Cost of Capital

Formulas:-

→ Cost of Debt / Preference

$$P_0 = \sum_{t=1}^{n} \frac{I}{(1+r_D)^t} + \frac{F}{(1+r_D)^n}$$

n = No of years, I = Interest, F = Maturity Value

It requires trial and Error Method. So.

Nearest Approximation

$$r_D = \frac{I + (F - P_0)/n}{0.6\,P_0 + 0.4\,F}$$

→ Debt issued at Par. = $k_d = \frac{Int}{B_0}$

After tax cost of Debt = $k_d (1-t)$

→ Cost of Equity

CAPM Model

$$r_E = R_f + B_e[E(R_m) - R_f]$$

Dividend Growth Model.

$$r_E = \frac{D_0(1+g)}{P_0} + g \quad / \quad P_0 = \frac{D_1}{r_E - g}$$

→ WACC

$w_1 c_e + w_2 c_p + w_3 c_d$. / $WACC = \frac{E}{V} r_E + \frac{D}{V} r_D(1-t)$

~~WACC~~

Example:

ABC Ltd. issued 20 year, 14 percent bond. Ten year ago. The bond which has a face value of Rs 100 is currently selling for Rs. 110.

(i) What is the pre-tax cost of debt?

(ii) What is after-tax cost of debt? (Assume a 35 percent tax rate)

Solution:-

$$r_D = \frac{14 + (100-110)/10}{0.4 \times 100 + 0.6 \times 110}$$

$$= \frac{14 + (-1)}{40 + 66} = \frac{13}{106} = 0.1226$$

$$= 12.26\%$$

After tax cost of Debt

$$r_D(1-t) = 12.26(1-0.35)$$

$$= 7.969\%$$

Example:

Yamaa Enterprises issued. 10 years, 9% Preference Shares. The Shares has a face value of Rs 100 currently selling for Rs 94. What is the cost of Preference Shares?

Solution:-

$$r_p = \frac{I + (F - P_0)/n}{0.6P_0 + 0.4F}$$

$$= \frac{9 + (100 - 94)10}{0.6 \times 94 + 0.4 \times 100}$$

$$= \frac{8.4}{56.4 + 40} = 0.0871 = \boxed{8.71\%}$$

Example:-

Raj corporation has a target capital structure of 60% equity and 40% debt. Its cost of equity is 16 percent and its pre-tax cost of debt is 14 percent. If the tax-rate is 35%, what is the Raj corporation WACC?

Solution:-

$$WACC = \frac{E}{V} r_E + \frac{D}{V} r_D (1 - t)$$

$$= 0.6 \times 0.16 + 0.40 \times 0.14 (1 - 0.35)$$

$$= 0.096 + 0.0364$$

$$= 0.1324 = \boxed{13.24\%}$$

Example:-

X Ltd. equity beta is 1.1. The market risk premium is 8 percent and the risk free rate is 9 percent. X has a debt equity ratio of 2:3. Its pretax cost of debt is 14%. If the tax rate is 35%, what is the WACC?

Solution:-

$$SML\ (\text{Cost of equity}) = R_f + \beta_e [E(R_m) - R_f]$$
$$= 9\% + 1.1\,[8\%]$$
$$= 0.09 + 0.088$$
$$= 0.178 = \boxed{17.8\%}$$

$$WACC = \frac{2}{5} \times 14\% \times (1 - 0.35) + \frac{3}{5} \times 17.8\%$$
$$= 0.0364 + 0.1068$$
$$= 0.1432$$
$$\boxed{= 14.32\%}$$

Example:-

XYZ Ltd WACC is 12% and tax rate is 35%. Company's pre-tax cost of debt is 16% and its debt-equity ratio is 1:1. Risk free rate is 9% and market risk premium is 6%. What is the beta of XYZ Ltd's equity?

Solution:-

$$WACC = 0.5 \times 16\% \times (1 - 0.35) + 0.5\, r_E =$$
$$12\% = 0.052 + 0.5\, r_E$$
$$r_E = 0.136$$
$$= 13.6\%$$

$$SML: \quad r_E = R_f + \beta\,[E(R_m) - R_f]$$
$$13.6\% = 9\% + \beta \times 6\%$$
$$\beta = 0.766$$

Example:-

Shaan corporation manufactures chemicals. Its debt equity ratio is 0.8. Its WACC is 14%. and tax rate is 35%.

(i) If Shaan's cost of equity is 20%, what is the pre-tax cost of debt?

(ii) If Shaan can issue debt at an interest rate of 14 percent, what is its cost of equity?

Solution:-

(i) $$WACC = \frac{E}{V} r_E + \frac{D}{V} r_D (1-t)$$

$$= \frac{5}{9} \times 20\% + \frac{4}{9} r_D (1-0.35)$$

$$0.14 = 0.111 + 0.288 r_D$$

$$r_D = 0.10069$$

$$= 10.07\%$$

(ii)

$$WACC = \frac{5}{9} r_E + \frac{4}{9} 0.14 (1-0.35)$$

$$0.14 = 0.55 r_E + 0.0404$$

$$r_E = 0.1810$$

$$= 18.1\%$$

Example:-

Sensex Ltd has the following book value capital structure:-

Equity Capital (10 million shares, Rs 10 per)	Rs 100 million
Preference Capital, 12% (1,00,000 shares, Rs 100)	Rs 10 mill.
Retained earnings	Rs 120 mill
Debentures 15% (5,00,000 debentures, Rs 100)	Rs 50 mill
Term loan, 14%	Rs 80 mill
Total.	Rs 360 mill

The next expected dividend per share is Rs 2. The dividend per share is expected to grow at the rate of 8%. The market price per share is Rs 20. Preference stock, redeemable after 10 years, is currently selling for Rs 75 per share. Debentures redeemable after 6 years, are selling for Rs 80 per debenture. Tax rate is 50%.

Calculate average cost of capital.

Solution:-

→ The cost of equity and retained earnings

$$r_e = \frac{D_1}{P_0} + g = \frac{2}{20} + 0.08 = 0.18$$

$$= 18\%$$

→ Cost of Preference

$$r_p = \frac{12 + (100-75)/10}{0.6 \times 75 + 0.4 \times 100} = 0.1705 \approx 17.05\%$$

→ Pre-tax cost of Debt

$$r_D = \frac{14 + (100-80)/6}{0.6 \times 80 + 0.4 \times 100} = \frac{17.33}{88} = 0.1969$$

$$= 19.69\%$$

→ Post-tax cost of debt

$$19.69\,(1-0.5) = 9.845\%$$

→ Post-tax cost of term loans is

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

Average Cost of Capital

Sources	Component Cost (1)	Book Value (2)	BV Proportion (3)	Product of (1)×(3)
Equity Capital and retained earnings	18%	220	0.612	0.110
Preference Capital	17.05%	10	0.027	0.005
Debentures	9.845%	50	0.138	0.0135
Term loans	7%	80	0.223	0.0156
		360		0.1441

$$= 14.41\%$$