\text{Book value per share} = \frac{\text{Networth}}{\text{Number of shares}} = \frac{11,00,000}{1,00,000} = \text{Rs. 11.00 per share}$$

17. Impact of bonus/split

- Any changes in the number of equity shares resulting from actions like bonus issues or stock splits will not have an impact on the **overall market capitalization of the company**.

- Market Price per Share (MPS), Earnings per Share (EPS), and Book Value per Share (BVPS), may undergo changes. However, it's essential to understand that the overall market capitalization/earnings/book value of the company will remain unchanged despite these changes.

Example:

Current book value per share = Rs.150. The company plans to make bonus issue of 2:1 and then split 100 rupees shares into 20 shares of 5 rupees each. What will be the book value per share post bonus issue and split respectively?

- 100 and 5
- 50 and 2.5
- 150 and 7.5
- 20 and 1

Answer:

The company makes bonus issue of 2 shares for every 1 share. Hence Rs.150 share will become three shares of Rs.50. Under split one share of Rs.50 will be split into 20 shares and value of each share will be Rs.2.5

18. Minimum vs Maximum Exchange Ratio (Negotiation)

- The ultimate exchange ratio agreed upon during negotiations in a share swap is contingent on the relative strength of the involved companies
- If the acquiring company is deemed stronger, the final exchange ratio is likely to be closer to the lower limit. Conversely, if the target company is stronger, the ratio may be closer to the upper limit.**
- The assessment of a company's strength or weakness can be based on various parameters such as Price-to-Earnings (PE) Multiple, Growth Rate, Return on Equity (ROE), Market Share, Brand Value, and other relevant factors.

Example:

A Limited (Acquiring company) and B Limited (Target company) are negotiating a merger deal. Two ER are currently under negotiation 1:2 and 1:3. Acquiring company has better PE Multiple/Growth rate/ROE. The final exchange ratio is likely to be closer to:

- 1:2
- 1:3
- 1:2.50

Answer:

Acquiring company is stronger company and they would like to pay a lower consideration in merger. Two exchange ratios under discussion is 0.5:1 (1:2) and 0.33:1 (1:3). **Final exchange ratio will be closer to lower limit of 1:3 or 0.33:1.**

19. Impact of Revision in Growth Rate on Value of firm

- Value of firm is highly dependent on growth rate and any change in growth rate will have direct impact on its valuation
- Compute existing cost of equity using the current growth rate
- Substitute the new growth rate in cost of equity formula and compute its valuation

Example:

Cash flows of Company A = 40 lacs; Expected Cash flows of Company B for next year = 80 lacs; Valuation of Company B presently is Rs.800 lacs and company B is likely to grow at 10 percent. Post merger Company B will grow at 15 percent. How much should be the revised value for business of Company B?

- Rs.800 lacs
- Rs.1,200 lacs
- Rs.1,600 lacs
- Rs.400 lacs

Answer:

Cost of equity of Company B = $\frac{80 \text{ lacs}}{800 \text{ lacs}} + 10\% = 20\%$

Revised growth rate = 15%

Revised value = $\frac{80 \text{ lacs}}{20\% - 15\%} = \text{Rs. 1,600 lacs}$

20. Intrinsic Value

Intrinsic value represents the true or underlying worth of a share, and **Market Price per Share (MPS) can serve as a proxy for this intrinsic value**

Example:

A Limited is planning to acquire B Limited. MPS of A Limited and B Limited is 40 and 20. A Limited has estimated the intrinsic value of B Limited to be 30. What should be the exchange ratio on the basis of intrinsic value?

- 2:1
- 1:2
- 1.33:1
- 1:1.33

Answer:

Intrinsic value of B Limited is Rs.30. Intrinsic value of A Limited will be taken as the market price of A Limited in absence of information. **Hence base values are 40:30 and exchange ratio will be 30:40 (or) 1:1.33**

21. Computation of Purchase Consideration (When shares allotted are not given in question)

- We should find the percentage shareholding of target company shareholders and compute the purchase consideration using the below formula:

Consideration Paid = Value of merged company x % shareholding of TC shareholders

Example:

Value of acquiring company before merger = 4,000 lacs; Value of acquiring company after merger = 10,000 lacs; Pre-merger no of Shares in both companies are same. The company has allotted 0.5 share for every 1 share of target company. How much is the purchase consideration paid?

- 5,000 lacs
- 3,333 lacs
- 2,000 lacs
- 1,333 lacs

Answer:

Let us assume no of shares of both companies to be 100

Shares issued as consideration = $100 \times \frac{1}{2} = 50$ or 33.333333% $\left(\frac{50}{150}\right)$

Consideration paid = 10,000 lacs x $\left(\frac{50}{150}\right) = 3,333$ lacs

Example:

Value of A Limited = 1000 lacs; Value of B Limited = 500 lacs; Synergy gain = 500 lacs; A is acquiring B Limited and exchange ratio agreed is 1:3. No of shares in both companies are same before merger. How much is the gross consideration paid?

- 500 lacs
- 1000 lacs
- 1500 lacs
- 2000 lacs

Answer:

Post-merger value = 1000 lacs + 500 lacs + 500 lacs = 2,000 lacs

Let us assume no of shares in both companies are 300. Exchange ratio agreed is 1:3 and hence we would have issued 100 shares for merger; No of shares post merger = 400

Value of shares issued = 2,000 lacs x $\left(\frac{100}{400}\right) = \text{Rs. } 500$ lacs

22. Exchange Ratio Based on Adverse Parameters

- Adverse parameters refer to the aspects that a company aims to minimize or reduce. Examples of such parameters include Gross Non-Performing Assets (NPA), Expense Ratio, and Cost of Goods Sold (COGS) ratio
- For adverse parameters the exchange ratio will be same as base values and no switching needs to be done

Example:

Gross NPA of Bank A = 40%; Gross NPA of Bank B = 20%. Number of shares of Bank A = 40,00,000. Bank B plans to acquire Bank A and exchange ratio is based on GNPA. How many shares are to be issued?

- a. 20,00,000
- b. 40,00,000
- c. 80,00,000

Answer:

Base values = 20:40. Swapping is not required for negative parameter

$$\text{Shares to be issued} = 40,00,000 \times \left(\frac{20}{40}\right) = 20,00,000 \text{ shares}$$

23. Ratios related to bank merger

$$\text{GNPA}(\%) = \frac{\text{GNPA in Rupees}}{\text{Advances}} \times 100$$

$$\text{Capital Adequacy Ratio}(\%) = \frac{\text{Networth}}{\text{Risk Weighted Assets}} \times 100$$

Example:

Networth of Bank A = 100 lacs; CAR = 16%; Networth of Bank B = 200 lacs; CAR = 6%; What is Capital Adequacy Ratio of merged Bank?

- a. 9.33%
- b. 12.67%
- c. 7.58%
- d. None of the above

Answer:

$$\text{Networth of Bank A} = 100 \text{ lacs; CAR} = 16\%; \text{Risk weighted assets} = \frac{100}{16\%} = 625 \text{ lacs}$$

$$\text{Networth of Bank B} = 200 \text{ lacs; CAR} = 6\%; \text{Risk weighted assets} = \frac{200}{6\%} = 3,333.33 \text{ lacs}$$

Total Networth of merged bank = 300 lacs; Total risk weighted assets = Rs.3,958.33 lacs

$$\text{CAR} = \left(\frac{300}{3,958.33}\right) \times 100 = 7.58\%$$

Advances of Bank A = 1000 lacs; GNPA (%) of Bank A = 20%; Advances of Bank B = 2,000 lacs; GNPA of Bank B = 10 lacs; What will be GNPA (%) of merged Bank?

- a. 20%
- b. 15%
- c. 12.50%
- d. 10.00%

Answer:

GNPA of Bank A = 1000 lacs x 20% = Rs.200 lacs

GNPA of Bank B = Rs.100 lacs

$$\text{GNPA}(\%) \text{ of merged Bank} = \frac{300 \text{ lacs}}{3,000 \text{ lacs}} = 10\%$$

24. Dupont Framework for computing ROE

$$\text{ROE} = \frac{\text{EPS}}{\text{BVPS}} \text{ (or) } \frac{\text{EAES}}{\text{Book value of equity}} \text{ (or) } \frac{\text{PAT}}{\text{Equity}}$$

$$\text{ROE as per Dupont Framework} = \left(\frac{\text{PAT}}{\text{Sales}}\right) \times \left(\frac{\text{Sales}}{\text{Assets}}\right) \times \left(\frac{\text{Assets}}{\text{Equity}}\right)$$

ROE as per Dupont Framework = Net Profit margin x Asset Turnover x Equity Multiplier

Note:

- If information on assets is not given then Assets = Debt + Equity

Example:

Net profit margin = 4%; Assets to sales ratio = 0.80; Debt to assets ratio = 40%. How much is the ROE?

- a. 12.50%
- b. 8.00%
- c. 8.33%
- d. 5.33%

Answer:

$$ROE = \frac{\text{Net Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}} = 4 \times \frac{1}{0.80} \times \frac{100}{60} = 8.33\%$$

Debt is 40% of assets and hence equity will be 60% of assets. Therefore, we can say that equity is Rs.60 if assets is Rs.100. The same has been used in above formula to compute ROE.

25. Bonus issue to reduce promoter Holding

A company may opt for a bonus issue to non-promoter shareholders as a means to lower the percentage ownership held by promoters. In this scenario, the total value of the firm remains constant, but there will be a change in the number of shares issued, thereby affecting the value per share.

Example:

Promoters hold 90 percent of a company. They are planning to issue bonus shares to minority shareholders to bring holding down to 75 percent. What is the bonus ratio?

- 2:1
- 1:2
- 1.5:1
- 1:1.5

Answer:

Let us assume there are 100 shares in the company. Promoters currently hold 90 shares in company and minority shareholder hold 10 shares. Target holding of promoter is 75 percent and hence 90 shares would represent 75 percent holding.

$$\text{Overall shares post bonus} = \frac{90}{75\%} = 120$$

We need to issue 20 shares as bonus and hence bonus ratio will be 20:10 (or) 2:1

26. Minimum consideration for promoters to relinquish Promoter Holding

- Promoters of a company can enjoy allied benefits such as higher salaries, perquisites due to controlling stake of promoter holding
- In that case they will need a consideration higher than current market price for them to give up controlling stake

$$\text{Minimum Price} = \text{Current Market Price} + \frac{\text{Value of extra Benefits}}{\text{No of shares held by promoters}}$$

Example:

Current market capitalization of company = 40,00,000. Promoters hold 40 percent of the company. No of shares of the company = 1,00,000. Promoters and their family members are part of top management and are currently over-paid. They had received excess remuneration of Rs.2,00,000 per year and the present value of these remuneration for infinite period is Rs.15,00,000. How much should be the minimum price per share paid by target company for the promoters to relinquish their controlling interest?

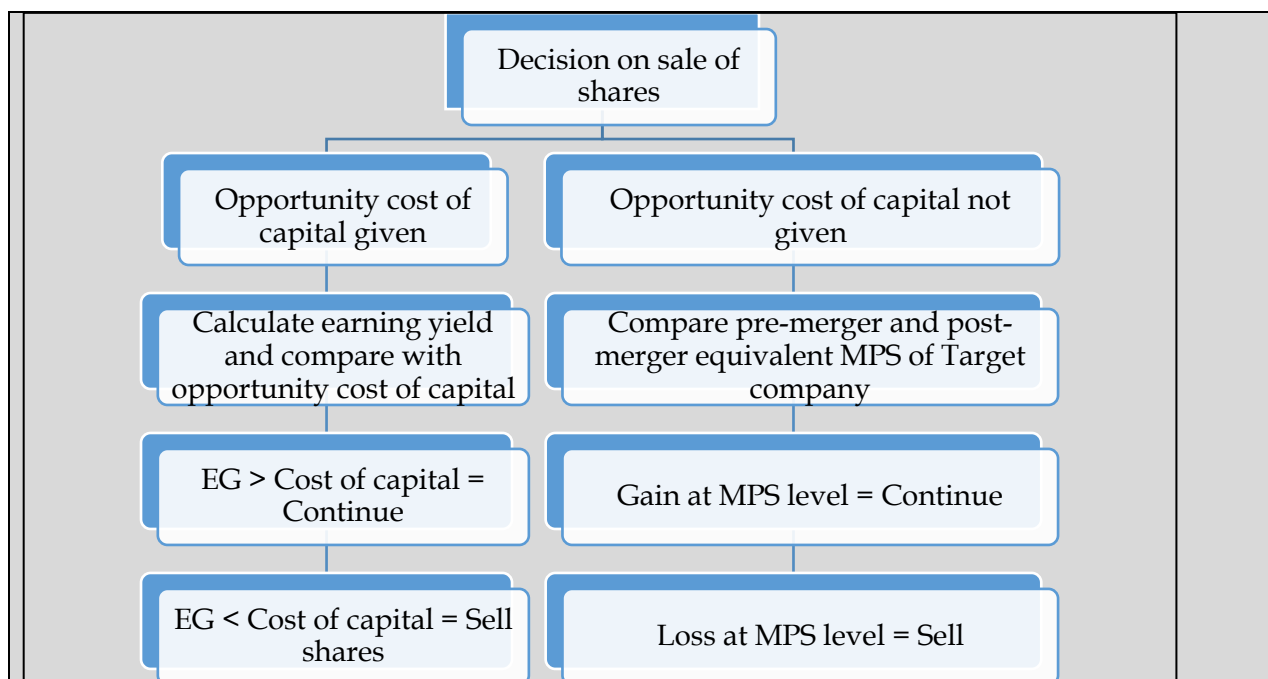
- Rs.40 per share
- Rs.45 per share
- Rs.77.50 per share
- Rs.80.00 per share

Answer:

Minimum compensation for promoters = Value of shares held (16,00,000) + Value of excess remuneration (15,00,000) = Rs.31,00,000

$$\text{Minimum price per share} = \frac{31,00,000}{40,000 \text{ shares}} = \text{Rs. 77.50 per share}$$

27. Decision on sale of shares

**Example:**

A Limited is planning to acquire B Limited. Current share price of B Limited is Rs.10 and the same got increased by 20% on merger announcement. Post-merger EPS and MPS will be Rs.2 and Rs.25. Exchange ratio offered in merger is 0.8:1. Mr. X, an investor, having 10,000 shares of B Ltd. is having another investment opportunity, which yields annual return of 12% is seeking your advise whether he needs to offload the shares in the market or accept the shares from A Limited.

- He should sell shares in market
- He should accept merger offer
- Indifferent between sales of shares and acceptance of merger offer

Answer:

$$\text{Earning yield of A Limited} = \frac{\text{Equivalent EPS}}{\text{CMP}} \times 100 = \frac{2 \times 0.8}{12} \times 100 = 13.33\%$$

Earning Yield from A Limited is better than alternative investment opportunity and **hence Mr.X should accept to merger offer**

Example:

A Limited is planning to acquire B Limited. Current share price of B Limited is Rs.14. Post-merger EPS and MPS will be Rs.3.13 and Rs.31.30. Exchange ratio offered in merger is 0.5:1. Mr. X, an investor, having 100 shares of B Ltd. is seeking your advise whether he needs to offload the shares in the market or accept the shares from A Limited.

- He should sell shares in market
- He should accept merger offer
- Indifferent between sales of shares and acceptance of merger offer

Answer:

Particulars	Calculation	Amount
Present market value of shares of B Limited	100 shares x 14	Rs.1,400
No of shares issued on merger	100 x 0.50	50
Value of shares post-merger	50 x 31.304	Rs.1,565
Increase in market value	1,565 - 1,400	Rs.165

We should accept the merger offer as there is an increase in value post merger.

28. Post-merger PAT if retained earnings have already been re-invested

- If retained earnings have already been reinvested, the profit after tax (PAT) of individual companies will continue to grow at their historical growth rate. However, starting from the next fiscal year, the growth rate will be determined by the expected growth rate of the merged firm.

$$\text{Post merger PAT of Year 1} = ((\text{PAT of AC} + \text{Growth rate}) + (\text{PAT of TC} + \text{Growth rate}) + \text{Synergy gain})$$

Post merger PAT of Year 2 = Post merger PAT of Year 1 + Merged Company Growth Rate

Example:

Last year earning of Acquiring company = 100 lacs; Growth rate = 10%; Last year earning of Target company = 50 lacs; Growth rate = 6%; Synergy gain due to merger = 10 lacs and the likely growth rate post merger is 12%. The companies have just paid dividends and retained earnings have already been re-invested in new projects. What is the likely PAT of merged firm for year 1?

- 178 lacs
- 179.2 lacs
- 173 lacs
- 163 lacs

Answer:

Earnings have already been reinvested and hence next year growth will be based on growth rate of individual companies

Next year PAT = (100 lacs + 10%) + (50 lacs + 6%) + 10 lacs = 173 lacs

29. Distribution of shares in case of partly paid shares

If part of shares is partly paid-up, we should convert partly paid-up shares into equivalent fully paid shares and then decide the distribution of shares.

Example:

A Limited will issue 1,00,000 shares as consideration to B Limited. B Limited currently has 30,00,000 shares comprising of 20,00,000 shares of Rs.10 each (fully paid) and 10,00,000 shares of Rs.10 each (partly paid of Rs.5). How many shares will be issued to Mr.A who holds 1,00,000 fully paid shares and 1,00,000 partly paid shares?

- 8,000 shares
- 6,000 shares
- 6,667 shares
- 10,000 shares

Answer:

- Equivalent fully paid shares of B Limited = 20,00,000 + (10,00,000 × 0.50) = 25,00,000
- A Limited will be issuing 1,00,000 shares for 25,00,000 equivalent fully paid shares
- No of equivalent fully paid shares held by Mr.A = 1,00,000 + (1,00,000 × 0.50) = 1,50,000 shares

No of shares issued = $\frac{1,00,000}{25,00,000} \times 1,50,000 = 6,000$ shares

30. Fund available for merger

Fund available for merger depends on debt-taking ability of the company and the available cash and cash equivalents. The same is computed using the below formula:

- Fund available = [Acquirer book equity × Debt/equity ratio] – [Existing debt of two companies] + Cash available

Example:

A Ltd.'s (Acquirer company) equity capital is Rs. 2,00,00,000. Both A Ltd. and T Ltd. (Target Company) have arrived at an understanding to maintain debt equity ratio at 0.30:1 of the merged company. Pre-merger debt outstanding of A Ltd. stood at Rs. 20,00,000 and T Ltd at Rs. 10,00,000 and marketable securities of both companies stood at Rs. 40,00,000. How much is the total fund available for merger?

- 60,00,000
- 40,00,000
- 70,00,000
- 30,00,000

Answer:

Particulars	Amount
Debt capacity of merged company (2,00,00,000 × 0.30)	60,00,000
Less: Debt of A Limited and T Limited	30,00,000
Balance debt can be raised	30,00,000
Add: Marketable securities	40,00,000
Total fund available	70,00,000

31. Post Merger Shareholding

- A shareholder can have a percentage holding in both acquiring and target company. The post-merger shareholding can be computed as under:

$$\text{Post-merger shareholding} = \frac{\text{No of shares held in AC} + (\text{No of shares held in TC} \times \text{ER})}{\text{Post merger no of shares}}$$

Example:

A Limited is acquire B Limited. Exchange ratio offered is 1:2. Mr.X holds 10% of A Limited and 5% of B Limited. A Limited shareholders hold 60% of merged firm. What will be X's shareholding in merged firm?

- 7.50%
- 8.00%
- 8.33%
- 15.00%

Example:

Shareholders	Total Shares	% holding	Shares held by Mr.X
A Limited shareholders	60	10%	6 shares [60 x 10%]
B Limited shareholders	40	5%	2 shares [40 x 5%]
Total shares	100	8% [8/100]	8 shares

32. Valuation of debt and equity [Not a logical item]

- Two distinct companies are on the verge of a potential merger, and the question wants us to determine the combined value of their debt and equity
- Valuation of debt and equity of individual companies:** Look at various scenarios and calculate the individual debt and equity values for each entity separately. In each scenario, the total firm value is to be allocated between debt and equity, with debt receiving its valuation first, and equity representing the residual value.
- Value of debt of individual companies = Weighted average of the value of different scenarios
- Value of equity would be arrived in similar manner
- Value of debt of merged entity = Value of debt of company 1 + Value of debt of company 2
- Value of equity of merged entity = Value of equity of company 1 + Value of equity of company 2

Summary Theory Notes

Chapter 1 - Financial Policy and Corporate Strategy	
<u>Advanced Role of CFO:</u>	• Supports strategic and operational decision making • <u>Emerging roles:</u> Risk management + Supply chain + Mergers acquisitions and corporate restructuring + Environmental, Social and Governance (ESG) Financing.
Fundamentals of Business = Strategy + Finance + Management	
Strategy can be defined as the long-term direction and scope of an organization to achieve competitive advantage	
<u>Functions of Strategic Financial Management:</u>	• Takes care of investment and financing decisions + Focuses on Strategic, Operational and Tactical level • Search for investment + Selection of investment + optimal mix + Systems for internal control + Results for future decision making
<u>Key decisions within scope of financial strategy:</u> Financing decisions, Investment decisions, Dividend decisions and Portfolio Decisions.	
<u>Different types of strategy:</u> Corporate Level Strategy, Business Unit Level Strategy and Functional Level Strategy	
<u>Financial Planning:</u>	• Financial Planning is the backbone of business planning and corporate planning • It defines the feasible area of operation • Three components of Financial Planning is summarized in the below equation:
Financial Resources + Financial Tools = Financial Goals	
<u>Outcome of financial planning:</u>	• Financial objectives + Financial Decision making + Financial Measures
<u>Interface between financial policy and strategic management:</u>	• Starting point of an organization is money and end-point is also money • Sources of finance and capital structure are the most important dimensions of a strategic plan • Another important dimension of interface between the two is investment and fund allocation decisions • Dividend decision is another financial decision which can affect the strategic performance of company • Hence financial policy cannot be worked out in isolation and it has closer link with overall organizational performance and growth
<u>Financial Goals and Sustainable Growth:</u>	• Organization need to consider the financial consequences of sales increases and set sales growth targets consistent with firm's operating and financial policies • Organization should focus not only on current stakeholders but also on future stakeholders • Example of Fuel industry where there is demarketing campaign preaching customers about fuel conservation • Incremental growth strategy, profit strategy and pause strategy are other variants of stable growth strategy • Important for long-term development. Too fast or too slow growth can impact the company's performance in future
<u>What makes an organization financially sustainable:</u>	• Have more than one source of income • Regular planning • have adequate financial systems • Good public image • Have clear values • Have financial autonomy
<u>Sustainable Growth Rate:</u>	• Maximum rate of growth in sales that can be achieved with current profitability, asset utilization, dividend payout and leverage ratios • How much can an organization grow without borrowing money

- $SGR = ROE \times (1 - \text{Dividend Payout Ratio})$
- It assumes target capital structure and target dividend payment ratio and increase sales as rapidly as market conditions allow

What makes an organization sustainable:

- Clear strategic direction
- Identify opportunities
- Adequate administrative and financial infrastructure
- Leverage further resources
- Get community support

Chapter 2 - Risk Management

Strategic Risk: Company's strategy becomes less effective and it struggles to achieve its goal

Compliance Risk: Non-compliance with rules and regulations leading to penalties in the form of fine and imprisonment

Operational Risk: Failure to cope up with day-to-day operational problems

Financial Risk: Unexpected changes in financial conditions (Prices, Exchange Rate, Credit Rating, Interest rate)

Types of Financial Risk:

- **Counter-party risk:** Non-honouring of obligations by counter-party
- **Political Risk:** Normally faced by overseas investors, as the adverse action by the Government of the host country may lead to huge losses
- **Interest rate risk:** Variation in cash flow due to change in interest rate. This risk is more important for banking companies
- **Currency risk:** Variation in cash flow due to changes in exchange rates
- **Liquidity risk:** Inability of the company to meet its liabilities.

Financial risk from different point of view:

- **Stakeholder's point of view:** Equity shareholders view financial gearing and new lenders view existing gearing
- **Company's point of view:** Excessive borrowing or lending to someone who defaults, can force company into liquidation
- **Government's point of view:** Failure of bank or financial institution leading to spread of distrust among society at large

Value-at-risk:

- **Meaning:** VAR answers two basic questions namely (i) what is the worst-case scenario and (ii) what will be the loss
- **Features:** Components (Time Period, Confidence Interval and Percentage loss), Statistical method, Time Horizon (One day, one week, one month etc.), Probability (normal distribution), Control risk (control risk by setting limits), Z-score
- **Application:** Measure maximum possible loss, benchmark for performance measurement, fix trading limits for front-office of treasury department, deciding trading strategies, tool for Asset and Liability Management in banks

Counter-party risk:

- **Hints:** Regulatory restrictions, Insolvency, Hostile action of foreign Government, Failure to obtain necessary resources, Let down by third party
- **Measures to manage:** Due-diligence, Exposure limits, Credit review and credit limits, performance guarantees, limiting exposure to a single company or group

Political risk:

- **How to assess:** Political ranking, country's macro-economic conditions, Popularity and stability of current Government, Advise from embassies
- **Measures to manage:** Local sourcing, Local financing, Prior negotiations, Entering into joint ventures

Interest rate risk:

- **How to assess:** Monetary Policy, Government action, Economic growth, Industrial data, Stock market changes, Investment by Foreign investors
- **Measures to manage:** Forward rate agreements, Interest rate options, Interest rate futures, Interest rate swaps

Currency risk:

- **How to assess:** Government action, Nominal interest rates, Inflation rate, Natural calamities, Wars, Change of Government
- **Measures to manage:** Currency invoicing, Forward contract, Currency futures, Currency options, Currency swaps, Leading and Lagging, Money Market Hedge

Chapter 3 – Advanced Capital Budgeting Decisions

Impact of inflation:

- Inflation can impact cash flows – Cash flows including inflation are called nominal cash flows and excluding inflation are called real cash flows
- Nominal cash flow needs to be discounted at Money Discount Rate and Real cash flows should be discounted at Real Discount Rate

Impact of Technology Change:

- Technology can impact future cash flows and it may lead to replacement of machinery with improved technology
- **Impact of technology on operations:** Alter production process, improved quality, delivery time, flexibility, shortening of product life cycle
- **Incorporation of this risk in decision making:** Use techniques like sensitivity analysis, scenario analysis, simulation analysis – Check if company needs to pursue abandonment due to changed technology and also adjust discount rate to reflect technology risk

Impact of change in Government Policies:

- Government policies can impact future cash flows - They can also impact company's customer, suppliers, service providers – Company should check for abandonment if operations are unviable
- **Fiscal policy and monetary policies** are short-term policies which impact companies and we also have long-term policies (>5 years) impacting cash flows.
- **Impact on domestic capital budgeting decision:** Revision in interest rates leading to change in cost of capital and fiscal policy changes (tax rates) can impact cash flows
- **Impact on international capital budgeting decision:** Monetary policy (Changes in bank rates and money supply which impacts exchange rates) + Fiscal policy (Changes in tax rates relating to foreign income or revision in DTAA)

Risk and uncertainty:

- Risk can be measured and uncertainty cannot be measured

Adjustment of risk in capital budgeting:

- Risk adjustment is critical to know the real value of cash flows – Adjustment of risk helps in checking whether a project is earning adequate returns compensating the risk undertaken

Sources of risk:

- **Internal Factors:** Project specific risk (Project completion, error in estimation) + Company specific risk (Downgrade of credit rating, changes in KMP)
- **External Factors:** Industry specific risk + Market risk + Competition risk + Risks due to economic conditions + International risk

Tools for incorporating risk:

- **Statistical techniques:** Probability + SD + Co-efficient of variation
- **Conventional Techniques:** RADR + CEF
- **Other Techniques:** Sensitivity Analysis + Scenario Analysis + Simulation Analysis + Decision Tree

RADR Approach:

- Risky projects are evaluated at higher discount rate
- **Advantages:** Easy + Discount factor incorporates risk
- **Limitations:** Difficulty in finding RADR + NPV can be computed but SD cannot be calculated

CEF Approach:

- Adjustment of cash flows based on certainty of cash flows
- **Advantages:** Simple and easy + Different levels of risk can be attached to different years
- **Disadvantages:** No objective method to ascertain certainty equivalent factor

RADR vs CEF:

- CEF is superior to RADR as different levels of risk can be attached to different years – However RADR is mostly followed as it is easy to adjust discount rate than assigning CEF to each year Cash flow

Sensitivity Analysis:

- Studies the impact of change in variables on project outcomes – It studies impact of only one variable at a time
- **Advantages:** Simple and identifies critical issues

- **Disadvantages:** Assumes variables are independent (not related to each other which is unlikely in real life) + Does not look into probability of changes

Scenario Analysis:

- Evaluates the impact of changes in multiple variables on NPV of the project – We start with analysis of base case NPV and then compute best case/worst case NPV with changes in multiple variables at a time

Scenario Analysis Vs Sensitivity Analysis:

- Sensitivity analysis evaluates the impact of change in single variable whereas scenario analysis considers impact where multiple variable change together

Simulation:

- Involves infinite calculations to obtain possible outcomes by modelling investment projects, cash flows and key factors affecting project
- **Advantages:** Predicting market situations + Handling complex inter-relationships
- **Limitations:** Specifying probability distribution of variable can be difficult + NPV is computed based on risk-free rate and the same may not give right view of final NPV

Decision-Tree Approach:

- Handles scenario with sequential investment decisions
- Handles two types of situations – Decision (manager has control) and Event (Manager has no control)

Chapter 4 – Security Analysis

Security Analysis:

- Systematic analysis of risk and return profile to help a rational investor make a decision on purchase of security
- Two approaches – Fundamental Analysis and Technical Analysis

Fundamental Analysis:

- Objective is to find intrinsic value which is the present value of future dividends discounted at appropriate discount rate
- Key variables = EIC Analysis – Economic, Industry and Company Analysis

Economic Analysis:

- Forecast national income and its various components that will have a bearing on specific industry and the company
- **Factors affecting economic Analysis:** Focus is on macro-economic factors such as growth rates of national income, growth rate of industrial sector, inflation and monsoon

Techniques used for Economic Analysis:

- **Anticipatory Surveys:** Help investors form an opinion on future state of economy by getting expert opinion on various factors impacting economy
- **Barometer/Indicator Approach:** Indicators to find how economy will perform in future. There are leading indicators, roughly coincidental indicators and lagging indicators
- **Economic model building approach:** Developing a precise and clear relationship between dependent and independent variables. In this approach forecasting of GDP is done in two ways. One is by measuring individual components and then adding up to overall GNP. This is then compared with GNP prediction of independent agency to check for accuracy and consistency

Industry Analysis:

- This is concerned with analysing the expected performance of the specific industry to which the company belongs. Demand, cost structure and other factors are analysed to identify the prospects of the company
- **Factors:** Product life-cycle, Demand supply gap, barriers to entry, Government attitude, state of competition, cost conditions and profitability, Technology and research
- **Techniques:** Regression Analysis (consider factors such as GNP, disposable income, per capita consumption, price elasticity to identify demand) and Input-output Analysis (track flow of goods across value chain to find changing trends indicating growth/decline of industries)

Company Analysis:

- **Factors:** Networth/Book value, Sources and uses of funds, Cross-sectional and time series analysis, size and ranking, Growth record, Financial Analysis, Competitive advantage, Quality of management, corporate Governance, Regulation, Location and Labour-management relations, Pattern of existing stock holding, Marketability of shares
- **Techniques:** Correlation and regression analysis, Trend Analysis and Decision Tree Analysis

Technical Analysis:

- **Meaning:** Method of study of share price movements based on study of price graphs or charts to find future trends in share prices
- **Assumption:** Price is dependent on supply and demand which are governed by several factors, stock prices move in trends, emphasis is on chart analysis rather than information in financial statements
- **Principles:** The market discounts everything, Price moves in trends and History tends to repeat itself

Dow Theory:

- **Two indices:** Dow Jones Industrial Average and Dow Jones Transportation Average
- **Three classification:** Primary movement, secondary movement and daily fluctuations
- **Primary movement:** Main trend usually for one year to 36 months – commonly called as bear or bull market
- **Secondary movement:** Opposite to primary movement and is shorter in duration
- **Daily fluctuations:** Not part of the interpretation
- **Interpretation:** Successive highs and lows of stock market averages are higher, then the same would be bull market. If the successive highs and lows are lower than it is bear market

- **Three moves:** First one by far-sighted knowledgeable investors, second one by arrival of earnings numbers and the third one is of speculative.

Elliott Wave Theory:

- Market exhibited certain repeated patterns or waves. Depending on demand and supply, waves are generated in the prices
- **Types of waves:** Impulsive patterns and corrective patterns
- **Impulsive Patterns (Basic Waves):** 3 or 5 waves in a given direction (upward or downward) – also called as basis movements which indicates bull or bear phase
- **Corrective Patterns (reaction waves):** Moves against the basis direction
- One cycle consists of waves made up to two distinct phases (bullish and bearish). On completion of one cycle, fresh cycle will start with similar impulses

Random Walk Theory:

- This theory states that the behaviour of stock market prices is unpredictable and there is no relationship between present and future prices
- Change in security prices behave nearly as if they are generated by a suitably designed roulette wheel
- **Supporting arguments:** Price cannot be predicted, price trends are statistical expression of past data, Periodical ups and downs,

Charting techniques:

- **Line Chart:** Lines are used to connect successive day's prices. The closing price for each period is plotted as a point
- **Bar Chart:** Vertical line (Bar) represents the lowest to the highest price, with a short horizontal line protruding from the bar representing both the opening and closing prices for the period
- **Japanese Candlestick Chart:** The bar chart **displays stock opening, closing, and highs and lows, with the color of the candlestick indicating the trend.** A black candlestick indicates a lower closing price, while a white candlestick indicates a higher one. A Doji candlestick indicates no change or near-no change
- **Point and figure chart:** They are used to detect reversals in a trend. For plotting a point and figure chart, we have to first decide the box size and the reversal criterion. The box size is the value of each box on the chart, for example each box could be 1, 2 or 0.50. The smaller the box size, the more sensitive would the chart be to price change

Market Indicators:

- **Breadth Index:** This is computed by dividing the net advances or declines in the market by the number of shares traded
- **Volume of transactions:** Rising index/falling index with increasing volume would indicate bull and bear market respectively
- **Confidence Index:** Ratio of high-grade bond yields to low-bond grade yields – Explains how willing the investors are willing to take a change – Rising confidence index is a sign of bull market and vice versa
- **Relative strength Analysis:** Some securities generate higher returns in bull market or decline more slowly in bear market. These securities demonstrate relative strength in the past and this can be used to buy securities with high relative strength
- **Odd-lot theory or Contrary- opinion theory:** It assumes that the average person is usually wrong and the wise course of action is to pursue strategies contrary to popular opinion

Support and Resistance Level:

- When the index/price **goes down from a peak**, the peak becomes the **resistance level**. When the index/price **rebounds after reaching a trough** subsequently, the lowest value reached becomes the **support level**

Tools to interpret price patterns:

- **Channel:** Series of uniformly changing tops and bottoms gives rise to a channel
- **Wedge:** A wedge is formed when tops (resistance levels) and bottoms (support levels) change in opposite direction
- ❖ **Head and Shoulders:** It is a distorted drawing of a human form, **with a large lump (for head) in the middle of two smaller humps (for shoulders).** This is perhaps the single most important pattern to indicate a reversal of price trend.
- **Triangular or coil formation:** Pattern of uncertainty and hence difficult to predict which way price will break out

- **Flags and Pennants form:** Signifies a phase after which the previous price trend is likely to continue
- **Double Top Form:** Represents a bearish development – price likely to fall
- **Double bottom form:** Represents a bullish development – price likely to rise
- **Gap:** A gap is the **difference between the opening price on a trading day and the closing price of the previous trading day.**

Moving average Analysis:

- **Buy Signals:** Stock price line goes above moving average line when moving average line is flattening out, stock price falls below rising moving average line, Stock price line which is above moving average line falls and begins to rise again above moving average line
- **Sell Signals:** Stock price line goes below moving average line when moving average line is flattening out, stock price rises above falling moving average line, Stock price line which is below moving average line rises and begins to fall again below moving average line

Evaluation of Technical Analysis:

- **Supporters:** Trends persist for some time due to human psychology, shift in demand and supply are gradual and not instantaneous, information is factored in gradually in price and hence price movement continues in same direction till information is fully factored in
- **Detractors:** No convincing explanation, early identification of trends may not be possible, many people employing technical analysis will lead to decline in value of technical analysis, supporting random walk theory which is not feasible

Fundamental Analysis vs Technical Analysis:

- Fundamental analysis predicts prices based on economy, industry and company factors whereas technical analysis predicts future prices based on historical price movements
- Fundamental analysis believes price discounts every information and useful for long-term investing whereas technical analysis believes in price capturing everything and is useful for short-term investing

Efficient market theory:

- **Conclusion:** All available price sensitive information is fully factored in share prices
- **Reason why consistent outperformance cannot happen:** Free availability of information, keen competition among market participants and price change will only be on new information
- **Misconceptions:** Prices factor in all available information, Price will fluctuate but they cannot reflect fair value due to surprise element, Random movement of stock price indicating stock market is irrational
- **Level of market efficiency:** Weak form (Reflect information found in record of past prices and volumes), semi-strong (past prices + Volumes + Other public information), Strong form (Public as well as private information)
- **Challenges:** Limited information processing capabilities, irrational behaviour and monopolistic influence of powerful institutions and big operators
- **Tests to check market efficiency:** Serial Correlation Test, Run Test and Filter rules Test

Tools available for equity research:

- Equity Research is a finance or investment banking field that analyzes a company's financial performance to determine whether to buy, sell, or hold equity shares
- **Available tools:** Bloomberg terminal, Businessquant, YCharts, MarketXLS

Chapter 5 – Security Valuation

Expected return and required return:

- Required return represents minimum rate of return which investor wants. This is also called as cost of capital
- Expected return reflect the return likely to be earned by investors
- Expected Alpha = Expected Return – Required Return

Equity risk premium:

- ❖ Equity risk premium is the **excess return that investment in equity shares** provides over a risk-free rate, such as return from tax free government bonds. This excess return compensates **investors for taking on the relatively higher risk of investing** in equity shares of a company.

Nominal cash flow and real cash flow:

- Nominal cash flow is the amount of cash flow without any adjustments for inflation. Real cash flows are company's cash flow with adjustments for inflation
- Nominal cash flow include inflation and is discounted with nominal discount rate whereas real cash flow exclude inflation and is discounted with real discount rate

Enterprise value:

- **Meaning:** Enterprise value is the true economic value of company. $EV = \text{Equity} + \text{Debt} + \text{Minority Interest} - \text{Cash and cash equivalents}$
- **Multiples in relation to EV:** EV to sales and EV to EBITDA

Duration:

- Duration is nothing but the **average time taken** by an investor to collect his/her investment. If an investor receives a **part of his/her investment** over the time on specific intervals before maturity, **the investment will offer him the duration which would be lesser than the maturity of the instrument**. Higher the coupon rate, lesser would be the duration.
- Duration is impacted by time to maturity and coupon rate

Immunization:

- Immunization happens if the weighted duration of the portfolio is equal to the period for which investment is required to be made. This is a level where price risk and reinvestment risk will offset each other leading to no impact to the investor

Term structure Theory:

- Explains the relationship between interest rates or bond yields and different terms/maturities
- **Types of Yield curve:** Upward sloping, Downward Sloping, Flat and Humped
- **Expectation theory:** Long-term interest rates can be used to forecast short-term interest rates
- **Liquidity preference theory:** Forward rates = Expected future spot rate + liquidity premium to compensate for exposure to interest rate risk
- **Preferred habitat theory (Market Segmentation Theory):** Premiums are related to supply and demand of funds at various maturities and not to the term of maturity

Convexity:

- Duration can be used to find the percentage change in bond price for small change in interest rates. However, this cannot accurately measure the change
- Accurate measurement can be done with the help of convexity adjustment

$$C \times (\Delta y)^2 \times 100$$

Where

Δy = Change in Yield

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

V_+ = Price of bond if yield increases by Δy

V_- = Price of bond if yield decreases by Δy

Modified duration:

- Volatility assumes linear relationship between yield and price change. However, the relationship is non-linear due to convexity adjustment. Hence, we can say that modified duration is only a proxy and not an accurate measure of change in price of bond due to change in interest rates

Reverse stock split:

- 'Reverse Stock Split' is a process whereby a company decreases the number of shares outstanding by combining current shares into fewer or lesser number of shares.
- **Reasons:** Avoiding delisting from stock exchanges, avoiding removal from constituents of index, to avoid the tag of Penny stock and to attract institutional investors and mutual funds

Zero Coupon Bond:

- ZCB do not pay interest during the life of the bonds. They are issued at discounted price and the amount will mature to face value by end of life

Arbitrage pricing theory:

- CAPM formula helps to calculate the market's expected return, APT uses the risky asset's expected return and the risk premium of a number of macroeconomic factors.
- Required return under APT = $R(f) + B_1(RP_1) + B_2(RP_2) + \dots B_j(RP_n)$

Money Market:

- Market for meeting short-term funding requirements of corporates and Banks
- **Features:** Short duration, Large volumes, De-regulated interest rates, highly liquid, safe investments

Different instruments:

- **Call/Notice Money:** Call money market is where scheduled commercial banks lend or borrow on call (overnight) or at short-notice. Under notice money market, funds are transacted for a period between two to 14 days
- **Treasury bills:** Short-term promissory notes issued by Government of India at a discount. These provide investor an opportunity to invest short-term surplus in instruments of varying maturities
- **Commercial bills:** A commercial bill is a bill of exchange containing a written order from the creditor to the debtor to pay a certain sum to a certain person after a specified period. The seller can get the bill discounted and use the same for meeting his working capital needs
- **Certificate of Deposit:** Term deposits accepted by commercial banks from bulk depositors. These are issued at discount and the face value is payable at maturity by the issuing bank
- **Commercial Paper:** Unsecured and negotiable promissory notes issued by high-rated corporate entities. These are issued directly to the market and used for funding working capital requirements. Generally, CP is issued at discount and yield is market determined
- **Repo and Reverse Repo:** Repo rate is the rate at which RBI lends to commercial banks and Reverse Repo rate is the rate at which Commercial banks lend to RBI. Repo and Reverse Repo refers to type of transaction in which money market participant raises funds by selling securities and simultaneously agreeing to repurchase the same along with interest in future

Valuers:

- **Purposes for which valuers are required:** Mergers/acquisitions/de-mergers/takeovers + Slump sale/Asset sale/IPR sale + Conversion of debt/security + Capital reduction + Strategic financial restructuring
- **Responsibilities:** Integrity and fairness + Professional competence and due care + Independence and disclosure of interest + Confidentiality + Information management + Not taking expensive gifts and hospitality + reasonable remuneration and cost reimbursement + Not accepting too many assignments which can impact execution
- **Precautions:** Spend adequate time in collecting data and understanding the firm + evaluate factors other than financial statements such as scalability, growth potential, cross-sell opportunities + Balance valuation based on numbers/story

Chapter 6 - Portfolio Management

Activities in Portfolio Management:

- Security selection – construction of feasible portfolios – Deciding the weights/proportion of securities to form optimal portfolio

Objectives of Portfolio Management:

- Security/safety of principal
- Stability of Income
- Capital Growth
- Marketability (ease with which a security can be bought or sold)
- Liquidity (nearness to money)
- Diversification
- Favourable tax status

Five Phases of Portfolio Management:

- Security Analysis – Examining the risk and return of individual characteristics and correlation among them
- Portfolio Analysis – Creation of large number of portfolios with the available securities
- Portfolio Selection – Identification of efficient portfolio among various set of feasible portfolios
- Portfolio Revision – Constantly monitor the selected portfolio to ensure it is optimal
- Portfolio Evaluation – Assessing the performance of the portfolio over selected period of time

Traditional Approach:

- Investor's study with an insight on age, health, need for income, attitude towards risk and taxation status
- Portfolio Objectives – Maximizing investor's wealth which is subject to risk
- Investment strategy – Balancing liquidity, return, dividends, capital gain etc
- Diversification
- Selection of individual investments – Intrinsic value analysis/expert advice/inside information/newspaper

Elements of risk:

- Total Risk = Systematic Risk + Unsystematic Risk
- Systematic risk comprises factors that are external to a company and affect a large number of securities. Systematic risk can be further subdivided into interest rate risk, purchasing power risk and market risk
- Unsystematic risk includes those factors which are internal to companies and affect only those particular company. Unsystematic risk can be further subdivided into business and financial risk

Assumptions of Markowitz Model:

- Return adequately summarizes the outcome – Investors visualize a probability distribution of rates of return – Return can be measured through measures such as NPV and Yield
- Risk estimates are proportional to the variance of return – Investors are risk-averse
- Investment decisions are based on expected return and variance
- Investors are assumed to be rational

Capital asset pricing model:

- Model explains the relationship between expected return, non-diversifiable risk and value of security
- Systematic risk cannot be diversified and will continue to be there in portfolio – Systematic risk is measured through beta and it does not remain same for all
- Expected return = $R_f + \text{Beta} \times (R_m - R_f)$

Assumptions:

- Efficient market
- Rational investment goals
- Risk aversion is adhered to but sometimes risk seeking behaviour is also adopted
- Assets are divisible and liquid
- Investor can borrow at risk-free rate of interest
- No transaction cost
- No risk of insolvency or bankruptcy

Advantages:

- Measurement of risk-adjusted return

- Computation of cost of equity for no dividend company

Limitations:

- Reliable beta may not be measured
- Ignoring unsystematic risk – however investor having undiversified portfolio carry this risk
- Information on risk-free rate of interest and expected return of market

Active Portfolio Strategy:

- An APS is followed by most investment professionals and aggressive investors who strive to **earn superior return after adjustment for risk**
- **APS involves a great deal of time on researching individual companies, gathering extensive data** about financial performance, business strategies and management characteristics

Principles:

- Market timing
- Sector rotation
- Security selection
- Use of specialized investment concept

Passive Portfolio strategy:

- Passive strategy rests on the tenet that the **capital market is fairly efficient** with respect to the available information. Example: Index Funds

Guidelines:

- Create a well-diversified portfolio for a level of risk
- Hold the portfolio relatively unchanged over time

Criteria for Bond selection:

- YTM
- Risk of default
- Tax Shield
- Liquidity

Approaches for selection of stock:

- Technical Analysis
- Fundamental Analysis
- Random selection analysis

Level of Efficiency/Approach	Technical Analysis	Fundamental Analysis	Random Selection
Inefficiency	Best	Poor	Poor
Weak form efficiency	Poor	Best	Poor
Semi-strong efficiency	Poor	Good	Fair
Strong form efficiency	Poor	Fair	Best

Portfolio revision and re-balancing strategies:

- **Buy and Hold Policy:** Also known as 'do nothing policy' as no balancing is required
- **Constant mix policy:** Do something policy that maintains stock exposure at a constant percentage of total portfolio
- **Constant Proportion Portfolio Insurance:** Sets a floor value for an asset's value and this is invested in safe assets and the balance is invested in equity shares

Asset Allocation Strategies:

- **Integrated asset allocation:** Allocation that best serves the investor's needs while incorporating the capital market forecast is determined
- **Strategic Asset Allocation:** Optimal portfolio mix based on risk, returns and co-variances are generated and adjusted periodically to restore target allocation
- **Tactical asset allocation:** Investor risk tolerance is assumed constant and allocation is changed based on capital market conditions
- **Insured asset allocation:** Risk exposure based on portfolio values is adjusted and more value means more ability to take risk

Fixed Income Portfolio:

- **Process:** Set objective + Draft guidelines for investment policies + Selection of portfolio strategy (active/passive) + Selection of securities + Evaluation of performance
- **Return computation:** Arithmetic rate of return/Time weighted rate of return/Rupee weighted rate of return/Annualized return

• Passive Strategies: Buy and Hold Strategy + Indexation strategy + Immunization + Matching cash flows • Active Strategies: Forecasting returns and Interest rates (Bullet Strategy + Barbell Strategy + Ladder Strategy) + Bond swaps (Pure Yield Pickup Swap + Substitution swap + International spread swap + Tax swap) + Interest rate swaps
Features of alternative investments: • High fees • Limited historical data • Illiquidity • Less transparency • Need for extensive research • Leveraged buying
Characteristics of real estate which makes valuation complex: • Inefficient market – Illiquidity – Comparison (difficult to find exact comparable property) – High transaction cost – No organized market
Approaches to value real estate: • Sales comparison approach – Value based on similar type of property • Income approach – Perpetual cash flow is discounted at market required rate of return • Cost approach – Value = Replacement cost of building + Estimated value of land • Discounted After tax cash flow approach – PV of expected inflows at required rate of return
Gold: • Popular mode of investment with Jewelry being the most common mode of purchase • Modes of investment: Gold Bars + SGB + Gold Exchange Traded Funds(ETFs) + E-Gold
Distressed Securities: • Purchasing the securities of companies that are in or near bankruptcy • Purpose is to buy securities at low price and revive a sick company to make huge profits • Arbitrage – Take a long position in debt and short position in equity • Risks – Liquidity risk, Event Risk, Market Risk and Human Risk
Strategy of portfolio rebalancing where portfolio does not fall below specified value: • Constant Proportion Portfolio Insurance (CPPI) policy can help in ensuring minimum portfolio value. We decide a floor value and the same is invested in safe assets such as treasury bill/bonds • Investment in shares = (Portfolio value – Floor value) x Multiplier

Chapter 7 - Securitization

Concept of Securitization:

- 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

Features of Securitization:

- Creation of financial instruments
- Bundling and unbundling
- Tool of risk management – Assets securitized on non-recourse basis then the risk of default is shifted
- Structured finance – Financial instruments are structured to meet the risk return trade off profile of investor
- Trenching – Each part (Trenche) carries a different level of risk and return
- Homogeneity – Even small investors can afford to invest in small amounts

Securitization in India:

- Citi Bank had pioneered the concept of securitization in India
- Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest (SARFAESI) Act 2002 was introduced to encourage securitization
- Initially it was started with auto loan receivables and gradually became a major source of funding for micro finance companies and NBFC

Benefits of Securitization:

From the angle of Originator:

- Off-balance sheet financing
- More specialization in main business
- Helps to improve financial ratios
- Reduced borrowing cost

From the angle of investor:

- Diversification of risk
- Regulatory requirement
- Protection against default

Participants in Securitization:

Primary Participants:

- **Originator:** It is the initiator of deal or can be termed as **securitizer**. It is an entity which sells the assets lying in its books and receives the funds generated through the sale of such assets
- **SPV:** SPV is created for the purpose of executing the deal. Since issuer/originator transfers all rights in assets to SPV, it holds the legal title of these assets. **SPV makes an upfront payment** to the originator, it holds the key position in the overall process of securitization
- **Investors:** Investors are the buyers of securitized papers

Secondary Participants:

- **Obligor:** They are the parties who owe money to the firm and are assets in the Balance Sheet of Originator. The amount due from the obligor is transferred to SPV
- **Rating agency:** The assets have to be assessed in terms of its credit quality and credit support available
- **Receiving and Paying Agent (RPA):** Also, called Servicer or Administrator, it collects the payment due from obligor(s) and passes it to SPV.
- **Agent or Trustee:** Trustees are appointed to oversee that all parties to the deal perform in the true spirit of terms of agreement
- **Credit Enhancer:** Since investors in securitized instruments are directly exposed to performance of the underlying and sometime may have limited or no recourse to the originator, **they seek additional comfort in the form of credit enhancement**
- **Structurer:** It brings together the **originator, investors, credit enhancers and other parties to the deal of securitization**. Normally, these are **investment bankers**

Mechanism or steps in Securitization:

- Creation of pool of assets
- Transfer to SPV
- Sale of Securitized Papers
- Administration of assets

- Recourse to originator
- Repayment of funds
- Credit rating of instruments

Problems in securitization or factors impact growth of securitization in India:

- **Stamp duty:** Stamp duty even goes upto 12% in some states of India. However, PTC are exempted from stamp duty. Also, some states have reduced the stamp duty on securitized instruments
- **Taxation:** No specific provision leading to difference in opinion on taxation
- **Accounting:** Although securitization is slated to an off-balance sheet instrument but in true sense receivables are removed from originator's balance sheet
- **Lack of standardization:** Every originator follows own format for documentation and administration leading to lack of standardization
- **Inadequate debt market**
- **Ineffective foreclosure laws:** Foreclosure laws are not supportive to lending institutions and this makes securitized instruments especially mortgaged backed securities less attractive as lenders face difficulty in transfer of property in event of default by the borrower

Securitization instruments:

- **Pass Through Certificates (PTCs):** Originator transfers the entire receipt of cash in **form of interest or principal repayment from the assets sold**. Thus, these securities **represent direct claim of the investors** on all the assets that has been securitized through SPV. Since all cash flows are transferred **the investors carry proportional beneficial interest** in the asset held in the trust by SPV. It should be noted that since it is a **direct route any prepayment of principal is also proportionately distributed among the securities holders**.
- **Pay Through Security (PTS):** In contrast to PTC in PTS, SPV debt securities backed by the assets and **hence it can restructure different tranches from varying maturities of receivables**. This structure **permits desynchronization of servicing of securities issued from cash flow generating from the asset**. Further, this structure also **permits the SPV to reinvest surplus funds for short term as per their requirement**
- **Stripped Securities:** Stripped Securities are created by dividing the cash flows associated with underlying securities into two or more new securities. Those two securities are as follows: (i) Interest Only (IO) Securities and (ii) Principle Only (PO) Securities. The holder of IO securities receives only interest while PO security holder receives only principal

Pricing of Securitized Instruments:

- **From originator's point of view:** 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 of time by investing the amount** raised through securitization
- **From Investor's point of view:** Security price **can be determined by discounting best estimate of expected future cash flows using rate of yield to maturity of a security** of comparable security with respect to credit quality and average life of the securities

Risks in Securitization:

- Credit risk or counterparty risk
- Legal risks
- Market risks (Macroeconomic risk + Prepayment risk + Interest rate risks)

Blockchain Technology:

- Decentralized open ledger with permanent entries and irreversible changes - A blockchain uses a chain of blocks representing digital information stored in a public database - A simple example of a blockchain technology is Google Documents
- **Working:** Transaction initiated + Transaction broadcasted + Validation of transaction by Network + Block is added to existing block chain + Transaction is complete
- **Application:** Financial services + Healthcare + Government + Travel industry + Economic forecasts
- **Risks:** No single party is in-charge and hence managing risks can be a challenge + Reliability will be lost if underlying technology is tampered with + risk of information overload

Tokenization:

- Process of conversion of tangible and intangible assets into blockchain tokens
- **Tokenization vs Securitization:** Liquidity + Diversification + Trading + New opportunities

Chapter 8 - Mutual Funds

Meaning of Mutual Fund:

- MF is a trust that pools together the resources of investors to make a foray into investment in capital market
- Managed by professional money manager

Classification:

Functional Classification:

- Open-ended: Investor can make entry and exit at any time
- Close-ended: Can buy during initial offer or from stock market post listing. It has limited life and then the scheme is liquidated
- Interval: Combination of open-ended and close-ended

Portfolio Classification:

- **Equity fund:** Invest in stocks. Following types are there:
 - Growth fund – Objective to provide long term capital appreciation
 - Aggressive funds – Super normal returns by investing in risky investments like start-ups, IPOs and speculative shares
 - Income funds – Invest in safe stocks having high cash dividends and in high yield money market instruments
- Debt funds: Invest in debt. Following types are there:
 - Bond funds – Invest in fixed income securities
 - Gilt funds – Invest mainly in Government securities
- **Special Funds:**
 - Index funds – Invest in stock index (NIFTY/SENSEX)
 - International funds – MF raise money in India and investing globally
 - Offshore funds – MF raising money globally and investing in India
 - Sector funds – Invest in particular industry
 - Money market funds – Invest in short-term debt-oriented schemes
 - Fund of funds – Invest in other mutual fund schemes
 - Capital protection-oriented fund -Objective is to protect the capital invested by investing in highly rated debt instruments
 - Gold funds – Invest in Gold or Gold related instrument
 - Quant funds – Works on a data-driven approach for stock selection and investment decisions + Eliminates the human biasness and subjectivity

Ownership Classification:

- Public sector Mutual Funds
- Private Sector Mutual Funds
- Foreign Mutual Funds

Direct Plan:

- **Mutual fund direct plans are those plan where Asset Management Companies or mutual fund Houses do not charge distributor expenses, trail fees and transaction charges.** NAV of the direct plan are generally higher in comparison to a regular plan.

Types of schemes:

- Balanced fund – Debt portfolio provides stability and equity provides growth. Consist of both debt and equity
- Equity diversified funds – High level of diversification and ensures risk reduction involved in the fund
- Equity tax linked savings scheme - To get tax benefit under Section 80C
- Sector funds – Focus on a particular industry
- Thematic funds – Broader outlook than sector funds
- Arbitrage funds – Focus is to earn better return than debt funds and lower volatility than equity funds
- Hedge funds – Aggressively managed portfolio of investment with a goal of generating high returns
- Cash fund – Liquid scheme which aims to provide returns with low risk and ensure better liquidity

• Exchange Traded Fund - Funds are listed on stock exchanges and their prices are linked to the underlying securities. Following are the types of ETF Products available in the market: (i) Index EFTs (ii) Commodity ETFs (iii) Bond ETFs (iv) Currency ETFs • Fixed maturity plans – Close-ended mutual funds + Invests in CDs, commercial papers, money market instruments and Non-convertible debentures + it carries credit risk
<u>Advantages of Mutual Funds:</u> • Professional Management + Diversification + Convenient administration + Higher returns + Low cost of management + Liquidity + Transparency + Other Benefits – Regular withdrawal and systematic investment plan + Highly regulated + Economies of scale + Flexibility + Convenience
<u>Drawbacks of Mutual Funds:</u> • No guarantee of Return + Diversification (Diversification minimizes risk but it does not ensure maximizing returns) + Selection of proper fund + Cost factor
<u>Trailing commission:</u> • Amount paid by MF investor to his advisor each year + It provides an incentive to the advisor to review their customer's holdings + It is calculated as a percentage of daily average AUM
<u>Expense Ratio:</u> • Percentage of assets spent on mutual fund operations + Needs to be monitored as high expense ratio can impact returns
<u>Side Pocketing:</u> • Separation of risky assets from other investments and cash holding. Money invested in MF linked to stressed assets gets locked, until the fund recovers the money from the company or could avoid distress selling of illiquid securities • Side Pocketing is beneficial for those investors who wish to hold on to the units of the main funds for long term. Therefore, the process of Side Pocketing ensures that liquidity is not the problem even in the circumstances of frequent allotments and redemptions.
<u>Tracking error:</u> • Divergence or deviation of fund's return from the benchmarks it is following – this is critical for passive mutual funds • Higher tracking error would indicate high risk profile • Tracking error can occur due to transaction cost, fees charged by AMCs, Fund expenses, Cash holdings and Sampling biasness
<u>Evaluation of MF performance:</u> • <u>Quantitative parameters:</u> Risk-adjusted returns + Benchmark returns + Comparison to peers + Comparison Returns of across different economic and market cycles + Financial measures (Expenses ratio + Sharpe Ratio + Treynor Ratio + Sortino Ratio) • <u>Qualitative parameters:</u> Quality of portfolio + Track record and competence of fund manager + Credibility of the fund house team
<u>Role of a fund manager:</u> • Good performance of the fund being managed • Role depends on whether it is <u>active fund or passive fund</u> + Active managed funds (Fund manager plays a crucial role and need to generates Alpha) + Passively Managed Funds (Minimum tracking error) • <u>Other key roles:</u> Compliances + Constant monitoring the performance of the fund + Creation of wealth and protection + Control over works outsourced to third parties
<u>Role of FII in Mutual Funds:</u> • FII are large foreign groups with substantial investible funds and are registered abroad • Strong research team and can buy domestic mutual funds directly from issuers or through registered stock brokers • FII enhances corporate governance, improve market competition and improve capital flow

Chapter 9 - Derivatives Analysis and Valuation

Meaning of Derivative Instrument:

- Derivative is a product **whose value is to be derived from the value of one or more basic variables called bases** (underlying assets, index or reference rate). The underlying assets can be **Equity, Forex, and Commodity**
- The value of derivative instrument changes with the change in value of underlying instrument

Users of derivatives:

- Corporation
- Individual investors
- Institutional investors
- Dealers

Cash market and derivatives market:

- Cash market – Tangible assets are traded; Derivatives market = Contract based on tangible or intangible assets like index
- We can purchase one share in cash market but there are minimum lots in derivative market
- Cash market is for consumption/investment whereas derivatives market is for hedging, arbitrage and speculation
- Buying securities in cash market involves putting up all money upfront whereas buying in futures market only involves margin money

Forward contract and Futures contract:

- Forward contracts are traded on personal basis whereas futures contracts are traded in a competitive arena
- Forward contracts have no standardized size whereas futures contracts are of standardized size
- Forward contracts are traded in over the counter market whereas futures are traded in stock exchanges
- Forward contracts are delivered whereas only net settlement happens in futures contract
- Cost of forward contract is based on bid-ask spread whereas futures contracts involve brokerages
- Forward contracts are not subject to mark to market and do not require margins. Futures contract are subject to mark to market and involves initial and maintenance margin
- Forward contract has credit risk whereas futures contracts do not have credit risk

Marking to Market:

- It implies the **process of recording the investments** in traded securities (shares, debt-instruments, etc.) at a **value, which reflects the market value of securities** on the reporting date. In the context of **derivatives trading**, the futures contracts are marked to market on **periodic (or daily) basis**

Advantages of stock index futures vs stock futures:

- Flexibility to investment portfolio
- Possibility of speculative gains using leverage
- Most cost-efficient hedging
- Stock index futures cannot be easily manipulated
- Less volatile
- Cash settlement
- Less regulatory complexity
- Hedging or insurance protection for a stock portfolio in falling market

Uses/Advantages of stock index futures:

- Changing weights or risk exposures of investment portfolio – Buying/selling index futures can increase/decrease risk
- Separation of market timing from market selection decisions
- Investors can make money through stock index futures through index arbitrage
- Hedging the value of portfolio
- Possibility of speculative gains through leverage
- Possibility of doing short-sell during falling markets
- Transfer risk quickly and efficiently

Options and Futures:

In options, the buyer of the options has the right but not the obligation to purchase or sell the stock. However, while going in for a long futures position, the investor is obligated to square off his position at or before the expiry date of the futures contract

Factors affecting value of an option:

- Price movement of the underlying instrument
- Time till expiry
- Volatility in stock prices
- Interest rates

Risks of financial products:

- **Market risk:** Risk due to adverse movement of stock market, interest rates and forex + can be hedged through normal derivatives
- **Credit risk:** Known as default risk + Can be hedged through credit derivatives

Working of Credit Default Swaps (CDS):

- Insurance against the risk of default + Credit protection buyer pays a regular premium to credit protection seller who in turn assumes credit risk

Features:

- Non-standardized contract between buyer and seller
- Normally not traded on any exchange
- International swap and Derivative Association (ISAD) publish the guidelines and rules for CDS contracts
- Cost of CDS (premium) has positive relationship with risk attached with loans
- Naked CDS – Buying a CDS without purchasing the underlying bonds

Applications:

- Hedging, Arbitrage and Speculation

Parties to CDS:

- Initial borrower + Protection buyer + Protection seller

Settlement in case of default:

- **Physical settlement:** Face value of bonds would be paid by protection seller and protection buyer will have to deliver bonds
- **Cash settlement:** Settlement amount to be paid by protection seller = Face value of bonds x (1 – Recovery rate)

Collateralized debt obligations (CDO):

- CDO pool together various debt instruments + Investors invest in CDO + CDO pays interest and principal to investors from the cash flows generated by the assets

Types:

- Cash flow CDO: Backed by cash market debt or securities having low risk
- Synthetic CDO: They do not hold actual debt instruments + However they take credit risk by taking exposure through CDS
 - **Unfunded:** Only consist of CDS
 - **Funded:** Consist of credit Linked Notes
 - **Partially Funded:** Partially through CLN and CDS
- **Arbitrage CDO:** Issuer captures spread between return realized collateral underlying the CDO and cost of borrowing to purchase the collaterals + Additionally fees is also collected for management of CDO

Risks in CDO:

- Default risk
- Interest rate risk
- Liquidity risk
- Prepayment risk
- Reinvestment risk
- Foreign exchange risk

Financial option and Real option:

- Financial options have underlying assets as financial securities (traded) whereas real options have underlying assets as projects that are not traded in market

- Pay-off structure of financial option is specified and fixed whereas pay-off structure of real option is varied
- Financial options are normally for a year whereas real options are for long period
- Financial options are traded and hence priced in market – Real options are not traded and hence needs to be valued

Key criteria for considering a commodity under commodity derivatives:

- Standardization + Deliverability + Liquidity + Price volatility + Market demand

Needs of users of commodity derivatives:

- Primary need (Hedger's need for price risk reduction) + Convenience needs (Flexibility in doing business + efficient clearing system)

Advantages of commodity market:

- Preference for derivatives as compared to tangible commodities + Less hassles + Indirect investment in real assets through derivatives

Advantages of commodity futures:

- Easy way to invest in commodities + Multiple categories (Agricultural products + Energy + metal)

Types of Commodity swaps:

- **Fixed-Floating Swaps:** They are just like the fixed-floating swaps in the interest rate swap market with the exception that both indices are commodity-based indices
- **Commodity-for-Interest Swaps:** They are similar to the equity swap in which a total return on the commodity in question is exchanged for some money market rate (plus or minus a spread)

Peculiar characteristics of commodity swaps having a bearing on valuation:

- Cost of hedging + Institutional structure of particular commodity + Liquidity of underlying commodity + Seasonality + Variability of bid/offer spread + Brokerage fees + Credit risk

Embedded Derivatives:

- An embedded derivative is a **derivative instrument that is embedded in another contract - the host contract**. The host contract might be a debt or equity instrument, a lease, an insurance contract or a sale or purchase contract.
- Derivatives require to be **marked-to-market through the income statement**, other than qualifying hedging instruments.
- **Example:** A coal purchase contract may **include a clause that links the price of the coal to a pricing formula** based on the prevailing electricity price or a related index at the date of delivery

Weather derivatives:

- Protection against loss arising due to unfavourable weather patterns – It primarily helps in managing volume risk, rather than price risk, due to changes in demand of goods due to weather-related changes
- **Underlying asset:** Weather which has several dimensions such as rainfall, temperature, humidity, wind speed
- **Weather derivatives vs insurance:** Insurance provides protection only against extreme low probability weather events such as earthquake, floods whereas weather derivatives protect from all types of risks
- Pricing of weather derivatives is challenging due to data reliability, forecasting difficulties and temperature modelling challenges.

Electricity derivatives:

- **Need:** Electricity prices are volatile and hence hedging instruments are needed for generators, buyers and load-serving entities to reduce price risk
- **Forms:** Forwards, Futures and Swaps
- **Electricity locational basis swap:** Holder of the swap agrees to pay or receive the difference between a specified futures contract price and another locational spot price. This is used to lock-in a fixed price at a geographic location.

Key lessons from derivatives 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

Chapter 10 – Foreign Exchange Exposure and Risk Management

Role of SWIFT in foreign exchange:

- SWIFT (Society for Worldwide Interbank Financial Communication) is a messaging system for business transactions
- SWIFT assigns 3 lettered codes to each country's currency + It is a standardized communication system for financial transactions
- **Importance of SWIFT:** Quick settlement + Reduces operational risk + Reduces costs + Operational efficiencies + Full backup and recovery system

Payment Gateway:

- Secure virtual mode for transferring cash, authenticating and routing payment details + It helps in collecting payments on e-commerce sites
- **Benefits:** Offers convenience, real-time card authorization, efficient transaction processing, multiple payment options, risk mitigation, real-time reports, customer refund facility and secure servers
- **Challenges:** Customer account not available with the bank supporting the payment gateway, limited bank networks, reliability and customer trust issues
- **International payment gateway:** Offers global/multi-currency payments and multiple-language payment interfaces

Nostro, Vostro and Loro Account:

- A bank's foreign currency account maintained by the bank in a foreign country and in the home currency of that country is known as **Nostro Account or "our account with you"**
- **Vostro account** is the local currency account maintained by a foreign bank/branch. It is also called **"your account with us"**.
- The **Loro account** is an account **wherein a bank remits funds in foreign currency to another bank for credit** to an account of a third bank.

Merchant rate and Interbank Rate:

- **Exchange rates applied to all types of customers** including that for converting inward remittance in USD to INR are called **merchant rates** as against the rates quoted to **each other by banks** in the interbank market, which are called **interbank rates**.
- Exchange margin will be added/subtracted to/from the interbank rate to arrive at the merchant rate for the customer

Techniques for exchange rate forecasting:

- Technical forecasting
- Fundamental forecasting
- Market-based forecasting – Using of market indicators to develop forecasts
- Mixed forecasting

Factors affecting exchange rates:

- Inflation rate
- Interest rate
- Deficit/surplus on capital/current account
- Trade barriers
- Intervention by Central Bank
- Government controls
- Expectations/speculations

Participants in Foreign Exchange Market:

- Non-bank entities – Individuals and corporates buying/selling foreign currency
- Bank
- Speculators – Commercial and investment banks, multinational companies and hedge funds
- Arbitrageurs
- Government

Types of exposure:

- Transaction exposure – Effect of exchange rate on outstanding obligations
- Translation exposure – Also called as Accounting exposure. Effect on owner's equity because of the need to translate foreign currency financial statements
- Economic Exposure – Extent to which the value of a company declines due to changes in exchange rate

<u>Foreign exchange risk management:</u> • <u>Meaning:</u> Protection against variation in exchange rates. • <u>Importance:</u> Helps in reducing costs + Gains competitive advantages + Improve cash flow + Ensure compliance with regulations
<u>Natural hedging strategy:</u> • Exporters can use natural hedging strategy for reducing forex risk by availing short-term foreign currency loans (PCFC/FCNR) • PCFC is available at a cheaper rate and will also help in using export receivables for PCFC loans outstanding
<u>Non-deliverable forward contract:</u> • A cash-settled, short-term forward contract on a <u>thinly traded or non-convertible foreign currency</u>, where the profit or loss at the time at the settlement date is calculated by taking the <u>difference between the agreed upon exchange rate and the spot rate at the time of settlement</u>, for an agreed upon notional amount of funds.
<u>Options vs Futures:</u> • Writer has obligation to perform in option whereas both parties have obligation in futures • Premium is to be paid in options. There is no premium in futures • Limited loss and unlimited gain for holder. Unlimited loss/gain for both parties • American option can be exercised on any date whereas futures have to be exercised only on maturity date
<u>Currency Swap:</u> • Currency swap involve an exchange of liabilities between currencies. It consists of spot exchange of principal, continuing exchange of interest payment during the term of the swap and re-exchange of principal on maturity • <u>Benefits:</u> Hedging, cost savings, permits funding in different currencies, diversification of borrowings
<u>Strategies for exposure management:</u> • Low risk: Low reward – All exposures hedged • Low risk: Reasonable reward – Selective hedging • High risk: Low Reward – All exposures unhedged • High risk: High reward – Active trading
<u>Netting:</u> • Netting helps in minimizing the total value of inter-company fund flows • <u>Advantages:</u> Reduces the number of cross-border transactions between subsidiaries + Reduces the need for foreign exchange and hence saved on transaction costs + Improves cash flow forecasting since cash transfers are made only at end of each period

Chapter 11 - International Financial Management

Complexities in multinational capital budgeting:

- Conversion of cash flows of foreign projects
- Parent cash flows are different from project cash flows
- Taxation in home country and host country
- Exposure to exchange rate risk
- Impact of inflation
- Repatriation restrictions
- Political risk
- Concession/benefits by host country

Problems faced in international capital budgeting:

- Multinational companies investing elsewhere are subjected to foreign exchange risk
- Due to restrictions imposed on transfer of profits, depreciation charges and technical differences exist between project cash flows and cash flows obtained by the parent organization
- Presence of two tax regimes makes computation of after tax cash flows difficult

Project cash flows vs Parent cash flows:

- **Project cash flows:** Evaluation of a project on the basis of own cash flows entails that the project should compete favourably with domestic firms and earn a return higher than the local competitors
- **Parent cash flows:** For evaluation of foreign project from the parent firm's angle, both operating and financial cash flows actually remitted to it form the yardstick for the firm's performance

Foreign currency convertible Bonds (FCCBs):

- A type of convertible bond issued in a currency different than the issuer's domestic currency.
- The investors receive the safety of guaranteed payments on the bond and are also able to take advantage of any large price appreciation in the company's stock
- **Advantages:** Flexibility to convert the bond into equity or redeem it, Delayed dilution of equity for company, easily marketable
- **Disadvantages:** Exposure to exchange risk, creation of more debt, low interest rate leading to low income for investor

American Depository Receipts:

- Depository receipts issued by a company in the United States of America (USA) is known as American Depository Receipts (ADRs)
- An ADR is generally created by the deposit of the securities of a non-United States company with a custodian bank in the country of incorporation of the issuing company.
- The ADR holder is entitled to the same rights and advantages as owners of the underlying securities in the home country

Global Depository Receipts:

- A depository receipt is basically a negotiable certificate, denominated in a currency not native to the issuer, that represents the company's publicly - traded local currency equity shares.
- Depository Receipts issued in the US are called American Depository Receipts (ADRs), which anyway are denominated in USD and outside of USA, these are called GDRs

Impact of GDR on Indian Capital Market:

- Shifting of Indian Stock market from Bombay to Luxembourg
- Arbitrage possibility in GDR issues
- Indian market is no longer independent from the rest of the world
- Retail investors are completely side-lined

Characteristics of GDR issues:

- Holder gets same benefit as ordinary shareholders without voting rights
- Listed in Luxembourg stock exchange
- Trading happens on over the counter basis
- Freely traded and marketed globally
- Investor earn fixed income by way of dividends
- Liquidation by cancellation of GDR after a cooling off period of 45 days

Euro Convertible Bonds:

- A convertible bond is a debt instrument which gives the holders of the bond an option to convert the bond into a predetermined number of equity shares of the company.

- The bonds carry fixed rate of interest and has an option of conversion into equity. The issuer can also add a call and put option

Other sources of international finance:

- Euro-convertible zero-coupon bond
- Euro-bonds with equity warrants – Carries a coupon rate + Warrants are detachable + Pure bonds are traded at a discount
- Syndicated bank loans – Large loans from banks + Longer maturity of 5 to 10 years + Interest rate is generally set with reference to an index
- Euro bonds – Debt instruments denominated in a currency issued outside country of that currency
Example: Yen bond floated in France + It can be in the form of traditional fixed rate bonds (or) Floating rate notes (or) Convertible bond
- Foreign bonds – Denominated in a currency which is foreign to the borrower
- Euro Commercial papers
- Credit instruments – Multiple types of credit instruments used in effecting foreign remittances

International Financial Centre:

- Hub that deals with flow of funds, financial products and financial services + caters to the needs of customers outside their own jurisdiction + Provides flexibility in currency trading, banking and other financial services

Benefits:

- Opportunity for qualified professional to work and pursue global opportunities without leaving their homeland
- Stops brain drain
- Trading of complicated financial derivatives can be started from India
- Bringing back those financial services transactions presently carried out abroad by overseas financial institutions/entities or branches or subsidiaries of Indian Financial Market

Constituents:

- Highly developed infrastructure
- Stable Political Environment
- Strategic location
- Quality life
- Rationale regulatory framework
- Sustainable economy

GIFT City:

- GOI operationalized International Financial Services Centre (IFSC) at GIFT Multi-services SEZ in April 2015
- Single window clearance + Competitive cost of operations with a very competitive tax regime + Relaxed company law provisions + FEMA rules do not apply in GIFT City
- More and more financial institutions are setting up business units in GIFT due to lower tax rates and the same can help in provision of foreign currency loans to Indian companies

Sovereign funds:

- State-owned investment fund + Generating money from surplus reserves + Benefits economy and citizens
- These are created for targeted purposes aiming at protecting revenues, stabilizing exports, diversifying and earning better returns, funding social and economic development projects
- **Classification:** Stabilization funds, savings or future generation funds, public benefit pension funds, reserve investment funds and strategic development SWFs
- **Investment vehicles:** Sovereign wealth funds (SWF), Public pension funds, State-owned enterprises and Sovereign wealth enterprises (SWE)

Complexities in International working capital management:

- Wider financing option
- Multiple interest and tax rates
- Forex risk
- Restrictions
- Multiple countries

- **Full capital convertibility:** India is currently not under full capital convertibility and restrictions are there on investments/repatriation

Objectives of international cash management:

- Minimize currency risk
- Minimize cash requirements
- Minimize transaction costs
- Minimize political risk
- Take advantage of economies of scale

Benefits of centralized cash management:

- Maintenance of optimum cash balance
- Managing liquidity requirements
- Optimal usage of hedging strategies
- Generating maximum returns
- Get benefit of multinational netting
- Maximum utilization of transfer pricing mechanism

Ways to optimize cash flow movements:

- Accelerating cash inflows
- Managing blocked funds
- Leading and lagging
- Minimizing tax through transfer pricing mechanism
- Netting
- Investing excess cash

Chapter 12 – Interest Rate Risk Management

Factors determining interest rates:

- Supply and demand of money
- Inflation
- Government

Benchmark rates:

- Benchmark rates forms the basis for determination of other interest rates + It is also known as reference rates
- Benchmark rates are crucial in derivative transactions, floating rate loans and are determined by an independent body
- **Popular benchmarks:** Secured Overnight Financing Rate (SOFR in USA), Sterling Overnight Index Average (SONIA in USA), Euro-Short-Term Rate (€STER in Europe), Tokyo Overnight Average Rate (TONAR in Japan) and Swiss Average Rate Overnight (SARON in Switzerland)
- **Indian Benchmark rates:** Repo rate + Prime Lending rate + MCLR + MIBOR (Mumbai Interbank Offered Rate) + MIBID (Mumbai Interbank Bid rate)

Interest rate risk:

- **Gap Exposure:** Gap or mismatch risk arises from holding assets and liabilities of different maturity dates or repricing dates, thereby creating exposure to unexpected changes in market interest rates
- **Basis Risk:** Interest rate of different assets, liabilities and off-balance sheet items may change in different magnitude. If variation in interest rates cause net interest income to expand, the banks have experienced favourable basis shifts and if it causes net interest income to contract, the basis has moved against the banks
- **Embedded option risk:** Significant change in interest rates may encourage prepayment of debt and exercise of call/put option on bonds/debentures and/or premature withdrawal of fixed deposits.
- **Yield curve risk:** In a floating rate scenario, banks may price their assets and liabilities based on different benchmarks. If there is non-parallel movement in these benchmarks then the same would impact NII
- **Price Risk:** This occurs when assets are sold before their stated maturities. This is particularly relevant for trading book, which is created for making profit out of short-term movement in interest rates
- **Reinvestment risk:** Uncertainty with regard to interest rate at which the future cash flows could be reinvested is called reinvestment risk
- **Net interest position risk:** Size of non-paying liabilities supports profitability of banks. Interest rate risk arises when market interest rates are adjusted downwards and bank has more earning assets then paying liabilities

Methods to hedge interest rate risk:

Traditional Methods:

- **Asset and Liability Management:** ALM is a **comprehensive and dynamic framework for measuring, monitoring and managing the market risk of a bank**. It is the management of structure of balance sheet (liabilities and assets) in such a way that the **net earnings from interest are maximized** within the overall risk preference (present and future) of the institutions.
- **Forward Rate Agreements (FRA):** Forward Rate Agreement (FRA) is an **agreement between two parties through which a borrower/ lender protects itself** from the unfavourable changes to the interest rate.

Modern Methods:

- **Interest Rate Futures (IRF):** An interest rate future is a contract between the buyer and seller **agreeing to the future delivery of any interest-bearing asset**. The interest rate future **allows the buyer and seller to lock** in the price of the interest-bearing asset for a future date
- **Interest Rate options:** Interest rate options (Interest Rate Guarantee (IRG)) is a right not an obligation and **acts as insurance by allowing businesses to protect themselves against adverse interest rate movements** while allowing them to benefit from favourable movements.
- **Interest Rate Swaps:** In an interest rate swap, the parties to the agreement, termed the swap counterparties, **agree to exchange payments indexed to two different interest rates**.

Types of Interest rate swaps:

- **Plain vanilla swap:** Also called as Generic swap and it involves exchange of a fixed rate loan to a floating rate loan

- **Basis Rate Swap:** Also called as non-generic swap and it involves exchange between two different variable rates
- **Asset Swap:** It is the exchange of fixed rate investments with a floating rate investment
- **Amortising Swap:** An interest rate swap in which the notional principal for the interest payment declines during the life of the swap

Swaptions:**Meaning:**

- An interest rate swaption is **simply an option on an interest rate swap.**

Types:

- A **fixed rate payer swaption** gives the owner of the swaption the right but not the obligation to enter into a swap where they pay the fixed leg and receive the floating leg
- A **fixed rate receiver swaption** gives the owner of the swaption the right but not the obligation to enter into a swap in which they will receive the fixed leg, and pay the floating leg

Uses:

- Useful for active traders as well as for corporate treasurers
- Swap traders can use them for speculation purposes
- Useful for hedging
- Useful for borrowers targeting an acceptable borrowing rate
- Protection against callable/puttable bond issues

Cheapest to Deliver in Interest rate futures:

- The CTD is the bond **that minimizes difference between the quoted Spot Price of bond and the Futures Settlement Price (adjusted by the conversion factor)**. It is called CTD bond because it is the least expensive bond in the basket of deliverable bonds.
- Profit of seller of futures = (Futures Settlement Price x Conversion factor) - Quoted Spot Price of Deliverable Bond
- Loss of Seller of futures = Quoted Spot Price of deliverable bond - (Futures Settlement Price x Conversion factor)

Chapter 13 - Business Valuation

Approaches of valuation:

- **Asset base valuation models:** Valuation based on net assets. Variants of asset-based valuation models are Net asset value/Net realizable value/replaceable value
- **Earning based models:** Useful when acquiring company intends to continue business of target company. Valuation is based on income generated and variants of this model are PE ratio/Earning Yield multiplier/Capitalization of earning
- **Cash-flow based approach:** Under cash flow-based approach we determine the amount of free cash flows and discount them at required return to value the company

Steps for valuation of unlisted companies:

- Take the industry Beta and convert the levered beta into unlevered beta
- Adjustment for gaps in accounting policies and accounting adjustments
- Find cost of equity using CAPM
- Find WACC using target debt-equity mix
- Add Goodwill/sweeteners as additional return
- Discount the cash flows at cost of capital
- Sum of PV of cash flows will be the value of firm

Relative Valuation Method:

- Relative Valuation is the method to arrive at a '**relative**' value using a '**comparative**' analysis to **its peers or similar enterprises**. However, increasingly the contemporary financial analysts are using relative valuation in conjunction to the afore-stated approaches to validate the intrinsic value arrived earlier
- **Steps:** Find out the drivers that will be best representative and arrive at multiple, compute the same through financial ratios, find the ratio for comparable firms and then use the same to value the company

Chop-shop method of valuation:

- Useful for valuation of companies having multiple segments in different industries
- Compute the value of each segment using average capitalization ratios and sum of the values of all segments will be the value of the firm

EVA versus MVA:

- MVA is the true value added that is perceived by the market whereas EVA is a derived value added

Valuation of a company which is not a going concern:

- Valuation based on liquidation value
- Going concern value will generally be greater than its liquidation value + Going concern company will have terminal value as the company would continue to earn profits + non-going concern company implies high risk and creates bad reputation for the company

Why cash flow method cannot be used for valuation of distressed companies?

- Discounted cash flow method assumes terminal value based on perpetual cash flows. However, this will not be relevant for a distressed firm
- Discount rates used in valuation reflect companies which are operationally and financially sound. However, this cannot be work in distressed company

Why traditional method cannot be used for valuation of start-ups:

- **Income approach:** This approach will not work as majority of start-ups are reporting losses
- **Asset approach:** Startups have negligible assets because a large chunk of their assets are in the form of intellectual property and other intangible assets
- **Market approach:** Start-ups are normally disruptors and hence does not have an established competitor for doing valuation under this method.

Value drivers for start-ups:

- Product
- Management
- Traction (demand for product)
- Revenue
- Industry attractiveness
- Demand-supply
- Competitiveness

Valuation of digital platforms: • Income approach – based on cash flows • Market approach – based on comparable multiples • Cost approach – based on cost incurred
Valuation of professional/consultancy firms: • Compute value based on normalized cash flows (adjust for non-recurring items) – Computed value can be adjusted based on the performance of the firm for various key performance indicators
Impact of ESG: • Environmental, Social and Governance (ESG) aspects helps in creating sustainable value + Increasing focus of companies and now this has become must-to-have • ESG can impact cash flows (Extra spending/saving to comply with ESG aspects) and can also impact discount rate (Lower discount rate for ESG compliant companies and vice versa)

Chapter 14 – Mergers, Acquisitions and Corporate Restructuring

Rationale for M&A:

- Synergistic operating economics + Diversification + Taxation + Growth + Consolidation of production capacities and increasing market power

Types of mergers:

- Horizontal Merger = Merger of two companies in the same industry
- Vertical merger = Two companies having buyer-seller relationship come together
- Conglomerate merger = Merger of firms engaged in unrelated type of business operations. However, there can still be some common factors such as unification of different kinds of businesses under one flagship company
- Congeneric merger = Acquirer and target companies are related through basic technologies, production processes or markets
- Reverse merger = Acquisition of a listed firm by a private company so that private company can go public
- Acquisition = Purchase of controlling interest by one company in the share capital of an existing company

Take-over strategies:

When the process of acquisition is unfriendly it is called as takeover. Following are takeover strategies:

- Street Sweep = Acquiring company accumulates larger number of shares before making an open offer
- Bear Hug = When the acquirer threatens the target company to make an offer, the board of target company agrees to a settlement
- Strategic Alliance = Offering a partnership rather than a buyout
- Brand Power = Alliance with powerful brands to make the target company brand weak and buyout the weakened company

Techniques to protect from hostile takeover:

- **Divestiture:** Target company divests or spins off some of its business. This will make the company less attractive for acquisition
- **Crown Jewels:** When a target company uses the tactic of divestiture **it is said to sell the crown jewels**
- **Poison pill:** Tactics used by the acquiring company to make itself unattractive to a potential bidder is called as Poison Pills
- **Poison Put:** Target company issue bonds that encourage holder to cash in at higher prices. Cash drainage will make the target company unattractive
- **Greenmail:** Incentive offered by the management of the target company to the potential bidder for not pursuing the takeover
- **White Knight:** Target company offers to be acquired by a friendly company to escape from a hostile takeover
- **White squire:** Selling out of shares to a company that is not interested in a takeover and hence management of target company will retain the control
- **Golden Parachutes:** When a company offers **hefty compensations to its managers** if they get ousted due to takeover, the company is said to offer golden parachutes
- **Pac-man defence:** This strategy aims at the target company **making a counter bid for the acquirer company.**

Reverse Merger:

- In a 'reverse takeover', a **smaller company gains control of a larger one.** This type of merger is also known as '**back door listing.**
- Three tests of reverse merger – Assets of transferor company are greater than the transferee company, equity capital to be issued by the transferee company pursuant to the acquisition exceeds its original issues capital and change in control

Divestiture:

- It means a **company selling one of the portions of its divisions or undertakings** to another company or creating an altogether separate company
- **Reasons:** Pay attention on core areas, division is not sufficiently contributing, size is too big to handle and urgent need of cash

Forms of divestiture/demerger:

- **Sell off/Partial Sell off:** Sale of an asset, factory, division, product line or subsidiary by one entity to another
- **Spin-off:** Part of the business is separated and created as a separate firm
- **Split-up:** This involves **breaking up of the entire firm into a series of spin off** (by creating separate legal entities).
- **Equity Carve Outs:** This is like spin off but some shares of the new company are sold in the market by making a public offer
- **Sale of a division:** Seller company is demerging its business whereas the buyer company is acquiring a business
- **Demerger or division of family-managed business:** Hiving off of unprofitable businesses or divisions with a view to meeting a variety of succession problems

Ways of doing Ownership Restructuring:

- **Going Private:** This refers to the situation wherein a **listed company is converted into a private company** by buying back all the outstanding shares from the markets.
- **Management Buyout:** Buyouts initiated by the management team of a company are known as management buyout. This is useful strategy for exiting those divisions that does not form part of core business
- **Leveraged buyout:** Acquisition which is entirely or partially (50% or more) using borrowed funds
- **Equity Buyback:** Situation wherein a company buys back its own shares from the market. This increases promoter's stake due to reduction in capital

Management Buyout Vs Leveraged Buyout:

- MBO – Buyouts initiated by the management team
- LBO – Buyouts primarily funded with debt
- **Purpose of LBO:** Intention of LBO is to improve the operational efficiency of a firm and increase the cash flow. Extra cash flow will be used to pay back the debt. Example of LBO: Buyout of Corus by Tata Steel

How M&A and business restructuring helps in unlocking value:

- Horizontal growth to achieve optimum size, enlarge market share
- Vertical combination to economise costs and eliminate avoidable taxes/duties
- Diversification
- Mobilizing financial resources – Use of idle funds of one company to expand other company business
- Merging subsidiary with parent company to improve cash flow
- Taking over shell company which has some industrial license
- Restructuring to enhance competitiveness, survival and provide new direction

Steps in successful M&A Programme:

- Manage the pre-acquisition phase + Screen candidates + Eliminate those do not meet the criteria and value the rest + Negotiate + Post-merger integration

Reasons for failure of M&A:

- Overpayment by acquirers + Over-estimation of value of synergy + Poor post-merger integration + Psychological barriers

Cross border M&A:

- Cross-border M&A is one where target and acquiring company are based out of different countries
- **Factors contributing to cross border M&A:** Globalization of production, Integration of global economy, Expansion of trade, privatisation of state-owned enterprises and consolidation of banking industry

IPO without commercial operations:

- **Special Purpose Acquisition Companies (SPACs)** has come into existence wherein an entity is set up with the objective to raise funds through an IPO to finance a merger or acquisition of an unidentified target within a specific time period. **It is commonly known as a blank cheque company**
- The main objective of SPAC is to raise money, despite not having any operations or revenues. **The money raised from the public is kept in an escrow account, which can be accessed while making the acquisition. However, in case the acquisition is not made within stipulated period of time of the IPO, the SPAC is delisted and the money is returned to the investors**

Chapter 15 – Startup Finance

Definition of Start-up:

- Incorporated as either private limited company or registered partnership or LLP in India **not prior to 5 years**
- **Turnover** in any fiscal year not to exceed **Rs.25 Crores**
- Should not have been formed by splitting up or reconstruction of business
- Working towards innovation, development, deployment or commercialization of new product, processes or services driven by technology or intellectual property

Additional Conditions:

- Cease to be a start-up on completion of 5 years or exceeding turnover of Rs.25 Crores
- Shall be eligible for tax benefits only after obtaining certification from the Inter-ministerial Board

Major reasons for sustainable development of start-ups in India:

- Government support
- Pool of talent
- Cost-effective workforce
- Increasing use of internet
- Technology
- Variety of funding options

Innovative ways of financing a start-up:

- **Personal Financing:** Investors will put money in a deal only if the entrepreneurs are contributing from their personal source
- **Personal credit lines:** Based on one's personal credit efforts. Example: Credit cards
- **Family and Friends:** These people will generally fund, without even thinking whether the idea works or not
- **Peer-to-peer lending:** In this group of people come together and lend money to each other
- **Crowd Funding:** Small amounts of capital from a large number of individuals
- **Micro Loans:** Small loan given by single individual or aggregated at a lower interest
- **Vendor financing:** Company lends money to its customers so that they can buy products from the manufacturers
- **Purchase order financing:** Purchase order financing companies often advance the required funds directly to the supplier.
- **Factoring account receivables:** Facility given to the seller who has sold the good on credit to fund his receivables

Pitch Presentation:

- Pitch deck presentation is a **short and brief presentation** (<20Min) to investors explaining about the **prospects of the company** and why they should invest into the startup business.

Steps:

- Introduction – Short introduction to attract the attention of investors
- Team – Introducing the team members
- Problem – Explain the problem that the start-up is going to solve
- Solution – Describing how the company will solve the problems
- Marketing – Explaining the market size of the product and target customers
- Projections – Projected financial statements
- Competition – Highlight the competition and how product/service is different from competitors
- Business model – Explaining the core aspects of the business
- Financing – Utilization of past money raised and an explanation on how much work has been done

Document that are required to make pitch presentations:

- Income statement
- Cash flow statement
- Balance sheet

Modes of financing startup:

- **Bootstrapping:** An individual is said to be boot strapping **when he or she attempts to found and build a company from personal finances** or from the operating revenues of the new company

- **Angel Investor:** Angel investors invest in small startups or entrepreneurs. They are among entrepreneur's family and friends. This can either be an one-time investment which can help the business propel or regular injection of money to support and carry the company through difficult early stages. Some investments can also be made through crowdfunding platforms or angel investor networks. **Angel investors normally represent individuals, but the entity that provides funds may be a limited liability company, a business, a trust or an investment fund**
- **Venture capital funds:** Money provided by **professionals who alongside management invest in young**, rapidly growing companies that have the potential to develop into significant economic contributors

Characteristics of venture capital financing:

- Long term horizon – Minimum of 3 years and maximum of 10 years
- Lack of liquidity – Less liquidity on the equity it gets and accordingly would be investing in that format
- High Risk – Works on principle of high risk and high return
- Equity participation – Investing in the form of equity so it helps to participate in the management and help the company grow

Advantages of bringing venture capital in the company:

- Injects long-term equity finance
- Shares both risks and rewards
- Practical advice and assistance to the company
- Network of contacts that can add value to the company
- Providing additional rounds of funding to finance growth
- Experiences in preparing a company for IPO
- Facilitate a trade sale

Stages of funding VC:

- Seed money - Start up - First stage - Second stage - Third stage - Fourth stage

Venture capital investment process:

- Deal organization
- Screening
- Due diligence
- Deal structuring
- Post investment activity
- Exit Plan

Structure of venture capital fund in India:

- **Domestic funds:** Structured as a domestic vehicle for pooling of funds from the investor and an investment advisor to carry the duties of asset manager
- **Offshore funds:**
 - **Offshore structure:** Investment vehicle directly makes investments in Indian Portfolio Companies. Assets are managed by an offshore manager and the investment advisor carries out due diligence and identifies deals
 - **Unified structure:** **Overseas investors pool their assets in an offshore vehicle that invests in a locally managed trust**, whereas domestic investors directly contribute to the trust.

Methods of Bootstrapping:

- **Trade Credit:** Credit received from suppliers will help in financing the startup. However, when a new business is started, suppliers are reluctant to give trade credit
- **Factoring:** This is a financing method where accounts receivables is sold to a commercial finance company to raise capital. It is a useful tool for raising money and keeping cash flowing
- **Leasing:** It will reduce the capital cost and also help lessee to claim tax exemption. It can be easy to take an asset on lease to avoid paying out lump sum money

Difference between startup and entrepreneurship:

- **Start up is a part of entrepreneurship.** Entrepreneurship is a broader concept and it includes a startup firm.
- Aim of startup is to **build a concern, conceptualize the idea which it has developed into a reality and build a product or service**. On the other hand, the major objective of an already established entrepreneurship concern is to attain opportunities with regard to the resources they currently control.

• <u>A startup generally does not have a major financial motive</u> whereas an established entrepreneurship concern mainly operates on financial motive
<u>Priorities and challenges which start-ups in India are facing:</u> • The priority is on bringing more and more smaller firms into existence • The main challenge with the startup firms is getting the right talent. Further startups <u>had to comply with numerous regulations which escalate its cost</u>
<u>Business Model:</u> • Denotes core aspects of business. It basically explains the way in which a company generates revenue and makes profit from company operations • It includes purpose, business process, target customers, offerings, strategies, infrastructure, organizational structures, sourcing, trading practices, and operational processes and policies including culture
<u>Peer-to-peer Lending vs Crowd Funding:</u> • Peer-to-peer lending is in existence for long period of time and crowd funding is a contemporary source of finance • In peer-to-peer lending group of people come together and lend money to each other • Crowdfunding is raising of small amounts of capital from a large number of individuals to finance a new business initiative.
<u>Unicorn:</u> • Privately held start-up company which has achieved valuation of USD 1 billion + It needs to have new ideas + Disruptive innovation + Consumer focus + technology focus • Next milestone is to become a decacorn which has valuation of USD 10 billion
<u>Succession planning:</u> • Identifying critical positions and having right individuals for those positions + This will ensure right people are available for jobs and provides a liquidity event for ownership transfer to rising employees • Helps companies promote and advance all employees
<u>Why should an organization go for succession planning?</u> • Risk Mitigation • Cause removal – If there are issues with existing leader then he may be barred by court/regulatory authorities and it would be easy to continue operations with succession planning • Talent Pipeline • Conflict resolution mechanism – Helps in promoting open and transparent communication • Aligning – Helps company to align with culture, vision, direction and values of the business
<u>Steps in business succession strategy:</u> • Evaluate key leadership positions • Map competencies required for above positions • Identify competencies of current workforce • Bridge leader – Appointment of outsider as a bridge leader in family-owned enterprises to develop business and prepare young family members into leadership role
<u>Challenges in implementing succession planning:</u> • Founder mindset might be different than the corporate mindset • Premature for startups to implement business succession – Startups at early growth stage should not implement succession planning as the same can slowdown growth • Founders are the face of startups