

## COST OF CAPITAL Q & A

### Problem No.1

A company issue ₹ 10,00,000 12% Debenture of ₹ 100 each. The debenture are redeemable after the expiry of fixed period of 7 years. The company is in 35% tax bracket.

Required:

- (i) Calculate the cost of debt after tax, if debenture are issued at (a) Par (b) 10% discount (c) 10% premium
- (ii) If brokerage is paid at 2%, what will be the cost of debenture, if issue is at par?

**Answer**

$$K_d = \frac{\text{Int} (1 - \text{tax}) + \frac{(\text{R.V} - \text{I.R})}{N}}{\frac{(\text{R.V} + \text{I.R})}{2}} * 100$$

**a) If issued at par**

$$= \frac{12 (1 - 0.35) + \frac{(100 - 100)}{7}}{\frac{(100 + 100)}{2}} * 100$$

= 7.80%

$$\text{Int} = 100 * 12\% = 12$$

$$t = 0.35$$

$$\text{RV} = 100$$

$$\text{NR} = 100$$

**b) Issued at 10% discount**

$$= \frac{12 (1 - 0.35) + \frac{(100 - 90)}{7}}{\frac{(100 + 90)}{2}} * 100$$

=  $\frac{7.8 + 1.43}{95}$

$$\text{NR} = 100 - 10\% = 90$$

$$= 9.71\%$$

**c) Issued at 10% premium**

$$= \frac{12 (1 - 0.35) + \frac{(100 - 110)}{7}}{\frac{(100 + 110)}{2}} * 100$$

$$\text{NR} = 100 + 10\% = 110$$

## COST OF CAPITAL Q & A

2

$$= \frac{7.8 + (-1.43)}{105}$$

$$= 6.07\%$$

**d) If brokerage paid at 2% & issued at par**

$$\frac{12(1 - 0.35) + \frac{(100 - 98)}{7}}{\frac{(100 + 98)}{2}} * 100 \quad \text{NR} = 100 + 2\% = 98$$

$$= \frac{7.8 + 0.29}{99} = 8.17\%$$

### **Problem No.2**

PQR Ltd. has the following capital structure on October 11, 2013 :

Particulars	₹
Equity Share Capital (2,00,000 shares of ₹ 10 each)	20,00,000
Reserve and Surplus	20,00,000
12% Preference Shares	10,00,000
9% Debentures	30,00,000

The market price of equity share is ₹ 30. It is expected that the Company will pay next year a dividend of ₹ 3 per share, which will grow at 7% forever. Assume 40% income tax rate. You are required to compute WACC using market value weight.

**Answer**

#### **Computation of WACC : Existing Capital Structure**

$$\text{Cost of Equity} = D_1/P_0 + g = 3/30 + 0.07 = 0.1 + 0.07 = 0.17 = 17\%$$

$$*K_d = \text{Rate of interest} * (1 - t) = 9\% * (1 - 0.4) = 5.4\% \text{ or } 0.054$$

Source	Amount	After Tax Cost	Weights	Weighted cost
Equity capital	60,00,000	0.17	0.6	0.102
12% PSC	10,00,000	0.12	0.1	0.012
9% Debentures	30,00,000	0.054*	0.3	0.0162
	<b>100,00,000</b>			<b>0.1302</b>

Weighted Average Cost of capital = 0.1302 or 13.02%

## COST OF CAPITAL Q & A

### Problem No. 3

A Limited has the following capital structure

Particulars	Amount ₹
Equity Share Capital (2,00,000 shares)	40,00,000
6% Preference Shares	10,00,000
8% Debentures	30,00,000

The market price of the company's equity share is ₹ 20. It is expected that company will pay a dividend of ₹ 2 per share at the end of current year, which will grow at 7 per cent forever. The tax rate may be presumed at 50 per cent. You are required to compute the following:

- A weighted average cost of capital based on existing capital structure.
- The new weighted average cost of capital if the company raises an additional ₹ 20,00,000 debt by issuing 10 per cent debentures, this would result in increasing the expected dividend to ₹ 3 and leave the growth rate unchanged but the price of share will fall to ₹ 15 per share.

The cost of capital if in (b) above, growth rate increases to 10 per cent.

**Answer**

$$K_e = \left[ \frac{D_1}{NR} \right] * 100 + G$$

$$= \left[ \frac{2}{20} \right] * 100 + 7$$

$$= \mathbf{17\%}$$

$$K_p = \frac{PD}{NR} * 100$$

$$= \frac{6}{100} * 100$$

$$= \mathbf{6\%}$$

$$K_d = \frac{8(1 - 0.5)}{100} * 100$$

$$= \mathbf{4\%}$$

## COST OF CAPITAL Q & A

i) Cal of WACC based on existing capital structure

Source	Amount (Rs.)	W	Cost	W * C
E.S.C	40,000	0.5	17%	8.50%
6% P.S.C	10,000	0.125	6%	0.75%
8% deb	30,000	0.375	4%	1.50%
	<b>80,000</b>			<b>10.75%</b>

ii) 
$$\text{New } K_d = \frac{10(1 - 0.5)}{100} * 100$$

$$= 5\%$$

$$K_e = \left[ \frac{3}{15} \right] * 100 + 7$$

$$= 27\%$$

**New WACC**

Source	Amount (Rs.)	W	Cost	W * C
E.S.C	40,00,000	0.4	27%	10.80%
P.S.C	10,00,000	0.1	6%	0.60%
8% deb	30,00,000	0.3	4%	1.20%
10% deb	20,00,000	0.2	5%	1.00%
	<b>1,00,00,000</b>			<b>13.60%</b>

iii) 
$$K_e = \left[ \frac{3}{15} \right] * 100 + 10$$

$$= 30\%$$

**Calculation of WACC**

Source	Amount (Rs.)	W	Cost	W * C
E.S.C	40,00,000	0.4	30%	12.00%
P.S.C	10,00,000	0.1	6%	0.60%
8% deb	30,00,000	0.3	4%	1.20%
10% deb	20,00,000	0.2	5%	1.00%
	<b>1,00,00,000</b>			<b>14.80%</b>

## COST OF CAPITAL Q & A

### Problem No.4

The capital structure of MNP Ltd. is as under

Particulars	Amount ₹
9% Debentures	₹ 2,75,000
11% Preference Share	₹ 2,25,000
Equity Share (face value: ₹ 10 per share)	₹ 5,00,000
<b>Total</b>	<b>₹ 10,00,000</b>

Additional information:

- (i) ₹ 100 per debenture redeemable at par has 2% flotation cost and 10 year of maturity. The market price per debenture is ₹ 105.
- (ii) ₹ 100 per preference share redeemable at par has 3% flotation cost and 10 year of maturity. The market price per preference share is ₹ 106.
- (iii) Equity share has ₹ 4 flotation cost and market price per share of ₹ 24. The next year expected dividend is ₹ 2 per share with annual growth of 5%. The firm has a practice of paying all earning in the form of dividend.
- (iv) Corporate income tax rate is 35%

Required: Calculate weighted average cost of Capital (WACC) using market value weight.

**Answer**

$$K_d = \frac{\text{Int} (1 - \text{tax}) + \frac{(\text{R.V} - \text{N.R})}{n}}{(\text{R.V} + \text{N.R})} * 100$$

$$= \frac{9 (1 - 0.35) + \frac{(100 - 102.9)}{10}}{(100 + 102.9)} * 100$$

$$= \frac{5.85 - 0.29}{99}$$

$$= \frac{5.56}{101.45}$$

$$= 5.48\%$$

Int = 100 \* 9% = 9

RV = 100

NR = 105 - 2% = 102.9

## COST OF CAPITAL Q & A

ii)

$$K_p = \frac{PD + \frac{(R.V - N.R)}{N}}{\frac{(R.V + N.R)}{2}}$$

$$= \frac{11 + \frac{(100 - 102.82)}{20}}{\frac{(100 + 102.82)}{2}}$$

$$= \frac{11 - 0.282}{101.41}$$

$$= 10.57\%$$

$$P.d = 100 * 11\% = 11$$

$$RV = 100$$

$$NR = 106 - 3\% = 102.82$$

iii)

$$K_e = \left[ \frac{D_1}{MV} \right] * 100 + G$$

$$= \left[ \frac{2}{20} \right] * 100 + 5$$

$$= 15\%$$

### Calculation of WACC using Market value weights

Source	Amount (Rs.)	W	Cost	W * C
E.S.C	12,00,000	0.7	15%	10.42%
P.S.C	2,38,500	0.1	10.57%	1.46%
Deb	2,88,750	0.2	5.48%	0.91%
				<b>12.79%</b>

### Problem No.5

An electric equipment manufacturing company wishes to determine the weighted average cost of capital for evaluating capital budgeting projects. You have been supplied with the following Information:

Balance Sheet			
Liabilities	₹	Assets	₹
Equity Share Capital	12,00,000	Fixed Assets	25,00,000
Pref. Share Capital	4,50,000	Currents assets	15,00,000

## COST OF CAPITAL Q & A

Retained Earnings	4,50,000		
Debentures	9,00,000		
Current Liabilities	10,00,000		
<b>Total</b>	<b>40,00,000</b>	<b>Total</b>	<b>40,00,000</b>

Additional information:

- i. 20 years 14% debentures of ₹ 2,500 face value, redeemable at 5% premium can be sold at par, 2% flotation costs.
- ii. 15% preference shares: Sale price ₹ 100 per share, 2% flotation costs.
- iii. Equity shares: Sale price ₹ 115 per share, flotation costs, ₹ 5 per share  
The corporate tax rate is 55% and the expected growth in equity dividend is 8% per year.

The expected dividend at the end of the current financial year is ₹ 11 per share. Assume that the company is satisfied with its present capital structure and intends to maintain it.

**Answer**

$$K_d = \frac{\text{Int} (1 - \text{tax}) + \frac{(\text{R.V} - \text{N.R})}{n}}{\frac{(\text{R.V} + \text{N.R})}{2}}$$

Int = 2500 \* 14% = 350  
RV = 2500 + 5% = 2625  
NR = 2500 - 2% = 2450

$$= \frac{350 (1 - 0.55) + \frac{(2625 - 2450)}{20}}{\frac{(2625 + 2450)}{2}}$$

$$= \frac{157.5 + 8.75}{2537.5}$$

$$= 6.55\%$$

$$K_p = \frac{\text{Pref div}}{\text{NR}} * 100$$

Pref div = 100 \* 15% = 15

NR = 100 - 2% = 98

$$= \frac{15}{98} * 100$$

$$= 15.31\%$$

$$K_e = \left[ \frac{D_1}{\text{MV}} \right] * 100 + G$$

$$= \left[ \frac{11}{110} \right] * 100 + 8$$

## COST OF CAPITAL Q & A

= 18%

$$K_r = \left[ \frac{D_1}{MV} \right] * 100 + G$$

MV = 115

$$= \left[ \frac{11}{115} \right] * 100 + 8$$

= 17.57%

### Calculation of WACC

Source	Amount (Rs.)	W	Cost	W * C
E.S.C	12,00,000	0.4	18%	7.20%
P.S.C	4,50,000	0.15	15.31%	2.30%
R.E	4,50,000	0.15	17.57%	2.64%
Deb	9,00,000	0.3	6.55%	1.97%
				<b>14.10%</b>

### Problem No.6

In considering the most desirable capital structure for a company, the following estimate cost of debt capital (after tax) have been made a various level of debt-equity mix.

Debts as percentage of Total Capital employed	Cost of Debt %	Cost of Equity %
0	7.0	15.0
10	7.0	15.0
20	7.0	15.5
30	7.5	16.0
40	8.0	17.0
50	8.5	19.0
60	9.5	20.0

You are required to find out the WACC of the firm for different proportions of debt

### Answer

Situation	% Debt	% Equity (b/f)
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## COST OF CAPITAL Q & A

1	0	100
2	10	90
3	20	80
4	30	70
5	40	60
6	50	50
7	60	40

### Situation

1 **WACC** =  $K_e = 15\%$       **WACC** = 15%

2 **WACC**

	Amount			
Source	(Rs.)	W	Cost	W * C
Equity	90	0.9	15%	13.50%
Debt	10	0.1	7%	0.70%
	<b>100</b>			<b>14.20%</b>

3 **WACC**

	Amount			
Source	(Rs.)	W	Cost	W * C
Equity	80	0.8	15.5%	12.40%
Debt	20	0.2	7%	1.40%
	<b>100</b>			<b>13.80%</b>

4 **WACC**

	Amount			
Source	(Rs.)	W	Cost	W * C
Equity	70	0.7	16%	11.20%
Debt	30	0.3	7.5%	2.25%
	<b>100</b>			<b>13.45%</b>

5 **WACC**

	Amount			
Source	(Rs.)	W	Cost	W * C
Equity	60	0.6	17%	10.20%
Debt	40	0.4	8.0%	3.20%
	<b>100</b>			<b>13.40%</b>

6 **WACC**

	Amount			
Source	(Rs.)	W	Cost	W * C

## COST OF CAPITAL Q & A

Equity	50	0.5	19%	9.50%
Debt	50	0.5	8.5%	4.25%
	<b>100</b>			<b>13.75%</b>

### 7 WACC

Source	Amount (Rs.)	W	Cost	W * C
Equity	40	0.4	20%	8.00%
Debt	60	0.6	9.5%	5.70%
	<b>100</b>			<b>13.70%</b>

### Problem No.7

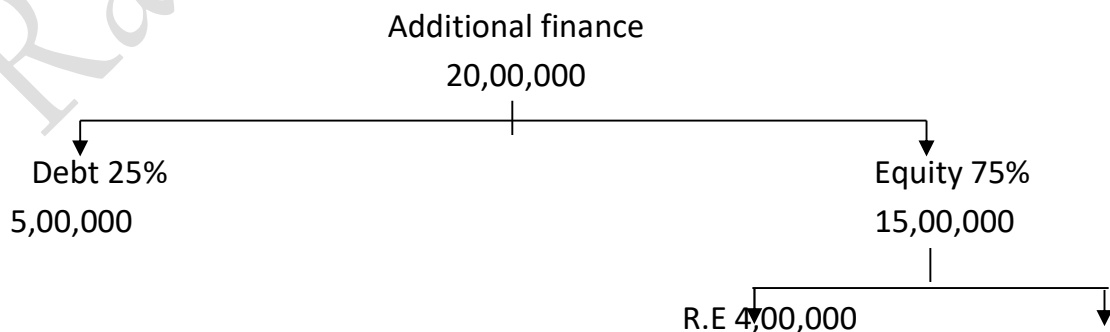
ABC Ltd. wishes to raise additional finance of ₹ 20 lakhs for meeting its investment plans. The company has ₹ 4,00,000 in the form of retained earnings available for investment purpose. The following are the further details:

- a. Debt equity ratio 25:75
- b. Cost of debt at the rate of 10% (before tax) up to ₹ 2,00,000 and 13% (before tax) beyond that
- c. Earnings per share ₹ 12
- d. Dividend payout 50% of earning
- e. Expected growth rate in dividend 10%
- f. Current market price per share ₹ 60
- g. Company tax rate is 30%, and shareholder **personal tax rate is 20%**

Required:

- (i) Calculate the post-tax average cost of additional debt
- (ii) Calculate the cost of retained earnings and cost of equity
- (iii) Calculate the overall weighted average (after tax) cost of additional debt

**Answer**



11,00,000

Up to 2,00,000 - 10%

Beyond - 13%

## COST OF CAPITAL Q & A

$$K_d = \frac{\text{Int} (1 - \text{tax})}{\text{NR}} * 100$$

$$\begin{aligned} \text{Int} &= 2,00,000 * 10\% = 20,000 \\ &3,00,000 * 13\% = 39,000 \\ &\underline{\hspace{1.5cm}} \\ &\mathbf{59,000} \end{aligned}$$

$$\begin{aligned} &\frac{59,000 (1 - 0.3)}{5,00,000} * 100 \\ &= \mathbf{8.26\%} \end{aligned}$$

$$K_e = \left[ \frac{D_1}{\text{MV}} \right] * 100 + G$$

$$= \left[ \frac{6.6}{60} \right] * 100 + 10$$

$$= 21\%$$

$$K_{re} = K_e (1 - \text{personal tax}) = 21 (1 - 0.2) = \mathbf{16.8\%}$$

### Calculation of WACC

Source	Amount (Rs.)	W	Cost	W * C
E.S.C	11,00,000	0.55	21%	11.55%
RE	4,00,000	0.2	16.80%	3.36%
Deb	5,00,000	0.25	8.26%	2.07%
				<u>16.98%</u>

$$\begin{aligned} D_1 &= \text{EPS} * 50\% \\ &= 12 * 50\% = 6 + 10\%(6) \\ &= 6 + 0.6 \\ &= 6.6 \end{aligned}$$

### Problem No.8

The following information is provided in respect of the specific cost of capital of different sources along with the book value (BV) and market value (MV) weights.

Sources	C / C	BV	MV
Equity Share Capital	18%	50%	58%
Preference Share	15%	20%	17%
Long term debts	7%	30%	25%

- i) Calculate the weighted average cost of capital, WACC, using both the BV and MV weights
- ii) Calculate the WMCC using marginal weights given that the company intends to raise additional fund using 50% long term debts, 35% preference shares and 15% by retaining profits.

## COST OF CAPITAL Q & A

### Answer

#### Calculation of WACC using Book value weights

Source	Amount (Rs.)	W	Cost	W * C
E.S.C	-	0.5	18%	9.00%
P.S.C	-	0.2	15.00%	3.00%
Deb	-	0.3	7.00%	2.10%
				<b>14.10%</b>

#### Calculation of WACC using Market value weights

Source	Amount (Rs.)	W	Cost	W * C
E.S.C	-	0.58	18%	10.44%
P.S.C	-	0.17	15.00%	2.55%
Deb	-	0.25	7.00%	1.75%
				<b>14.74%</b>

#### Calculation of WACC using Marginal weights

Source	Amount (Rs.)	W	Cost	W * C
Deb	-	0.5	7%	3.50%
P.S.C	-	0.35	15.00%	5.25%
R.E.	-	0.15	18.00%	2.70%
				<b>11.45%</b>