BASICS

Income Statement

Sales	₹ 1000
Less: Variable cost	400
Contribution	600
Less: Fixed Cost	150
EBIT or Operating income	450
Less: Interest on Debt	75
EBT	375
Less: Taxes @ 40 %	150
EAT	225
Less: Preference dividend	25
EAES	200
÷ No. of Eq Shares	40
EPS	5
Less: DPS	2
Retained earnings per share	3

👉 Reverse calculation

EAT   1000
Tax Rate   30%
EBT   ?

Ans:

Dividend %   Vs.   Dividend Payout ratio   Vs.   Dividend yield %

$$= \frac{DPS}{Face\ value}$$

$$= \frac{₹\ 2}{₹\ 100}$$

$$= 2\%$$

$$= \frac{DPS}{EPS}$$

$$= \frac{₹\ 2}{₹\ 5}$$

$$= 40\%$$

$$= \frac{DPS}{MP}$$

$$= \frac{₹\ 2}{₹\ 500\ (say)}$$

$$= 0.40\%$$

PV Ratio [Profit Volume Ratio] aka Contribution Ratio

$$PV\ Ratio = \frac{Contribution}{Sales} \times 100$$

Breakeven Point [BEP] is a level of sales at which there is no profit no loss. In other words, Contribution is just sufficient to meet Fixed cost

$$\text{BEP (in units)} = \frac{\text{Fixed Cost}}{\text{Contribution pu}}$$

$$= \frac{₹\,35000}{₹\,700}$$

$$= 50 \text{ units}$$

Practice Q	
SP	1000
VC	300
Cpu	700
FC	35000

$$\text{BEP (in Value)} = \text{BEP units} \times \text{SP pu}$$
$$= 50 \text{ units} \times ₹\,1000$$
$$= ₹\,50000$$

or

$$= \frac{\text{Fixed Cost}}{\text{PV Ratio}} = \frac{₹\,35000}{70\,\%} = ₹\,50000$$

Margin Of Safety [MOS] is a level of sales over & above BE sales.

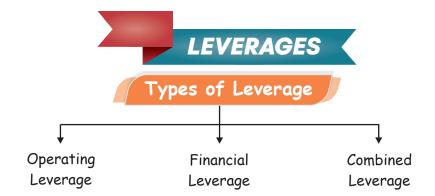Suppose actual sales qty = 80 units

MOS (in units)	=	Actual Sales Quantity - Breakeven sales Qty
	=	80 - 50
	=	30 units

MOS (in Value)	=	Actual Sales - Breakeven sales
	=	₹ 80000 - ₹ 50000
	=	₹ 30000

$$\text{MOS (in \%)} = \frac{\text{ASQ - BEQ}}{\text{ASQ}} = \frac{80 - 50}{80} = 37.5\%$$

or

$$= \frac{\text{Actual Sales - Breakeven sales}}{\text{Actual Sales}} = \frac{₹\,80000 - ₹\,50000}{₹\,80000} = 37.5\%$$

ASQ = 80

30

BEP = 50

Profit

Loss

LEVERAGES

Types of Leverage

- Operating Leverage
- Financial Leverage
- Combined Leverage

Operating Leverage

माँ के लिए साड़ी खरीदना है, बहन की शादी करनी है, मैं Fixed Cost का बोझ नहीं उठा सकता

ज्यादा Fixed Cost के लिए अब्बू नहीं मानेंगे

Aal Izz Well

	Situation 1: FC=₹0, VC= ₹25pu Proposal with No FC		Situation 2: FC=₹10000, VC=₹15pu Proposal with Lower FC but Higher VC		Situation 3: FC= ₹20000, VC= ₹5pu Proposal with Higher FC but Lower VC		
	1000 20%→ **1200**		**1000** ←20% 16.67% **1200**		BEP=800 ←25% **1000**	←20% 16.67% **1200**	
Sales @ ₹ 30	30000	36000	30000	36000	24000	30000	36000
Less :VC @ ₹25 or 15 or 5pu	25000	30000	15000	18000	4000	5000	6000
Contribution @ ₹ 5 or 15 or 25pu	5000 20%→	6000	15000 ←20% 16.67%	18000	20000 25%→	25000 ←20% 16.67%	30000
Less: Fixed cost	0	0	10000	10000	20000	20000	20000
EBIT or Operating income	5000 20%→	6000	5000 ←60% 37.5%	8000	0 ∞%→	5000 ←100% 50%	10000
DOL	1 times	1 times	3 times	2.25 times	∞ times	5 times	3 times

Degree of Operating Leverage

$$DOL = \frac{\% \Delta \text{ in EBIT}}{\% \Delta \text{ in Sales}} = \frac{60\%}{20\%} = 3 \text{ times}$$

$$DOL = \frac{\text{Contribution}}{\text{EBIT}} = \frac{15000}{5000} = 3 \text{ times} \quad \text{(Preferred formula)}$$

$$DOL = \frac{1}{\text{MOS \%}} = \frac{1}{33.33 \%} = 3 \text{ times}$$

MOS% calculation explained

$$\text{BEP in situation 1} = \frac{FC}{Cpu}$$

$$= 10000/15$$

$$= 666.67 \text{ units}$$

$\therefore$MOS = 1000 - 666.67
= 333.33

$\therefore$MOS = $\frac{333.33}{1000}$

= 33.33%
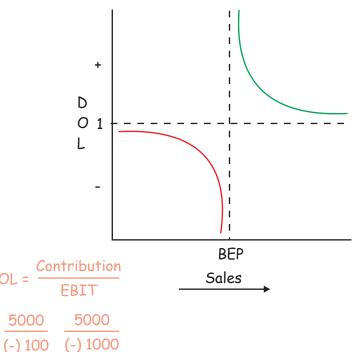
Definition:
Operating Leverage is magnification of EBIT or Operating Income that results from having fixed cost in the. Company's Cost Structure.
Operating Leverage is a measure of Business risk.

Observations :

1. If there is No Fixed cost then there is No Operating Leverage [DOL = 1]. It means there will be no magnification of Operating Income.

2. Higher the Proportion of Fixed cost in the cost Structure , higher will be DOL & vice-versa.

3. At BEP, DOL = ∞

4. As we move beyond BEP i.e as our sales starts rising above BEP, then DOL starts falling.

   This is so because DOL is a measure of Business risk. At BEP, Business risk is highest (because any fall in sales will lead to Losses). However as we move above BEP , our MOS ↑, Business Risk ↓ and hence, DOL being a measure of Business Risk also ↓

5. If sales are expected to increase then higher DOL is preferred so that Operating Income rises by a higher %.

6. If we expect decrease in sales eg in times of Recession then lower DOL is preferred

7. A positive DOL means the firm is operating above BEP. A Negative DOL means the firm is o p e r a t i n g below BEP.

$$DOL = \frac{Contribution}{EBIT}$$

$$\frac{5000}{(-)\ 100} \qquad \frac{5000}{(-)\ 1000}$$

$$= -50 \qquad\quad = -5$$

Derivation of DOL $= \dfrac{Contribution}{EBIT}$

$$DOL = \frac{\%\ \Delta\ in\ EBIT}{\%\ \Delta\ in\ Sales}$$

we know that % Δ in Sales = % Δ in Contribution (it's a fact)

$$= \frac{\%\ \Delta\ in\ EBIT}{\%\ \Delta\ in\ Contribution}$$

$$= \frac{\dfrac{New\ \cancel{EBIT} - EBIT}{EBIT}}{\dfrac{New\ \cancel{Contr} - Contr}{Contr}}$$

← Here EBIT & Contribution means Existing EBIT & Contribution

Since Increase / Decrease in EBIT ₹ = Inc/Dec in Contribution ₹, ∴ they will cancel each other in the formula.

$$\therefore DOL = \frac{Contribution}{EBIT}$$

Derivation of DOL = 1/ MOS %

$$\text{MOS \%} = \frac{\text{Actual Sales - Break even Sales}}{\text{Actual Sales}}$$

Multiply & Divide RHS by PV Ratio

$$\text{MOS \%} = \frac{\text{Actual Sales - Break even Sales}}{\text{Actual Sales}} \times \frac{\text{PV Ratio}}{\text{PV Ratio}}$$

$$= \frac{\text{Actual Sales} \times \text{PV Ratio} - \boxed{\text{BES} \times \text{PV Ratio}}}{\text{Actual Sales} \times \text{PV Ratio}} \qquad \text{BES} = \frac{FC}{PVR}$$

$$= \frac{\text{Contribution} - \boxed{\text{Fixed Cost}}}{\text{Contribution}}$$

$$\text{MOS \%} = \frac{\text{EBIT}}{\text{Contribution}}$$

∵ MOS % is inverse of DOL   ∴ DOL = 1/MOS %

Financial Leverage

Eg.   Let's say, Total capital Requirement = ₹ 10,00,000

there are three ways to finance the same

Situation 1 :	Situation 2 :	Situation 3 :
Equity : ₹ 10 lakhs	Equity : ₹ 5 lakhs	Equity : ₹ 4 lakhs
	Debt : ₹ 5 lakhs	Preference : ₹ 4 lakhs
		Debt : ₹ 2 lakhs

Let's say , EBIT is ₹ 1,00,000 under all three Situation

Intt on Debt is 10 %

Preference Dividend is 12 %

Face Value of Eq Sh is ₹ 100

Tax Rate = 30 %

Income Statement

Particulars	Situation 1:		Situation 2:		Situation 3	
	Base Case (i)	Case (ii)	Base Case (i)	Case (ii)	Base Case (i)	Case (ii)
EBIT / Op Inc	100000 →20%→ 120000 16.67%		100000 →20%→ 120000 16.67%		100000 →20%→ 120000 16.67%	
Less: Intt on Debt	-	-	50000	50000	20000	20000
EBT	1,00,000	120000	50000	70000	80000	100000
Less: Taxes @30%	30000	36000	15000	21000	24000	30000
EAT	70000	84000	35000	49000	56000	70000
Less: Pref. Div	-	-	-	-	48000	48000
EAES	70000 →20%→ 84000 16.67%		35000 →40%→ 49000 28.57%		8000 →175%→ 22000 63.64%	
÷ No. of Sh.	10000	10000	5000	5000	4000	4000
EPS	7 →20%→ 8.4 16.67%		7 →40%→ 9.8 28.57%		2 →175%→ 5.5 63.64%	
DFL	1 times	1 times	2 times	1.71 times	8.75 times	3.82 times

Degree of Financial Leverage

$$DFL = \frac{\% \Delta \text{ in EAES or } \% \Delta \text{ in EPS}}{\% \Delta \text{ in EBIT}}$$

$$= \frac{40\%}{20\%}$$

$$= 2 \text{ times}$$

$$= \frac{175\%}{20\%}$$

$$= 8.75 \text{ times}$$

If only Debt exists & there is No preference share capital

$$DFL = \frac{EBIT}{EBT}$$

$$= \frac{100000}{50000}$$

$$= 2 \text{ times}$$

If both Debt & Preference exists

$$DFL = \frac{EBIT}{EBIT - I - \dfrac{Dp}{1-t}} \quad \text{(Preferred Formula)}$$

$$= \frac{100000}{100000 - 20000 - \dfrac{48000}{1-0.3}}$$

$$= 8.75 \text{ times}$$

Alternatively,

$$= \frac{EBIT(1-t)}{(EBIT - I)(1-t) - Dp}$$

$$= \frac{100000(1-0.3)}{(100000 - 20000)(1-0.3) - 48000}$$

$$= 8.75 \text{ times}$$

Definition of Financial leverage :
Financial leverage is magnification of EAES (or EPS) due to the presence of fixed intt & dividend bearing liabilities in the Capital structure

Observations :
1. If there is no Debt & No Preference Capital then there is No financial leverage. DFL= 1 times [refer Situation 1 in our example]
2. Higher the Debt & Preference higher would be the financial leverage & vice - versa
3. If Company expects Operating Income will increase in the future then higher DFL is preferred.
4. If Co. expects bad times ahead eg. Recession or downward business cycle etc then Lower DFL is preferred.
5. At Financial BEP , DFL = ∞
    Above financial BEP, as firms EBIT increases, DFL starts falling

Operating BEP   **Vs.**   ## Financial BEP

Operating BEP is a level of sales at which EBIT = 0

$$\text{Operating BEP} = \frac{FC}{Cpu} \quad \text{or} \quad \frac{FC}{PV \text{ Ratio}}$$

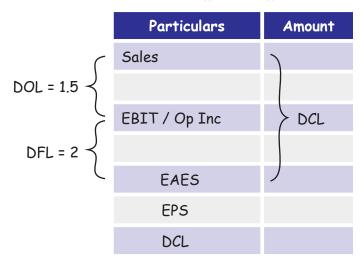Financial BEP is a level of EBIT at which EAES (or EPS) = 0

$$\text{Financial BEP} = \text{Interest on debt} + \frac{\text{Pref. Div}}{1-t}$$

Financial BEP for Situation 3
$$= 20000 + \frac{48000}{1- 0.30}$$
$$= ₹ 88571$$

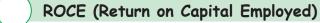## Combined Leverage

Income Statement

Particulars	Amount
Sales	
EBIT / Op Inc	DCL
EAES	
EPS	
DCL	

DOL = 1.5

DFL = 2

DCL = DOL × DFL

$$DCL = \frac{\% \Delta \text{ in EAES}}{\% \Delta \text{ in Sales}}$$

$$DCL = \frac{\text{Contribution}}{EBIT - I - \frac{DP}{1 - t}}$$

DOL × DFL
$$\frac{\text{Contribution}}{EBIT} \times \frac{EBIT}{EBIT - I - \frac{DP}{1 - t}}$$

Ratios

ROCE (Return on Capital Employed)   **Vs.**   **ROE (Return on Equity)**

aka ROI

Eg. Total Capital Requirement is ₹ 10 lakhs to start a new business.

Equity   ₹ 6,00,000
12 % Debt   ₹ 4,00,000
                  ₹ 10,00,000
EBIT (Say)   ₹ 1,50,000

Prepare Income Statement & Calculate ROCE & ROE

Solve:

Income Statement

Particulars	Amount
EBIT	1,50,000
Less : Intt on Debt [12% × ₹ 4,00,000]	48,000
EBT	1,02,000
Less : Taxes @ 30 % (say)	30,600
EAT or EAES	71,400

Caution Note:
Do not make the mistake of calculating Intt % on EBIT. Intt % should be applied on Debt amount.

ROCE i.e Return on capital employed $= \dfrac{\text{EBIT}}{\text{Capital Employed}} = \dfrac{1,50,000}{10,00,000} \times 100 = 15\%$

Return on Equity i.e. ROE $= \dfrac{\text{EAES}}{\text{Equity Sh. hl. fund}} = \dfrac{71,400}{6,00,000} = 11.9\%$

↗ Eq Sh capital + R & S

Tutorial Note
By Default, ROE always means Post – tax ROE

Q. Calculate After - tax ROCE in the above case ?

After- tax ROCE = Pretax ROCE (1-t)

$$= 15\% \ (1 - 0.3)$$

$$= 10.5 \ \%$$

After- tax ROCE $= \dfrac{EBIT \ (1\text{-}t)}{Cap \ Employed}$

$$= \dfrac{1,50,000 \ (1\text{-} \ 0.3)}{10,00,000}$$

$$= 10.5\%$$

○ **Debt – Equity Ratio**   **Vs.**   **Debt to Total capital Ratio**

aka Debt Ratio

DE Ratio $= \dfrac{Debt}{Equity}$ $= \dfrac{Debt}{Debt + Equity}$

Eg.

B/S		
Equity	150	
Debt	60	

Solve :   DE Ratio $= \dfrac{D}{E} = \dfrac{60}{150} = 0.40$ | Debt Ratio $= \dfrac{D}{D+E} = \dfrac{60}{60+150} = 0.2857$

○ **Asset Turnover Ratio**

Asset Turnover Ratio = ~~$\dfrac{Total \ Assets}{Turnover}$~~   Asset Turnover Ratio $= \dfrac{Turnover}{Assets}$

☞ It shows how well we have utilized our Assets in generating the Turnover. Generally, higher assets T/o ratio vs industry is considered better.

PE Ratio i.e. Price to earnings Ratio

Eg. Infy
MP = ₹1250
EPS = ₹50

Local software Co.
MP   ₹150
EPS   ₹10

$$PE\ Ratio = \frac{Market\ Price}{EPS}$$

Infosys
$$= \frac{₹1250}{₹50}$$

Local software Co.
$$= \frac{₹150}{₹10}$$

= 25 Times   = 15 Times

Observations:

PE Ratio tells us how much Price we have to pay for every ₹1 of earnings.

1. A Company having higher Goodwill, Brand- name , Reputation etc will have higher PE Ratio.
2. A Co. having lower risk level will command higher PE Ratio.
3. A Co. having higher future growth expectations will have higher PE Ratio.
4. Other things being Constant, a Company having higher PE Ratio is Overvalued & a Company having lower PE Ratio is Undervalued.

Remember, MP = PE Ratio × EPS

Capital Gearing Ratio

$$= \frac{Debt + Preference}{Equity\ Sh\ hl\ Fund}$$

👉 By showing Eq Shhl funds, how much Debt & Pref funds Co. is able to raise. This ratio shows the level of gearing or leveraging

Operating Income ratio   Vs.   Operating Cost Ratio

aka Operating Profit Ratio   aka Operating Ratio

$$= \frac{EBIT\ or\ Operating\ income}{Sales}$$

$$= \frac{450}{1000} \quad \{Using\ Eg\ 1\ of\ Basics\ Data\}$$

= 45%

$$= \frac{Total\ Operating\ Cost}{Sales}$$

= 1 - Operating Profit Ratio

= 1- 0.45

= 0.55 or 55 %

Financial Leverage as a 'Double Edged sword' or Should we employ debt ?

When should company borrow debt ?

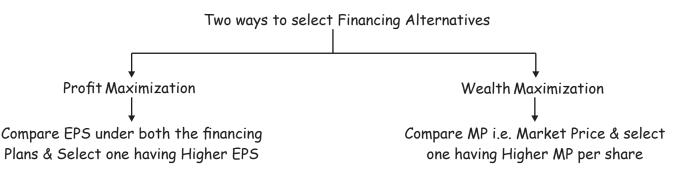|		
If Pre-tax ROCE or ROI % > Interest rate %	Favourable leverage i.e Company should employ Debt	
If Pre-tax ROCE or ROI % < Interest rate %	Unfavourable leverage i.e Company should NOT employ Debt	
If Pre-tax ROCE or ROI % = Interest rate %	Neutral i.e. Neither Advantage Nor Disadvantage	

Since. Co. is earning higher on Amt borrowed than what Co. has to pay in the form of Interest.

When should company employ preference share capital ?

If Post-tax ROCE > Preference Div %	Then favourable leverage i.e Company should raise money from Preference
If Post-tax ROCE < Preference Div %	Then Unfavorable leverage i.e Company should NOT raise Preference Sh. Capital
If Post-tax ROCE = Preference Div %	The neutral i.e. Neither Advantage Nor Disadvantage

Selection of Financing Plans

In this topic, we will be presented with two or more Financing Alternatives (Eg. Alt 1: Eq= ₹ 5 lakhs & Debt = ₹ 5 lakhs; Alt 2: Eq = ₹ 8 lakhs & Debt = ₹ 2 lakhs) & now we have to DECIDE which alternative to select ?

Two ways to select Financing Alternatives

Profit Maximization

Wealth Maximization

Compare EPS under both the financing Plans & Select one having Higher EPS

Compare MP i.e. Market Price & select one having Higher MP per share

Caution Note :
Always compare earnings per share or market price per share. Do not make the mistake of Comparing total earnings i.e. EAES or Total Market Value because other things being constant a financing plan with higher equity Investment will always have Higher Total Earnings or Total MV

Segmentation of ROE
(due to the presence of Debt & Preference in the capital structure)

or

Reconciliation of ROE & ROCE

Situation 1: 100 % funding by Equity
Total capital requirment = ₹ 10 lakhs
EBIT or Operating income = ₹ 1.20 lakhs
Tax rate = 30 %
Calculate ROCE & ROE ?

Solve:

Income Statement

EBIT	120000
Less : Intt on Debt	——
EBT	120000
Less : Taxes @ 30%	36000
EAT or EAES	84000

$$ROCE = \frac{EBIT}{Capital\ Employed}$$

$$= \frac{120000}{1000000}$$

$$= 12\%$$

$$ROE = \frac{EAES}{Eq\ Sh\ hi\ fund}$$

$$= \frac{84000}{1000000}$$

$$= 8.40\ \%$$

Why ROCE% & ROE% are different despite the fact that 100% of Capital has been provided by Equity ?
Ans: ROCE is Pre-tax whereas ROE is Post-tax

If we calculate Post- tax ROCE then it would tally with ROE (∵ 100% funding is done by Eq Shhl)
Post-tax ROCE = Pre-tax ROCE (1-t)
              = 12% (1 - 0.30)
              = 8.40% (which is same as ROE]

Situation 2: When Debt - Equity mix is used

	Equity	6,00,000	
	10 % Debt	4,00,000	EBIT = ₹ 120000
		10,00,000	Tax rate = 30 %

Calculate ROCE & ROE ?

Solve:

Income Statement
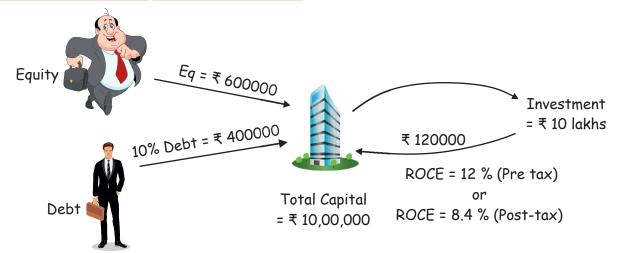
Income Statement	
EBIT	120000
Less : Intt on Debt	40000
EBT	80000
Less : Taxes @ 30%	24000
EAT or EAES	56000

$$ROCE = \frac{120000}{1000000} = 12\%$$

$$ROE = \frac{56000}{600000} = 9.33\%$$

Equity

Eq = ₹ 600000

10% Debt = ₹ 400000

Debt

Total Capital = ₹ 10,00,000

₹ 120000

Investment = ₹ 10 lakhs

ROCE = 12 % (Pre tax)
or
ROCE = 8.4 % (Post-tax)

Present Segmentation of ROE ?

ROE = Post tax ROCE + (Pre tax ROCE - Intt rate %) (1-t) $\times \dfrac{D}{E}$

$$= 8.4\% + (12\% - 10\%)(1-0.3) \times \frac{400000}{600000}$$

$$= 8.4\% + 0.93\%$$

$$= 9.33\%$$

Situation 3: When both Debt & preference are used along with equity

	Equity	2,50,000	
	10 % Debt	3,50,000	
	6 % Pref	4,00,000	EBIT = ₹ 120000
		10,00,000	Tax rate = 30 %

Calculate ROCE & ROE. Reconcile ROCE with ROE ?

Solve :

Income Statement
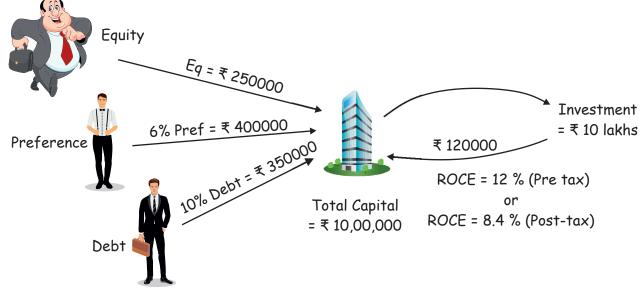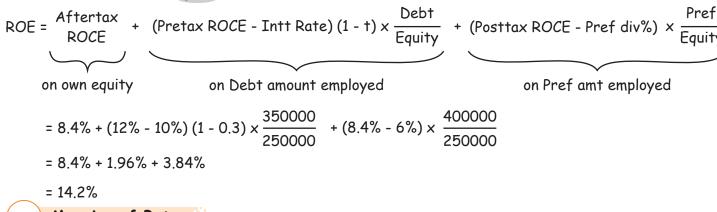
EBIT	120000
Less : Intt on Debt	35000
EBT	85000
Less : Taxes @ 30%	25500
EAT	59500
Less : Dp	24000
EAES	35500

$$\text{ROCE} = \frac{120000}{1000000} = 12\%$$
(Pretax)

$$\text{ROCE} = 12\% (1-0.3) = 8.4\%$$
(After tax)

$$\text{ROE} = \frac{35500}{250000} = 14.2\%$$

Equity

Eq = ₹ 250000

Preference

6% Pref = ₹ 400000

10% Debt = ₹ 350000

Debt

Total Capital = ₹ 10,00,000

Investment = ₹ 10 lakhs

₹ 120000

ROCE = 12 % (Pre tax)
or
ROCE = 8.4 % (Post-tax)

$$\text{ROE} = \underbrace{\frac{\text{Aftertax}}{\text{ROCE}}}_{\text{on own equity}} + \underbrace{(\text{Pretax ROCE} - \text{Intt Rate})(1-t) \times \frac{\text{Debt}}{\text{Equity}}}_{\text{on Debt amount employed}} + \underbrace{(\text{Posttax ROCE} - \text{Pref div\%}) \times \frac{\text{Pref}}{\text{Equity}}}_{\text{on Pref amt employed}}$$

$$= 8.4\% + (12\% - 10\%)(1-0.3) \times \frac{350000}{250000} + (8.4\% - 6\%) \times \frac{400000}{250000}$$

$$= 8.4\% + 1.96\% + 3.84\%$$

$$= 14.2\%$$

Meaning of Beta

Beta measures sensitivity of a particular stock with respect to changes in the Overall Stock Market

Stock Mkt   Infosys Share

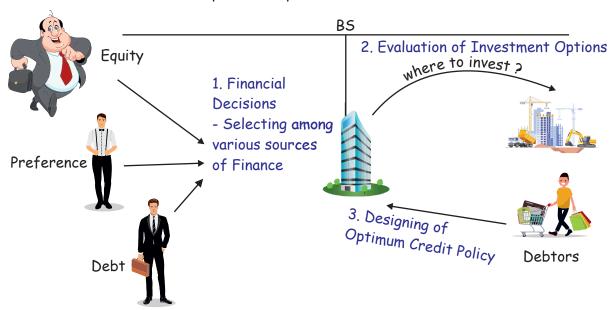falls by | 10%   falls by | 15%

∴ Beta of Infosys = 1.5 times

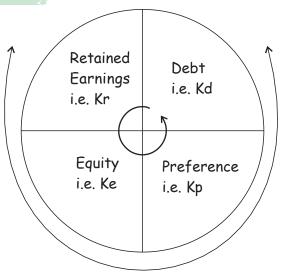Generally Speaking Higher DOL & DFL leads to Higher Beta & vice-versa

COST OF CAPITAL

"Cost of Capital" is the return expected by the providers of capital.

Significance of 'Cost of Capital'

Three areas where 'Cost of Capital' concept is used

BS

Equity

Preference

Debt

1. Financial Decisions - Selecting among various sources of Finance

2. Evaluation of Investment Options
where to invest ?

3. Designing of Optimum Credit Policy

Debtors

Various sources of Finance

Retained Earnings i.e. Kr

Debt i.e. Kd

Equity i.e. Ke

Preference i.e. Kp

Overall Cost of capital i.e. Ko

Time Value of Money

Future Value of a Single Sum

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

Q. You have ₹ 10,000 today. You can invest it @ 10 % p.a. in a Bank's fixed deposit for 3 Years. Calc Future Value at the end of 3 Yrs

Solve :

₹ 10,000 → @ 10% / ₹ 1000 → 11000 → @ 10% / ₹ 1100 → 12100 → @ 10% / 1210 → 13310
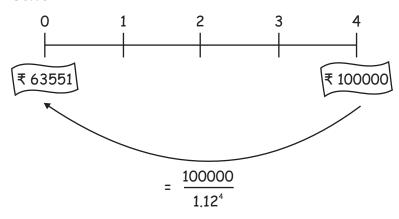
$= ₹ 10000 (1 + 0.10)^3$
$= ₹ 13310$

Present Value of a Single Sum

$PV = \dfrac{FV}{(1 + r)^n}$

Q. You have been promised by your parents to give you ₹ 100000 gift on becoming CA after 4 years. If rate of interest is 12%, Calc PV ?

Solve :

```
0      1      2      3      4
```

₹ 63551   ₹ 100000

$= \dfrac{100000}{1.12^4}$

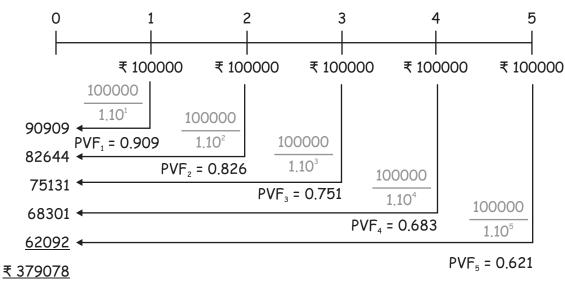## Present value of an Annuity

Annuity is a series of Cash flow
- ✓ having same amount every time
- ✓ having equal time gap between any two consecutive amounts

$$PVA = A \times \left(\frac{1 - \left(\frac{1}{1+r} \right)^n}{r} \right)$$

— n means No. of Annuity Payments

Eg. You will receive ₹ 100000 per year from a client for next 5 year. calculate PV if rate of intt is 10% ?

Solve:

₹ 379078

OR

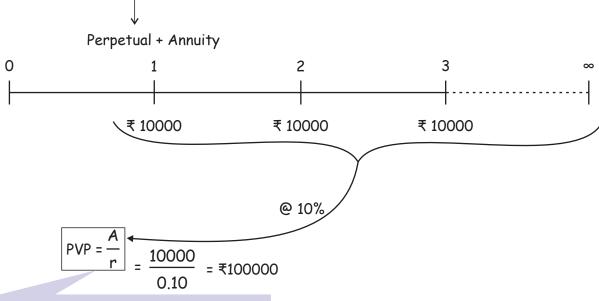$$PVA = A \times \left(\frac{1 - \left(\frac{1}{1+r} \right)^n}{r} \right)$$

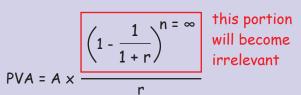$$= 100000 \times \left(\frac{1 - \left(\frac{1}{1.10} \right)^5}{0.10} \right)$$

= 379078

OR

$PVA = A \times PVAF_{(@ 6\%, \, n \, yrs)}$

$= 100000 \times PVAF_{(@10\%, 5yrs)}$

$= 100000 \times 3.79078$

$= 379078$

Present Value of Perpetuity

Perpetual + Annuity

```
0          1          2          3          ∞
|──────────|──────────|──────────|─ ─ ─ ─ ─ ─|
        ₹ 10000    ₹ 10000    ₹ 10000
```

@ 10%

$$PVP = \frac{A}{r} = \frac{10000}{0.10} = ₹100000$$

$$PVA = A \times \frac{\left(1 - \dfrac{1}{1 + r}\right)^{n = \infty}}{r}$$

this portion will become irrelevant

PV of Uneven Cash Flows

Eg.

```
0          1          2          3          4          5
|──────────|──────────|──────────|──────────|──────────|
       ₹ 100000   ₹ 120000   ₹ 125000   ₹ 140000   ₹ 150000
```

Rate of Intt = 10%
Calc PV

Solution :

Year	Cashflow	PVF @10%	Present Value
1	100000	0.909	90909
2	120000	0.826	99173
3	125000	0.751	93914
4	140000	0.683	95621
5	150000	0.621	93138
			PV of Cash flows = 472755
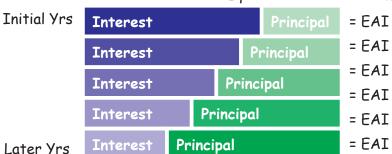
Loan Amortization Schedule | Equated monthly installments (EMI)

Car Loan Sanctioned	=	₹ 500000
Tenure	=	5 Yrs
Rate of Intt	=	7%
Loan Repayment Style	=	EAI
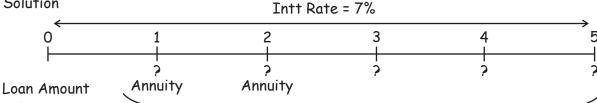
↓
Equated Annual Installment

Initial Yrs
Interest	Principal	= EAI
Interest	Principal	= EAI
Interest	Principal	= EAI
Interest	Principal	= EAI
Interest	Principal	= EAI

Later Yrs   Interest   Principal   = EAI

Calculate EAI ?

Solution

Intt Rate = 7%

```
0        1        2        3        4        5
|        ?        ?        ?        ?        ?
```

Annuity   Annuity

Loan Amount
= ₹ 500000

Present Value of an Annuity

$$PVA = A \times \dfrac{1 - \left(\dfrac{1}{1+r}\right)^n}{r}$$

$$500000 = A \times \dfrac{1 - \left(\dfrac{1}{1.07}\right)^5}{0.07}$$

$$500000 = A \times 4.1002$$

$$\therefore A = 121945$$

$PVA = A \times PVAF_{(@r\%, \, n \, yrs)}$

$500000 = A \times PVAF_{(@7\%, \, 5 \, yrs)}$

$500000 = A \times 4.1002$

Loan amortization schedule

Year	Opening Balance	Add: Interest @ 7%	Installments		Closing Balance
			Interest payment	Principal Repayment	
1	500000	35000	35000	86945	413055
2	413055	28914	28914	93031	320021
3	320021	22402	22402	99543	220481
4	220481	15434	15434	106511	113970
5	113970	7975 (b/f)	7975	113970	0

Calculation of Cost of Capital

Cost of Debt [K_d]

Irredeemable Debt

$$K_d = \frac{I(1-t)}{NP}$$

here,
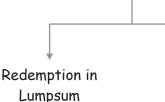
Kd   = Cost of Debt after tax
I   = Annual Interest
t   = Tax Rate
NP or MP = Net Proceeds or
                Market Price

Net Proceeds = Gross Isssue Proceeds
           less Flotation Cost

here, Flotation Cost includes
- Brokerage
- Legal & Admin Charges
- Listing fees
- Brochure printing
- Advertisements etc.

Redeemable Debt

Redemption in Lumpsum

(i) Approximation Method or Shortcut formula

$$K_d = \frac{I(1-t) + \dfrac{RV - NP}{n}}{\dfrac{RV + NP}{2}} \quad \text{(Preferred)}$$

Tutorial Note:
This formula assumes
- Tax benefit is available only on Intt
- Rate of Intt is constant

or

$$K_d = \frac{I + \dfrac{RV - NP}{n}}{\dfrac{RV + NP}{2}}(1-t)$$

Tutorial Note:
This formula assumes that Tax benefit is available on all viz Intt, Floatation Cost & Premium paid

(ii) Accurate Method
      Use IRR Technique

Redemption in Installments

Use IRR Technique

Convertible Debt

Same formulas as taught earlier for Redeemable Debt but use RV or CV (Conversion value) whichever is higher in place of RV in the formula
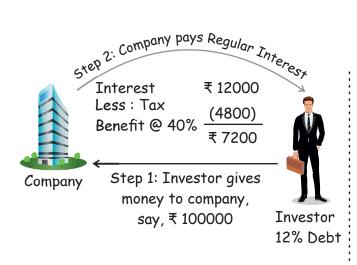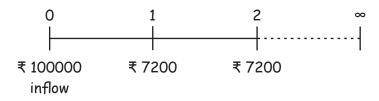
Use either
- ✓ Approx Method
    or
- ✓ IRR Technique

Eg. How to calculate of cost Debt - Irredeemable Debt
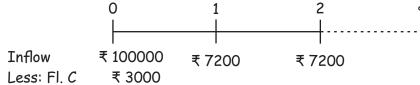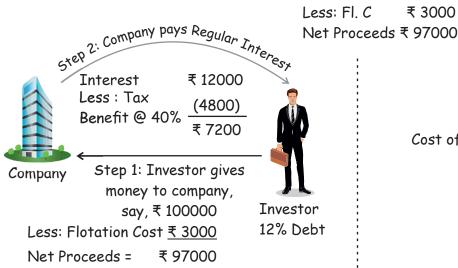
Situation 1: If there is No Floatation Cost

```
0           1           2           ∞
|           |           |  ----------|
₹ 100000    ₹ 7200      ₹ 7200
inflow
```

Step 2: Company pays Regular Interest

Interest	₹ 12000
Less : Tax Benefit @ 40%	(4800)
	₹ 7200

Company

Step 1: Investor gives money to company, say, ₹ 100000

Investor
12% Debt

$$\text{Cost of Debt i.e. } K_d = \frac{₹ 7200}{₹ 100000}$$

$$= 7.2\%$$

Situation 2: If Floatation Cost exists
Q. What if in above case, Co. has incurred floatation cost of 3%.

Solve

```
0           1           2           ∞
|           |           |  ----------|
₹ 100000    ₹ 7200      ₹ 7200
```

Inflow	₹ 100000
Less: Fl. C	₹ 3000
Net Proceeds	₹ 97000

Step 2: Company pays Regular Interest

Interest	₹ 12000
Less : Tax Benefit @ 40%	(4800)
	₹ 7200

Company

Step 1: Investor gives money to company, say, ₹ 100000

Less: Flotation Cost ₹ 3000

Net Proceeds = ₹ 97000

Investor
12% Debt
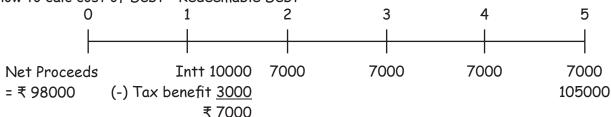
$$\text{Cost of Debt i.e. } K_d = \frac{₹ 7200}{₹ 100000 - ₹ 3000}$$

$$= 7.426\%$$

Eg 2: How to calc cost of Debt - Redeemable Debt

0	1	2	3	4	5

Net Proceeds = ₹ 98000

Intt 10000 7000 7000 7000 7000
(-) Tax benefit 3000   105000
₹ 7000

Net Proceeds = ₹ 98000 ← -

Floatation Cost = ₹2000

Rate of Intt = 10%

Investor ₹ 100000
Bond Life = 5 Yrs
Redeemable @ 5% premium

Tax Rate = 30%
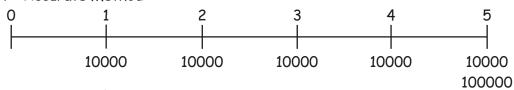
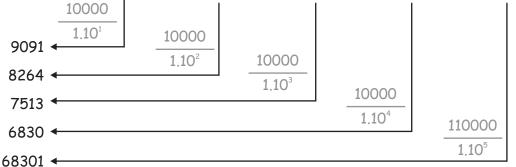$$K_d = \cfrac{I(1-t) + \cfrac{RV - NP}{n}}{\cfrac{RV + NP}{2}} = \cfrac{10000(1-0.3) + \cfrac{105000 - 98000}{5\ Years}}{\cfrac{105000 + 98000}{2}} = 8.275\ \%$$

Cal^{-n} of cost of Debt - Accurate Method

Debt Raised
i.e. Inflow 100000

0	1	2	3	4	5

10000 10000 10000 10000 10000
100000

$\dfrac{10000}{1.10^1}$

$\dfrac{10000}{1.10^2}$

$\dfrac{10000}{1.10^3}$

$\dfrac{10000}{1.10^4}$

$\dfrac{110000}{1.10^5}$

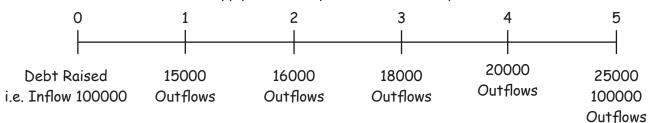9091 ←

8264 ←

7513 ←

6830 ←

68301 ←

₹ 100000

Tutorial Note:
Future Outflows against any Loan are reflection of "Principal Repayment + Intt on loan". Hence, Future Outflows are equal to loan Amount + interest Rate compounded (i.e. Added in the Loan Amount.) Accordingly, if we think other way round, then 'Discounting Future Cash Outflows @ K$_d$ will equate to the PV of Loan Amount" This rate is found by Trial & Error.

Let's apply the concept in another example :

0	1	2	3	4	5
Debt Raised i.e. Inflow 100000	15000 Outflows	16000 Outflows	18000 Outflows	20000 Outflows	25000 100000 Outflows

Solve: Using interest Rate of Return Method [IRR Method] aka Present Value Method OR Yield Method To Maturity

Calculation of K_d using Trial & Error Method

Year	Cashflows	PV @ 18%		PV @ 19%	
		PVF	PV	PVF	PV
1	15000	0.847	12712	0.840	12605
2	16000	0.718	11491	0.706	11299
3	18000	0.608	10955	0.593	10681
4	20000	0.515	10316	0.498	9973
5	125000	0.437	54639	0.419	52381
		PV of Outflows =	100113	PV_O =	96939
		PV of Inflows =	100000	PV_I =	100000
		Net Present Value	(113)	NPV =	+ 3061

Using Interpolation :

$$= L + \frac{NPV_L}{NPV_L - NPV_H} (H - L)$$

here,
    L means Lower Rate
    H means Higher Rate
    NPV_L means NPV at Lower Rate
    NPV_H means NPV at Higher Rate

Tutorial Note:
1. Interpolation can be applied only when one NPV is -ve & another is +ve
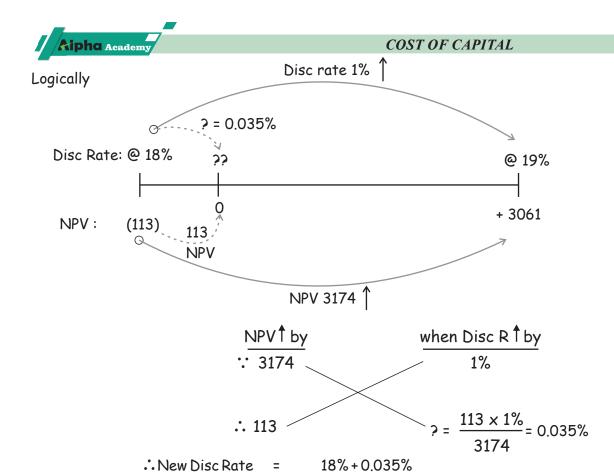2. Prefer using Formula in Exam instead of doing it logically

$$= 18\% + \frac{-113}{-113 - 3061} (19\% - 18\%)$$

$$= 18\% + \frac{113}{3174} (19\% - 18\%)$$

$$= 18\% + 0.035\%$$
$$= 18.035\%$$

or

Logically

Disc rate 1% ↑

? = 0.035%

Disc Rate: @ 18%   ??   @ 19%

0   + 3061

NPV :   (113)   113   NPV 3174 ↑

NPV

$$\text{NPV} \uparrow \text{by} \qquad \text{when Disc R} \uparrow \text{by}$$

$$\because \quad 3174 \qquad\qquad 1\%$$

$$\therefore \quad 113 \qquad\qquad ? = \frac{113 \times 1\%}{3174} = 0.035\%$$

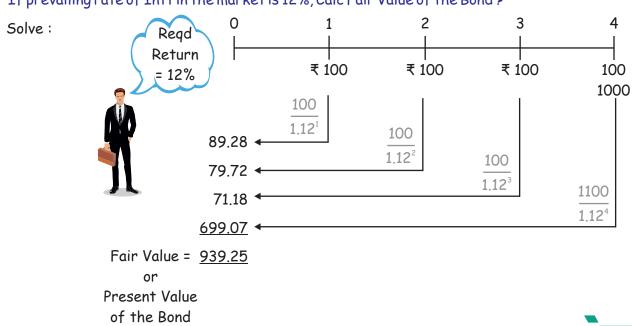$$\therefore \text{New Disc Rate} \quad = \quad 18\% + 0.035\%$$
$$= \quad 18.035\%$$

How to calculate Fair Value of the Bond?

'Fair Value of the Bond' is the Present Value of future Cash flows (in the form of Interest + Redemption Value) discounted @ Required/Expected Rate of return (or prevailing rate of return)

Example: IMC has an outstanding Bond having Face Value of ₹ 1000, offering 10% Coupon Rate & remaining 4 years of maturity.

If prevailing rate of Intt in the market is 12%, Calc Fair Value of the Bond?

Solve :

Reqd Return = 12%

0	1	2	3	4
	₹ 100	₹ 100	₹ 100	100
				1000

$$\frac{100}{1.12^1}$$

89.28

$$\frac{100}{1.12^2}$$

79.72

$$\frac{100}{1.12^3}$$

71.18

$$\frac{1100}{1.12^4}$$

699.07

Fair Value = 939.25
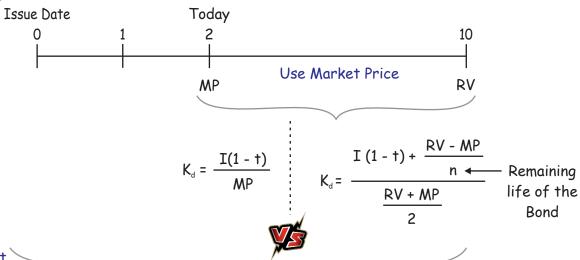   or
Present Value
of the Bond

Q. If Actual Market Price of the Bond is ₹ 900. Would you buy this Bond ?

Solution: Since Actual MP (₹ 900) < Fair Price (₹ 939.25), therefore, Bond is Undervalued. Hence, we should buy this Bond.

Exam Tip:

While calculating K_d - When to use NP & When to use MP ?

Issue Date   Today

0   1   2   10

Use Market Price

MP   RV

$$K_d = \frac{I(1-t)}{MP}$$

$$K_d = \frac{I(1-t) + \dfrac{RV - MP}{n}}{\dfrac{RV + MP}{2}} \longleftarrow \text{Remaining life of the Bond}$$

VS

Use Net Proceeds

Issue Price
(-) Flotation Cost
Net Proceeds

$$K_d = \frac{I(1-t)}{NP} \quad OR \quad K_d = \frac{I(1-t) + \dfrac{RV - NP}{n}}{\dfrac{RV + NP}{2}} \longleftarrow \text{Life of the Bond}$$

Convertible Debt

Issue Date   5

8% Coupon Convertible
Debt into 5 Eq. Sh.
Life = 5 Yrs

OR

$$K_d = \frac{I(1-t) + \dfrac{RV^* - NP}{n}}{\dfrac{RV^* + NP}{2}}$$

If Redeemed
say, Redeemable @
10% Premium = ₹ 110
is Redemption Value

If Converted into eq sh
5 Eq. shares × ₹ 27, Say
[Estimated Shares Price] Vs. = ₹ 135 is Conversion Value

* whichever is higher would be opted by Debenture holder & hence Higher of these two Numbers is taken as RV
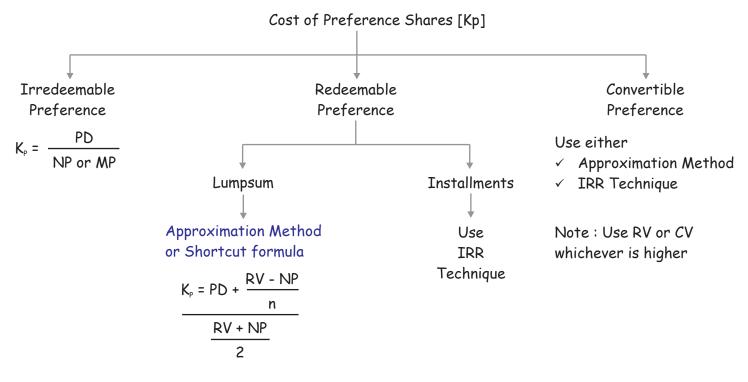
Cost of Preference Shares

- Unlike Debt where we pay Interest, in case of Preference shares we pay preference Dividend
- Interest is an Expense but Preference Dividend is an Appropriation of Profits. Hence, 'Interest' attracts Tax benefit but there is no such Tax benefit on payment of Preference Dividend.
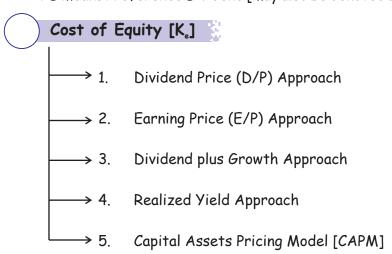
Cost of Preference Shares [Kp]

Irredeemable Preference

$$K_p = \frac{PD}{NP \text{ or } MP}$$

Redeemable Preference

Lumpsum

Approximation Method or Shortcut formula

$$K_p = \frac{PD + \dfrac{RV - NP}{n}}{\dfrac{RV + NP}{2}}$$

Accurate Method
Use IRR Technique

Installments

Use
IRR
Technique

Convertible Preference

Use either
✓ Approximation Method
✓ IRR Technique

Note : Use RV or CV whichever is higher

here,

PD means Preference Dividend [may also be denoted by Dp]

Cost of Equity [K_e]

1. Dividend Price (D/P) Approach

2. Earning Price (E/P) Approach

3. Dividend plus Growth Approach

4. Realized Yield Approach

5. Capital Assets Pricing Model [CAPM]

1. Dividend Price Approach

$$K_e = \frac{D}{P_0}$$

here
D means Dividend
P_0 means Market Price as of today

2. Earning Price Approach

$$K_e = \frac{EPS}{P_0}$$

3. Dividend plus Growth Approach   aka Gordon's growth Model aka Discounted Cash Flow [DCF technique]
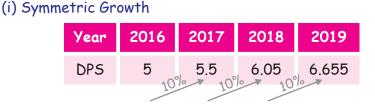
$$K_e = \frac{D_1}{P_0} + g$$

here,
    D_1 means Expected Dividend in the Next Yr i.e. $D_o(1+g)$

 'g' means Growth Rate

How to find out growth rate ?

Average Method

(i) Symmetric Growth

Year	2016	2017	2018	2019
DPS	5	5.5	6.05	6.655

10% 10% 10%

∴ growth in dividends = 10% in the above case

(ii) Asymmetric Growth

Year	2016	2017	2018	2019	2020
DPS	5	5.75	6	8	10

g = 15% g = 4.34% g = 33.33% g = 25%

Solve: Use Geometric Mean

$$G.M = \sqrt[n]{(1+r_1)(1+r_2)..........(1+r_n)} - 1$$

$$= \sqrt[4]{(1.15)(1.0434)(1.3333)(1.25)} - 1$$

$$= 0.1892 \text{ or } 18.92\%$$

Formula Method

$$g = b \times r$$
or
$$g = RR \times ROE$$

here,
b means Retention Ratio
r means Return on Equity

OR

Use FV PV Formula

$D_o = D_n (1 + r)^n$ ⟵ just like FV = PV $(1 + r)^n$

here, $r = \sqrt[n]{\dfrac{D_0}{D_n}} - 1$

D_o means Current Dividend

D_n means Dividend n yrs ago

$10 = 5 (1 + r)^4$

$2 = (1 + r)^4$

$\sqrt[4]{2} = 1 + r$

$1.1892 = 1 + r$

∴ r = 18.92 %

Existing Equity Vs New Equity

$K_e = \dfrac{D_1}{P_0} + g$

👉 If Q. has given a separate
Issue Price then 'Use Issue
Price in place of P_o

$K_e = \dfrac{D_1}{P_0 - F} + g$

here,

F means Flotation Cost

Note : If Flotation Cost is given in % terms then either

✓ Calc Flotation Cost amount by multiplying Fl. cost %
with P_o

✓ & Rewrite the formula as

$K_e = \dfrac{D_1}{P_0 (1 - F\%)} + g$

4. Realized Yield Approach

Single Period

$Y_1 = \dfrac{D_1 + P_1 - P_0}{P_o}$

here,

Y_1 means Yield during Yr 1

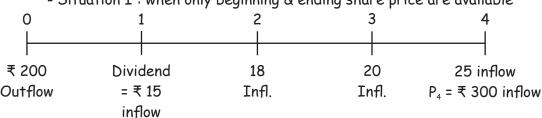D_1 means Dividend at the end of Yr 1

P_0 & P_1 Price of the Share at the end of Yr 0 & Yr 1.

Multiple Period

- Situation I : when only beginning & ending share price are available

```
0           1           2           3           4
|-----------|-----------|-----------|-----------|
```

₹ 200   Dividend   18   20   25 inflow
Outflow   = ₹ 15   Infl.   Infl. P_4 = ₹ 300 inflow
            inflow

Calculate Return earned by an Investor over 4 yrs period ?

Solve: Hint : Use IRR Technique
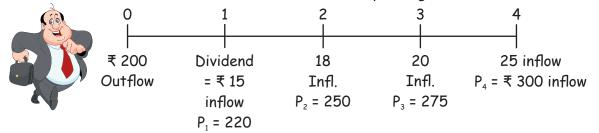
Year	Cashflow	PV @ 18%		PV @ 20%	
		PVF	PV	PVF	PV
1	15	.			
2	18	.			
3	20	.			
4	25 + 300 = 325	.			
		PV_I =	205.44		193.31
		Pv_0 =	200		200
		NPV	5.44		(6.69)

Using Interpolation : -

$$=$$

$$= 18.9\%$$

Situation II : When Share Prices at the end of each yr are given ?

```
    0           1           2           3           4
    |           |           |           |           |

  ₹ 200      Dividend       18          20        25 inflow
  Outflow    = ₹ 15        Infl.       Infl.    P₄ = ₹ 300 inflow
             inflow       P₂ = 250    P₃ = 275
             P₁ = 220
```

Calculate Realized Yield ?

Solve: Two steps are involved :

Step 1: Treat each 1 year period as a 'Single Period' & calculate yield using :

$$Y_1 = \frac{D_1 + P_1 - P_0}{P_0}$$

Now we'll have yield for each of the 4 years

Step 2: Find Geometric Mean

Step 1: Calculate Yield for each year

$$\text{Yield \%} = \frac{D_1 + P_1 - P_0}{P_0}$$

Year 1

$$= \frac{15 + 220 - 200}{200} = 17.5\%$$

Year 2

$$= \frac{18 + 250 - 220}{220} = 21.82\%$$

Year 3

$$= \frac{20 + 275 - 250}{250} = 18\%$$

Year 4

$$= \frac{25 + 300 - 275}{275} = 18.18\%$$

Step 2: Calc Geometric Mean

$$= \sqrt[4]{(1 + Y_1)(1 + Y_2)(1 + Y_3)(1 + Y_4)} - 1$$

$$= \sqrt[4]{(1.175)(1.2182)(1.18)(1.1818)} - 1$$

= 18.87% 😄 Same answer as situation I. In fact both the situations are effectively the same.

Tutorial Note:
Which Approach shall we use in Exam ?
If Share Prices at the end of each yr are given then use 'Geometric Mean' else 'Use IRR"

5. CAPITAL ASSET PRICING MODEL [CAPM]

$K_e = R_f + \beta (R_m - R_f)$

'$R_m - R_f$' means Market Risk Premium

here,

R_f means Risk-free Rate of Return

R_m means Return from Market

β means Sensitivity of a particular stock w.r.t. Market. β is a measure of Systematic Risk

Eg. R_f = 6%   , R_m = 15%   , β = 1.5 times
Calc K_e ?

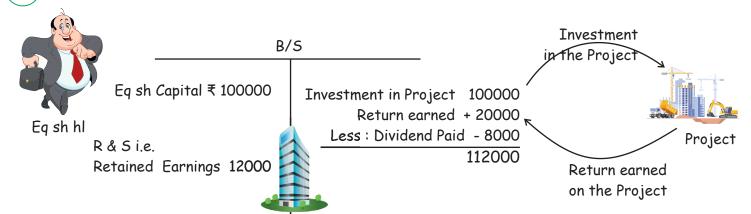Solve : K_e = $R_f + \beta (R_m - R_f)$
                =   6% + 1.5 (15% - 6%)
                =   19.5%

R_m = 15%

Market
Risk
Prem
= 9%

R_f = 6%

Cost of Retained Earnings [K_r]

Eq sh hl

Eq sh Capital ₹ 100000

R & S i.e.
Retained Earnings 12000

B/S

Investment in Project   100000
Return earned + 20000
Less : Dividend Paid - 8000
112000

Investment
in the Project

Return earned
on the Project

Project

Concept: Since both Eq Sh Capital as well as Retained Earning belong to the same person & carries the same risk, therefore,

$$K_r = K_e$$

So the formulas we have learned for K_e, applies equally to K_r

Exceptions:

1. $K_r \neq K_e$ if Flotation Cost is given in the Question.

   For Cal^n of K_e: 'P' Could be 'P$_O$ - f' i.e. (i) issue price less Flotation cost   or   (ii) Market Price

   For Cal^n of Kr: 'P' will always be P$_o$ i.e. Current Mkt Price

      because No Flotation
         Cost is incurred
      for Retained Earnings

2.   If Personal tax rates is also given in the question then $K_r = K_e$
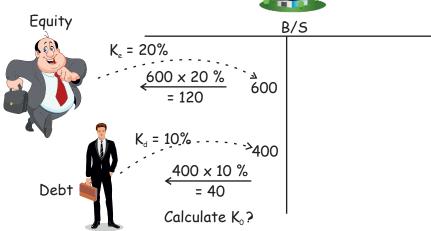 $K_r = K_e (1 - t_p)$
   here,
         t_p means Personal Tax Rate on dividend

3.   If both Flotation Cost & Personal Tax Rates are given
   $K_r = K_e (1 - t_p) (1 - f)$
   here,
         'f' means flotation cost%

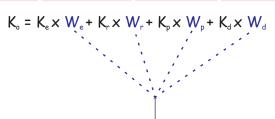## Cost of Capital or Weighted Average (WACC) or K_o Cost of Capital

Equity

B/S

$K_e = 20\%$

$600 \times 20\% = 120$ → 600

$K_d = 10\%$ - - - →400

$400 \times 10\% = 40$

Debt

Calculate K_o?

Alternative 1:

Sources of finance	Cost%	Amount	Cost ₹
Eq	20%	600	120
Debt	10%	400	40
		1000	160

$\therefore K_o = 160/1000$
$= 16\%$

Alternative 2:

Sources of finance	Cost%	Amount	Weights	Cost% × weights
Eq	20%	600	0.60	12%
Debt	10%	400	0.40	4%
		1000	1	16%

$$K_o = K_e \times W_e + K_r \times W_r + K_p \times W_p + K_d \times W_d$$

Book Value Weights

Simply pick up values of Eq.
Debt etc. from Balance sheet

Market Value Weights

We use Market Prices
of Equity Shares, Preference
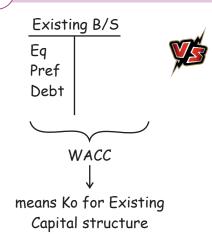Shares & Debentures
to calc Market Values.

👉 Key Points to Remember : -

1. While writing MV Weights, use Market Values (Not Market Price). MP is per share/ debenture whereas MV = MP × n,

2. When using MV Weights approach, MP of Eq Shares represents both Eq Sh Capital + R & s'. Hence MV of Equity represents combined position of 'Eq Sh Capital + R & S'

3. If K_e & K_r are different and we are using MV weights then Split MV between Eq & Reserves Surplus in the ratio of Book value of Eq Sh Capital : R & S.

4. If Q is silent about choice of weights - Prefer MV Weights because MV represents true & updated picture of the business.

5. If Such words "Co. is satisfied with its present capital Structure" are written then it means we have to use BV Weights

⃝ Weighted Marginal Cost of Capital [WMCC]/ Marginal Average Cost of Capital [MACC]

Existing B/S

Eq
Pref
Debt

Vs

Additional Equity

Additional Pref.

Additional Debt

WACC

WMCC

means Ko for Existing Capital structure
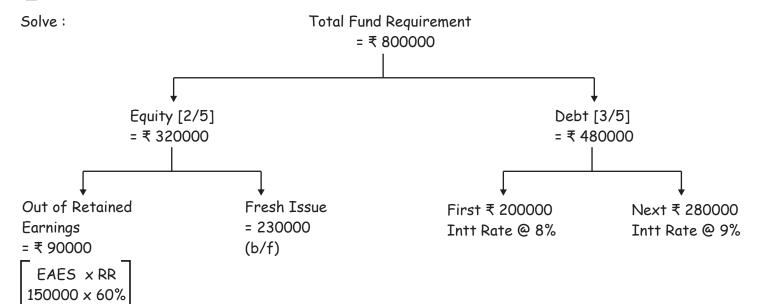
means Ko for Addl. funds

Cal⁻ⁿ of WMCC	
Income Statement	
Sales	10,00,000
Contribution	4,00,000
EBIT	2,50,000
EAES	1,50,000
÷ n	10000 shares
EPS	15
DPR	40%

Others Information	
Proposed Capital Investment	= ₹ 800000
D E Ratio	3 : 2
Intt Rate:	
Upto ₹ 200000	8%
Beyond ₹ 200000	9%
MP	₹ 63
Expected growth	7%
Flotation Cost of Eq.	₹ 3
Tax Rate	30%

Calculate WMCC ? (or MACC)

Solve :

$$\text{Total Fund Requirement} = ₹\ 800000$$

Equity [2/5]
= ₹ 320000

Debt [3/5]
= ₹ 480000

Out of Retained Earnings
= ₹ 90000

$$\begin{bmatrix} \text{EAES} \times \text{RR} \\ 150000 \times 60\% \end{bmatrix}$$

Fresh Issue
= 230000
(b/f)

First ₹ 200000
Intt Rate @ 8%

Next ₹ 280000
Intt Rate @ 9%

Caln of Cost of various source of finance

1. Debt

First ₹ 200000 : Kd = I% (1 - t)
= 8% (1 - 0.3)
= 5.6%

Alternatively

$$K_d = \frac{I(1-t)}{NP}$$

$$= \frac{16000\ (1-0.3)}{200000}$$

= 5.6%

Next ₹ 280000 : Kd = 9% (1 - 0.3)
= 6.3%

2. Equity

New Equity:

$$K_e = \frac{D_1}{P_O - F} + g$$

$$= \frac{₹\ 6 \times 1.07}{63 - 3} + 0.07$$

= 17.7%

Retained Earnings

$$K_r = \frac{D_1}{P_O} + g$$

$$= \frac{₹\ 6 \times 1.07}{63} + 0.07$$

= 17.19%

Caln of WMCC

Sources of funds	Cost	Amount	Weights	Cost × W
Equity	17.7%	230000	23/80	
Retained earnings	17.19%	90000	9/80	
Debt upto ₹ 200000	5.6%	200000	20/80	
Beyond ₹ 200000	6.3%	280000	28/80	
		800000		10.63%

Exam Tip

What's special in WMCC vs WACC ?

Also take into account availability of funds through Retained Earnings of the latest year

Caution Note

Do not make the mistake of taking entire 'R & S' Balance from Balance Sheet because it pertains not just to last year but it could be accumulation of past so many years which must have been invested in the past years projects

Q. Calculate Maximum Investment Amount that can be done
✓ without raising fresh equity
✓ while maintaining DE Ratio

Solve: Retained Earnings Available = ₹ 90000

We know that DE Ratio is 3:2

Which means that if Total Cap Req is ₹ 5, then ₹ 3 will be raised from Debt & ₹ 2 will be raised from Equity

∴ Maximum Cap Inv = ₹ 90000 × $\dfrac{5}{2}$

= ₹ 225000

Learning Objective: To learn how to design optimal capital structure

Below table is from the view point of company

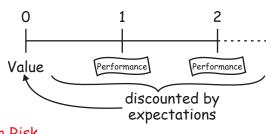| Type	Risk	Cost	Control
Equity	Low Risk	Most Expensive	Dilution of Control
Pref	Slightly Higher Risk	Slightly Cheaper than Equity	No Dilution
Debt	High Risk	Cheapest	No Dilution

👉 The ultimate objective is 'Wealth Maximization'

$$Value = \frac{Performance}{Expectations}$$

It's a reflection of PVP formula

i.e. $PVP = \dfrac{A}{r}$

expectations depends upon risk level

If low Risk then Return Expectations are also low

If High Risk then Return Expectations are also high

```
0        1         2    .........
|        |         |
Value  Performance  Performance
```

discounted by expectations

Formula to calc Value

Value of Equity [S] = $\dfrac{Net\ Income}{Ke}$

+

Value of Debt [D] = $\dfrac{Interest}{Kd}$

=

Value of Firm [F or V] = $\dfrac{EBIT}{Ko}$

Value of Firm [F or V] = Value of Equity [S] + Value of Debt [D]

i.e., V_F or $V_O = V_E + V_D$

Example

Income Statement	
EBIT	100000
Less: Interest	10000
EBT or Net Income	90000

Equity Ke = 18%   Value ?

10% Debt $\dfrac{100000}{??}$

Calculate value of Equity, Value of Debt, Value of firm and Reconcile them ?

Solve:

Value of Equity [S] = $\dfrac{\text{Net Income}}{Ke}$ = $\dfrac{90000}{18\%}$ = 500000

Value of Debt [D] = $\dfrac{\text{Interest}}{Kd}$ = $\dfrac{10000}{10\%}$ = 100000

Value of Firm   = Value of Equity + Value of Debt
               = 500000   + 100000
               = 600000

Alternatively,

Value of Firm = $\dfrac{\text{EBIT}}{Ko^{*}}$

$= \dfrac{100000}{16.6667\%}$

= 600000

*Ko = Ke × We + Kd × Wd

$= 18\% \times \dfrac{500000}{600000} + 10\% \times \dfrac{100000}{600000}$

= 16.6667%

Tutorial Note: Conclusion: To maximize Value of Firm we have to design a capital structure that minimizes Ko

Capital Structure Theories

Capital Structure Relevance Theory

1.   Net Income (NI) Approach

3.   Traditional Approach

5.   Modigliani & Miller Approach - with Tax

Capital Structure Irrelevance Theory
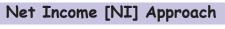
2.   Net Operating Income (NOI) Approach
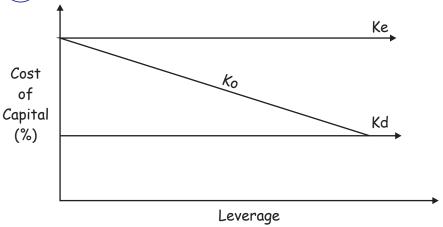
4.   Modigliani & Miller Approach - without Tax

Other Capital Structure Theories
6.   The Trade-off Theory

7.   Pecking order Theory

Net Income [NI] Approach

According to this Theory :-
1.   Ke and Kd are assumed to be constant. They do not change with the leverage.
2.   As Debt increases, Ko decreases.
3.   As Ko decreases, Value of firm increases
4.   Optimum Capital Structure - This theory suggests maximum possible debt financing (theoretically, 100% debt financing) to minimize Ko and hence to maximize value of firm.

Practical steps involved under NI approach

Step 1: Calc market value of Equity [S]

$$= \frac{\text{Net Income}}{\text{Ke}}$$

Step 2: Calc market value of Debt [D]

$$= \frac{\text{Interest}}{\text{Kd}}$$
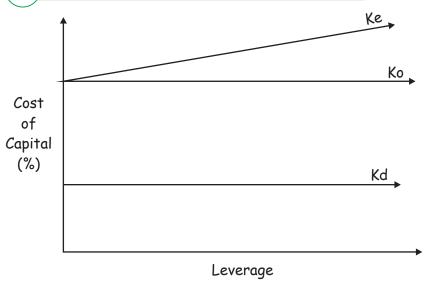
Step 3: Calc market value of Firm [V]

V = S + D

Step 4: Calc Overall cost of capital [Ko]

$$\text{Ko} = \frac{\text{EBIT}}{\text{V i.e. value of firm}}$$

Net Operating Income [NOI] approach

According to this theory :-

1. Kd and Ko remains constant irrespective of Debt: Eq. mix
2. As we increase leverage, risk of Eq Sh hl starts rising. The increase in risk leads to an increase in Ke [i.e. return expectations of Eq Sh hl]. Ke increases in such a manner so that overall cost of capital i.e. Ko finally remains same.

Practical steps involved under NOI approach

Step 1: Calculate Value of Firm

$$V = \frac{EBIT}{Ko}$$

Step 2: Calc Value of Debt

$$D = \frac{Interest}{Kd}$$
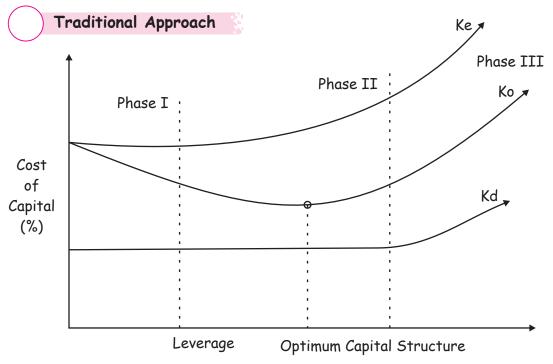
Step 3: Calc Value of Equity

S = V - D

i.e. Value of Equity = Value of Firm - Value of Debt

Step 4: Calc Cost of Equity

$$Ke = \frac{Net\ Income}{Value\ of\ Equity} \quad i.e. \quad \frac{NI}{S}$$

Traditional Approach

Phase	I	II	III
Equity i.e. Ke	Constant	Increasing	Increasing at a faster rate
Debt i.e. Kd	Constant	Constant	Increasing
Overall i.e. Ko	Declines	Constant	Increasing

Can we have an optimal capital structure ?
Yes, it is found where Ko is minimum

Explanation of each phase of theory
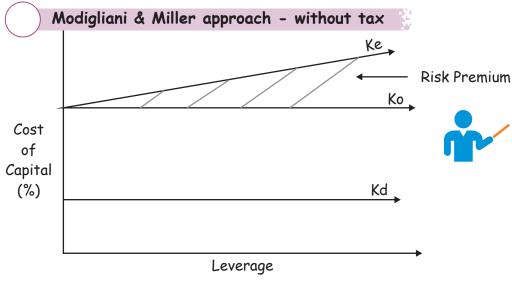
Phase I: Initially the ratio of Debt is very small (between 0% to 20%) due to which neither Equity nor Debt feels the risk. Hence both Ke & Kd remains constant. Consequently, Ko declines as leverage increases.

Phase II: As the ratio of Debt increases further, the fixed financial burden is now felt by Equity and hence Ke starts increasing gradually. Consequently, Ko declines but upto certain point only beyond which it start increasing.

Phase II: Beyond certain leverage level (say more than 60% ratio of Debt) both Eq as well as Debt stand at risk leading to an increase in Kd & Ke
Resultantly, Ko increases sharply

Somewhere in the middle of phase II we come across "Optimum capital structure"

Modigliani & Miller approach - without tax

Ke = Ko + Risk Premium

$$Ke = Ko + (Ko - Kd) \times \frac{Debt}{Equity}$$

here, Ke means Ke of a levered firm

Modigliani & Miller Approach - With Tax

A levered firm having Debt in its capital structure will be able to claim tax benefit on intt & hence $V_L > V_U$ to the extent of tax advantage. Therefore, capital structure (i.e. debt equity mix) becomes relevant.

Value of a levered firm　　= Value of an Unlevered firm + Tax benefit

$$V_L = V_U + (D \times t)$$

here,

　　D means Debt amount

　　t means corporate tax rate

Steps to calc Value of Firm, Equity & Cost of Capital & Equity

Steps will remain the same as under NOI approach (although formulas are relevant but can't be applied due to lack of info)

Step 1:　(a)　Calc value of Unlevered firm

$$V_U = \frac{EBIT(1-t) \text{ or } EAT}{\text{Overall capitalization rate of an unlevered firm}} \quad or \quad \frac{}{K_e \text{ of an unlevered firm}}$$

(b)　Calc value of a Levered firm

$$V_F = \frac{EBIT}{K_o} \qquad V_L = V_U + D \times t$$

Since Ko is changing hence not available

Step 2: Calc value of equity

= Value of firm (-) value of debt

Step 3: Calc cost of equity

$$K_e = \frac{\text{Net income i.e. EAT}}{\text{Value of equity}}$$
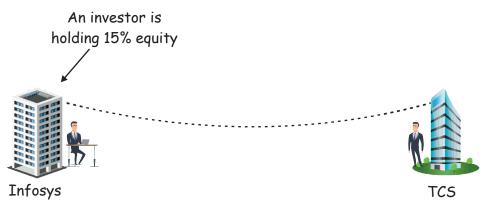
Step 4: Calc cost of capital

$$K_o = K_e \times w_e \quad + \quad K_d \times w_d$$

Step 3 ⟶ $\frac{E}{E+D}$ I% (1 - t) $\frac{D}{E+D}$

Arbitrage process under M-M approach

Assumptions: 1. There are NO taxes
2. 100% of earnings are distributed as dividends i.e. 100% dividend payout ratio

An investor is
holding 15% equity

Infosys   TCS

Same ₹	Revenue	Same ₹
Same ₹	Op. Inc. ie. EBIT	Same ₹
Same	Business Risk Level	Same
Unlevered	Leverage Level	Levered

Overall value of both the firms must be the same irrespective of capital structure

Example 1: When Unlevered firm is Overvalued

Infosys		TCS
₹ 1,00,000	Operating Income	₹ 1,00,000
-	Debt @8%	₹ 3,00,000
10%	Equity capitalization rate i.e. Ke	16%

Solve:

	Infosys i.e. unlevered firm	TCS i.e. levered firm
Operating income	₹ 1,00,000	₹ 1,00,000
Less: Interest	-	24,000
EBT i.e. Net income	₹ 1,00,000	₹ 76,000
Ke	10%	16%
Value of Equity $\left(\dfrac{NI}{Ke}\right)$	10,00,000	4,75,000
Value of Debt	-	3,00,000
Value of Firm	10,00,000	7,75,000
Valuation status	Overvalued	Undervalued

Comment: Ideally, Overall value of both the firms must be the same under MM approach (w/o taxes). If there is a difference then arbitrage process will start where investors in an overvalued firm will sell their holdings & buy holdings in an undervalued firm.

Steps under arbitrage process when unlevered firm is overvalued

		Particulars	Amoumt
Step 1:		Investor's present position in overvalued firm	
	(a)	Market value of investment [₹ 10,00,000 x 15% shareholding]	₹ 150000
	(b)	Dividend income [₹ 1,00,000 x 15% shareholding]	₹ 15000
Step 2:		Investor sells his present stake	
	(a)	Proceeds from selling stake	₹ 150000
Step 3:		He purchases same % stake* in undervalued firm	
	(a)	Investment in Equity [₹ 475000 x 15%]	₹ 71250
	(b)	Investment in Debt [₹ 300000 x 15%]	₹ 45000
			₹ 116250
Step 4:		His income after switching process	
	(a)	Dividend income [₹ 76000 x 15%]	11400
	(b)	Interest income [₹ 24000 x 15%]	3600
	(c)	Total income	15000

It may be observed that investor is able to maintain his same earnings of ₹ 15000 but reduced outlay by ₹ 33750.

Step 5: The amount by which investor could reduce his outlay [₹ 150000 - ₹ 116250]

*Alternatively he could have invested whole proceeds of ₹ 150000 to buy 19.35% [₹ 150000 / ₹ 775000] and earn additional income of ₹ 4350 [₹ 100000 × 19.35% - ₹ 15000]

New Earnings   Present Earnings

Example 2: When Levered firm is Overvalued

	Infy i.e. Unlevered	TCS i.e. Levered
Operating Inc.	₹ 100000	₹ 100000
8% Debt		₹ 300000
Eq. Cap rate ie Ke	15%	16%

How arbitrage process can be carried by an investor holding 15% equity stake in Overvalued firm ?

Solve:

	Infosys	TCS
Operating Income	100000	100000
Less: Intt	-	24000
PBT or Net income	100000	76000
Ke	15%	16%
Value of Eq [NI / Ke]	666667	475000
Value of Debt	-	300000
Value of Firm	666667	775000
Valuation status	Undervalued	Overvalued

Ideally, Value of both the firms must be the same. In case of difference, on investor will switch from an overvalued firm to an undervalued firm.
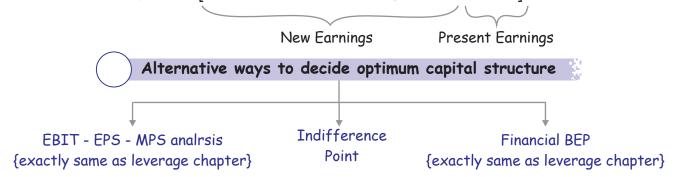
Steps under arbitrage process when levered firm is overvalued

	Particulars		Amoumt
Step 1:	Investor's present positions in overvalued firm		
	(a)	Market value of investment [₹ 475000 x 15%]	71250
	(b)	Dividend income [₹ 76000 x 15%]	11400
Step 2:	Investor sells his present stock		
	(a)	Proceeds from selling stoke	71250
	(b)	He borrows proportionate to his share of debt [300000 x 15%]	45000
	(c)	Total amount available	116250
Step 3:	He purchases same % *of equity holding of an undervalued firm [₹ 666667x15%]		100000
Step 4:	His net income after switching process		
	(a)	Dividend income [₹ 10000 x 15%]	15000
	(b)	Less: Interest on personal borrowings [₹ 45000 x 8%]	3600
	(c)	Net income	11400
Step 5:	The amount by which investor could reduce his outlay through the use of arbitrage process		₹ 16250

It may be observed that investor is able to maintain his earnings of ₹ 11400 but reduced outlay by ₹ 16250.

*Alternatively, he could have invested whole proceeds of ₹ 116250 to buy 17.44% [₹ 116250 / ₹ 666667] and earn additional income of ₹ 2437 [₹ 100000 x 17.44% - 45000 @ 8% intt - ₹ 11400]

New Earnings   Present Earnings

Alternative ways to decide optimum capital structure

EBIT - EPS - MPS analrsis
{exactly same as leverage chapter}

Indifference Point

Financial BEP
{exactly same as leverage chapter}

Various financing alternatives or capital structures would be given. We have to prepare I/s to find out EPS (or MPS) for each alternative and select the Alternative that results in highest EPS (or MPS)

For various financing alternatives, we have to calc Financial BEP & select the Alternative having least Financial BEP.

Indifference point | EBIT - EPS Indifference Point | Debt - Equity Indifference Point
is a level of EBIT at which EPS under both the financing alternatives is same.

I/S

Particulars	Alt I Debt financing	Alt II Equity financing
EBIT	?	?
.	.	.
.	.	.
EPS	Same EPS =	Same EPS

Example:
Capital requirement = ₹ 10,00,000

	Alt I	Alt II
10% Debt	200000	500000
Equity (Face Value = ₹ 10)	800000	500000

Tax rate = 30%
Calc Indifference Point ?

Solve:
There are two ways to salve
├─ Statement Approach
└─ Formula Approach

Statement Approach
Let the EBIT be x at which EPS under both the alternatives is same.

Income Statement

	Alt 1	Alt 2
EBIT	x	x
Less: Interest on Debt	20000	50000
EBT	x - 20000	x - 50000
Less: Taxes @30%	0.3x - 6000	0.3x - 15000
EAT	0.7x - 14000	0.7x - 35000
Less: Dp	-	-
EAES	0.7x - 14000	0.7x - 35000
÷ No. of shares	80000	50000
EPS	0.7 - 14000	0.7x - 35000
	80000	50000

Equating EPS under both the alternatives

$$\Rightarrow \quad \frac{0.7x - 14000}{\underset{1.6}{80000}} = \frac{0.7x - 35000}{50000}$$

$\Rightarrow 0.7x - 14000 = 1.12x - 56000$

$\Rightarrow 56000 - 14000 = 1.12x - 0.7x$

$\Rightarrow 42000 = 0.42x$

$\therefore x = 42000/0.42 = 100000$

Formula Approach

$$\frac{(EBIT - I_1)(1 - t) - Dp}{E_1} = \frac{(EBIT - I_2)(1 - t) - Dp}{E_2}$$
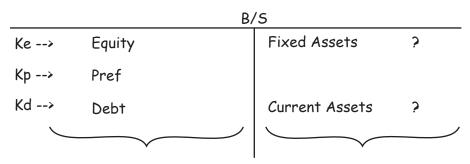
here,

I_1 & I_2 means Interest amount under Alt 1 & 2

E_1 & E_2 means No. of equity shares under Alt 1 & 2

Conclusion

Level of EBIT	Reference	Comment
EBIT < Indiff Point	Prfer an option having more equity	Since our EBIT would be less therefore it is NOT financially prudent to have fixed Intt commitment on Debt.
EBIT = Indiff Point	Either Alterative can be selected	Since EPS would be same under both the Alt
EBIT > Indiff Point	Prefer an option having more amt of Debt	Since Co. is now capable to meet fixed intt obligation & hence using more Debt will result in less dilution of EPS.

Investment Decisions

```
                                B/S
Ke --→        Equity          | Fixed Assets        ?
Kp --→        Pref            |
Kd --→        Debt            | Current Assets      ?
         ⎨_____⎬          ⎨_____⎬
```
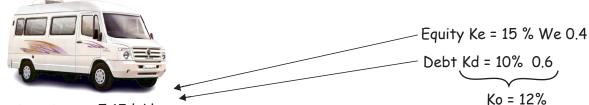
Financing Decisions   Investment Decisions
1. Leverages
2. Cost of capital
3. Capital Structure

Learning Objective: How to take Investment Decisions ? How to analyze financial viability of Investment / capital expenditure ?

Eg. Force Motors - Traveller vehicle

Equity Ke = 15 % We 0.4

Debt Kd = 10% 0.6

Ko = 12%

Investment   = ₹ 15 lakhs
Life   = 5 yrs.
Revenue   = ₹ 25 per km x 250 kms per day x 20 days per month x 12 months
Cost   = Diesel   =   15 kmpl , ₹ 100 per liter of diesel
                   Driver's Sal. =   ₹ 15000 per month
                   Other Op Cost (Repairs, Maintenance etc) = ₹ 300000 per annum
Depn.   = 25 % WDV   Tax Rate = 30 %
Scrap value   = ₹ 300000
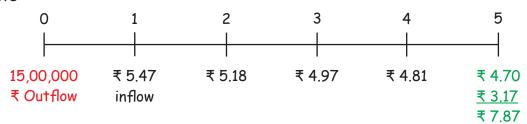
Solve:

```
      0         1         2         3         4         5
      |─────────|─────────|─────────|─────────|─────────|

15,00,000    ₹ 5.47    ₹ 5.18    ₹ 4.97    ₹ 4.81    ₹ 4.70
₹ Outflow    inflow                                  ₹ 3.17
                                                     ₹ 7.87
```

A. **Initial Investment**
   Cost of Vehicle = ₹ 15,00,000 [Outflow]

B. Annual Cash Flows   [₹ in lakhs]

Particulars	1	2	3	4	5
Revenue [₹25 per km x 250kms x 20 days x 12 m]	15	15	15	15	15
Less: Cash Operating Cost					
- Diesel $\left[\dfrac{60000 \text{ kms}}{15 \text{ kmpl}} \times ₹ 100 \text{ per litre}\right]$	4	4	4	4	4
- Driver	1.8	1.8	1.8	1.8	1.8
- Other Op Cost	3	3	3	3	3
CFBT	6.2	6.2	6.2	6.2	6.2
Less : Depn	3.75	2.8125	2.1	1.58	1.19
PBT	2.45	3.39	4.10	4.62	5.01
Less ; Taxes @ 30 %	0.73	1.02	1.23	1.39	1.50
PAT	1.72	2.37	2.87	3.23	3.51
Add back : Depn	3.75	2.81	2.1	1.58	1.19
CFAT	5.47	5.18	4.97	4.81	4.70
PVF @ 12 %	0.892	0.797	0.712	0.635	0.567
PV of annual CF's	4.87	4.13	3.54	3.05	2.66

18.25 lakhs

C. Terminal Value

Proceeds on sale of Asset	300000
Tax benefit on capital loss [(355957 - 300000) x 30 % tax benefit]	16787
	316787
PVF (@ 12%, 5th yr)	0.567
PV of terminal Cf's	1.80 lakhs

NPV = PV$_I$ - PV$_O$

=   18.25 lakhs + 1.80 lakhs - 15 lakhs

=   + 5.05 lakhs   Since NPV is +ve therefore, Accept the project

WN # 1   Cal of WDV

= $1500000 \times (1 - 0.25)^5$

= ₹ 355959
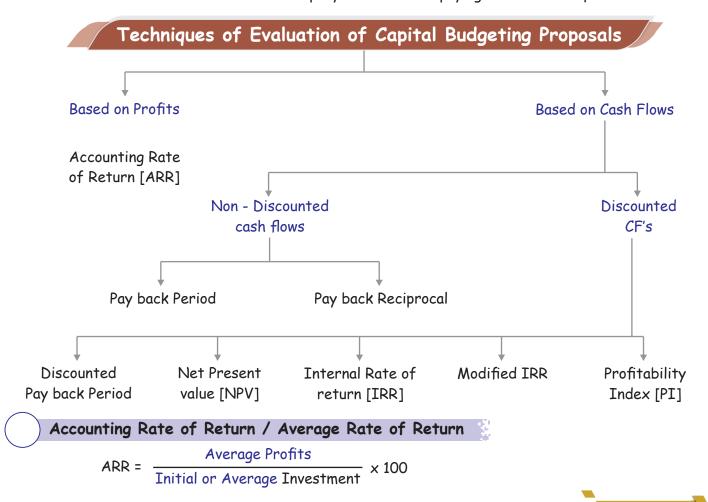
Important Points to remember :-

1. **Why we add back Depn ?**

   Since we have already deducted full amount of Initial Investment there fore, deducting Depn once again from Annual CFS would tantamount to double consideration of the Same Expenditure.

   Still we deduct Depn from cash flows. The purpose is to ascertain the correct amount of Tax (i.e. to take Tax benefit on Depn) and there after we add back Depn to nullify the effect of deducting Depn.

2. **Why we don't deduct Interest while calc. Annual Cf's ?**

   Interest Expenses are already incorporated when discounting @ Ko

3. **Since we are not deducting Intt on Debt, are we loosing the Tax benefit ?**

   No, we are not loosing the Tax benefit. In fact, it has already, been considered while calc Kd (Remember that Kd is based on after- tax intt Rates) & hence when we use Kd we have already taken into account tax benefit on interest exps.

4. **Where are we paying back Principal amount of Debt ?**

   When we deduct initial outflow of ₹ 15 lakhs from PV_I (i.e. from ₹ 20.05 lakhs) then it is effectively just like paying back principal amount raised from Debt (₹ 9 lakhs) and equity (₹ 6 lakhs). Hence NPV of ₹ 5.05 lakhs is the met addition to the company's wealth after paying back to both Eq. & Debt.

Techniques of Evaluation of Capital Budgeting Proposals

Based on Profits

Based on Cash Flows

Accounting Rate of Return [ARR]

Non - Discounted cash flows

Discounted CF's

Pay back Period

Pay back Reciprocal

Discounted Pay back Period

Net Present value [NPV]

Internal Rate of return [IRR]

Modified IRR

Profitability Index [PI]

Accounting Rate of Return / Average Rate of Return

$$ARR = \frac{Average\ Profits}{Initial\ or\ Average\ Investment} \times 100$$

Eg.

Initial Investment = ₹ 15 lakhs

Salvage Value at the end = ₹ 3 lakhs

Depn on SLM basis

Profit after tax is as below:-   (₹ lakhs)

Year	1	2	3	4	5
PAT	₹ 4	₹ 3	₹ 2.5	₹ 2	₹ 1

Calc ARR using 3 Different Ways

 (i) Total Investment basis

 (ii) Annual basis

 (iii) Average Investment basis

Solve: <u>Working Note</u>

Year	PAT	Valve of Investment	
		Beginning	End
1	4	15	12.6
2	3	12.6	10.2
3	2.5	10.2	7.8
4	2	7.8	5.4
5	1	5.4	3

(i) Total Investment basis (aka initial investment basis)

$$ARR = \frac{\text{Average Annual PAT}}{\text{Investment in the beginning}} \times 100$$

$$= \frac{(4+3+2.5+2+1)/5 \text{ Yrs}}{15} \times 100$$

$$= \quad 16.67\,\%$$

(ii) Annual basis (i.e. calc profit % for each year by dividing PAT by investment value at the beginning of that yr)

Year	Computation	Rate of Return
1	4 / 15	26.67 %
2	3 / 12.6	23.80 %
3	2.5 / 10.2	24.51 %
4	2 / 7.8	25.64 %
5	1 / 5.4	18.5 %

Average ARR = $\dfrac{26.67\ \% + 23.80\ \% + 24.51\ \% + 25.64\ \% + 18.5\%}{5}$

= 23.83 %

(iii) Average Investment basis

Average Investment = $\dfrac{\text{Initial Inv + Salv value}}{2}$

= $\dfrac{15\ \text{lakhs} + 3\ \text{lakhs}}{2}$

= 9 lakhs

or

= 1/2 (Initial Inv - Salvage Value) + Salvage Value

= 1/2 (15 lakhs - 3 lakhs) + 3 lakhs

= 9 lakhs

Average Annual Profit = $\dfrac{4 + 3 + 2.5 + 2 + 1}{5\ \text{Yrs}}$

= 2.5 lakhs

ARR = $\dfrac{\text{Avg Ann Profit}}{\text{Avg Inv}} \times 100$

= $\dfrac{2.5\ \text{lakhs}}{9\ \text{lakhs}} \times 100$

= 27.78 %

Tutorial Note: If Q is silent about which version of ARR to be used in exam then prefer either (i) or (iii) method & write the corresponding assumption

Decision Rule :

ARR   Vs.   Minimum Acceptable rate of return

If ARR > Minimum Acceptable   If ARR < Minimum Acceptable

Accept   Reject

Pay - Back Period

is the time required to recover the initial Investmeat back

If uniform Cash flow over the life

Pay back = $\dfrac{\text{Total Initial Investment}}{\text{Annual CFAT}}$

If Not uniform Cash flows

There is no formula as such. The Simple trick is to cumulate the Cash flows and stop at that point of time where cumulative CF's = Initial investment

Example: Initial investment = ₹ 10 lakhs
Uniform Annual Cf's = ₹ 1 lakhs
calc payback period ?

Solve :   Pay - back period $= \dfrac{\text{Initial investment}}{\text{Annual CFAT}} = \dfrac{10,00,000}{1,00,000} = 10\,yrs$

Q.   What if in above Q , CF pattern is not uniform as indicated below :-
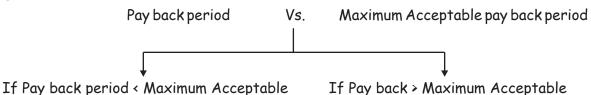
Year	CF
1	100000
2	150000
3	200000
4	250000
5	400000
6	500000

Solve :   Use Cumulative CF Technique

Year	CF	Cumulative CF
1	100000	100000
2	150000	250000
3	200000	450000
4	250000	700000
5	400000	1100000
6	500000	1600000

Pay back Period = 4 Years + $\dfrac{3,00,000}{4,00,000}$ ← Unrecovered remaining portion of ini. inv.

← Total CF in the next yr

= 4.75 years
or 4 years & 9 months ← 0.75 Yr x 12 M

Decision Rule :

Pay back period   Vs.   Maximum Acceptable pay back period

If Pay back period < Maximum Acceptable   If Pay back > Maximum Acceptable

Accept   Reject

Pay - back Reciprocal

Pay back Reciprocal $= \dfrac{1}{\text{Pay back Period}}$

Pay back reciprocal is a close approximation of the 'rate of return' on the project.

Eg. Calc pay back reciprocal for above example

Solve :

$= \dfrac{1}{4.75 \text{ Years}}$

$= 21.05\,\%$
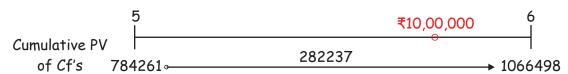
Discounted Pay back Period

Instead of cumulating CF's (as we used to do under 'Payback Period Method'), we will cumulate PV of CF's to calc Disc pay back period.

Eg.   In above eg, Say Discounting Rate is 10 %

Solve:

Year	CF	PV of CF @ 10 %	Cumulative PV of CF's
1	100000	90909	90909
2	150000	123967	214876
3	200000	150263	365139
4	250000	170753	535892
5	400000	248369	784261
6	500000	282237	10,66,498

Cumulative PV of Cf's

5   ₹10,00,000   6

784261   282237   1066498

Discounted Pay back Period = 5 Years + $\dfrac{215739}{282237}$ ◄— Shortfall i.e. Unrecovered remaining amount

◄— Amount if we work for the entire year

= 5.76 years

or 5 years 9 month 4 days

⭕ Net Present Valve Method [NPV Method]

$$NPV = PV \text{ of Inflows} - PV \text{ of Out flows (aka Initial Inv.)}$$

PV of Annual CF's   PV of Terminal Cf's

Generally, it is a 4 - step process :-

Step 1: Calc PV_o, i.e Initial Investment

Step 2: Calc CFAT & its PV of Annual Cf's

Step 3: Calc Terminal CF's & its PV of Terminal Cf's

Step 4: NPV = PV of Annual Cf's + PV of Terminal Cf's - Ini. Inv

Format for solving Question :-

A. **Initial Investment**
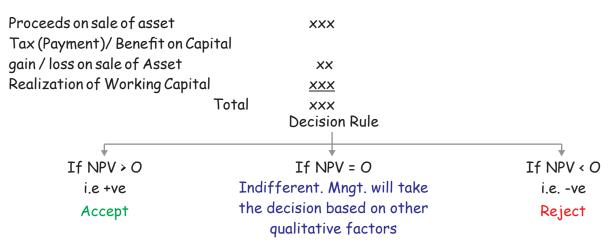
Purchase Cost of Asset	xxx
Investment in Working Cap	xxx
	xxx

B. Pv of Annual CF's

Particulars	Year 1	Year 2	Year 3
Sales Revenue		xxx	
Less : Variable Cost		xxx	
Contibution		xxx	
Less : Cash Fixed Cost		xx	
CFBT		xxx	
Less : Depn		xx	
PBT			
Less : Taxes			
PAT			
Add back : Depn			
CFAT		xxx	
Less : Additional cap Expenditure		xx	
Less : Incremental W/c Investment		xx	
Net CF's		xx	

C. PV of Terminal Cf's

Proceeds on sale of asset	xxx
Tax (Payment)/ Benefit on Capital gain / loss on sale of Asset	xx
Realization of Working Capital	xxx
Total	xxx

Decision Rule

If NPV > O	If NPV = O	If NPV < O
i.e +ve	Indifferent. Mngt. will take the decision based on other qualitative factors	i.e. -ve
Accept		Reject
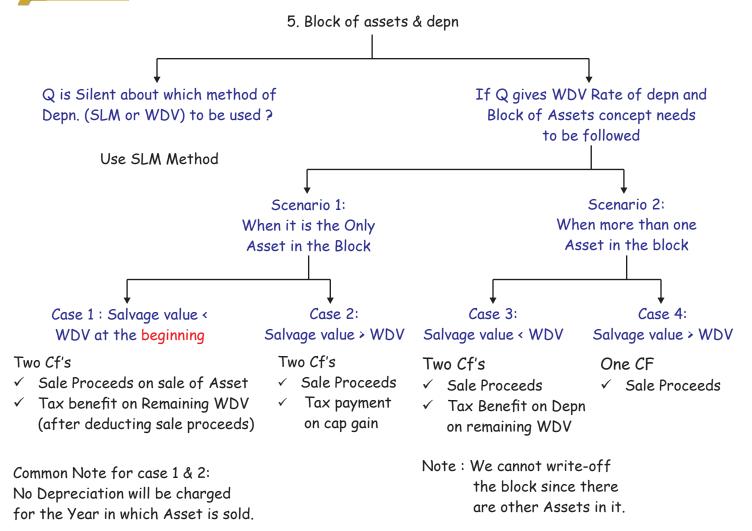
👉 Points to Remember :
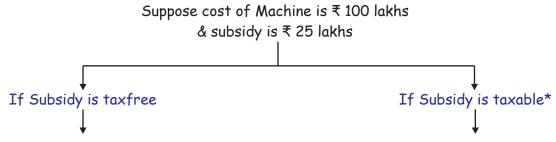
1. In case of Replacement Decisions, Purchase cost of New Asset is an Outflow (as usual) but sale proceeds of old asset along with tax treatment on Cap Gain / loss (if any) is considered as an inflow

4. Sunk cost is an outlay that has already been incurred and hence becomes irrelevant in decision - making. Ignore such costs eg. consultancy fees already paid.

2. Opportunity Cost - Opportunity Cost is the benefit foregone due to accepting the project Eg. Rental Income lost due to using Rented premises for own use in the project.
   Opp costs are deducted from annual Cf's.
   If Q has given 'Opp cost after taxes amount' then deduct from CFAT.
   If Q has given 'Opp cost pre tax amount' then deduct before calculating PBT

3. Allocated Overheads - Allocated Overheads represents a fair share of Expenditure already been incurred. Either, we Accept or Reject the project the Overall Expenditure is going to remain same hence such Allocated cost should be ignored while taking decision.

6. Don't forget to consider recapture of W/c. W/c to be recaptured should include initial W/c Inv as well as Incremental Inv in W/c (if any) during the project period.

7. Don't forget to calc PV of Terminal CF's

5. Block of assets & depn

Q is Silent about which method of Depn. (SLM or WDV) to be used ?

Use SLM Method

If Q gives WDV Rate of depn and Block of Assets concept needs to be followed

Scenario 1: When it is the Only Asset in the Block

Scenario 2: When more than one Asset in the block

Case 1 : Salvage value < WDV at the beginning

Two Cf's
- ✓ Sale Proceeds on sale of Asset
- ✓ Tax benefit on Remaining WDV (after deducting sale proceeds)

Common Note for case 1 & 2:
No Depreciation will be charged for the Year in which Asset is sold.

Case 2: Salvage value > WDV

Two Cf's
- ✓ Sale Proceeds
- ✓ Tax payment on cap gain

Case 3: Salvage value < WDV

Two Cf's
- ✓ Sale Proceeds
- ✓ Tax Benefit on Depn on remaining WDV

Case 4: Salvage value > WDV

One CF
- ✓ Sale Proceeds

Note : We cannot write-off the block since there are other Assets in it.

1.   # Subsidy

Suppose cost of Machine is ₹ 100 lakhs & subsidy is ₹ 25 lakhs

If Subsidy is taxfree

- ✓ Subsidy of ₹ 25 lakhs is an Inflow
- ✓ Depn in the following years shall be Charged on full amount of ₹ 100 lakhs

If Subsidy is taxable*

- ✓ Subsidy of ₹ 25 lakhs is an Inflow
- ✓ Instead of Paying tax on Subsidy Income of ₹ 25 lakhs, Simply adjust it against cost of Asset of ₹ 100 lakhs & then claim Depn on only ₹ 75 lakhs in the following years.

*This is the default assumption if Q is silent.

4.

Carry - Forward of loss

| If Q says "Losses can be carried forward to subsequent years" {Refer Q28} | If Q is completely silent | If Q says "Assume that loss cannot be carried forward" {Refer Q29} |

Same Year: Tax benefit CANNOT be claimed

Next Year: C/f losses will be adjusted against Profits (on calculator) to determine Net Taxable Income & Taxes thereon

Same Year: Claim Tax benefit in the same year

Same Year: Tax benefit CANNOT be claimed

Next Year: Again Tax benefit CANNOT be claimed

Example : Purchase Cost of Asset = ₹ 100000
Life = 5 Years
WDV Rate = 25 %

Tutorial Note: Irrespective of any case / any scenario, calculation of depn for first 4 Years under WDV method will remain the same.

Solve: Calculation of Depn & WDV

Year	Opening WDV	Less: Depn @ 25 %	Closing WDV
1	100000	25000	75000
2	75000	18750	56250
3	56250	14063	42187
4	42187	10547	31640
5	31640	?	

Scenario 1: When it is the only Asset in the block

Case 1 : When Asset is sold @ ₹ 10000

Case 2 : When Asset is sold @ ₹ 40000

- ✓ Depn for 5th Year ie. Year in which Asset is sold is NOT Claimed
- ✓

Cal. of Short term capital loss	
WDV at the beginning of 5 th Year	31640
Less : Sale Proceeds	10000
Remaining Block value	21460

This amount of ₹ 21640 is treated as capital loss on which Tax benefit (₹ 21610 x 30 % tax rate, say) is claimed

Conclusion: Cash flow Position	
Sale Proceeds	₹ 10000 inflow
Tax benefit on Capital Loss [21640 x 30 %]	₹ 6492 inflow

- ✓ Depn for 5th Year i.e. Year in which Asset is sold is NOT Claimed
- ✓

Cal. of Short term capital gain	
WDV at the beginning of 5 th Year	31640
Sale Proceeds	40000
Short Term Capital gain	8360

On above amount of ₹ 8360 we have to pay tax

Conclusion: Cash flow Position	
Sale Proceeds	₹ 40000 inflow
Tax payment on cap gain [8360 x 30%]	₹ 2508 outflow

Scenario 2:   When more than one Asset in the block

Case 1 : When Asset is sold @ ₹ 10000

Case 2 : When Asset is sold @ ₹ 40000

✓ Amount of ₹ 10000 is considered as sale proceeds and hence deducted from the beginning value of block
✓ Remaining value of the block is used to charge Depn for 5th Year

Block at the beginning	31640
(-) Sale Proceeds	10000
Remaining Block value	21640
Depn @ 25 %	5410
Tax benefit @ 30 %	1623

Conclusion: Cash flow Position	
Sale Proceeds	10000 inflow
Tax benefit on Depn	1623 inflow*

✓ Amount of ₹ 40000 is considered as an inflow
✓ No Treatment of capital gain/ (loss) needs to be done.

Tutorial Note: Why No Treatment of cap gain ?
Because ₹ 40000 would be deducted from Gross value of block (which might be, say, ₹ 25 lakhs since block comprises of other Assets as well) hence block will still exist with substantial amount & hence there would be no capital gain
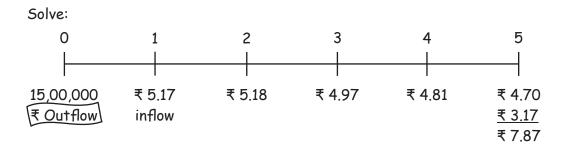
Conclusion: Cash Flow position	
Sale Proceeds	40000 inflow
No CG tax treatment since block still exists	×

Internal Rate of Return Method [IRR]

A rate at which NPV = 0 or in other words, $PV_I = PV_O$
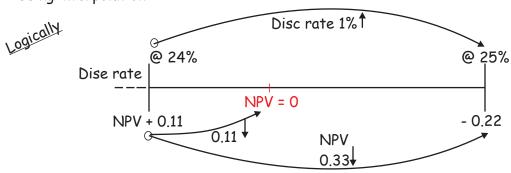
Eg. Let us consider our first example i.e Traveller vehicle and Cale IRR for those CF's

Solve:

```
0          1          2          3          4          5
|----------|----------|----------|----------|----------|

15,00,000  ₹ 5.17    ₹ 5.18     ₹ 4.97     ₹ 4.81     ₹ 4.70
₹ Outflow  inflow                                     ₹ 3.17
                                                      ₹ 7.87
```
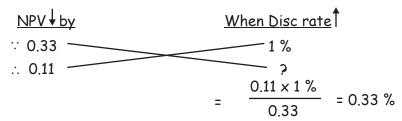
Year	Cash Flows	By Trial & Error				
		@15%		@ 24%		@ 25%
		PVF	PV	PVF	PV	
1	5.47	.	4.76	.	4.41	
2	5.18	.	3.92		.	
3	4.97	.	3.27		.	
4	4.81	.	2.75		.	
5	7.87	.	3.91		.	
		PV_I	18.6		15.11	14.78
		PV_O	15		15	15
		NPV	3.6		+0.11	(0.22)

Using interpolation :-

Logically

@ 24%   Disc rate 1% ↑   @ 25%

Dise rate

NPV = 0

NPV + 0.11   0.11 ↓   NPV 0.33 ↓   – 0.22

NPV ↓ by	When Disc rate ↑
∵ 0.33	1 %
∴ 0.11	?

$$= \frac{0.11 \times 1\%}{0.33} = 0.33\%$$

∴ Disc Rate i.e. IRR   =   24 % + 0.33 %

                   =   24.33 %

Formula

$$= \quad LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} (HR - LR)$$

$$= \quad 24\% + \frac{0.11}{0.11 - (-0.22)} (25\% - 24\%)$$

$$= \quad 24.33\%$$

Decision Rule:

If IRR > WACC i.e Ko	If IRR = WACC i.e. Ko	If IRR < WACC i.e. Ko
Accept	Indifferent	Reject

Comparative Analysis of NPV & IRR

In most of the cases both NPV & IRR gives same Accept / Reject signals. However, in certain cases NPV & IRR may give conflicting results . In such cases NPV method is considered superior to IRR method because .
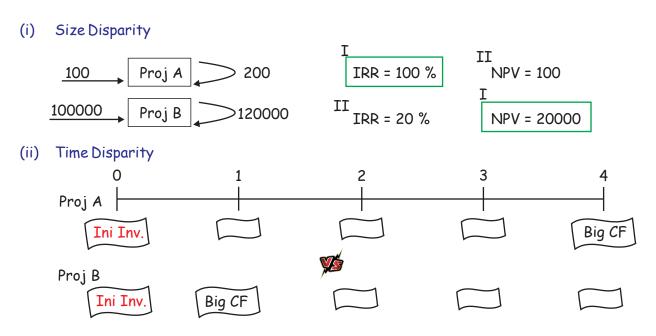
1. NPV method gives answer in Absolute terms whereas IRR method gives answer in % age terms .

    Answer in Absolute terms is better for decision making since it is in conformity with basic objective of financial mngt i.e. wealth Maximization.

    Project A ₹ 100000   COMPANY   IRR= 20%
    NPV = ₹ 20000

    Vs.

    Project B ₹ 10000   IRR= 50%
    NPV = ₹ 5000

    Although Proj B gives higher return in % terms but think which projects adds More wealth for the Co. ?

2. **Reinvestment Assumption:** NPV Method assumes reinvestment of intermediate CF's @ Ko where as IRR method assumes reinvestment of intermediate Cf's @ IRR itself .
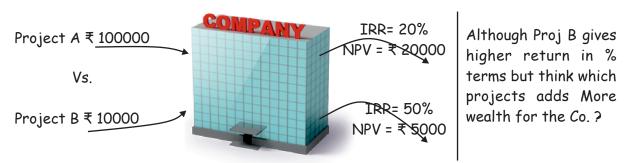   It is relatively easy to reinvest CF's @ ko as compared to reinvesting @ higher IRR. hence, reinv. assumption of NPV method is better (i.e. more realistic) than that of IRR method.

3. In case of mutually exclusive projects, in certain situations, NPV & IRR methods may give contradictory results the different rankings given by NPV & IRR methods could be due to:

    (i)   Size Disparity

    100 → Proj A > 200
    100000 → Proj B > 120000

    I   IRR = 100 %   II   NPV = 100
    II IRR = 20 %   I   NPV = 20000

    (ii) Time Disparity

	0	1	2	3	4
Proj A	Ini Inv.				Big CF
Proj B	Ini Inv.	Big CF			
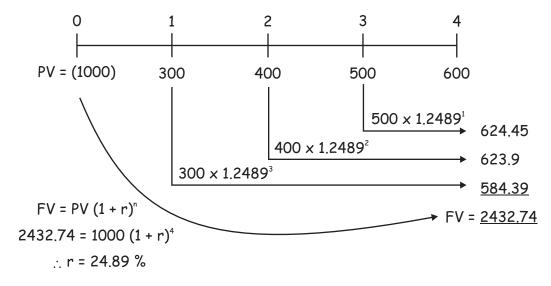
    Other things being constant if a big chunk of CF is recd. in initial yrs itself in proj B then it will command higher IRR despite having lower NPV.

Modified Internal Rate of Return [MIRR]

The inherent assumption of IRR method is that intermediate CF's are reinvested at the same rate as IRR itself which may not be a realistic assumption. On the contrary, MIRR provides the flexibility of using a different reinvestment & hence addresses the issue of unrealistic assumption in IRR.

$$FV = PV (1 + r)^n$$
$$2432.74 = 1000 (1 + r)^4$$
$$\therefore r = 24.89 \%$$

Disclaimer: Above calculated IRR of 24.89% can be earned only when Co. is able to reinvest inter mediate Cf's @ 24.89% again .

Q. What if I could not reinvest @ 24.89% instead I could reinvest only @ 12 % ?

Answer: Then your real rate of return went be 24.89% In fact, it would be definitely less than 24.89%.

Q. Then how much would be my actual / Real rate of return ?

Ans: The. answer lies in MIRR as calc below :-
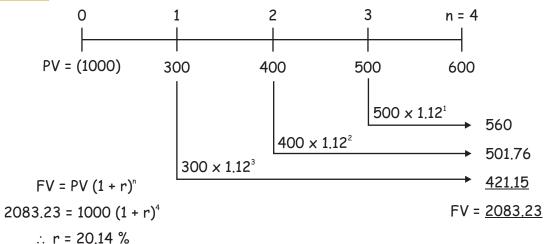
Rough work - cal. of IRR			
Year	CF	PV @ 24%	PV @ 25%
1	300		
2	400		
3	500		
4	600		
		1081.1	997.76
		(1000)	(1000)
NPV		18.1	(2.24)

Using interpolation :

$$= 24 \% + \frac{18.1}{18.1 - (-2.24)} = 24.89 \%$$

Q.   Then how much would be my Actual / Real Rate of return ?

Ans: The answer lies in MIRR as calc below :-

$$0 \quad\quad 1 \quad\quad 2 \quad\quad 3 \quad\quad n = 4$$

PV = (1000)   300   400   500   600

$500 \times 1.12^1 \rightarrow$ 560

$400 \times 1.12^2 \rightarrow$ 501.76

$300 \times 1.12^3 \rightarrow$ 421.15

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

$$2083.23 = 1000(1+r)^4$$

FV = 2083.23

$$\therefore r = 20.14\%$$

Note1: It is not essential to calc IRR before calc MIRR. Infact MIRR can be calc even without knowing IRR.

Note 2: To calc MIRR, Q has to provide reinvestment rate. If not given in the Q then Simply assume reinvestment rate to be same as Ko.

Profitability Index Method/Desirability Factor-Useful in Situations of Capital Rationing

Eg. Investment Amount Available = ₹ 200000

	Educational Institute	Hostel	Cafe	Hotel
Initial Inv./ PV of Outflows	1,00,000	60,000	40,000	80,000
PV of inflows	1,25,000	70,000	45,000	94,000

Case 1:
When Projects are Divisible in nature

Step 1: Calculate Profitability Index

$$= \frac{PV\ of\ inflows}{Initial\ Inv}$$

Step 2: Rankings in the decreasing order of PI.

Step3: Allocation of Capital based on Rankings

Step4 : Calc Aggregate NPV.

Case 2:
When Projects are Indivisible in nature

Step 1: Calculate Profitability Index

$$= \frac{PV\ of\ inflows}{Initial\ Inv}$$

Step 2: Rankings in the decreasing order of PI.
Note: But do not make allocation of Capital based on rankings

Step3: Make various Alternatives using permutations /combinations that are feasible within the limit of Capital available.

Step4 : Calc Aggregate NPV for each alternatives & select Alt that has highest NPV.
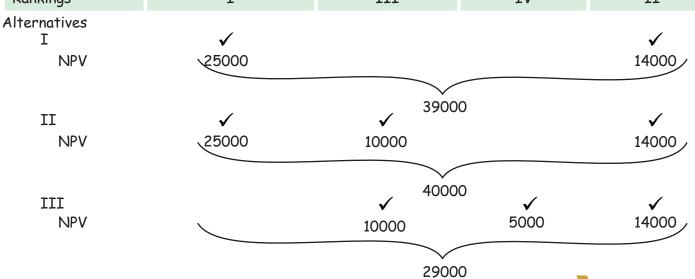
Solve: Case 1: When Projects are DIVISIBLE

Particulars	Educational Institute	Hostel	Cafe	Hotel
PV of inflows	1,25,000	70,000	45,000	94,000
Ini inv.	1,00,000	60,000	40,000	80,000
NPV	25,000	10,000	5,000	14,000
PI $\left(\dfrac{PV_I}{Ini\ Inv}\right)$	1.25	1.167	1.125	1.175
Rankings	I	III	IV	II
Allocation of capital	100000	20000 (bal. flg)	-	80000
NPV	25000	3333 $\left[10000 \times \dfrac{20000}{60000}\right]$	-	14000

42333

Case 2: When Projects are INDIVISIBLE

Particulars	Educational Institute	Hostel	Cafe	Hotel
PV of inflows	1,25,000	70,000	45,000	94,000
Initial Inv.	1,00,000	60,000	40,000	80,000
NPV	25,000	10,000	5,000	14,000
PI $\left(\dfrac{PV_I}{Ini\ Inv}\right)$	1.25	1.167	1.125	1.175
Rankings	I	III	IV	II

Alternatives

	Educational Institute	Hostel	Cafe	Hotel
I	✓			✓
NPV	25000			14000

39000

	Educational Institute	Hostel	Cafe	Hotel
II	✓	✓		✓
NPV	25000	10000		14000

40000

	Educational Institute	Hostel	Cafe	Hotel
III		✓	✓	✓
NPV		10000	5000	14000

29000

Decision: Co. should select Alternative II (i.e. implement Project - Ed Inst, hostel & Cafe) since it results in highest NPV of ₹ 40000.

Note: If in exam, instead of PVI, Q has directly given NPV we may simply calc Profitability Index by using

$= \dfrac{NPV}{Ini\ Inv}$ (Refer Q 18 & Q 19)

Projects with Unequal life
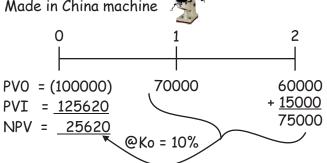
	Made in China machine [Mach - A]	Made in Japan machine [Mach - B]
Cost of machine	1,00,000	1,80,000
Life	2 Years	3 Years
Salvage value	15,000	18,000
Net CFAT Year 1 2 3	70,000 60,000 -	90,000 80,000 70,000
Ko	10%	

Solve :

Made in China machine

```
        0            1            2
        |------------|------------|

PVO  = (100000)    70000        60000
PVI  =  125620                + 15000
NPV  =   25620                  75000
                 @Ko = 10%
```

Since life of both the Machines is Unequal, therefore, we cannot Compare NPVs

We have to calc ENPV & then Compare ENPV

$ENPV = \dfrac{NPV}{PVAF_{(@\ r\%,\ life\ yrs)}}$

$= \dfrac{25620}{PVAF_{(@\ 10\%,\ 2\ yrs)}} = \dfrac{25620}{1.735} = 14762$

Made in Japan machine

	0	1	2	3

PVO = (180000)   90000   80000   70000

PVI = 214050   18000

NPV = 34050   88000

@Ko = 10%

$ENPV = \dfrac{NPV}{PVAF_{(@ \, r\% \, life \, yrs)}}$

$= \dfrac{34050}{PVAF_{(@ \, 10\%, \, 3 \, yrs)}} = \dfrac{34050}{2.486} = 13692$
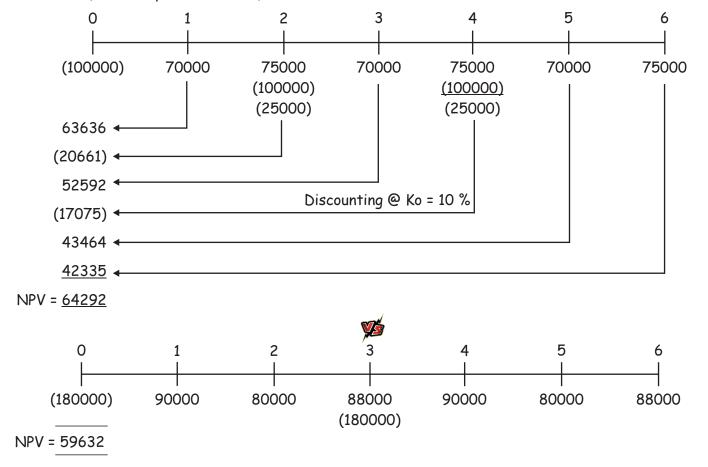
Decision: We should select 'Made in China' machine since it results in higher ENPV

To deal with situation of Projects with Unequal Life, there are 2 methods :-
1. Equivalent NPV (ENPV) / Equivalent Annual criterion (EAC)
2. Replacement chain method / Common life / Time Horizon method
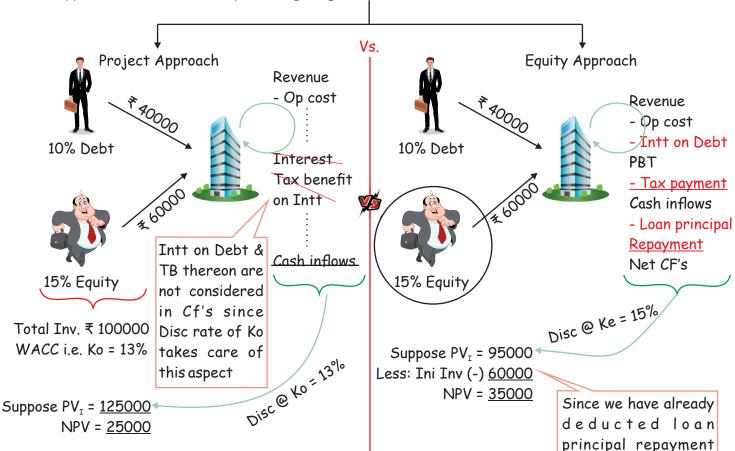
Replacement chain Method / Common Life Method / Common time Horizon method
Made in China (will be repeated 3 times)

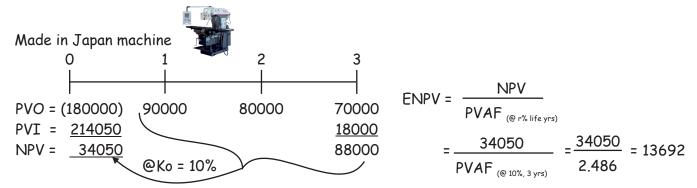| 0	1	2	3	4	5	6

(100000)   70000   75000   70000   75000   70000   75000

(100000)   (100000)

(25000)   (25000)

63636

(20661)

52592

Discounting @ Ko = 10 %

(17075)

43464

42335

NPV = 64292

VS

0	1	2	3	4	5	6

(180000)   90000   80000   88000   90000   80000   88000

(180000)

NPV = 59632

Now, we can simply compare NPVs of both the proposals and take decision based on NPV since Life of both the projects is same.

#Two Approaches to evaluate capital budgeting decisions

Vs.

Project Approach

₹ 40000

10% Debt

₹ 60000

15% Equity

Total Inv. ₹ 100000
WACC i.e. Ko = 13%

Suppose PV_I = 125000
NPV = 25000

Revenue
- Op cost
Interest
Tax benefit
on Intt

~~Interest~~
~~Tax benefit~~
~~on Intt~~

Cash inflows

> Intt on Debt & TB thereon are not considered in Cf's since Disc rate of Ko takes care of this aspect

Disc @ Ko = 13%

Equity Approach

₹ 40000

10% Debt

₹ 60000

15% Equity

Revenue
– Op cost
– Intt on Debt
PBT
– Tax payment
Cash inflows
– Loan principal Repayment
Net CF's

Disc @ Ke = 15%

Suppose PV_I = 95000
Less: Ini Inv (–) 60000
NPV = 35000

> Since we have already deducted loan principal repayment while calc net Cf's therefore only amount that remains to be paid out is investment by equity

Summary of above

	Project Approach	Equity Approach
Discount Rate	: Ko	Ke
Intt on Debt	: Not considered in Cf's {but intt indirectly gets considered in Ko}	Yes, deducted while calc CF's
Tax benefit on Intt	: Not considered in Cf's {but intt indirectly gets considered in Ko}	Yes, Considered while calc Cf's since PBT is calc after deducting intt.
loan Principal Repayment	: Not deducted from Cf's {but Since we deduct Total initial investment from PV_I, these fore, it indirectly gets considered}	Yes. deducted while calculating CF's

Replacement Decisions

👉 Use 'Incremental' Approach i.e (i) Incremental Ini Inv (ii) Incremental Annual Cf's (ii) Incremental Terminal CF's

Eg.
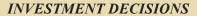
Old Machine		New Machine
	Cost of New Machine	25,00,000
500000	Sale Proceeds on sale of old Machine today	
5 Years	Remaining Life / Life	5 Years
50,000	Salvage value at the end of life	3,00,000
90000 units	Production Capacity	100000 units
₹ 120	Selling Price pu	₹ 120
55	VC pu	₹ 50
600000 p.a.	Repairs & Maint	200000 p.a.
42 lakhs	Other Op Fixed cost	40 lakhs
40%	Tax Rate	40%
15%	Ko	15%
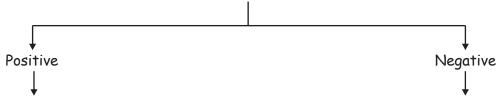
Solve: Evaluation of replacement decision   Prefer in Exam

Particulars	Old Machine	New Machine	Incremental Approach
A. Initial Investment			
Cost of new Machine		(25,00,000)	(25,00,000)
Proceeds on sale of old machine	(5,00,000) being Opp loss		5,00,000
		Incremental Initial Investment	(20,00,000)
B. Annual CF's			
No. of units	<u>90000</u>	<u>100000</u>	
Sales Revenue	₹ 108 lakhs	₹ 120 lakhs	₹ 12 lakhs
Less : Variable Cost	₹ 49.5 lakhs	₹ 50 lakhs	₹ 0.5 lakhs
Contri	58.5 lakhs	₹ 70 lakhs	11.5
Less : Repairs & Maint	6	2	Savings 4
: Other Op. cost	42	40	Savings 2
CFBT	10.5 lakhs	₹ 28 lakhs	₹ 17.5 lakhs
Less : Depn	0.90 lakhs $\left[\dfrac{500000 - 50000}{5 \text{ yrs}}\right]$	4.4 $\left[\dfrac{₹ 25 \text{ lakhs} - 3 \text{ lakhs}}{5 \text{ yrs}}\right]$	₹ 3.5 lakhs Incremental Depn
PBT	9.60 lakhs	₹ 23.6 lakhs	14 lakhs
Less : Taxes @ 40 %			
PAT			
Add back : Depn			Incremental
CFAT	6.66 lakhs	18.56 lakhs	CFAT 11.90 lakhs
PVAF (@15%,5 yrs)	3. _ _ _	3. _ _ _	3. _ _ _
PV of Annual CF's	22.32 lakhs	62. _ lakhs	39.89 lakhs
C. Terminal CF's			
Salvage Value	0.50 lakhs	3 lakhs	2.5 lakhs
PVAF (@15%,5th yrs)	0. _ _ _	0. _ _ _	0. _ _ _
PV of Terminal CF	0.25 lakhs	1.49 lakhs	1.24 lakhs
NPV	17.57 lakhs Vs.	38.71 lakhs	Incremental NPV 21.13 lakhs

Decision Rule: If Incremental NPV is

Positive → Replace Old machine with New machine

Negative → Continue with Old machine

Caution Note:

Old Asset
Sale value of Old Asset
+/- Tax Treatment on CG/CL
After tax salv of old

New Asset
Sale value of New Asset
+/- Tax Treatment on CG/CL
After tax salv of New   =

Incremental
Incremental Sale value
Incremental Tax Treatment
Incremental After tax salv value

Not Recommended in exams
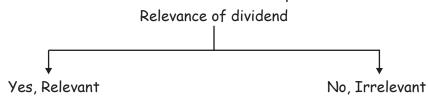
Recommended Approach in Exams
So as to avoid any kind of
calculation +/- mistake

CFBT	1000
- Depn	200
PBT	800
- Taxes @ 30 %	240
PAT	560
+ Depn	200
CFAT	760

or

CFAT = CFBT (1 - t) + Depn × t
= 1000 (1-0.3) + 200 × 30 %
= 700 + 60
= 760

Dividend Decisions
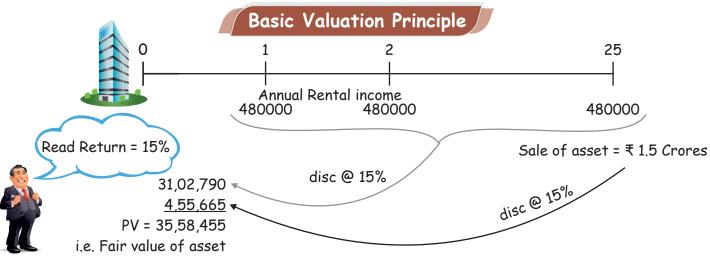
Learning Objective: How to frame dividend policies so as to maximize shareholder's wealth

Price per share x No. of shares

Relevance of dividend

Yes, Relevant | No, Irrelevant
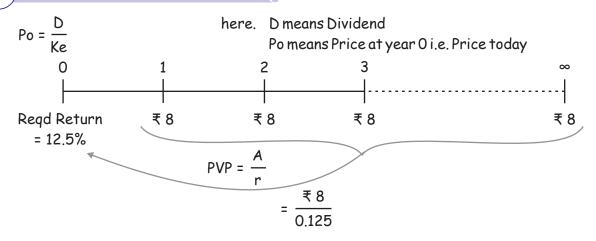
1. Dividend capitalization model
2. Gordon's model
3. Walter's model
4. Graham & Dodd model
5. Lintner's model

6. Earnings capitalization model
7. Modigliani & Miller model

Basic Valuation Principle

| 0 | 1 | 2 | 25 |

Annual Rental income
480000   480000   480000

Read Return = 15%

Sale of asset = ₹ 1.5 Crores

disc @ 15%

disc @ 15%

31,02,790
4,55,665
PV = 35,58,455
i.e. Fair value of asset

☞ "Value of any asset today is the present value of Future cash flows generated from such asset discounted @ "Required rate of return"

Dividend Capitalization Model

$$Po = \frac{D}{Ke}$$

here. D means Dividend
Po means Price at year 0 i.e. Price today

| 0 | 1 | 2 | 3 | ∞ |

Reqd Return
= 12.5%

₹ 8   ₹ 8   ₹ 8   ₹ 8

$$PVP = \frac{A}{r}$$

$$= \frac{₹\ 8}{0.125}$$

Fair value per share = ₹ 64
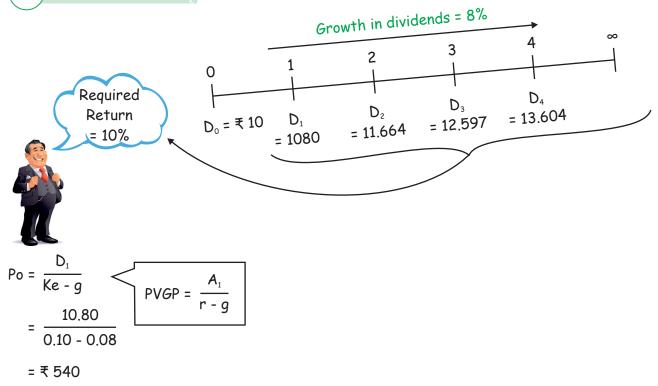
Tutorial Note:

Assumption of dividend capitalization model: Dividend amount will remain constant forever. / Dividend growth model / Dividend discount model / Constant growth model / Dividend valuation model / DCF technique

Gordon's Model

Growth in dividends = 8%

```
        0       1        2         3         4          ∞
        |-------|--------|---------|---------|----------|
     D₀ = ₹ 10   D₁       D₂        D₃        D₄
              = 1080   = 11.664   = 12.597   = 13.604
```

Required Return = 10%

$$P_0 = \frac{D_1}{Ke - g}$$

$$PVGP = \frac{A_1}{r - g}$$

$$= \frac{10.80}{0.10 - 0.08}$$

$$= ₹ 540$$
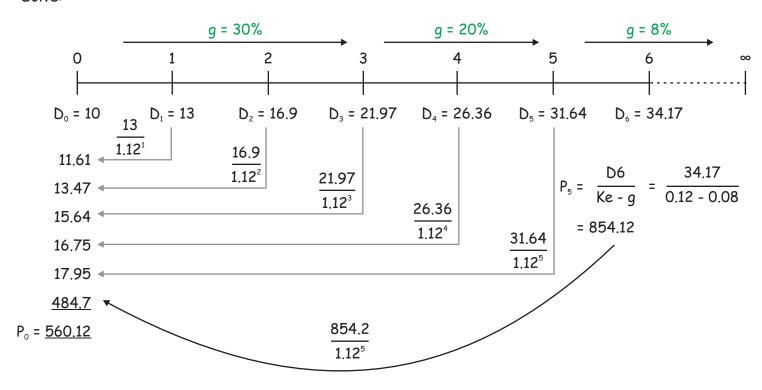
What if there is a variable growth rate in dividends instead of constant growth rate ?

Answer: Use 'Variable growth rate Gordon's Model' / Two stage growth model / Three stage growth model.

Q. Rjio has paid a dividend of ₹ 10 per share in the last year. growth rate is estimated to be 30% for first 3 years, there after it will fall to 20% for next 2 years and it will then stabilize to 8% forever.

Calc Po if investors reqd rate of return is 12% ?

Solve:

$g = 30\%$ $g = 20\%$ $g = 8\%$

```
0        1        2        3        4        5        6        ∞
```

$D_0 = 10$ $D_1 = 13$ $D_2 = 16.9$ $D_3 = 21.97$ $D_4 = 26.36$ $D_5 = 31.64$ $D_6 = 34.17$

$\dfrac{13}{1.12^1}$

11.61

$\dfrac{16.9}{1.12^2}$

13.47

$\dfrac{21.97}{1.12^3}$

15.64

$\dfrac{26.36}{1.12^4}$

16.75

$\dfrac{31.64}{1.12^5}$

17.95

$P_5 = \dfrac{D6}{Ke - g} = \dfrac{34.17}{0.12 - 0.08}$

$= 854.12$

484.7

$\dfrac{854.2}{1.12^5}$

$P_0 = \underline{560.12}$

Exam Presentation

Year	Cash flows / Dividend	PVF @ 12%	PV
1	$D_1 = 10 \times 1.30 = 13$		
2	$D_2 = 13 \times 1.30 = 16.9$		
3	$D_3 = 16.9 \times 1.30 = 21.97$		
4	$D_4 = 21.97 \times 1.20 = 26.364$		
5	$D_5 = 26.364 \times 1.20 = 31.6368$		
5	$P_5 = \dfrac{D_6}{Ke - g} = \dfrac{31.6368 \times 1.08}{0.12 - 0.08}$		
	$= 854.20$		
			$P_0 = 560$

Q. If stock R Jio is available @ ₹ 700 Should you buy the stock ?

Answer: Since actual price (₹ 700) > Fair price (₹ 560) therefore stock of Rjio is overvalued. Hence we should not buy the stock.

Q. Let's say you still decide to buy the shares of Rjio @ ₹ 700 today. How much return will you earn ?

Use 👉 IRR

Year	CF's	@ 10% PVF	@ 10% PV	@ 11% PVF	@ 11% PV	@ 12% PV
1	13					
2	16.9					
3	21.97					
4	26.364					
5	31.6368					
5	$P_5 = \dfrac{34.17}{Ke - 0.08}$	1061.__				

⚠️ **Caution Note:**
Don't make the mistake of using $P_5 = 854$
directly bcoz it has been calc @ $Ke = 12\%$

$P_5 = \dfrac{34.17}{Ke - 0.08}$ 1708

1708 is P_5. Remember, we don't
have to write P_5 in this column.
Instead we have to write PV of P_5

PVI	1140.79	753	560
PV_0	700	700	700
NPV	+ 440.79	+ 53	140

Using Interpolation:

$$= LR + \frac{NPV_{LR}}{NPV_{LR} - NPV_{HR}} \ (HR - LR)$$

$$= 11\% + \frac{53}{53 - (- 140)} \times (12\% - 11\%)$$

$$= 11.276\% \sim 11.28\%$$

Rate of return an investor will earn on his investment in Rjio stock is 11.28%

👉 Above rate of 11.28% is return for an Investor & Cost of equity (Ke) for the company.

How to calc growth rate - formula method

$g \quad = RR \times ROE \qquad or \qquad g = b \times r$
$\quad = 0.40 \times 20\%$
$\quad = 8\%$

Note: 'g' in earnings = 'g' in dividends provided both RR & ROE remains constant

Eg.   Price per share today = ₹ 540
      Growth rate = 8%
      Expected dividend = ₹ 10.80

      Calc K_e ?
Solve:

$Ke = \dfrac{D_1}{P_0} + g$

$\quad = \dfrac{10.80}{540} + 0.08$

$\quad = 10\%$

ROE = 20%

Q. If Co. earns 20% on retained earnings and shall retain 30% of its earnings.
(i)   whether growth rate will change ?
(ii) Calc Ke ?

Solve:
(i) $g \quad = RR \times ROE$
      $\quad = 0.30 \times 20\%$
      $\quad = 6\%$
      Yes, growth rate is changing

(ii) $Ke = \dfrac{D_1}{P_0} + g$

Tutorial Note: As per ICAI CA Only make adjustment for change in DPR's and hence dont adjust for change in growth rate

$$= ₹ 10.80 \times \frac{70\% \longleftarrow \text{New DPR}}{60\% \longleftarrow \text{Old DPR}}$$

$$= ₹ 12.6$$

$$Ke = \frac{D_1}{P_0} + 9$$

$$= \frac{12.6}{540} + 0.06$$

$$= 8.33\%$$

CA inter study mat has adopted this alternative in one of the Q's hence prefer this alt 2 in exam.

Alternative 2: Assuming 0th yr div has already been paid & retention for 0th yr has already been done

Under this alternative the growth rate for yr 1 will remain same at 8% because we have already retained 40% earnings in 0th yr

Therefore, D_1 will be impacted just because of change in DPR and will not be impacted due to Δ in growth rate

Earlier Expended D_1 = 10.80

Old ↑ DPR = 60%
New ↓ DPR = 80%

Now Expected D_1 = 10.80 $\times \dfrac{80\%}{60\%}$

$$= 14.44$$

$$\therefore Ke = \frac{D_1}{P_0} + g$$

$$= \frac{14.4}{540} + 0.04$$

$$= 6.67\%$$

How to calc growth rate - formula method

$g = RR \times ROE$ or $g = b \times r$

Eg.   Dividend payout ratio = 70%
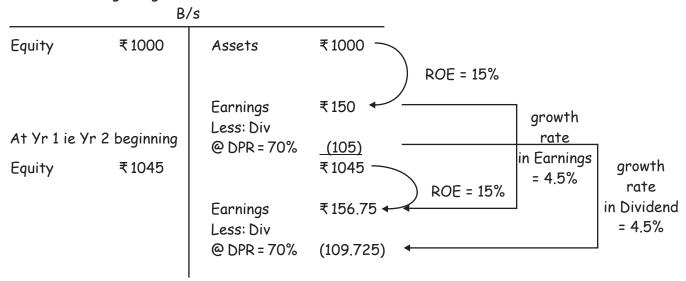
ROE = 15%

Calc g ?

Solve:

g $= RR \times ROE$

      $= 0.30 \times 15\%$

      $= 4.5\%$

Proof

At Yr 0 ie Yr 1 beginning

<div align="center">B/s</div>

Equity	₹ 1000	Assets	₹ 1000

ROE = 15%

Earnings   ₹ 150
Less: Div
@ DPR = 70%   (105)

At Yr 1 ie Yr 2 beginning

Equity	₹ 1045		₹ 1045

growth rate in Earnings = 4.5%

ROE = 15%

Earnings   ₹ 156.75
Less: Div
@ DPR = 70%   (109.725)

growth rate in Dividend = 4.5%

Note: 'g' in earnings = 'g' in dividends. But it will be true only when DPR (or RR) are constant over the yrs. If DPR is changed then result of above formula will only tell you 'g' in earnings. In such case, 'g' in dividends would be at a different rate for that particular year.

⭕ Walter's Model

$$P_0 = \frac{D + \dfrac{r}{Ke}(E - D)}{Ke}$$

here,

       D means Dividend per share

       E means Earnings per share

       r means Rate of return on retained earnings or Return on equity or Return on investment
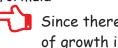
       Ke means Cost of equity

Tutorial Note: Assumption is that 100% inv. is done by Eq hence ROI = ROE will be the same

Derivation of the formula:

$$P_0 = \frac{D + P_1}{1 + Ke}$$

👉 Since there is NO such concept of growth in dividends hence no need to write D_1. Simply write 'D'

$$1 + K_e = \frac{D + P_1}{P_0}$$

$$K_e = \frac{D + P_1}{P_0} - 1$$

$$K_e = \frac{D + P_1 - P_0}{P_0}$$

$$K_e = \frac{D + \boxed{\Delta P}}{P_0}$$

👉 ΔP denotes change in price

$$K_e = \frac{D + \boxed{\dfrac{r}{Ke}(E - D)}}{P_0}$$

👉 Change in share price takes place due to retained earnings. The amount of change in price will be equivalent to PV of return on inv. of such retained earnings disc @ Ke.

$$P_0 = \frac{D + \dfrac{r}{Ke}(E - D)}{Ke}$$

Eg 1

Situation I		II		III	
EPS	= ₹ 10	EPS	= ₹ 10	RR	= 90%
RR	= 40%	RR	= 70%		
RORE	= 15%	RORE	= 15%		
Ke	= 12%	Ke	= 12%		

Calc P_0 using walter's model ?

Solve:

$$P_0 = \frac{D + \dfrac{r}{Ke}(E - D)}{Ke}$$

$$= \frac{6 + \dfrac{0.15}{0.12}(10 - 6)}{0.12}$$

$$= ₹ 91.67$$

$$= \frac{3 + \dfrac{0.15}{0.12}(10 - 3)}{0.12}$$

$$= ₹ 97.\_\_$$

$$= \frac{1 + \dfrac{0.15}{0.12}(10 - 1)}{0.12}$$

$$= ₹ 102.\_\_$$

Observation: As we increase the retention ratio, share price increases.

Tutorial Note: But remember that's an incomplete observation. See Example 2 below

Eg 2

Situation I	II	III
EPS = ₹ 10	EPS = ₹ 10	RR = 90%
RR = 40%	RR = 70%	
r = 10%	r = 10%	
Ke = 12%	Ke = 12%	

Calc P_0 using walter's model ?

Solve:

$$P_0 = \frac{6 + \frac{0.10}{0.12}(10 - 6)}{0.12}$$

= ₹ 77.78

$$= \frac{3 + \frac{0.10}{0.12}(10 - 3)}{0.12}$$

= ₹ 73.61

$$= \frac{1 + \frac{0.10}{0.12}(10 - 1)}{0.12}$$

= ₹ 70.83

Complete Observation

(i) When r > Ke (i.e. Co. can earn more return% that what shhl expectations are) then share prices increases when RR increases.

(ii) When r < Ke (i.e. Co. can earn less return% than what shhl expectations are) then share prices decreases when RR increases.

Tutorial Note: This conclusion opplies to both i.e. walter's as well as gordon's

Optimum Dividend Policy

Condition	Optimum dividend payout ratio	Comment
r > Ke say 15% > 12% [Generally growth companies]	0%	Since Co. can earn returns which are above sh hi expectations
r < Ke say 10% < 12% [Generally Maturity companies or declining]	100%	Since Co. cannot meet sh hi expectations.
r = Ke say 12% = 12% [Constant businesses]	Any payout ratio is optimum	Since Co. can earn returns that exactly equals Sh hi expectations hence shhi will be indifferent as regards Co's dividend policy

Relationship between Ke & PE ratio

$$\text{PE ratio} = \frac{MP}{EPS} \qquad \& \ Ke = \frac{EPS}{MP} \ \text{(this is one of the formulas)}$$

Inverse Relationship

$$\text{i.e. } Ke = \frac{1}{PER}$$

Exam Tip: If Q asks comment about "Whether co. is following optimum div policy" then make it a habit to also calc P_0 at both - the actual DPR as well as optimum DPR.
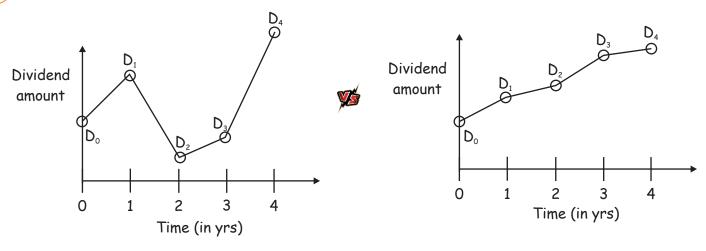
Graham & Dodd Model [Traditional Model]

$$P_0 = m \times \left[D + \frac{E}{3} \right]$$

here,

m means multiplier

Lintner's Model [Traditional Model]
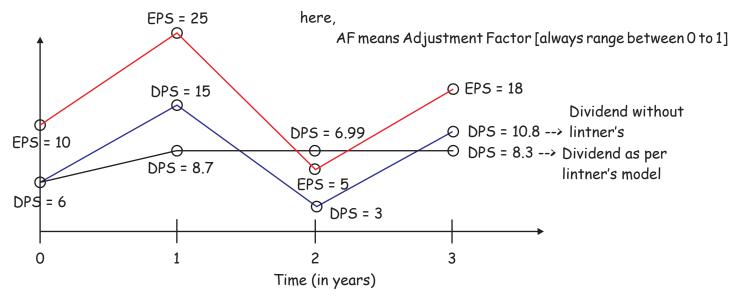
$$D_1 = D_0 + [(EPS_1 \times \text{Target payout ratio}) - D_0] \times AF$$

here,

AF means adjustment factor [always range between 0 to 1]

Target DPR = 60%

EPS = 25

here,

AF means Adjustment Factor [always range between 0 to 1]

DPS = 15

EPS = 18

Dividend without

DPS = 6.99

DPS = 10.8 --> lintner's

EPS = 10

DPS = 8.3 --> Dividend as per

DPS = 8.7

lintner's model

DPS = 6

EPS = 5

DPS = 3

0   1   2   3

Time (in years)

$D_1 = D_0 + [(EPS_1 \times \text{Target payout ratio}) - D_0] \times AF$

Year 1

$= 6 + [(25 \times 0.6) - 6] \times 0.30$

$= 6 + 2.7$

$= 8.7$

Year 2

$= 8.7 + [(5 \times 0.6) - 8.7] \times 0.30$

$= 6.99$

Year 3

$= 6.99 + [(18 \times 0.6) - 6.99] \times 0.30$

$= 8.13$

Tutorial Note: Note on adjustment factor: In exams, AF will always be given in the Questions. In real life, adjustment factor depends on how stable or fluctuating companies earnings are ? If Co. is expected to have stable earnings then keep AF between 0.60 to 0.90. If Co. is expected to experience high fluctuations in earnings then keep AF low (between 0.10 to 0.50). What would be the exact number of AF is a subjective matter.

Irrelevance of Dividend

Earnings Capitalization Model

$$P_0 = \frac{E}{Ke}$$

Assumption of this model: Earnings will remain constant forever.

Modigliani & Miller Model

$$nP_0 = \frac{(n - \Delta n) P_1 - I + E}{1 + Ke}$$

here,

   n means No. of shares outstanding today
   Δn means no. of shares to be issued at the end of year 1
   P_0 & P_1 means price of the share at Yr 0 & Yr 1
   I means Investments to be made i.e. capital expenditure
   E means Earnings

Derivation:

$$P_0 = \frac{D_1 + P_1}{1 + Ke}$$

Multiply both the sides by 'n'

$$nP_0 = \frac{nD_1 + nP_1}{1 + Ke}$$

Add & subtract ΔnP_1 to the RHS numerator

$$nP_0 = \frac{nD_1 + nP_1 + \Delta nP_1 - \Delta nP_1}{1 + Ke}$$

here,

   ΔnP_1 means additional capital raised

$\Delta nP_1 = I - (E - nD_1)$
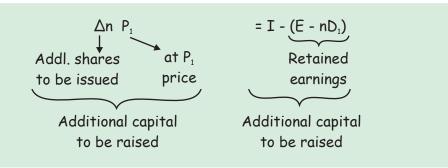
Suppose, Capex to be done at Yr 1 end = ₹ 100 cr.

   Earnings for the next yr = ₹ 30 cr.

   Total dividends to be paid in the next yr [nD_1] = ₹ 10 cr.

   $\therefore$ Additional capital to be raised at yr 1 = 100 cr. - (₹ 30 cr - ₹ 10 cr)

                                                        = 80 crores

$$\underbrace{\Delta n \quad P_1}_{\substack{\text{Addl. shares} \quad \text{at } P_1 \\ \text{to be issued} \quad \text{price}}} \qquad \underbrace{= I - (E - nD_1)}_{\substack{\text{Retained} \\ \text{earnings}}}$$

Additional capital to be raised   Additional capital to be raised

Replace $\Delta n P_1$ by $I - (E - nD_1)$

$$nP_0 = \frac{nD_1 + nP_1 + \Delta nP_1 - [I - (E - nD_1)]}{1 + Ke}$$

$$nP_0 = \frac{\cancel{nD_1} + (n + \Delta n)\,P_1 - I + E - \cancel{nD_1}}{1 + Ke}$$

$$nP_0 = \frac{(n + \Delta n)\,P_1 - I + E}{1 + Ke}$$

Since dividends are not present anywhere in the above formula, hence dividends are irrelevant in determining value of the firm.

Eg. Proof of irrelevance of dividend
No. of share outstanding today = 100000
Planned capex for the next yr = ₹ 30 lakhs
Earnings for the next yr = ₹ 12 lakhs
P_0 = ₹ 150
Ke = 8%
Calc value of firm today under following situations:-
(i)   If dividends @7 per share are paid
(ii)   If dividends are not paid

Solve:

Proof of irrelevance of dividend

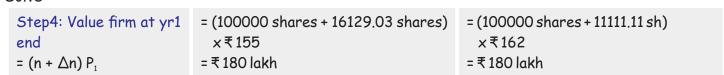| Particulars	If dividends are paid	If Dividends are not paid
Step1: Calculate Price at the end of yr 1 i.e. P_1 $P_1 = P_0 (1 + Ke) - D_1$	= ₹ 150 (1.08) - 7 = ₹ 155	= ₹ 150 (1.08) - 0 = ₹ 162
Step2: Calculate addl no. of shares to be issued at yr 1 end i.e. Δn $\Delta n = \dfrac{I - (E - nD_1)}{P_1}$	$= \dfrac{₹30 \text{ lakhs} - \left(₹12 \text{ lakhs} - \dfrac{1 \text{ lakh}}{\text{shares}} \times ₹7\right)}{₹155}$ = 16129.03 shares	$= \dfrac{₹30 \text{ lakhs} - \left(₹12 \text{ lakhs} - \dfrac{1 \text{ lakh}}{\text{shares}} \times 0\right)}{₹162}$ = 11111.11 shares
Step3: Calc value of firm $nP_0 = \dfrac{(n + \Delta n) P_1 - I + E}{1 + Ke}$	$= \dfrac{\left(\substack{100000 \\ + 16129.03}\right) 155 - ₹30 \text{ lakhs} + ₹12 \text{ lakh}}{1.08}$ = ₹ 150 lakhs	$= \dfrac{\left(\substack{100000 \\ + 11111.11 \\ \text{Shares}}\right) 162 - ₹30 \text{ lakhs} + ₹12 \text{ lakh}}{1.08}$ = ₹ 150 lakhs

Q. In the above case, prove that value of firm at the end of yr1 is also same under both the situations.

Solve

Step4: Value firm at yr1 end
 	
$= (n + \Delta n) P_1$
	= (100000 shares + 16129.03 shares)
	   × ₹ 155
	= ₹ 180 lakh
		= (100000 shares + 11111.11 sh)
		   × ₹ 162
		= ₹ 180 lakh

Stock Split & Stock Dividends
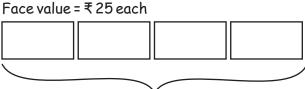
Face value (before split) = ₹ 100

Face value (after stock split) = ₹ 25 each

vs

Reverse stock split
Face value = ₹ 25 each

Consolidate to 1 share of FV = ₹ 100

When cos. share price increases sharply such that it goes out of the reach of a normal investor, then Co. goes for stock split to make it affordable for investors.

When share prices falls sharply then investors might consider such a Co. as a penny stock company. To save the face, Co. goes for reverse stock split.

Q. Current MP of MRF = ₹ 82000
Face value = ₹ 100
n = 1 crore
If co. goes for 4:1 stock split
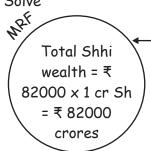
Don't read: as 'is to'
Read it as 'for'

then calc new MP ?

Solve

MRF

Total Shhi
wealth = ₹
82000 x 1 cr Sh
= ₹ 82000
crores
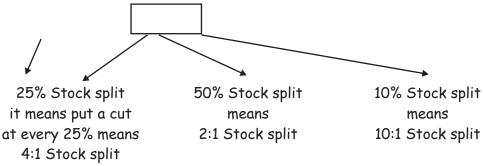
At present the total wealth is divided among 1 cr sh. But now, after split, the same wealth will get divided among 4 cr. sh.

New MP = $\dfrac{P_0 \times n}{n + \Delta n}$ here, n + Δn means Total no. of shares O/s

= $\dfrac{₹\ 82000 \times 1\ cr.\ sh}{4\ cr.\ sh}$ = ₹ 20500

If stock split info is given in % terms instead of ratio

25% Stock split
it means put a cut
at every 25% means
4:1 Stock split

50% Stock split
means
2:1 Stock split

10% Stock split
means
10:1 Stock split

'Stock dividends' simply means issue of bonus shares

Eg. No. of Sh o/s before bonus issue = 1 crore sh.

Co. declares bonus in the ratio of 4:1 find new total no. of shares o/s after bonus issue.
Solve:
= $\dfrac{₹\ 82000 \times 1\ cr}{1\ cr + 4\ cr}$ = ₹ 16400
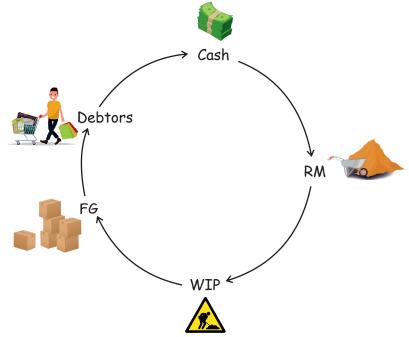
Q. If co. declares 100% bonus issue then it simply means that total no. of shares will now double after bonus issue [i.e. 1:1 bonus issue]. Similarly if co. declares 20% bonus then what will be the ratio ?

Solve:
1:5 [1 share for every 5 shares will be issued as bonus]

for

MANAGEMENT OF WORKING CAPITAL

Unit 1: Estimating Working Capital Requirements

four approaches to estimate W/c Requirement

| Approach 1 : Operating Cycle Approach | Approach 2 : Components of Working Capital Method | Approach 3 : Ratio of Sales | Approach 4 : Ratio of Fixed Investments |

Operating Cycle Approach

Steps under 'Operating Cycle Approach'

Step 1: Calculate Length of Operating Cycle

= RM holding Period + Conversion Period or WIP Period + FG holding period + Debtors collection Period − Credit period allowed by Creditors

Step 2: Calc No. of Operating cycles in a Year

$$= \frac{360 \text{ or } 365 \text{ days}}{\text{Operating Cycle Period}}$$

👉 Use '12' in Numerator if OC period is given in months

Step 3: Calc 'Working Capital Requirement'

$$= \frac{\text{Annual Operating Cost}}{\text{No. of Operating Cycles in a Year}}$$

How to calculate Holding Period for each of the elements of Op cycle

COST SHEET

Opening RM	xxx
+ RM Purchases	xxxx
- Closing RM	(xx)
RM Consumption	xxx
+ Direct labour & Direct Exps	xxx
+ Factory Overheads	xx
+ Opening WIP	xx
- Closing WIP	(xx)
FACTORY COST	xxx
+ Admin [Factory Admin Exps here]	xx
COST OF PROD^{-n}	xxx
+ Opening FG	xx
- Closing FG	(xx)
COGS	xxx
+ Admin [General Admin Exps]	xx
+ Selling & Distr^{-n}	xx
COS	xxx
+ Profit	xx
Sales	xxxx

Credit Period allowed by suppliers $= \dfrac{\text{Average Creditors}}{\text{Avg RM Credit purchases per day}}$

RM Storage Period $= \dfrac{\text{Average RM Stock}}{\text{Avg RM Consumption per day}}$

⚠️ Caution: Do not make the mistake of directly using RM Purchase here
RM Consumption ≠ RM Purchases

WIP Holding Period $= \dfrac{\text{Average WIP}}{\text{Avg COP per day}}$

FG Holding Period $= \dfrac{\text{Average Stock of FG}}{\text{Avg COGS per day}}$

Debtors Collection Period $= \dfrac{\text{Average Debtors}}{\text{Avg Credit Sales per day}}$

Alternatively, Holding Periods may also be calculated with the help of Respective Turnover Ratios

Generic Formula

$$\text{Holding Period} = \frac{360 \text{ or } 365}{\text{Respective T/O Ratio}}$$

$$\text{RM Holding Period} = \frac{360 \text{ or } 365}{\text{RM Turnover Ratio}} \longleftarrow \qquad \text{RM T/O Ratio} = \frac{\text{Annual RM Consumption}}{\text{Avg RM Stock}}$$

$$\text{WIP Conversion Period} = \frac{360 \text{ or } 365}{\text{WIP T/O Ratio}} \longleftarrow \qquad \text{WIP T/O Ratio} = \frac{\text{Annual COP}}{\text{Avg WIP}}$$

$$\text{FG Holding Period} = \frac{360 \text{ or } 365}{\text{FG T/O Ratio}} \longleftarrow \text{FG T/O Ratio} = \frac{\text{Annual COGS}}{\text{Avg FG Stock}}$$

$$\text{Debtors Collection Period} = \frac{360 \text{ or } 365}{\text{Debtors T/O Ratio}} \longleftarrow \text{Debtors T/O Ratio} = \frac{\text{Annual Credit Sales}}{\text{Avg Debtors}}$$

$$\text{Creditors Payment Period} = \frac{360 \text{ or } 365}{\text{Creditors T/O Ratio}} \longleftarrow \text{Creditors T/O Ratio} = \frac{\text{Annual Credit Purchase}}{\text{Avg Creditors}}$$

Components of Working Capital Method

Estimation of Working Capital Requirements

		Amount	Amount	Amount
I.	**Current Assets:**			
	Inventories:			
	- Raw Materials	----		
	- Work-in-process	----		
	- Finished goods	----	----	
	Receivables:			
	- Trade debtors	----		
	- Bills	----	----	
	Minimum Cash Balance		----	
	Gross Working Capital		----	----
II.	**Current Liabilities:**			
	Trade Payables		----	
	Bills Payables		----	
	Wages Payables		----	
	Payables for overheads		----	----
III.	**Excess of Current Assets over Current Liabilities [I – II]**			----
IV.	Add: Safety Margin			----
V.	**Net Working Capital [III + IV]**			----

There are 3 ways to calculate 'Amounts' for above statement

	Way 1: Total Approach	Way 2: Total Cost Approach	Way 3: Cash Cost Approach
	includes element of Profit as well wherever required	excludes Profits but values components at Total Cost (including Depn).	excludes both Profit as well as Depn.
WIP	is valued @ Cost of Prod^{-n} including depn.	is valued @ COP including Depn.	is valued @ Cash COP excluding Depn
FG	is valued @ Total Cost Pr including depn.	is valued @ Total Cost including depn.	is valued @ Cash Total Cost excluding depn.
Debtors	is valued @ Total SP including depn & including Profits	is valued @ Total Cost including depn but excluding Profit	is valued @ Cash Cost excluding depn & excluding Profit

Note: Rest of the Components of W/C viz. RM, Creditors, Wages O/S, Cash balance etc. remains exactly same under all 3 ways.

Example

Garments Manf. co.

Cost Sheet per unit	
RM	₹300
DL	₹ 100
Factory OH (inclusive of Depn = ₹ 25)	₹ 150
Total Cost	₹ 550
Profit	150
Selling Price	₹ 700

Planned Prod^{-n} level = 180000 Units

Co. will keep RM in stock, on an average for 15 days requirement.

Similarly, Conversion period is 7 days

FG remain in FG store for an average of 45 days

Debtors credit period averages to 60 days.

Creditors allow 30 days credit period.

Wages: Lag in payment of wages by 10 days

Lag in payment of Manf. overheads by 15 days

Cash & Bank balances to be kept = ₹25,00,000

Safety Margin @ 10% is desired.

Compute W/C Requirement as per 'Components of W/C Approach' under all 3 ways ?

Assume 360 days in a year.

Solve :   Statement showing Estimation of W/c Req.   [Total Amount in ₹ Lakhs]

Particulars	Units	Total Approach Amount Per Unit	Total Approach Total	Total Cost Approach Amount Per Unit	Total Cost Approach Total	Cash Cost Approach Amount Per Unit	Cash Cost Approach Total
A. CURRENT ASSETS Inventories - RM	7500 [180000x15/360]	300	22.5	300	22.5	300	22.5
- WIP	3500 [180000 x 7/360]	425 [300x100%] [+100x50%] [+150x50%]	14.875	425 [300x100%] [+100x50%] [+150x50%]	14.875	412.5 [300x100%] [+100x50%] [+125x50%]	14.4375
- FG	22500 [180000x45/360]	550	123.75	550	123.75	525	118.125
Debtors	30000 [180000x60/360]	700	210	550	165	525	157.5
Cash & Bank Balance			25		25		25
Total CA or Gross Working Capital			**396.125**		**351.125**		**337.5625**
B. CURRENT LIABILITIES Creditors	15000 $\left[180000 \times \dfrac{30}{360}\right]$	300	45	300	45	300	45
Wages Pybl	5000 $\left[180000 \times \dfrac{10}{360}\right]$	100	5	100	5	100	5
Manf OH	7500 $\left[180000 \times \dfrac{15}{360}\right]$	125	9.375	125	9.375	125	9.375
TOTAL CURRENT LIAB			**59.375**		**59.375**		**59.375**
C. Excess of CA over CL			**336.75**		**291.75**		**278.1875**
D. Add : Safety Margin @ 10%			33.675		29.175		27.81875
E. NET WORKING CAPITAL			**370.425 ~ 370**		**320.925 ~ 321**		**306.00625 ~ 306**

👉 Things to Remember

1. If Q is silent then WIP is assumed to be 50% complete regarding Conversion cost. As regards RM component there are 2 choices

Labour & Manf OH

Assume that RM is issued at the start of Prod^{-n} process	Assume that RM is issued evenly throughout the Prod^{-n} process
then RM will be taken as 100% complete in WIP	then RM will be taken as 50% complete

2. Whether under 'Total Approach' or 'Total Cost Approach', Manf OH Outstanding Amount will always be Excluding Depn. Amount (because Depn . Amt cannot be O/S)

3. If Q is silent whether Company is an Existing Co. or Newly commencing business, then default assumption is that it's an Existing Co .
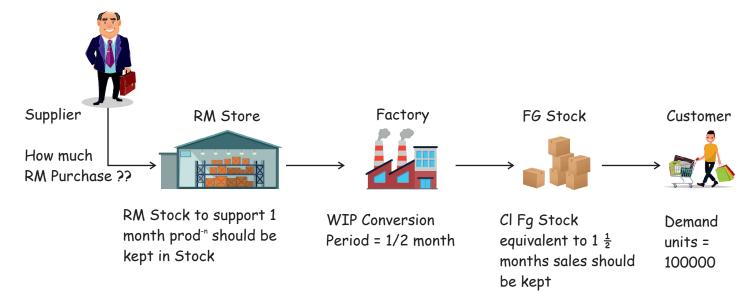
Existing Co .	Co - Newly commencing business
Unless otherwise specified, simply assume that co. is operating at a constant levels over the years & hence, ✓ Op stock = Closing Stock ✓ RM Consumption = RM Purchase ✓ Prod^{-n} = Sales	Then Opening Stock must be assumed as 'O' & hence RM Consumption ≠ RM Purchase Similarly, Prod^{-n} ≠ sales [because RM Purchases now needs to be sufficient to support both (i) Consumption & (ii) Closing stock and Prod^{-n} also needs to be sufficient to support both i) Sales & ii) Cl. FG]

How to calc RM Purchase when Co. is newly commencing business ?

Supplier	RM Store	Factory	FG Stock	Customer
How much RM Purchase ??	RM Stock to support 1 month prod^n should be kept in Stock	WIP Conversion Period = 1/2 month	Cl Fg Stock equivalent to $1\frac{1}{2}$ months sales should be kept	Demand units = 100000

Solve :

Sales		100000 Units
+ Closing FG $\left[100000 \times \dfrac{1.5}{12}\right]$		12500 Units
Total Completed Units of Prod^n		112500 Units
+ WIP $\left[112500 \times \dfrac{0.5}{12}\right]$		4687.5 Units
Total RM Consumption		117187.5 Units
+ Closing RM Stock $\left[117187.5 \times \dfrac{1}{12}\right]$		9765.625 Units
		126953125
Total RM Purchase from supplier		~ 126953 Units

[assuming 100% of RM is issued at the start of the Prod process]

4. If I didn't define whether "Overheads" are Factory OH or Admin OH or selling Ovhs then just the word 'Overheads' implies that these are 'Factory Ovhs'.

5. When reading WCM - Unit I Question in exam, pay special attention to whether Co. is (i) an existing co, or (ii) newly commencing business. Because this info makes a HUGE difference in the way we calc W/C Requirement.

6.   Which way i.e. Way 1 or way 2 or way 3 to follow in exams if Q is silent ?

If Depn info is given in the Q	If Depn info is not given
Use "Cash Cost Approach"	Use "Total Cost Approach "

Effect of Double shift working on W/C Req .

Component	No.of Units	Amount	Comment
Raw Material Stock	Double	Little less than Double	Since RM Purchased Qty from Supplier will double - up, we might get Bulk-Qty. discounts
WIP [RM + Lab + Factory Ovhs]	~~Double~~ SAME	Same or little bit less or little bit more	Due to concept of 'Pipeline Theory' the No. of Units of WIP will remain same (because 2nd shift workers will start work where 1st shift workers have left). If RM Purchase price has reduced (due to bulk Qty discount) OR Fixed Factory Cost (eg. Factory Rent) has reduced due to producing double no. of units then WIP Val^{n} will decrease. Alternatively, if 2nd shift workers are paid a higher wage rate then WIP Value will increase.
Finished goods stock.	Double	Little bit more/less than 'Exact Double Am'	Same reason as written above.
Debtors	Double	Little bit more/ less than 'Exact Double Amt'	Same reason as written above.
Creditors	Double	Little bit more/less than 'Exact Double Amt'	Amount Depends on new RM Purchase price (eg Bulk Qty Discounts offered)

Two ways to look @ Double shift W/C Req.

To assess the Impact of Double shift FOR LONG TERM as a matter of prod^{-n} policy

here Double Prod^{-n} means Double sales

To assess the impact of Double shift TO MITIGATE IMMEDIATE DEMAND FOR NEXT YEAR ONLY

here, Double Prod^{-n} does Not translate into Double sales [because some of the increased Prod^{-n} is kept in FG stock to meet increased level of FG]

		doubled to	
eg. Prod^{-n}	25000	→	50000
FG	2000	→	4000
Sales	25000	→	50000
			48000

Out of 50000 units we will keep 2000 addll. units to meet increased req. of FG stock.

To conclude. we don't have to think about Differences in
Op Stock &
Closing Stock levels.
Simply assume that
Op Stk = Cl Stock.

Just like
Existing Co. case

Exam Tip:
Prefer this approach in exam

To conclude.
∵ Op FG ≠ Cl FG
∴ Prod^{-n} ≠ Sales

Similarly,
∵ Op RM ≠ Cl RM
∴ RM Cons ≠ Rm Purch.

But Remember that
Op WIP = Cl WIP
(in terms of units)
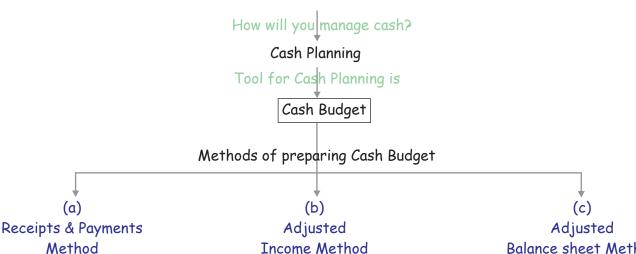
Just like
'Newly commencing business'

Exam Tip:
Always first prepare Cost sheet for both Single shift & Double shift before estimating W/C Req.

Unit II: Treasury & Cash Management

Learning Objective: Management of Cash

How will you manage cash?

Cash Planning

Tool for Cash Planning is

| Cash Budget |

Methods of preparing Cash Budget

**(a)
Receipts & Payments
Method**

is as good as 'Cash
A/c' or as good as
'Direct Method of
preparing Cash flow
Statement '

👉 Preferred Method
for short - term
Cash Budgets

**(b)
Adjusted
Income Method**

is as good as
'Indirect Method
of preparing Cash
flow St'
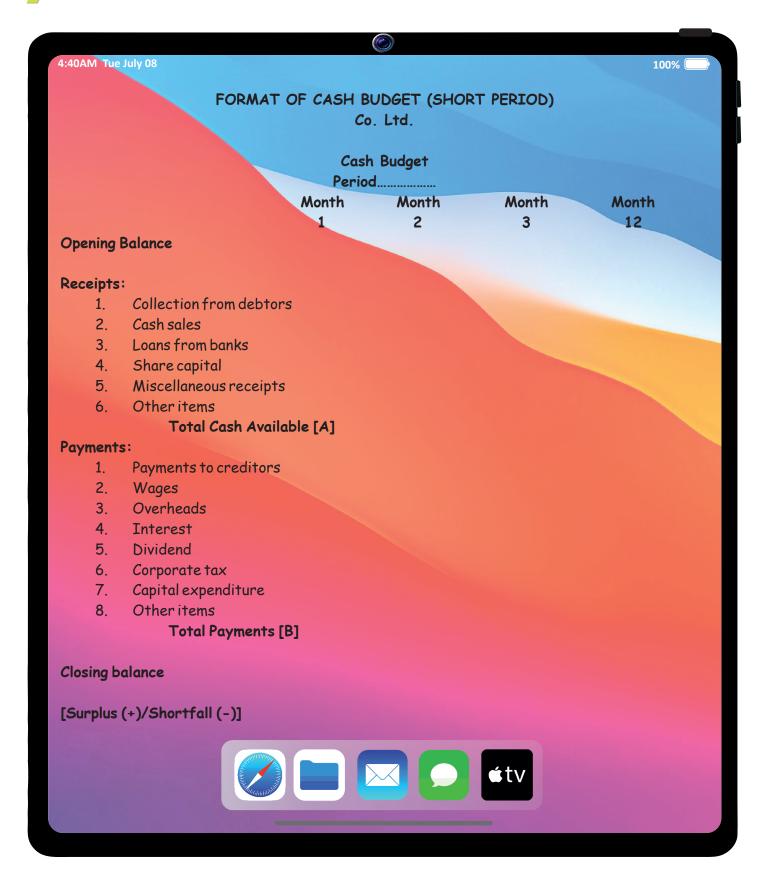
👉 Preferred for
Long - term Cash
Budgets

**(c)
Adjusted
Balance sheet Method**

Prepare Forecasted B/S
i.e. forecast All liabilities &
All FA & CA except Cash
bal.
Cash balance simply
becomes a balancing figure.

4:40AM Tue July 08   100%

FORMAT OF CASH BUDGET (SHORT PERIOD)
Co. Ltd.

Cash Budget
Period................

	Month 1	Month 2	Month 3	Month 12

Opening Balance

Receipts:
1. Collection from debtors
2. Cash sales
3. Loans from banks
4. Share capital
5. Miscellaneous receipts
6. Other items

  Total Cash Available [A]

Payments:
1. Payments to creditors
2. Wages
3. Overheads
4. Interest
5. Dividend
6. Corporate tax
7. Capital expenditure
8. Other items

  Total Payments [B]

Closing balance

[Surplus (+)/Shortfall (−)]

Fund Flow Statement

Sources of Funds	Application of Funds
✓ Issue of shares (for cash)	✓ Buyback of Shares/Payment of Div
✓ Issue of Debentures/ long - term Debt	✓ Repayment of LT Debt
✓ Sale proceeds of fixed Assets	✓ Purchase of FA
✓ Liquidation of Investments	✓ Purchase of Investments
✓ Non-Operating Income (eg. Dividend/Intt on Inv.)	✓ Non Operating Exps (eg Payment of under - writing Comm./Preliminary Exps)
✓ Funds from Operations	✓ Funds used in Operations
✓ Decrease in Working Cap	✓ Increase in W/C.

How to calc Inc / Decrease in W/C

Particulars	Amounts		Changes in W/C	
	Prev. Yr	Current Yr	Increase	Decrease
A. Current Assets				
Debtors	100000	120000	20000	
Cash & Balance				
B. Current liabilities				
Creditors	50000	55000		5000

How to calc FFO ?

Net Profit for the Year	xxxx
Less: Gain on sale of Assets / Non - Op Inc .	xxx
Add: Depn / Non- Cash Expenses	xxx
Loss on sale of Assets / Non - op Exps	xxx
FUNDS FROM OPERATIONS	xxx

FORMAT of Fund Flow Statement

A. Sources of Funds

.
. items as mentioned above   xx
.   xx
.   xx
TOTAL of Sources of funds   xxx

B. Application of Funds

.
. items as mentioned above   xx
.   xx
.   xx
TOTAL of Application of Funds   xxx

The Totals will match
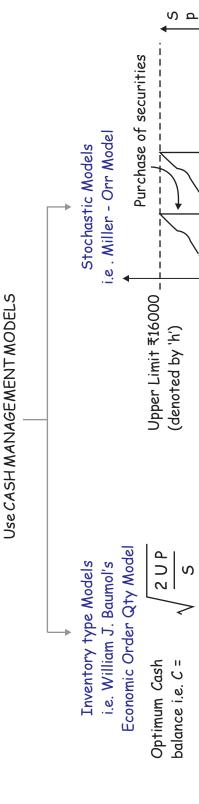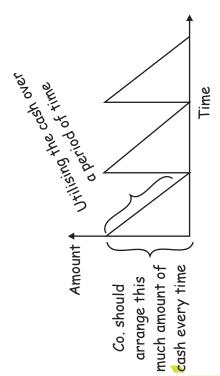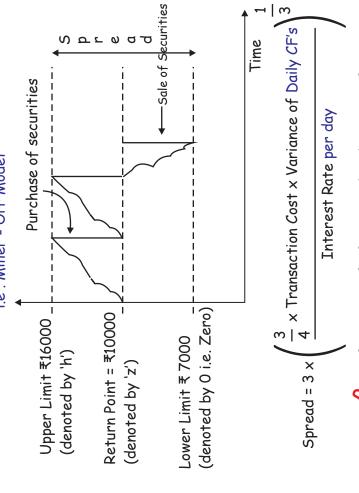
Determining Optimum Cash Balance

Use CASH MANAGEMENT MODELS

Inventory type Models
i.e. William J. Baumol's
Economic Order Qty Model

Optimum Cash
balance i.e. $C = \sqrt{\dfrac{2 U P}{S}}$

here,

U = Annual Cash Requirement

P = Fixed Cost per transaction

S = Opportunity Cost per rupee per annum
i.e. Rate of Intt on Short term Securities

☞ If 'U' is Annual then 'S' should be per annum.
If 'U' is Monthly then 'S' should be per month

Amount | Utilising the cash over a period of time

Co. should arrange this much amount of cash every time

Time

Stochastic Models
i.e. Miller - Orr Model

Purchase of securities

Sale of Securities

S
p
r
e
a
d

Time

Upper Limit ₹16000
(denoted by 'h')

Return Point = ₹10000
(denoted by 'z')

Lower Limit ₹ 7000
(denoted by 0 i.e. Zero)

$$\text{Spread} = 3 \times \left(\dfrac{\dfrac{3}{4} \times \text{Transaction Cost} \times \text{Variance of Daily CF's}}{\text{Interest Rate per day}} \right)^{\frac{1}{3}}$$

☞ If variance of Cf's is per day then rate of intt must also be per day

Upper limit = Lower limit + Spread

or

Return Point + $\dfrac{2}{3}$ Spread

Return Point = Lower limit + $\dfrac{\text{Spread}}{3}$

or
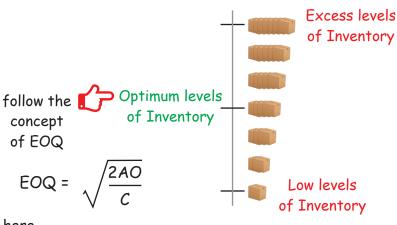
Upper limit - $\dfrac{2}{3} \times$ Spread

Unit III: Management of Inventory

Excess levels of Inventory

Optimum levels of Inventory

Low levels of Inventory

Excess level of inventory leads to Very high carrying cost in terms of
(i)   Opp cost of funds blocked in inventory
(ii) Operating cost of godown etc. needs to be incurred

Low levels are is not advisable because
(i)   there would be frequent stock-out situation
(ii) No. of orders to be placed will increase leading to high ordering cost

follow the 👉 concept of EOQ

$$EOQ = \sqrt{\dfrac{2AO}{C}}$$

here,

A means Annual Requirement of RM
O means Ordering Cost per Order
C means Carrying Cost per unit per annum

Exam Tip:
If in Q, Monthly Req. of RM (instead of Annual req) is given then use 'C' as carrying cost per unit per month (instead of per annum)
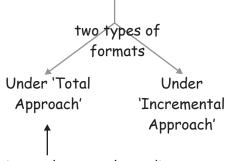
Unit IV: Management of Receivables

three functions comes under mngt of Receivables

Deciding credit policy

we evaluate various credit policies by preparing 'Statement showing evaln of credit policies'

two types of formats

Under 'Total Approach'

Under 'Incremental Approach'

i.e. evaluate each credit policy separately / individually and don't make any incremental calculations

Credit Analysis

means evaluating whether credit should be given to a particular customer or not ?
✓ Credit Ratings
✓ Decision-tree
Analysis of granting credit

Example given after some pages

Collection of Rcbls/Monitoring Receivables

Mainly two ways to monitor Rcbls Collection progress
(i)   Calculate Avg Collection period - & watch for the trend
(ii) Ageing schedule

Refer Format on Next page

APPROACHES TO EVALUATION OF CREDIT POLICIES

There are basically two methods of evaluating the credit policies to be adopted by a Company – Total Approach and Incremental Approach. The formats for the two approaches are given as under:

Statement showing the Evaluation of Credit Policies (based on Total Approach)

Particulars		Present Policy	Proposed Policy I	Proposed Policy II	Proposed Policy III
		(₹)	(₹)	(₹)	(₹)
A. Expected Profit:					
(a)	Credit Sales	....	....	....	....
(b)	Total Cost other than Bad Debts				
	(i) Variable Costs	....	....	....	....
	(ii) Fixed Costs	....	....	....	....
		....	....	....	....
(c)	Bad Debts	....	....	....	....
(d)	Cash discount				
(e)	Expected Net Profit before Tax	....	....	....	....
(a-b-c-d)					
(f)	Less: Tax	....	....	....	....
(g)	Expected Profit after Tax	....	....	....	....
B. Opportunity Cost of Investments in Receivables locked up in Collection Period		....	....	....	....
Net Benefits (A – B)		....	....	....	....

Advise: The Policy……. should be adopted since the net benefits under this policy are higher as compared to other policies.

Here

(i)   Total Fixed Cost = [Average Cost per unit – Variable Cost per unit] x No. of units sold on credit under Present Policy

(ii)   Opportunity Cost

$$= \text{Total Cost Of Credit Sales} \times \frac{\text{Collection period (Days)}}{365 \text{ (or 360)}} \times \frac{\text{Required Rate of Return}}{100}$$

Statement showing the Evaluation of Credit Policies (based on Incremental Approach)

Particulars	Present Policy days (₹)	Proposed Policy I days (₹)	Proposed Policy II days (₹)	Proposed Policy III days (₹)
A. Incremental Expected Profit:				
Credit Sales	....	....	....	....
(a)　Incremental Credit Sales	....	....	....	....
(b)　Less: Incremental Costs of Credit Sales				
(i)　Variable Costs	....	....	....	....
(ii)　Fixed Costs	....	....	....	....
(c)　Incremental Bad Debt Losses	....	....	....	....
(d)　Incremental Cash Discount	....	....	....	....
(e)　Incremental Expected Profit (a-b-c-d)	....	....	....	....
(f)　Less: Tax	....	....	....	....
(g)　Incremental Expected Profit after Tax	....	....	....	....
	....	....	....	....
B. Required Return on Incremental Investments:				
(a)　Cost of Credit Sales	....	....	....	....
(b)　Collection Period (in days)	....	....	....	....
(c)　Investment in Receivable (a x b/365 or 360)	....	....	....	....
(d)　Incremental Investment in Receivables	....	....	....	....
(e)　Required Rate of Return (in %)	....	....	....	....
(f)　Required Return on Incremental Investments (d x e)	....	....	....	....
Incremental Net Benefits (A – B)	....	....	....	....

Advise: The Policy ……….should be adopted since net benefits under this policy are higher as compared to other policies

Here:

(i)　Total Fixed Cost = [Average Cost per unit – Variable Cost per unit] x No. of units sold on credit under Present Policy

(ii)　Opportunity Cost = Total Cost of Credit Sales x $\dfrac{\text{Collection period (Days)}}{365 \text{ (or 360)}}$ x $\dfrac{\text{Required Rate of Return}}{100}$

$$\text{Debtors Turnover Ratio} = \frac{\text{Credit Sales}}{\text{Avg. Debtors}} = \frac{\text{Say, ₹ 100000}}{\text{₹ 10,000}} = 10 \text{ times}$$

$$\text{Average Collection Period} = \frac{360 \text{ or } 365}{\text{Debtors T/o Ratio}} = \frac{\text{Say, 360 days}}{10 \text{ times}} = 36 \text{ days}$$
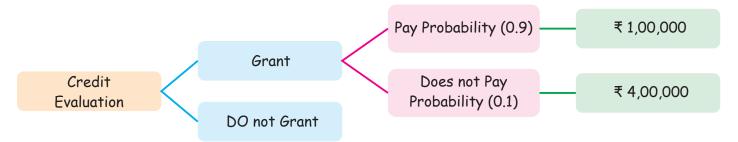
👉 Point to Remember:

While calculating "Opportunity cost of funds blocked in debtors" use "Total cost of credit sales other than bad debts & cash disc".

However if info related to cost is not given in the Q then use "Full credit sales value" for calculation purposes"

Format of Credit Analysis - Decision Tree diagram

Format of Ageing Schedule

Age Classes (Days)	As on 30th June, 2020		
	Month of Sale	Balance of Receivables	Percentage to total
		(₹)	
1 - 30	June	41,500	11.9
31 - 60	May	74,200	21.4
61 - 90	April	1,85,600	53.4
91 - 120	March	35,300	10.2
121 and more	Earlier	10,800	3.1
		3,47,400	100

Aipha Academy

Financing of Receivables

Pledging | **Factoring** | **Forfeiting**

Using receivables as a security to arrange short term finance from bank.

is same as factoring but is done in case of international trade

Factor

Step2: Supplier sends documents eg Invoice, E-way bill to Factor

Step3: Factor pays advance* to supplier

Step 1: Supplier sells goods to the customer

Step 4: On due date customer makes payment to the factor

Supplier

Customer

*Amount of accounts receivables — xxxx
Less: Factor reserve @10% (say) — (xxxx)
xxxx
Less: Factoring commission — xx
Amount available for advance — xxx
Less: Interest to the factor — xxx
Net Advance paid — xxx

Two types of Q's in case of Factoring

Q asks for ADVISE or DECIDE

Answer is usually given in absolute terms by either comparing the Two Alternatives (eg In-house management of receivables vs Factoring) or solving on incremental basis
Example:

Bank
Bank loan @10% interest

Supplier

Annual Sales = ₹ 36 lakhs
Credit Period = 60 days

Customers

If inhouse mngt of receivables
Cost of credit administration = ₹1.25 lakhs
Bad debts = 1.5%

Case (i)
Advise or decide whether supplier should go for factoring proposal or not ? Assume that bank finance 80% of receivables & for balance amount own funds are arranged @18% ?

Q asks for calculate 'Effective cost of Factoring'

Answer is given in %age terms

Factor Comm = 1%
Factor Reserve = 15%
Intt to factor on advance = 11%

Solve:

<div align="center">Evaluation of both the proposals</div>

In-House management of receivables

1. Cost of credit admin   = ₹ 125000
2. Bad debts = ₹ 36 lakhs × 1.5%   = ₹ 54000

3. Cost of bank funds

   Avg Inv in debtors = ₹ 36 lakhs × $\dfrac{60}{360}$

                    = ₹ 6 lakhs

   Out of above :-
   - Bank finance [80%] = ₹ 4.8 lakhs
   - Own funds [20%] = ₹ 1.2 lakhs

   Intt on bank loan @10% = ₹ 4.8 lakhs × 10%
                                 = ₹ 48000

4. Cost of own funds
   = ₹ 1.2 lakhs × 18%   = ₹ 21600

   Total cost of Inhouse Mngt of Receivables
                                 ₹ 248600

Factoring Proposal

1. Cost of credit admin   x

   ☞ Since ₹ 125000 cost is already charged as a cost under proposal 1 ∴ it would be wrong to write ₹ 125000 as savings here. It will amount to double consideration of the same amount

2. Bad debts   x

   ☞ If Q is silent then it is assumed that factoring proposal is on Non-recourse basis

3. Factoring Comm
   = ₹ 36 lakhs × 1% =   ₹ 36000

4. Interest to factor

Avg Inv in Debtors	₹ 6 lakhs
Less: Factor reserve @15%	0.90 lakhs
Less: Commission [1% × ₹ 6 lakhs]	0.06 lakhs
Amt available for advance	₹ 504000
Less: Intt to factor [₹ 504000 × 11% p.a. × 60/360]	9240
Net advance to be paid by Factor to Supplier	₹ 494760
∴ Annual intt to factor	₹ 55440

   $$\left[\; ₹\, 9240 \times \dfrac{360}{60} \;\right]$$

5. Cost of own funds

   Own funds to be arranged = ₹ 6 lakhs - ₹ 494760
                                   = ₹ 105240

   ∴ Intt on own funds   = ₹ 105240 × 18%
                                   = ₹ 18943

   Total cost of factoring proposal = ₹ 110383

Advise:

Co. should select factoring proposal since it results in Net benefit of ₹ 138217 [₹ 248600 - ₹ 110383]

Case (ii):

Calculate effective cost of factoring arrangement in the above example assuming :-

(a) No info regarding own funds is given

(b) Cost of credit administration is only ₹ 25000

(c) Factoring comm @4%

Solve:

<div align="center">

Statement showing evaluation of factoring proposal

</div>

A. **Annual savings on taking factoring services**

Cost of credit admin saved	₹ 25000
Bad debts avoided	₹ 54000
	₹ 79000

B. **Annual cost of factoring services**

Factoring commission [4% x ₹ 36 lakhs]	₹ 144000
Interest to factor [₹ 486000 x 11%]	₹ 53460
	₹ 197460

C. **Net annual cost of factoring services**   **₹ 118460**

∴ Effective cost of factoring $= \dfrac{\text{Net annual cost of factoring}}{\text{Net advance paid [WN\#1]}} \times 100$

or

Total amt available for advance

$$= \frac{₹\ 118460}{486000} \times 100 \quad \text{or} \quad = \frac{₹\ 118460}{₹\ 477090} \times 100$$

$$= 24.37\% \qquad\qquad = 24.83\%$$

Advice:

Since effective cost of factoring [24.37% or 24.87%] > Cost of bank finance [10%], therefore, Co. should reject the factoring proposal.

WN#1

Avg inv in receivables $\left[₹\ 36\ \text{lakhs} \times \dfrac{60}{360} \right]$	₹ 600000
Less: Factor reserve [15% x ₹ 600000]	₹ 90000
Less: Commission [4% x ₹ 600000]	₹ 24000
Amount available for advance	₹ 486000
Less: Interest to factor $\left[₹\ 4860000 \times 11\% \times \dfrac{60}{360} \right]$	8910
Net advance paid	₹ 477090

Decision tree analysis of granting credit
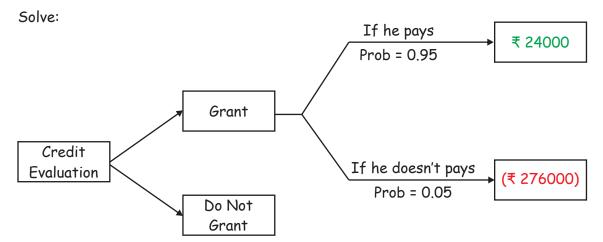
Eg.

Probability of recovery = 95%

hence, Risk of default = 5%

Sales revenue = ₹ 300000

Profit margin = 8%

Evaluate whether credit should be granted or not ?

Solve:

If we grant credit

= 0.95 × ₹ 24000 + 0.05 × (₹ 276000)

= ₹ 9000 net benefit

If we donot grant credit:

= ₹ 0
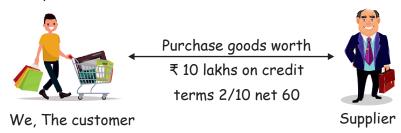
Advice: Co. should grant credit since net benefit is positive.

Unit V: Management of Payables
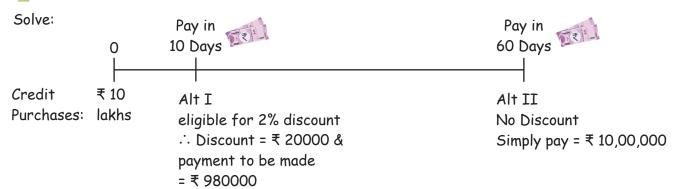
Creditors are generally seen as free of cost sources of finance. However, the reality could be that supplier is indirectly charging us inflated price / not offering cash discount if we wish to avail credit period.

Learning Objective: How to calc cost of trade credit ?

Example:

Purchase goods worth ₹ 10 lakhs on credit terms 2/10 net 60

We, The customer

Supplier

Calc Cost of Trade credit ?

Solve:

Pay in 10 Days

Pay in 60 Days

0

Credit Purchases: ₹ 10 lakhs

Alt I
eligible for 2% discount
∴ Discount = ₹ 20000 &
payment to be made
= ₹ 980000

Alt II
No Discount
Simply pay = ₹ 10,00,000

There are 2 ways to calculate Cost of Trade Credit / Cost of Cash Disc Lost
(i)   Ignoring compounding effect i.e. simple rate of intt
(ii) Take in to account compounding effect

Way 1: Simple Interest Rate

$$= \frac{d}{100 - d} \times \frac{365}{t}$$

here,
   d means Rate of Cash Discount
   t means no. of credit days after cash disc period is over / Total credit days - Cash disc period
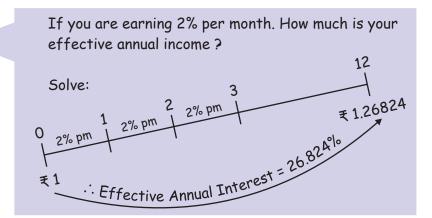
$$= \frac{2}{100 - 2} \times \frac{365}{50} \quad \longleftarrow \quad 60 \text{ days - 10 days}$$

   = 14.90%

Way 2:

$$= \left(\frac{d}{100 - d} \right)^{\frac{365}{t}} - 1$$

$$= \left(\frac{2}{100 - 2} \right)^{\frac{365}{50}} - 1$$

= 1.1589 - 1
= 0.1589 or 15.89%

If you are earning 2% per month. How much is your effective annual income ?

Solve:

0 —2% pm— 1 —2% pm— 2 —2% pm— 3 12

₹ 1

₹ 1.26824

∴ Effective Annual Interest = 26.824%

Note: ICAI always assumes 365 days in a year for this unit V

RATIO ANALYSIS

Sources of Financial Data for Analysis

The sources of information for financial statement analysis are:

1. Annual Reports
2. Interim financial statements
3. Notes to Accounts
4. Statement of cash flows
5. Business periodicals
6. Credit and investment advisory services

Types of Ratios

- Leverage Ratios/ Long term Solvency Ratios
- Capitel Structure Ratios
- Coverage Ratios
- Liquidity Ratios/ Short-term Solvency Ratios

- Activity Ratios/ Efficiency Ratios/ Performance Ratios/ Turnover Ratios*
- Profitability Ratios
- Related to Sales
- Required for analysis from Owner's point of view
- Related to overall Return on Invertment (Assets/ Capital Employed/ Equity)
- Related to Market/ Valuation/ Investors

SUMMARY OF RATIOS

Ratio	Formulae	Interpretation
Liquidity Ratio		
Current Ratio	$\dfrac{\text{Current Assets}}{\text{Current Liabilities}}$	A simple measure that estimates whether the business can pay short term debts.
Quick Ratio	$\dfrac{\text{Quick Assets}}{\text{Current Liabilities}}$	It measures the ability to meet current debt immediately. Ideal ratio is 1
Cash Ratio	$\dfrac{\text{(Cash and Bank balaces + Marketable securities)}}{\text{Current Liabilities}}$	It measures absolute liquidity of the business.
Basic Defense Interval Ratio	$\dfrac{\left(\text{Cash and Bank balaces + Net Receivables + Marketable securities}\right)}{\text{Operating Expenses} \div \text{No.of days}}$	It measures the ability of the business to meet regular cash expenditures.
Net Working Capital Ratio	Current Assets – Current Liabilities	It is a measure of cash flow to determine the ability of business to survive financial crisis.
Capital Structure Ratio		
Equity Ratio	$\dfrac{\text{Shareholder's Equity}}{\text{Net Assets}}$	It indicates owner's fund in companies to total fund invested.

Debt Ratio	$$\dfrac{\text{Total Debt}}{\text{Net Assets}}$$	It is an indicator of use of outside funds.
Debt to equity Ratio	$$\dfrac{\text{Total Outside Liabilities}}{\text{Shareholders Equity}}$$	It indicates the composition of capital structure in terms of debt and equity.
Debt to Total Assets Ratio	$$\dfrac{\text{Total Outside Liabilities}}{\text{Total Assets}}$$	It measures how much of total assets is financed by the debt.
Capital Gearing Ratio	$$\dfrac{\left(\begin{array}{c}\text{Preference Share Capital + Debentures}\\ \text{+ Other Borrowed funds}\end{array}\right)}{\left(\begin{array}{c}\text{Equity Share Captial +}\\ \text{Reseves and Surplus - Losses}\end{array}\right)}$$	It shows the proportion of fixed interest bearing capital to equity shareholders' fund. It also signifies the advantage of financial leverage to the equity shareholder.
Proprietary Ratio	$$\dfrac{\text{Proprietary Fund}}{\text{Total Assets}}$$	It measures the proportion of total assets financed by shareholders.

Coverage Ratios

Debt Service Coverage Ratio (DSCR)	$$\dfrac{\text{Earnings available for debt services}}{\text{Interest + Instalments}}$$	It measures the ability to meet the commitment of various debt services like interest, instalment etc. *Ideal ratio is 2.*
Interest Coverage Ratio	$$\dfrac{\text{EBIT}}{\text{Interest}}$$	It measures the ability of the business to meet interest obligations. *Ideal ratio is > 1.*

Preference Dividend Coverage Ratio

$$\frac{\text{Net Profit / Earnings after taxes (EAT)}}{\text{Preferences divident liability}}$$

It measures the ability to pay the preference shareholders' dividend.
Ideal ratio is > 1.

Fixed Charges Coverage Ratio

$$\frac{\text{EBIT + Depreciation}}{\text{Interest + Repayment of loan}}$$

This ratio shows how many times the cash flow before interest and taxes covers all fixed financing charges.
Ideal ratio is > 1.

Activity Ratio/ Efficiency Ratio/ Performance Ratio/ Turnover Ratio

Total Asset Turnover Ratio

$$\frac{\text{Sales / Cost of Goods Sold}}{\text{Average Total Assets}}$$

A measure of total asset utilisation. It helps to answer the question - What sales are being generated by each rupee's worth of assets invested in the business?

Fixed Assets Turnover Ratio

$$\frac{\text{Sales / Cost of Goods Sold}}{\text{Fixed Assets}}$$

This ratio is about fixed asset capacity. A reducing sales or profit being generated from each rupee invested in fixed assets may indicate overcapacity or poorer performing equipment.

Capital Turnover Ratio

$$\frac{\text{Sales / Cost of Goods Sold}}{\text{Net Assets}}$$

This indicates the firm's ability to generate sales per rupee of long term investment.

Working Capital Turnover Ratio

$$\frac{\text{Sales / COGS}}{\text{Working Capital}}$$

It measures the efficiency of the firm to use working capital.

Inventory Turnover Ratio

$$\frac{\text{COGS / Sales}}{\text{Average Inventory}}$$
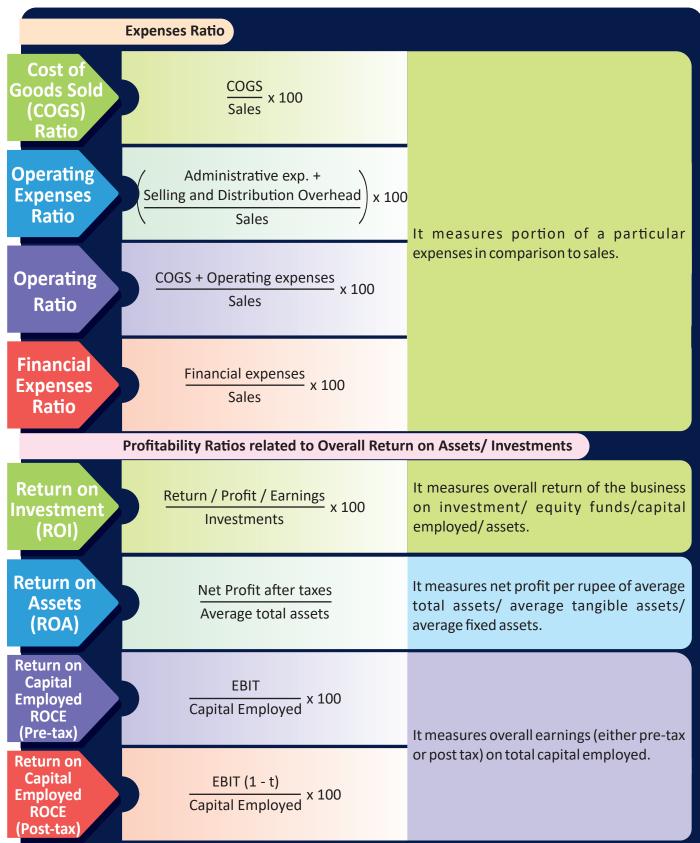
It measures the efficiency of the firm to manage its inventory.

Debtors Turnover Ratio	$\dfrac{\text{Credit Sales}}{\text{Average Accounts Receivables}}$	It measures the efficiency at which firm is managing its receivables
Receivables (Debtors') Velocity	$\dfrac{\text{Average Accounts Receivables}}{\text{Average Daily Credit Sales}}$	It measures the velocity of collection of receivables
Payables Turnover Ratio	$\dfrac{\text{Annual Net Credit Purchases}}{\text{Average Accounts Payables}}$	It measures the velocity of payables payment.

Profitability Ratios based on Sales

Gross Profit Ratio	$\dfrac{\text{Gross Profit}}{\text{Sales}} \times 100$	This ratio tells us something about the business's ability consistently to control its production costs or to manage the margins it makes on products it buys and sells.
Net Profit Ratio	$\dfrac{\text{Net Profit}}{\text{Sales}} \times 100$	It measures the relationship between net profit and sales of the business.
Operating Profit Ratio	$\dfrac{\text{Operating Profit}}{\text{Sales}} \times 100$	It measures operating performance of business.

Expenses Ratio

Cost of Goods Sold (COGS) Ratio

$$\frac{COGS}{Sales} \times 100$$

Operating Expenses Ratio

$$\left(\frac{Administrative\ exp.\ +\ Selling\ and\ Distribution\ Overhead}{Sales}\right) \times 100$$

Operating Ratio

$$\frac{COGS + Operating\ expenses}{Sales} \times 100$$

Financial Expenses Ratio

$$\frac{Financial\ expenses}{Sales} \times 100$$

It measures portion of a particular expenses in comparison to sales.

Profitability Ratios related to Overall Return on Assets/ Investments

Return on Investment (ROI)

$$\frac{Return\ /\ Profit\ /\ Earnings}{Investments} \times 100$$

It measures overall return of the business on investment/ equity funds/capital employed/ assets.

Return on Assets (ROA)

$$\frac{Net\ Profit\ after\ taxes}{Average\ total\ assets}$$

It measures net profit per rupee of average total assets/ average tangible assets/ average fixed assets.

Return on Capital Employed ROCE (Pre-tax)

$$\frac{EBIT}{Capital\ Employed} \times 100$$

Return on Capital Employed ROCE (Post-tax)

$$\frac{EBIT\ (1 - t)}{Capital\ Employed} \times 100$$

It measures overall earnings (either pre-tax or post tax) on total capital employed.

Return on Equity (ROE)

$$\frac{\text{Net Profit after taxes}}{\text{Net worth / Equity shareholders' fund}} \times 100$$

Preferences dividend (if any)

It indicates earnings available to equity shareholders in comparison to equity shareholders' net worth.

Profitability Ratios Required for Analysis from Owner's Point of View

Earnings per Share (EPS)

$$\frac{\text{Net profit available to equity shareholders}}{\text{Number of equity shares outstanding}}$$

EPS measures the overall profit generated for each share in existence over a particular period.

Dividend per Share (DPS)

$$\frac{\text{Dividend paid to equity shareholders}}{\text{Number of equity shares outstanding}}$$

Proportion of profit distributed per equity share.

Dividend payout Ratio (DP)

$$\frac{\text{Dividend per equity share}}{\text{Earning per share (EPS)}}$$

It shows % of EPS paid as dividend and retained earnings.

Profitability Ratios related to market/ valuation/ Investors

Price-Earnings per Share (P/E Ratio)

$$\frac{\text{Market Price per Share (MPS)}}{\text{Earning per share (EPS)}}$$

At any time, the P/E ratio is an indication of how highly the market "rates" or "values" a business. A P/E ratio is best viewed in the context of a sector or market average to get a feel for relative value and stock market pricing.

Dividend Yield

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

OR

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

It measures dividend paid based on market price of shares.

Earnings Yield

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

It is the relationship of earning per share and market value of shares

Market Value / Book Value per Share	$\dfrac{\text{Market value per share}}{\text{Book value per share}}$	It indicates market response of the shareholders' investment.
Q Ratio	$\dfrac{\text{Market Value of equity and liabilities}}{\text{Estimated replacement cost of assets}}$	It measures market value of equity as well as debt in comparison to all assets at their replacement cost.

Students are requested to refer Alpha Academy Booklets/ Notes for Ratios, formulas and interpretation.

☞ Point to remember :-

1. EBIT = Operating income [usually]
   But, if Non-Operating items are given, then EBIT ≠ Op Inc.

   Sales

   -VC
   _____

   Contribution

   -FC
   _____

   Operating Income

   + Non-operating income eg. intt on FD/dividend income on Non-trade investment
   - Non-operating cost eg loss on sale of asset
   EBIT

2. While calc ROA, ROCE & ROE if sufficient info is available to calc avg assets/avg cap emp/avg equity then average must be taken in denominator.

   If averages are not available then 2nd preference is to use opening assets/CE/Equity

3. While writing comments on 'Ratio analysis' type questions - prefer to write numeric values of the ratios as well instead of just using a generic language.