

Illustration 17-I 26

The Capital structure of Vikas Ltd. is as follows :

(Rs.)

Source	Book value	Market value
a. Equity share capital	10,00,000	20,00,000 (200% of Book value)
b. Retained earnings	5,00,000	—
c. 14% Preference share capital	7,00,000	7,00,000 (Just par)
d. 12% Debentures	6,00,000	6,00,000 (Just par)

After tax, cost of capital of these different sources is Equity share capital 18%, Retained earnings 15%, Preference share capital 14%, and Debentures 8%. Calculate the weighted average cost of capital of the company.

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Calculation of weighted average cost of Capital

Source	Amount Rs.	% to total funds	After tax cost of capital	Cost of capital (3) × (4)
(1)	(2)	(3)	(4)	(5)
Equity share capital	10,00,000	35.71	18	6.43
Retained earnings	5,00,000	17.86	15	2.68
Preference share capital	7,00,000	25.00	14	3.50
Debentures	6,00,000	21.43	8	1.71
Total	28,00,000	100.00		Wall = 14.32%

∴ Weighted average cost of capital is 14.32%

WACC is the discount rate that can be used to evaluate the company's new investments, provided that they have the same risk profile as the company as a whole and provided that they used the same combination of debt and equity to finance the proposed investments, or financed by company reserves.

Illustration 17-I 27

Prabhat Steels Ltd. has issued 5,00,000 equity shares of Rs. 10 each. It has retained earnings of Rs. 30 lakhs, 15% Redeemable 10,000 preference shares of Rs. 100 each, 14% 30,000 Non-convertible Debentures of Rs. 100 each, Rs. 30 lakhs 18% Institutional term loan. Assume the cost of capital of each capital component and calculate the WACC.

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Rs.	Capital Structure	Weightage %	Assumed cost of capital	Weighted cost
50,00,000	Equity Capital	33.33	19%	6.33
30,00,000	Retained earnings	20.00	17%	3.40
10,00,000	15% Preference capital	6.67	16%	1.07
30,00,000	14% Debentures	20.00	11%	2.20
30,00,000	18% Institutional Loan	20.00	13%	2.60
1,50,00,000		100%		15.60%

The weighted average cost of capital is 15.60%

The weighed average cost of capital of a company is calculated in two ways.

- ♦ Based on weight of costs by the book value of the different forms of capital.
- ♦ Based on weight of market value of each form of capital.

The market value approach is more realistic for the reasons given below :

- ♦ The cost of funds invested at market prices is familiar with the investors.
- ♦ Investments are generally rated by the reference to their earnings yield, and the company has a responsibility to maintain that yield.

- ◆ Historic book values have no relevance in calculation of real cost of capital.
- ◆ The market value represents near to the opportunity cost of capital.

Illustration 17-128

Amarnath Cements Ltd. has the following capital structure :

(Rs. Lakhs)

Particulars	Market Value	Book Value	Cost %
Equity Share Capital	80	120	18
Preference Share Capital	30	20	15
Fully Secured Debentures	40	40	14

Calculate the company's weighted average cost of capital. Cost of individual sources of capital is net of tax.

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WACC based on Market Value

Capital Source	Market Value (Rs. lakhs) (a)	% (b)	Cost (net of tax) (c)	Weighted cost of capital (b) × (c) = (d)
Equity Capital	80	53.33	18	9.60
Preference Capital	30	20.00	15	3.00
Debentures	40	26.67	14	3.73
Total	150	100		16.33

The weighted average cost of capital of the company based on market values is 16.33%.

WACC based on book value

Capital Source	Market Value (Rs. lakhs) (a)	% (b)	Cost (net of tax) (c)	Weighted cost of capital (b) × (c) = (d)
Equity Capital	120	66.67	18	12.00
Preference Capital	20	11.11	15	1.67
Debentures	40	22.22	14	3.11
Total	180	100		16.78

The weighted average cost of capital of the company based on book values is 16.78%.

17.8-2 WACC after Considering Tax Shields - After taking the tax shields into account, the following formula is applied for calculation of WACC.

$$\text{WACC} = \left[K_E \frac{E}{D + E} \right] + \left[(1 - T) K_D \frac{D}{D + E} \right]$$

Where, K_E = Cost of equity capital
 K_D = Cost of debt
 E = Market value of equity capital
 D = Market value of debt
 T = Corporate tax rate

The simplified version of the above formula is given below :

$$\text{WACC} = (\text{Cost of Equity} \times \% \text{ of Equity}) + [\text{Cost of Debt} (1 - \text{Tax rate}) \times \% \text{ of Debt}]$$

The percentage of equity and debt represents the gearing of the company. The tax rate is corporate rate of tax payable by the company from profits.

Illustration 17-129

Good Health Ltd. has a gearing ratio of 30%. The cost of equity is computed at 21% and the cost of debt 14%. The corporate tax rate is 40%.

Calculate WACC of the company.

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$$\begin{aligned} \text{WACC} &= (21\% \times 0.70) + [14\% (1 - 0.40) \times 0.30] \\ &= 14.70\% + 2.52\% = 17.22\% \end{aligned}$$

Illustration 17-I 30

Hindustan Chemicals Ltd. has paid up equity capital 6,00,000 equity shares of Rs. 10 each. The current market price of share is Rs. 24. During the current year, the company has declared a dividend of Rs. 6 per share. The company has also previously issued 14% preference shares of Rs. 10 each aggregating Rs. 30 lakhs and 13% 50,000 debentures of Rs. 100 each. The company's corporate tax rate is at 40%, the growth in dividends on equity shares is expected at 5%. In case of preference shares the company has received only 95% of the face value of shares after deducting issue expenses.

Calculate WACC of the Company.

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(1) Cost of Equity Capital

$$\begin{aligned} K_E &= \left[\frac{\text{Dividend}}{\text{Market price}} \times 100 \right] + \text{growth rate} \\ &= \frac{\text{Rs. 6}}{\text{Rs. 24}} \times 100 + 5\% = 30\% \end{aligned}$$

(2) Cost of Preference Capital

$$K_p = \frac{\text{Preference Dividend}}{\text{New issue receipt}} = \frac{\text{Rs. 1.4}}{\text{Rs. 9.50}} \times 100 = 14.74\%$$

(3) Cost of Debentures

$$\begin{aligned} K_D &= I(1 - T) \\ \text{Where } I &= \text{Interest rate} \\ T &= \text{Tax rate} \\ &= 13\% (1 - 0.40) = 7.8\% \end{aligned}$$

1st Method

Nominal Value (Rs.)	Nature of Stock	Ratio %	Cost of capital %	Weighted Cost of Capital %
(1)	(2)	(3)	(4)	(3) × (4) = (5)
60,00,000	Equity Capital	42.86	30	12.86
30,00,000	14% Preference Capital	21.43	14.74	3.16
50,00,000	15% Debentures	35.71	7.8	2.78
1,40,00,000		100		WACC = 18.80

2nd Method

Nature of stock	Nominal value Rs.	Cost of capital %	Product
Equity Capital	60,00,000	30	18,00,000
14% Preference Capital	30,00,000	14.74	4,42,200
15% Debentures	50,00,000	7.8	3,90,000
	1,40,00,000		26,32,200

$$\text{WACC} = \frac{26,32,200}{1,40,00,000} \times 100 = 18.80\%$$

Illustration 12-I 31

The capital structure of Bombay Traders Ltd. as on 31-3-2001 is as follows :

(Rs. Crores)

Equity Capital : 100 lakhs equity shares of Rs. 10 each	10
Reserves	2
14% Debentures of Rs. 100 each	3

For the year ended 31-3-2001 the company has paid equity dividend at 20%. As the company is a market leader with good future, dividend is likely to grow by 5% every year. The equity shares are now treated at Rs. 80 per share in the stock exchange. Income-tax rate applicable to the company is 50%.

Required :

- (a) The current weighted cost of capital.
- (b) The company has plans to raise a further Rs. 5 crores by way of long term loan at 16% interest. When this takes place the market value of the equity shares is expected to fall to Rs. 50 per share. What will be the new weighted average cost of capital of the company ?

(I.C.W.A. INTER, DEC. 1996)

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(a) Current Weighted Average Cost of Capital

(i) Cost of Debt Capital :

$$K_D = I(1 - T)$$

Where, K_D = Cost of debt
 I = Annual interest rate i.e. 14%
 T = Corporate tax rate i.e. 50%

Then

$$K_D = 14(1 - 0.5) = 7\%$$

(ii) Cost of equity capital applying dividend growth model :

$$K_E = \left[\frac{D}{MV} \times 100 \right] + g$$

Where, K_E = Cost of equity capital
 D = Amount of dividend per share
 MV = Market value of share
 g = Growth % in dividend

Then,

$$K_E = \left[\frac{2}{80} \times 100 \right] + 5\% = 7.5\%$$

(iii) Weighted average cost of capital (WACC)

Particulars	Rs. crores		%	Cost of funds %
Shareholders funds				
Equity Capital	10			
Reserves	2	12	80%	7.5
Debentures (debt)		3	20%	7.0
Total		15	100%	

$$\begin{aligned} \text{WACC} &= (\text{Cost of Equity} \times \% \text{ of Equity}) + (\text{Cost of Debt} \times \% \text{ of Debt}) \\ &= (7.5 \times 0.80) + (7 \times 0.20) = 6 + 1.4 = 7.4\% \end{aligned}$$

(b) Weighted Average Cost of Capital After Raising Further Debt of Rs. 5 crores :

- (i) Cost of existing debt of Rs. 3 crores = 7%
- (ii) Cost of new debt of Rs. 5 crores = $16(1 - 0.5)$ = 8%
- (iii) Cost of Equity

$$= \left[\frac{2}{50} \times 100 \right] + 5\% = 9\%$$

New Capital structure would be :

Particulars	Rs. crores		%	Cost of funds %
Shareholders funds	12		60	9
Debentures	3		15	7
Long term Loan	5		25	8
Total	20		100	

$$\begin{aligned}\text{New WACC} &= (9 \times 0.60) + (7 \times .15) + (8 \times .25) \\ &= 5.4 + 1.05 + 2 = 8.45\%\end{aligned}$$

Illustration 17-132

M/s. Albert & Co. has the following capital structure as on 31st March, 2001 :

	(Rs.)
10% Debentures	3,00,000
9% Preference Shares	2,00,000
Equity - 5,000 shares of Rs. 100 each	5,00,000
Total	10,00,000

The equity shares of the company are quoted at Rs. 102 and the company is expected to declare a dividend of Rs. 9 per share for 2001.

- Assuming the tax rate applicable to the company at 50%. Calculate the weighted average cost of capital. State your assumptions, if any.
- Assuming in the exercise, that the company can raise additional term loan at 12% for Rs. 5,00,000 to finance an expansion, calculate the revised weighted cost of capital. The company's assessment is that it will be in a position to increase the dividend from Rs. 9 per share to Rs. 10 per share, but the business risk associated with new financing way bring down the market price from Rs. 102 to Rs. 96 per share.

(C.S. FINAL DEC., 1989)

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- (i) Calculation of weighted average cost of capital (WACC) of M/s. Albert & Co. before raising additional finance.

Source	Proportion	Cost of funds (%)	Weighted cost of capital (%)
Debentures (10%)	(3/10)	5*	$(5 \times 3/10) = 1.5$
Preference Shares (9%)	(2/10)	9	$(9 \times 2/10) = 1.8$
Equity Shares	(5/10)	13.8**	$(13.8 \times 5/10) = 6.9$
WACC before raising additional finance			10.2

$$\begin{aligned}\text{*Cost of Debentures (K}_D\text{)} &= \text{Rate of interest - Tax Shield} \\ &= 10\% - (\text{Tax @ 50\% on 10\%}) = 5\%\end{aligned}$$

**Cost of Equity Capital is calculated as follows :

$$\begin{aligned}K_E &= \frac{\text{Dividend}}{\text{Market price per share}} + \text{Growth rate} \\ &= (9/102) + 0.05 = 0.138 \text{ or } 13.8\%\end{aligned}$$

- (ii) Calculation of WACC after raising a term loan of Rs. 5,00,000 @ 12% p.a.

Source	Proportion	Cost of funds (%)	Weighted cost of capital (%)
Debentures (10%)	(3/15)	(10-50% Tax) = 5.0	$(5 \times 3/15) = 1.0$
Term Loan (12%)	(5/15)	(12-50% Tax) = 6.0	$(6 \times 5/15) = 2.0$
Preference shares (9%)	(2/15)	9.0	$(9 \times 2/15) = 1.2$
Equity	(5/15)	15.4*	$(15.4 \times 5/15) = 5.1$
WACC after raising a term loan of Rs. 5,00,000			= 9.3

*Cost of Equity Capital is calculated as follows :

$$K_E = \frac{\text{New Dividend}}{\text{Market price per share}} + \text{Growth rate}$$

$$= \frac{(10/96)}{0.05} + 0.05 = 0.154 \text{ or } 15.4\%$$

Illustration 17-I 33

The capital structure of Swan & Co. comprising of 12% debentures, 9% preference shares and equity shares of Rs. 100 each is in the proportion of 3:2:5.

The company is contemplating to introduce further capital to meet the expansion needs by seeking 14% term loan from financial institutions. As a result of this proposal, the proportions of debentures, preference shares and equity would get reduced by 1/10, 1/15 and 1/6 respectively.

In the light of above proposal, calculate the impact on weighted average cost of capital assuming 50% tax rate, expected dividend of Rs. 9 per share at the end of the year and growth rate of dividends 5%. No change in dividend, dividend growth rate and market price of share is expected after availing the proposed term loan.

(C.S. FINAL JUNE, 1990)

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Cost of Capital before raising Term Loan.

Source	Proportion	Effective interest (%)	Weighted Cost
Debentures (12%)	(3/10)	$12 \times (50\% \text{ Tax}) = 6$	$(6 \times 3/10) = 1.8$
Preference Shares (9%)	(2/10)	9	$(9 \times 2/10) = 1.8$
Equity	(5/10)	13.2*	$(13.2 \times 5/10) = 6.6$
Weighted cost of capital			10.2

*Working for cost of Equity.

Cost of Equity Capital is calculated as below :

Let us assume the market price of Equity is Rs. 110

Then, the cost of equity capital under Gordons growth model:

$$K_E = \frac{\text{Dividend}}{\text{Market price}} + \text{Dividend growth rate}$$

$$= \frac{9}{110} + 0.05 = 0.132 \text{ or } 13.2\%$$

Cost of Capital after raising Term Loan.

Source	Proportion	Effective interest rate (%)	Weighted Cost
Debenture (12%)	(3/15)	$12 \times (50\% \text{ Tax}) = 6.0$	$(6 \times 3/15) = 1.20$
Preference Shares (9%)	(2/15)	9.0	$(9 \times 2/15) = 1.20$
Term Loan (14%)	(5/15)	$14 \times (50\% \text{ Tax}) = 7.0$	$(7 \times 5/15) = 2.33$
Equity	(5/15)	13.2	$(13.2 \times 5/15) = 4.40$
Weighted Cost of Capital			9.13

PROBLEM 17-P4

Aries Limited wishes to raise additional Finance of Rs. 10 lakhs for meeting its investment plans. It has Rs. 2,10,000 in the form of retained earnings available for investment purposes. The following are the further details :

(1) Debt/equity mix	30%/70%
(2) Cost of debt	
upto Rs. 1,80,000	10% (before tax)
beyond Rs. 1,80,000	16% (before tax)
(3) Earnings per share	Rs. 4
(4) Dividend pay out	50% of earnings
(5) Expected growth rate in dividend	10%
(6) Current market price per share	Rs. 44
(7) Tax rate	50%

You are required :

- To determine the pattern for raising the additional finance.
- To determine the post-tax average cost of additional debt.
- To determine the cost of retained earnings and cost of equity, and
- Compute the overall weighted average after tax cost of additional Finance

(C.A. FINAL MAY, 1993)

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(a) Pattern of raising additional finance

Equity	=	70% of Rs. 10,00,000	=	Rs. 7,00,000
Debt	=	30% of Rs. 10,00,000	=	Rs. 3,00,000

The Capital Structure after raising additional finance :

(Rs.)

Shareholders funds			
Equity Capital	(7,00,000 - 2,10,000)		4,90,000
Retained earnings			2,10,000
Debt (Interest at 10% p.a.)			1,80,000
(Interest at 16% p.a.)	(3,00,000 - 1,80,000)		1,20,000
Total funds			10,00,000

(b) Determination of Post-tax average cost of additional debt

$$K_D = I(1-T)$$

Where,

I = Interest rate

T = Corporate tax-rate

on Rs. 1,80,000 = 10% (1 - 0.5) = 5% or 0.05

on Rs. 1,20,000 = 16% (1 - 0.5) = 8% or 0.08

Average Cost of Debt

$$= \frac{(\text{Rs. } 1,80,000 \times 0.05) + (\text{Rs. } 1,20,000 \times 0.08)}{\text{Rs. } 3,00,000} \times 100 = 6.2\%$$

(c) Determination of cost of retained earnings and cost of equity applying dividend growth model :

$$K_E = \frac{D_1}{P_0} + g$$

Where,

 K_E = Cost of equity D_1 = $D_0(1 + g)$ D_0 = Dividend payout (i.e., 50% earnings = 50% × Rs. 4 = Rs. 2)

g = Growth rate i.e., 10%

 P_0 = Current market price per share i.e., Rs. 44

Then,

$$K_E = \frac{\text{Rs. } 2(1.1)}{\text{Rs. } 44} + 10\%$$

$$= \frac{\text{Rs. } 2.2}{\text{Rs. } 44} + 10\% = 5\% + 10\% = 15\%$$

(d) Computation of overall weighted average after tax cost of additional finance

Particulars	Rs.	Weights	Cost of funds
Equity (including retained earnings)	7,00,000	0.70	15%
Debt	3,00,000	0.30	6.2%

Problem 17-P5**COST OF CAPITAL**

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$$\begin{aligned}
 \text{WACC} &= (\text{Cost of Equity} \times \% \text{ Equity}) + (\text{Cost of Debt} \times \% \text{ Debt}) \\
 &= (15\% \times 0.70) + (6.2\% \times 0.30) \\
 &= 10.5\% + 1.86\% = 12.36\%
 \end{aligned}$$

PROBLEM 17-P5

The following information has been extracted from the balance sheet of Fashions Ltd. as on 31-3-2001 :

(Rs. lakhs)

Equity	400
12% Debentures	400
Term loan (interest 18%)	1,200
	2,000

- Determine the weighted average cost of capital of the company. It had been paying dividends at a consistent rate of 20% p.a.
- What difference will it make if the current price of the Rs. 100 share is Rs. 160?
- Determine the effect of Income-tax on the cost of capital under both premises.

(I.C.W.A. FINAL JUNE, 1995)

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- Calculation of weighted average cost of capital of Fashions Ltd. based on book value and before consideration of tax shield on interest :

Source of Capital	Amount (Rs.lakhs)	Proportion to total capital %	Cost of capital %	Weighted cost of Capital %
Equity	400	.20	20	4.00
12% Debentures	400	.20	12	2.40
Term Loan (18%)	1200	.60	18	10.80
Total	2000	1.00		17.20

The weighted average cost of capital of the company is 17.20% based on the book value of equity.

- Calculation of WACC based on market price but before considering tax shield on interest :

Source of Capital	Proportion to total capital %	Cost of Capital %	Weighted cost of capital %
Equity	0.20	12.5*	2.5
12% Debentures	0.20	12	2.4
Term Loan 18%	0.60	18	10.8
Total	1.00		15.7

*Cost of equity capital based on market price of equity share.

$$= \frac{20}{160} \times 100 = 12.5\% \text{ p.a.}$$

(c) Calculation of WACC based on book value and after considering tax shields (Assumption Tax rate @ 50%).

Source of capital	Cost of capital %	Tax shield %	Net cost of capital %	Proportion of capital %	Weighted cost %
Equity	20	-	20	0.20	4.00
12% Debentures	12	0.5	6	0.20	1.20
Term Loan (18%)	18	0.5	9	0.60	5.40
Weighted average cost of capital					10.60

WACC = 10.60%

Calculation of WACC based on market price of equity shares and after considering tax shields (Assumption Tax rate @ 50%).

Source of capital	Cost of capital %	Tax shield %	Net cost of capital %	Proportion of capital %	Weighted cost %
Equity	12.5	-	12.5	0.20	2.50
12% Debentures	12	0.5	6.0	0.20	1.20
Term Loan (18%)	18	0.5	9.0	0.60	5.40
Weighted average cost of capital					9.10

PROBLEM 17-P6

ZED Limited is presently financed entirely by equity shares. The current market value is Rs. 6,00,000. A dividend of Rs. 1,20,000 has just been paid. This level of dividend is expected to be paid indefinitely. The company is thinking of investing in a new project involving an outlay of Rs. 5,00,000 now and is expected to generate net cash receipts of Rs. 1,05,000 per annum indefinitely. The project would be financed by issuing Rs. 5,00,000 debentures at the market interest rate of 18%.

Ignoring tax consideration:

- (1) Calculate the value of equity shares and the gain made by the shareholders if the cost of equity rises to 21.6%.
- (2) Prove that the weighted average cost of capital is not affected by gearing.

(C.A. FINAL NOV., 1995)

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(Rs.)

Cash inflow from project	1,05,000
Less : Debenture interest (@ 18% p.a. on Rs. 5,00,000)	90,000
Amount available for dividends	15,000
Original dividend	1,20,000
	1,35,000
Value of Equity $\left(\frac{1,35,000 \times 100}{21.6} \right)$	6,25,000
Original Value	6,00,000
Gain to Equity Shareholders	25,000

Calculation of weighted average cost of capital (WACC)

Source of capital	Market Value (Rs.)	Proportion	Cost %	WACC %
Equity Capital	6,25,000	5/9	21.6	12
Debentures	5,00,000	4/9	18.0	8
Total				20

Cost of equity capital (existing)

$$= \frac{\text{Original dividend}}{\text{Original value of equity capital}} = \frac{\text{Rs. 1,20,000}}{\text{Rs. 6,00,000}} \times 100 = 20\%$$

PROBLEM 17-P7

Three companies A, B & C are in the same type of business and hence have similar operating risks. However, the capital structure of each of them is different and the following are the details :

		A	B	C
Equity Share Capital [Face value Rs. 10 per share]	Rs.	4,00,000	2,50,000	5,00,000
Market value per share	Rs.	15	20	12
Dividend per share	Rs.	2.70	4	2.88
Debentures [Face value per debenture Rs. 100]	Rs.	Nil	1,00,000	2,50,000
Market value per debenture	Rs.	-	125	80
Interest rate	-	-	10%	8%

Assume that the current levels of dividends are generally expected to continue indefinitely and the income-tax rate at 50%.

You are required to compute the weighted average cost of capital of each company.

(C.A. FINAL NOV., 1995)

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Cost of Equity

$$K_E = \frac{\text{Dividend}}{\text{Market value}} \times 100$$

$$\text{Company A} = (2.70/15) \times 100 = 18\%$$

$$\text{Company B} = (4/20) \times 100 = 20\%$$

$$\text{Company C} = (2.88/12) \times 100 = 24\%$$

Cost of Debt

$$K_D = \frac{\text{Interest (1 - Tax)}}{\text{Market value}} \times 100$$

$$\text{Company B} = \frac{\text{Rs. 10 (1 - 0.50)}}{\text{Rs. 125}} \times 100 = 4\%$$

$$\text{Company C} = \frac{\text{Rs. 8 (1 - 0.50)}}{\text{Rs. 80}} \times 100 = 5\%$$

(at market value)

Name of Company	Equity		Debt	
	Rs.	%	Rs.	%
A	6,00,000	100	-	-
B	5,00,000	80	1,25,000	20
C	6,00,000	75	2,00,000	25

WACC (at market values of debt and equity)

$$= (\text{Cost of equity} \times \% \text{ of equity}) + (\text{Cost of debt} \times \% \text{ of Debt})$$

A	=	$(18\% \times 1.00)$	=	18%
B	=	$(20\% \times 0.80) + (4\% \times 0.20)$	=	16.8%
C	=	$(24\% \times 0.75) + (5\% \times 0.25)$	=	19.25%

PROBLEM 17-P8

You are required to determine the weighted average cost of capital (K_w) of the K.C. Ltd. using (i) book value weights; and (ii) market value weights. The following information is available for your perusal.

The K.C. Ltd.'s present book value capital structure is : (Rs.)

Debentures	(Rs. 100 per debenture)	8,00,000
Preference shares	(Rs. 100 per share)	2,00,000
Equity shares	(Rs. 10 per share)	10,00,000
		20,00,000

All these securities are traded in the capital markets. Recent prices are debentures @ Rs. 110, preference shares @ Rs. 120 and equity shares @ Rs. 22. Anticipated external financing opportunities are—

- (i) Rs. 100 per debenture redeemable at par : 20-year maturity, 8% coupon rate, 4% flotation costs, sale price Rs. 100.
- (ii) Rs. 100 preference share redeemable at par : 15-year maturity, 10% dividend rate, 5% flotation costs, sale price Rs. 100.
- (iii) Equity shares Rs. 2 per share flotation costs, sale price Rs. 22.

In addition, the dividend expected on the equity share at the end of the year Rs. 2 per share; the anticipated growth rate in dividends is 5% and the company has the practice of paying all its earning in the form of dividends. The corporate tax rate is 50%.

(C.S. FINAL DEC., 1996)

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Calculation of Weighted Average Cost of Capital (WACC)**(i) Cost of Equity Capital (K_e)**

$$K_e = \frac{D_1}{NP} + g$$

Where

- K_e = Cost of equity capital
- D_1 = Expected dividend i.e. Rs. 2
- NP = Net proceeds i.e. sale price - Flotation Cost i.e., Rs. 22 - Rs. 2 = Rs. 20
- g = Growth rate in dividend

By substituting, we get;

$$K_e = \frac{\text{Rs. 2}}{\text{Rs. 20}} + 0.05 = 0.15 \text{ or } 15\%$$

(ii) Cost of Debentures (K_d)

$$K_d = \frac{\left[I + \left(\frac{RV - SV}{N} \right) \right] (1 - T)}{\left(\frac{RV - SV}{2} \right)}$$

Where

- K_d = Cost of debentures
 I = Annual Interest payment *i.e.*, Rs. 8
 RV = Redeemable value of debentures at the time of maturity *i.e.*, Rs. 100
 SV = Out sale value from the issue of debentures (Less of discount and flotation expenses) *i.e.*, Rs. 96
 N = Term of maturity period of debenture *i.e.*, 20 years
 T = Tax rate *i.e.*, @ 50%

By substituting, we get,

$$\begin{aligned}
 K_d &= \frac{\left[Rs. 8 + \left(\frac{Rs. 100 - Rs. 96}{20} \right) \right] (1 - 0.50)}{\left(\frac{Rs. 100 - Rs. 96}{2} \right)} \\
 &= \frac{(Rs. 820) (0.50)}{Rs. 98} \\
 &= \frac{Rs. 410}{Rs. 98} = 0.0418 \quad \text{or} \quad 4.18\%
 \end{aligned}$$

(iii) Cost of Preference Shares (K_p)

$$K_p = \frac{\left[D + \left(\frac{RV - SV}{N} \right) \right]}{\left(\frac{RV + SV}{2} \right)}$$

Where

- K_p = Cost of preference shares
 D = Constant annual dividend payment *i.e.*, Rs. 10
 R_v = Redeemable value at the time of redemption *i.e.*, Rs. 100
 S_v = Sale out value Less flotation cost *i.e.*, Rs. 95
 N = Maturity period preference shares *i.e.*, 15 years

By substituting, we get

$$\begin{aligned}
 K_p &= \frac{Rs. 10 + \left(\frac{Rs. 100 - Rs. 95}{15} \right)}{\left(\frac{Rs. 100 + Rs. 95}{2} \right)} \\
 &= \frac{Rs. 10.33}{Rs. 97.5} = 0.1059 \quad \text{or} \quad 10.59\%
 \end{aligned}$$

(1) Weighted Average Cost of Capital (K_o)

(based on book value of weights)

Source of Capital	Book Value Rs.	%	Cost of capital	Total cost
Equity capital	10,00,000	0.50	0.1500	0.0750
Preference capital	2,00,000	0.10	0.1059	0.0106
Debentures	8,00,000	0.40	0.0418	0.0167
Total	20,00,000	1.00		0.1023

Weighted Average cost of capital $K_o = 10.23\%$ (2) Weighted Average Cost of Capital (K_o)

(based on market value of weights)

Source of Capital	Market value Rs.	%	Cost of capital	Total cost
Equity share capital	22,00,000	0.6626	0.1500	0.09939
Preference share capital	2,40,000	0.0723	0.1059	0.00766
Debentures	8,80,000	0.2651	0.0418	0.01108
Total	33,20,000	1.000		0.11813

Weighted Average cost of capital $K_o = 11.81\%$

PROBLEM 17-P9

Gentry Motor, Inc. a producer of turbine generators, is in this situation: EBIT = Rs. 40 lakh; tax rate = $T = 35\%$; debt outstanding = $D = Rs. 20$ lakhs; $K_d = 10\%$; $K_e = 15\%$ shares of stock outstanding = No. = 6,00,000; and book value per share = Rs. 10. Since Gentry's product market is stable and the company expects no growth, all earnings are paid out as dividends. The debt consists of perpetual bonds.

- What are the Gentry's earning per share (EPS) and its price per share (P_o)?
- What is Gentry's weighted average cost of capital (K_o)?
- Gentry can increase its debt by Rs. 80 lakhs, to a total of Rs. 1 crore, using the new debt to buy back and retire some of its shares at the current price. Its interest rate on debt will be 12% (it will have to call and refund the old debt), and its cost of equity will rise from 15% to 17%. EBIT will remain constant. Should Gentry change its capital structure?

(C.S. FINAL DEC., 1998)

♦♦

Gentry Motors Inc.

(i) Calculation of Earning Per Share (EPS) and Price per share (P_o)

(Rs.)

EBIT	40,00,000
Interest (Rs. 20,00,000 \times 0.153846)	3,07,692
Net Income before tax	36,92,308
Less Taxes (35%)	12,92,308
Net Income after taxes	24,00,000

$$\begin{aligned}
 \text{EPS} &= \text{Rs. } 24,00,000 / 6,00,000 = \text{Rs. } 4.00 \\
 P_o &= \text{Rs. } 4.00 / 0.15 = \text{Rs. } 26.67 \\
 (\text{Given } D/p &= 100\% \text{ and } G = 0) \\
 K_d &= K_i (1-t), \\
 10 &= K_i (1-0.35) \\
 K_i &= 15.3846\%
 \end{aligned}$$

Where

- K_d = Cost of debentures
 I = Annual Interest payment i.e., Rs. 8
 RV = Redeemable value of debentures at the time of maturity i.e., Rs. 100
 SV = Out sale value from the issue of debentures (Less of discount and flotation expenses) i.e., Rs. 96
 N = Term of maturity period of debenture i.e., 20 years
 T = Tax rate i.e., @ 50%

By substituting, we get,

$$\begin{aligned}
 K_d &= \frac{\left[Rs. 8 + \left(\frac{Rs. 100 - Rs. 96}{20} \right) \right] (1 - 0.50)}{\left(\frac{Rs. 100 - Rs. 96}{2} \right)} \\
 &= \frac{(Rs. 820) (0.50)}{Rs. 98} \\
 &= \frac{Rs. 410}{Rs. 98} = 0.0418 \quad \text{or} \quad 4.18\%
 \end{aligned}$$

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Where

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 S_v = Sale out value Less flotation cost i.e., Rs. 95
 N = Maturity period preference shares i.e., 15 years

By substituting, we get

$$\begin{aligned}
 K_p &= \frac{Rs. 10 + \left(\frac{Rs. 100 - Rs. 95}{15} \right)}{\left(\frac{Rs. 100 + Rs. 95}{2} \right)} \\
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(based on book value of weights)

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Weighted Average cost of capital $K_o = 11.81\%$

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- Gentry can increase its debt by Rs. 80 lakhs, to a total of Rs. 1 crore, using the new debt to buy back and retire some of its shares at the current price. Its interest rate on debt will be 12% (it will have to call and refund the old debt), and its cost of equity will rise from 15% to 17%. EBIT will remain constant. Should Gentry change its capital structure?

(C.S. FINAL DEC., 1998)

◆◆ Gentry Motors Inc.

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(Rs.)

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Interest (Rs. 20,00,000 \times 0.153846)	3,07,692
Net Income before tax	36,92,308
Less Taxes (35%)	12,92,308
Net Income after taxes	24,00,000

$$\text{EPS} = \text{Rs. } 24,00,000 / 6,00,000 = \text{Rs. } 4.00$$

$$P_o = \text{Rs. } 4.00 / 0.15 = \text{Rs. } 26.67$$

$$\text{(Given } D/p = 100\% \text{ and } G = 0)$$

$$K_d = K_i (1-t)$$

$$10 = K_i (1-0.35)$$

$$K_i = 15.3846\%$$

Problem 17-P10

COST OF CAPITAL

2.338

(ii) Calculation of Weighted Average Cost of Capital (K_a)

Equity (6,00,000 × Rs. 10)	(Rs.)
Debt	60,00,000
Total capital	20,00,000
	80,00,000

$$K_a = (K_e \times W_1) + (K_d \times W_2)$$

where K_e = Cost of equity,

W_1 = Weight of equity

K_d = After tax Cost of debt,

W_2 = Weight of debt

$$= (0.15)(0.75) + (0.10) \times (0.25)$$

$$= 0.1125 + 0.25$$

$$= 0.1375 \text{ or } 13.75\%$$

(iii) EBIT

Interest (Rs. 1,00,00,000 × 0.12)	(Rs.)
Net Income Before taxes	40,00,000
Less : Taxes (35%)	12,00,000
Net Income after taxes	28,00,000
	9,80,000
	18,20,000

Shares bought and retired:

$$\Delta N = \text{Debt} / P_o = \text{Rs. } 80,00,000 / 26.67 = 2,99,963 \text{ shares}$$

New Outstanding shares:

$$N = N_o - \Delta N = 6,00,000 - 2,99,963 = 3,08,037$$

$$\text{New EPS : EPS} = 18,20,000 / 3,08,037 = \text{Rs. } 5.90$$

$$\text{New price per share} = P_o = 5.90 / 0.17 = \text{Rs. } 34.71$$

Results

$$\text{New EPS} = \text{Rs. } 5.90 \text{ as against existing EPS of Rs. } 4.00$$

$$\text{New price per share} = \text{Rs. } 34.71 \text{ as against existing price per share of Rs. } 26.67$$

Therefore, Gentry should change its capital structure.

Assumption : K_d is assumed as after tax cost of debt, K_1 before tax cost of debt and $K_d = K_1(1-t)$

PROBLEM 17-P10

The following is the capital structure of Simons Company Ltd. as on 31-12-2001 :

Equity shares : 10,000 shares (of Rs. 100 each)	(Rs.)
10% Preference Shares (of Rs. 100 each)	10,00,000
12% Debentures	4,00,000
	6,00,000
	20,00,000

The market price of the company's share is Rs. 110 and it is expected that a dividend of Rs. 10 per share would be declared for the year 2001. The dividend growth rate is 6% :

- If the company is in the 50% tax bracket, compute the weighted average cost of capital.
- Assuming that in order to finance an expansion plan, the company intends to borrow a fund of Rs. 10 lakh bearing 14% rate of interest, what will be the company's revised weighted average cost of capital? This financing decision is expected to increase dividend from Rs. 10 to Rs. 12 per share. However, the market price of equity share is expected to decline from Rs. 110 to Rs. 105 per share.

(C.A. FINAL NOV., 1999)

(i) Current Finance Scheme

Working Notes :

1. Cost of Equity shares (K_E)

$$K_E = \frac{D_1}{P_E} + g$$

Where

 D_1 = Current dividend per share i.e., Rs. 10 P_E = Market price per share i.e., Rs. 110 g = Expected growth rate i.e., 6%

$$K_E = \frac{\text{Rs. 10}}{\text{Rs. 110}} + 0.06$$

$$= 0.1509 \text{ or } 15.09\%$$

Calculation of WACC

Source	Amount Rs.	Proportion	Cost of capital %	Weighted cost of Capital %
Equity shares	10,00,000	0.50	15.09	7.54
10% preference shares	4,00,000	0.20	10.00	2.00
12% Debentures	6,00,000	0.30	6.00*	1.80
Total	20,00,000	1.00		WACC = 11.34

*12% - Tax shield 50% of 12% = 6%

(ii) Revised Finance Scheme

Working Notes :

$$K_E = \frac{\text{Rs. 12}}{\text{Rs. 105}} = 0.06$$

$$= 0.1742 \text{ or } 17.42\%$$

Calculation of Revised WACC

Source	Amount Rs.	Proportion	Cost of capital %	Weighted cost of Capital %
Equity shares	10,00,000	0.333	17.42	5.80
10% Preference Shares	4,00,000	0.134	10.00	1.34
12% Debentures	6,00,000	0.200	6.000*	1.20
14% Loan	10,00,000	0.333	7.00*	2.33
Total	30,00,000	1.000		WACC = 10.67

*Less tax shield of 50%.

Problem 17-P11**PROBLEM 17-P11**

The following are the extracts from the financial statements of ABC Ltd :

(Rs. lakhs)

Operating Profit	105
Less: Interest on Debenture	33
	72
Less: Income Tax	36
Net Profit	36
Equity Share Capital (shares of Rs. 10 each)	200
Reserves and Surplus	100
15% Non-convertible Debentures	220
	520

The Market price per Equity Share is Rs. 12 and per Debenture is Rs. 93.75.

- (a) What is the Earning per Share ?
 (b) What is the percentage of Cost of Capital to the Company for the Debenture fund and the Equity ?

(I.C.W.A. FINAL JUNE, 2000)

♦♦

(a) Calculation of Earning Per Share

$$\text{EPS} = \frac{\text{Profit after tax}}{\text{No. of Equity shares}} = \frac{\text{Rs. 36,00,000}}{20,00,000 \text{ Equity shares}} = \text{Rs. 1.80}$$

(b) Calculation of Cost of Capital**(i) Cost of Debenture Fund**

$$K_D = \frac{I(1 - T)}{D}$$

Where

 K_D = Cost of Debenture fund

I = Interest paid on Debenture fund i.e. Rs. 33,00,000

T = Corporate tax rate i.e. 50% or 0.50

D = Total debenture fund

♦ **At Book value**

$$K_D = \frac{\text{Rs. 33,00,000} (1 - 0.50)}{\text{Rs. 2,20,00,000}} = 0.075 \text{ or } 7.5\%$$

♦ **At Market value**

$$K_D = \frac{\text{Rs. 33,00,000} (1 - 0.50)}{\text{Rs. 2,06,25,000}} = 8\%$$

(ii) Cost of Equity Capital

$$K_E = \frac{E}{P_E}$$

Where

 K_E = Cost of Equity capital

E = Current earnings per share i.e. Rs. 1.80

 P_E = Market price of Equity share i.e. Rs. 12

$$K_E = \frac{\text{Rs. 1.80}}{\text{Rs. 12}} = 0.15 \text{ or } 15\%$$

PROBLEM 17-P12

XYZ Ltd., has the following book value capital structure :

Equity Capital (in shares of Rs. 10 each, fully paid up - at par)	Rs. 15 crores
11% Preference Capital (in shares of Rs. 100 each, fully paid-up at par)	Rs. 1 crore
Retained Earnings	Rs. 20 crores
13.5% Debentures (of Rs. 100 each)	Rs. 10 crores
15% Term Loans	Rs. 12.5 crores

The next expected dividend on equity shares per share is Rs. 3.60; the dividend per share is expected to grow at the rate of 7%. The market price per share is Rs. 40.

Preference stock, redeemable after ten years, is currently selling at Rs. 75 per share.

Debentures, redeemable after six years, are selling at Rs. 80 per debenture.

The Income-tax rate for the company is 40%.

(i) Required :

Calculate the weighted average cost of capital using :

- (a) book value proportions; and
- (b) market value proportions.

(ii) Define the weighted marginal cost of capital schedule for the company, if it raises Rs. 10 crores next year, given the following information :

- (a) the amount will be raised by equity and debt in equal proportions;
- (b) the company expects to retain Rs. 1.5 crores earnings next year;
- (c) the additional issue of equity shares will result in the net price per share being fixed at Rs. 32;
- (d) the debt capital raised by way of term loans will cost 15% for the first Rs. 2.5 crores and 16% for the next 2.5 crores.

(C.A. FINAL NOV., 2000)

◆◆

Working Notes**1. Cost of Equity Capital (K_E) and Cost of Retained Earnings (K_R)**

$$K_E = \frac{D_1}{P_0} + g$$

Where

D_1 = Expected dividend at the end of year 1 i.e., Rs. 3.60

P_0 = Current market price of Equity share i.e., Rs. 40

g = Growth rate of Dividend i.e. 7% or 0.07

$$\begin{aligned} K_E &= \frac{3.60}{40} + 0.07 \\ &= 0.09 + 0.07 \\ &= 0.16 \text{ or } 16\% \end{aligned}$$

2. Cost of Preference Share Capital (K_p)

$$K_p = \frac{\left[D + \left(\frac{R_v - S_v}{N} \right) \right]}{\left(\frac{R_v + S_v}{2} \right)}$$

Where

D = Annual preference Dividend i.e. Rs. 11

R_v = Redeemable value of preference share at the end of maturity i.e. Rs. 100

S_v = Sale value of preference share after discount and flotation costs i.e. Rs. 75

N = No. of years to redemption i.e. 10 years

$$K_p = \frac{11 + \left(\frac{100 - 75}{10} \right)}{\frac{100 + 75}{2}}$$

$$= \frac{11 + 2.5}{87.5}$$

$$= \frac{13.5}{87.5} = 0.1543 \text{ or } 15.43\%$$

3. Cost of Debentures (K_D)

$$K_D = \frac{\left[I + \left(\frac{R_v - S_v}{N} \right) \right] (1 - T)}{\left(\frac{R_v + S_v}{2} \right)}$$

Where

I = Interest on Debentures p.a. i.e. Rs. 13.50

R_v = Redeemable value of debenture at the time of maturity i.e. Rs. 100

S_v = Sale value of debenture after discount and flotation expenses i.e. Rs. 80

T = Company Tax rate i.e. 40% or 0.40

N = No. of years to maturity i.e. 6 years

$$K_D = \frac{\left[13.5 + \left(\frac{100 - 80}{6} \right) \right] (1 - 0.40)}{\left(\frac{100 + 80}{2} \right)}$$

$$= \frac{(13.5 + 3.33) (0.60)}{90}$$

$$= \frac{10.098}{90} = 0.1122 \text{ or } 11.22\%$$

4. Cost of Term Loans (K_T)

$$K_T = R(1 - T)$$

Where,

R = Rate of interest on term loan i.e. 15% or 0.15

T = Company's tax rate i.e. 40% or 0.40

$$K_T = 0.15 (1 - 0.40)$$

$$= 0.15 (0.60)$$

$$= 0.09 \text{ or } 9\%$$

5. Cost of Fresh Equity Shares (K_E)

$$K_E = \frac{D_1}{P_0} + g$$

Where

 D_1 = Expected dividend at the end of year 1 i.e. Rs. 3.60 P_0 = Current market price of equity share i.e. Rs. 32 g = Growth rate of dividend i.e. 7% or 0.07

$$K_E = \frac{3.60}{32} + 0.07$$

$$= 0.1125 + 0.07$$

$$= 0.1825 \text{ or } 18.25\%$$

6. Cost of Term Loans (K_T)

$$K_T = R(1-T)$$

I On first Rs. 2.5 Crores Term Loan

$$K_T = 0.15 (1 - 0.40)$$

$$= 0.15 (0.60)$$

$$= 0.09 \text{ or } 9\%$$

II On next Rs. 2.5 Crores Term Loans

$$K_T = 0.16 (1 - 0.40)$$

$$= 0.16 (0.60)$$

$$= 0.096 \text{ or } 9.6\%$$

(i)(a) Calculation of WACC (using book value proportions)

Source of finance	Book value (Rs. Crores)	Weight	Cost of Capital	Weighted Cost of Capital
Equity capital	15	0.256	0.1600	0.04096
11% Pref. capital	1	0.017	0.1543	0.00262
Retained earnings	20	0.342	0.1600	0.05472
13.5% Debentures	10	0.171	0.1122	0.019186
15% Term loan	12.5	0.214	0.0900	0.01926
Total	58.5	1.000		WACC = 0.1367

WACC = 0.1367 or 13.67%

(b) Calculation of WACC (using market value proportions)

Source of finance	Market value (Rs. Crores)	Weight	Cost of Capital	Weighted Cost of Capital
Equity Capital (1.5 crores shares \times Rs. 40 each)	60.00	0.739	0.16	0.11824
11% pref. capital (1 lakh share \times Rs. 75)	0.75	0.009	0.1543	0.00139
13.5% debentures (10 lakh debentures \times Rs. 80)	8.00	0.098	0.1122	0.01099
15% Term Loan	12.50	0.154	0.09	0.01386
	81.25			0.14448

WACC = 0.14448 or 14.45%

Note : Retained earnings is considered for calculation of WACC since it does not have any market value separately. The market value of equity shares reflects the value of retained earnings also.

(ii) Calculation of WACC of XYZ Ltd. if it raises Rs. 10 crores next year

Source of finance	Amount Rs. Crores	Weight	Cost of Capital	Weighted Cost of Capital
I. Retained earnings	1.5	0.5	0.16	0.08
Debt	1.5	0.5	0.09	0.045
WACC				0.125 or 12.5%
II. Equity shares	1.0	0.5	0.1825	0.09125
Debt	1.0	0.5	0.09	0.045
WACC				0.13625 or 13.625%
III. Equity shares	2.5	0.5	0.1825	0.09125
Debt	2.5	0.5	0.096	0.048
WACC				0.13925 or 13.925%

PROBLEM 17-P13

Nishce Ltd. is an all equity financed company. The current market price of the share is Rs. 180. It had just paid a dividend of Rs. 15 per share and expected future growth in dividends is 12%. Currently, it is evaluating a proposal requiring funds of Rs. 20,00,000 with annual inflows of Rs. 10,00,000 for 3 years. Find out the NPV of the proposal if:

- It is financed from retained earnings.
- It is financed by issuing fresh equity (flotation costs 5%)

(C.S. FINAL DEC., 2000)

♦♦

Calculation of NPV if project is financed from retained earnings:

Cost of retained Earnings =

$$= \left[\frac{\text{Expected Dividend at the end of year 1}}{\text{Current market Price of share}} \times 100 \right] + \text{Growth rate of dividend}$$

$$= \left[\frac{15(1.12)}{180} \times 100 \right] + 12\%$$

$$= \left[\frac{16.80}{180} \times 100 \right] + 12\% = 9.3\% + 12\% = 21.3\%$$

$$\text{NPV of the proposal} = -20,00,000 + \frac{10,00,000}{1.213} + \frac{10,00,000}{(1.213)^2} + \frac{10,00,000}{(1.213)^3}$$

$$\text{NPV} = -20,00,000 + \frac{10,00,000}{1.213} + \frac{10,00,000}{1.471369} + \frac{10,00,000}{1.784770}$$

$$= -20,00,000 + 8,24,402 + 6,79,639 + 5,60,296$$

$$= -20,00,000 + 20,64,337$$

$$= \text{Rs. } 64,337$$

Calculation of NPV if project is financed by issuing fresh equity (floatation costs 5%)

Cost of equity =

$$\begin{aligned}
 &= \left[\frac{\text{Expected dividend at the end of year 1}}{\text{Current market price of share (1 - floatation costs)}} \times 100 \right] + \text{growth rate} \\
 &= \left[\frac{15 (1.12)}{180 (1-0.05)} \right] + 12\% \\
 &= \left[\frac{16.80}{171} \times 100 \right] + 12\% \\
 &= 9.8\% + 12\% \\
 &= 21.8\%
 \end{aligned}$$

$$NPV = -20,00,000 + \frac{10,00,000}{1.218} + \frac{10,00,000}{(1.218)^2} + \frac{10,00,000}{(1.218)^3}$$

$$\begin{aligned}
 NPV &= -20,00,000 + \frac{10,00,000}{1.218} + \frac{10,00,000}{1.483524} + \frac{10,00,000}{1.806932} \\
 &= -20,00,000 + 8,21,018 + 6,74,071 + 5,53,424 \\
 &= -20,00,000 + 20,48,513 \\
 &= \text{Rs. 48,513}
 \end{aligned}$$