Computing Cost of Capital of Individual components

There are four basic sources of long term funds for a business firm :

(i) Long-term Debt and Debentures
(ii) Preferences share capital,
(iii)Equity share capital,
(iv)Retained Earnings.

Through all of these sources may not be tapped by the firm for funding its activities, each firm will have some of these sources in its capital structure. The specific cost of each source of funds is the after-tax cost of financing. It can be before-tax, provided the basis is the same for all the sources of finance being considered for calculating the cost of capital. The procedure for determining the costs of debt, preferences and equity capital as well as retained earnings is discussed in the following sub-sections.

COST OF LONG TERM DEBT

Debt may be issued at par, or at premium or at of discount. It may be perpetual or redeemable. The technique of computation of cost in each case has been explained in the following paragraphs.

(a) The formula for computing the Cost of Long Term debt at par is
   Kd = (1 – T) R
   where
   Kd = Cost pf long term debt
   T = Marginal Tax Rate
   R = Debenture Interest Rate

For example, if a company has issued 10% debentures and the tax rate is 50%, the cost of debt will be

(1 - .5) 10 = 5%

(b) In case the debentures are issued at premium or discount, the cost of debt should be calculated on the basis of net proceeds realised.

The formula will be as follows :

$$K_d = \frac{I}{N_P} (1 – T)$$

where
K_d = Cost of debt after tax

 I = Annual Interest Payment

 N_P = Net Proceeds of Loans

 T = Tax Rate

Illustration No. 1 : A company issue 10% irredeemable debentures of Rs. 10,000. The company is in 50% tax bracket. Calculate cost of debt capital at par, at 10% discount and at 10% premium

Solution :

$$\text{Cost of debt at par} = \frac{\text{Rs. } 1,000}{\text{Rs. } 10,000} * (1 - .50)$$
$$= 5\%$$

$$\text{Cost of debt issued at} = \frac{\text{Rs. } 1,000}{\text{Rs. } 9,000} * (1 - .50) \; 10\% \text{ discount}$$
$$= 5.55\%$$

$$\text{Cost of debt issued at} = \frac{\text{Rs. } 1,000}{\text{Rs. } 11,000} * (1 - .50) \; 10\% \text{ premium}$$
$$= 4.55\%$$

(c) For computing cost of redeemble debts, the period of redemption is considered. The cost of long term debt is the investor's yield to maturity adjusted by the firm's tax rate plus distribution cost. The question of yield to maturity arises only when the loan is taken either at discount or at premium. The formula for cost of debt will be

$$\frac{I + \dfrac{\textbf{Discount}}{\textbf{mp}} \quad (\textbf{In case of Premium, } \dfrac{\textbf{Premium}}{\textbf{mp}} \textbf{ will be subtracted})}{\dfrac{\textbf{p + np}}{\textbf{2}}} * 100 \; (1 - T)$$

where
mp = maturity period
p = nominal or par value
np = net proceeds i.e. (Par value – Discount + Premium)

Illustration No. 2 : A firm issued 100 10% debentures, each of Rs. 100 at 5% discount. The debentures are to be redeemed at the end of 10th year. The tax rate is 50%. Calculate cost of debt capital.

 Solution :

$$\text{Cost of Debt Capital} = \frac{1,000 + \dfrac{500}{10}}{\dfrac{10,000 + 9,500}{2}} = \frac{1,050}{9,750} * .50$$

$$2$$
$$= 5.385\%$$

(d) In case of underwriting and other issuing costs, they are adjusted in the same way as discount is being adjusted in net proceeds and other calculations.

Illustrations No. 3 : A company raised loan by selling 250 debentures with 10% rate of interest at premium of Rs. 5 per debentures (Par value = Rs. 100), redeemable at the end of 10th year. Underwriting and other issuance costs amounted to 3% of the proceeds. The tax rate is 50%. Calculate cost of debt capital.

Solution :

$$
\text{Cost of Capital} = \cfrac{2{,}500 - \cfrac{1{,}250}{10} + \cfrac{7{,}8750}{10}}{\cfrac{25{,}000 + 25463}{2}} (1 - .5) * 100
$$

$$= 4.865\%$$

(e) Yield to maturity method of computing cost of debt capital is an approximation method. A better method is that which converts yield to maturity into a discount rate. James C. Van Horne says "the discount rate that equates the present value of the funds received by the firm, net of underwriting and other costs with the present value of expected outflows. These outflows may be interest payments, repayment of principal or dividends".

It may symbolically written as :

$$np = \sum_{t=1}^{n} \frac{(\text{cash outflows})^t}{(1 + K)^t}$$

where ,m   m,,
,
np = net amount available for use
(cash outflows) ^{t} = amount of interest after tax + amount of repayment of principal in different periods
K = discount rate

Illustration No. 4 : A company has issued 11% debentures for Rs. 2,00,000. The underwriting, brokerage and other issuance costs amount to Rs. 10,000. The terms of debenture issue provide for repayment of principal in 5 equal instalments starting at the end of the first year. The tax rate is 60%. Calculate cost of debt capital.

Solution :

Cash inflow = Rs. 2,00,000 - Rs. 10,000
= Rs. 1,90,000

Cash outflows

Year Total Rs.	Installment Rs.	Interest Rs.	Total Rs.	Discount Factor 14%	Present Value	Discount Factor 12%	Present Value
1	40000	22,000	62,000	.877	54374	.893	55366

2	40000	17,600	57,600	.769	44294	.797	45907
3	40000	12,200	53,200	.675	35910	.712	37875
4	40000	8,800	48,800	.592	28890	.630	30744
5	40000	4,400	44,400	.519	23044	.576	25175
					186512		195067

$$12\% + \frac{(195067 - 190000)}{(195067 - 186512)} (14 - 12)$$

$$12 + \frac{5067}{8555} * 2$$

$$= 13.184\%$$

(f) Effective cost of debt is lower than the interest paid to the creditors because the firm can deduct interest amount from its taxable income. The higher the tax rate, the lower will be the effective interest rate and the cost of debt.

Illustration No. 5 : There are two firms, A and B. The firm A has no debt and is totally financed by equity capital. The firm B has Rs. 200 lakhs outstanding debt and pays an interest rate of 10%. The firm's ne t income after-taxes are calculated using three tax rates, 0, 25 and 50 percent and the resulting values of net incomes are compared. Assume that the earnings before interest and taxes of both firms is Rs. 100 lakhs each. Calculate cost of debt capital.

Solution :

Tax Rates and Effective Cost of Debt

Rs. in lakhs

	0% tax rate		25% tax rate		50% tax rate	
	Firm A	Firm B	Firm A	Firm B	Firm A	Firm B
1. Earnings before-interest and taxes	100	100	100	100	100	100
2. Interest	0	20	0	20	0	20
3. Taxable Income	100	80	100	80	100	80
4. Taxes	0	0	25	20	50	40
5. Net income after taxes (NIAT)	100	80	75	60	50	40
(a) Difference	20		15		10	
(b) Effective rate	10%		7.5%		5%	

Notes :

NIAT of firm A – NIAT of firm B.

(a) + Rs. 200 lakhs of outstanding debt of firm B.

If no taxes were paid, the only difference between the net incomes of the two firms would be the interest expenses incurred by the firm B. As the tax rate increases, this difference diminished.

In the case of 0% tax rate, we can say that the effective rate of debt is 10% (Rs.20/Rs.200 = 10%).

In the case of 25% and 50% it is 7.5% and 5% respectively.

A simple formula for computing the cost of debt may be stated as follows :
Effective cost of debt
= Interest rate * (1.0 – tax rates) substituting the date from the above example.

1) Effective cost of debt at 0% tax rate
   = 10% * (1.0 – 0.00) = 10%

2) Effective cost of debt at 25% tax rate
   = 10% * (1.0 – 0.25) = 7.5%

3) Effective cost of debt at 50% tax rate
   = 10% * (1.0 – 0.50) = 5%

COST OF PREFERENCE CAPITAL

The preference share represents a special type of ownership interest in the firm. Preference shareholders must receive their stated dividends prior to the distribution of any earnings to the equity shareholders. In this respect preference shares are very much like bonds or debentures with fixed interest payment. The cost of preference shares can be estimated by dividing the preference dividend per share by the current price per share, as the dividend can be considered a continuous level payment.

$$\text{Cost of Preference Capital} = \frac{\text{Dividend}}{\text{Market Price} - \text{Issue Cost}}$$

For example, A company is planning to issue 9% preference shares expected to sell at Rs.85 per share. The costs of issuing and selling the shares are expected to be Rs.3 per share.

The first step in finding out the cost of the preference capital is to determine the rupee amount of preference dividends, which are stated as 9% of the share of Rs. 85 per share. Thus 9% of Rs. 85 is Rs. 7.65. After deducting the floatation costs, the net proceeds are Rs. 82 per share.

Thus the cost of preference capital :

$$= \frac{\text{Dividend per share}}{\text{Net proceeds after selling}}$$

$$= \frac{\text{Rs. } 7.65}{\text{Rs. } 82} = 9.33 \%$$

Now, the companies can issue only redeemable preference shares. Cost of capital for such shares is that discount rate which equates the funds available from the issue of preference shares with the present values of all dividends and repayment of preference share capital. This present value method for cost of preference share capital is similar to that used for cost of debt capital, the

only difference is that in place of `interest' stated dividend on preference share is used. Use PVIF Factor

Illustration No. 6 : A company issued Rs. 100 preference shares with a 7% dividend on a price of Rs. 110 with a provision to redeem the capital at the end of 5 year period.
Calculate cost of preference share capital.

Year	Dividend		Principal	Rate	Present Value at 7%
1	7	-	7	.935	6.545
2	7	-	7	.873	6.111
3	7	-	7	.816	5.712
4	7	-	7	.763	5.341
5	7	100	107	.713	76.291
	----	-----	-----		--------
	35	100	135		100
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There is no need to use any other discount rate. The cost of preference capital is 7%.

COST OF EQUITY CAPITAL

"Cost of equity capital is the cost of the estimated stream of net capital outlays desired from equity sources" E.W. Walker.
James C. Van Horne defines the cost of equity capital can be thought of as the rate of discount that equates the present value of all expected future dividends per share, as perceived by investors.

The cost of equity capital is the most difficult to measure. A few problems in this regard are as follows :
  i) The cost of equity is not the out of pocket cost of using equity capital.
  ii) The cost of equity is based upon the stream of future dividends as expected by shareholders (very difficult to estimate).
  iii) The relationship between market price with earnings is known. Dividends also affect the market value (which one is to be considered).
  The following are the approaches to computation of cost of equity capital :
  (a) E / P Ratio Method : Cost of equity capital is measured by earning price ratio.
    Symbolically
        Eo (current earnings per share)
        ----- * 100
        Po (current market price per share)
The limitations of this method are :
• Earnings do not represent real expectations of shareholders.
• Earnings per share is not constant.
• Which earnings-current earnings or average earnings (It is not clear).

The method is useful in the following circumstances :
• The firm does not have debt capital.
• All the earnings are paid to the shareholders.
• There is no growth in earnings.

(b) E / P Ratio + Growth Rate Method : This method considers growth in earnings. A period of 3 years is usually being taken into account for growth.

The formula will be as follows :

$$\frac{E_0 (1 + b) 3}{P_0}$$

Where $(1 + b) 3$ = Growth factor where b is the growth rate as a percentage and estimated for a period of three years.

For example, A firm has Rs. 5 EPS and 10% growth rate of earnings over a period of 3 years. The current market price of equity share is Rs. 50

$$\frac{Rs. 5 (1+.10)^3}{Rs.50} * 100$$

$$\frac{Rs. 5 (1.331)}{Rs. 50} * 100$$

$$= \frac{6.655}{50} * 100$$

$$= 13.31\%$$

(c) D / P Ratio Method : Cost of equity capital is measured by dividends price ratio.

Symbolically

$$\frac{D_0 \text{ (Dividend per share)}}{P_0 \text{ (Market price per share)}} * 100$$

The following are the assumptions :
   i) The risk remains unchanged.
   ii) The investors give importance to dividend.
   iii) The investors purchase the shares at par value.

Under this method, the future dividend stream of a firm as expected by the investors are estimated. The current price of the share is used to determine shareholders' expected rate of return. Thus, if Ke is the risk-adjusted rate of return expected by investors, the present value of future dividends, discounted by Ke would be equal to the price of the share. Thus,

$$P = \frac{D1}{(1 + Ke)^1} + \frac{D2}{(1 + Ke)^2} + \frac{D3}{(1 + Ke)^3} + \frac{D4}{(1 + Ke)^4}$$

where,

P = price of the share

D1 ……. Dn = dividends in periods 1,2,3,….n,

K_e = the risk adjusted rate of return expected by equity investors.

Given the current price p and values for future dividends `Dt' , one can calculate K_e by using IRR procedure. If the firm has maintained some regular pattern of dividends in the past, it is not unreasonable to expect that the same pattern will prevail. If a firm is playing a dividend of 20% on a share with a par value of Rs. 10 as a level perpetual dividend, and its market price is Rs. 20, then

$$P = \frac{DP}{K_e}$$

$$20 = \frac{2}{Ke}$$

$$Ke = \frac{2}{20} = 10\%$$

(d) D / P + Growth Rate Method : The method is comparatively more realistic as
 i) it considers future growth in dividends,
ii) it considers the capital appreciation.
Thus

$$Po = \frac{D1}{Ke - g} \text{ or } Ke = \frac{D1}{Po} + g$$

where,
Po = the current price of the equity share
D1 = the per share dividend expected at the end of year 1.

K_e = the risk adjusted rate of return expected an equity shares.
G = the constant annual rate growth in dividends and earnings. The equation indicate that the cost of equity share can be found by dividing the dividend expected at the end of the year 1 by the current price of the share and adding the expected growth rate.

Illustration No. 7 : Raj Textiles Ltd. wishes to determine its cost of equity capital, Ke. The prevailing market price of the share is Rs. 50 per share. The firm expects to pay a dividend of Rs. 4 at the end of the coming year 2003. The dividends paid on the equity shares over the past six years are as follows :

Year	Dividend (Rs.)
2002	3.80
2001	3.62
2000	3.47
1999	3.33
1998	3.12
1997	2.97

The firm maintained a fixed dividend payout from 1996 onwards. The annual growth rate of dividends, g , is approximately 5 percent. Substituting the data in the formula

$$Rs. 50 = \frac{Rs. 4}{Ke - 0.05}$$

$$Ke = \frac{Rs. 4}{Rs. 50} + 0.05$$

$$= 0.08 + 0.05 = 13\%$$

The 13% cost of the equity share represents the return expected by existing shareholders on their investment so that they should not disinvest in the share of Raj Textiles Ltd. and invest elsewhere.

(e) Realised Yield Method : One of the difficulties in using D/P Ratios and E/P Ratios for finding out K_e is to estimate the rate of expected return. Hence, this method depends on the rate of return actually earned by the shareholders. The most recent five to ten years are taken and the rate of return is calculated for the investor who purchased the shares at the beginning of the study period, held it to the present and sold it at the current prices. This is also the realized yield by the investor. This yield is supposed to indicate the cost of equity share on the assumption that the investor earns what he expects to earn. The limiting factors to the usefulness of this method are the additional conditions that the investors expectation do not undergo change during the study period, no significant change in the level of dividend rates occurs, and the attitude of the investors towards the risk remain the same. As these conditions are rarely fulfilled, the yield method has severe limitations. In addition, the yield often differs depending on the time period chosen.

(f) Security's Beta Method : An investor is concerned with the risk of his entire portfolio, and that the relevant risk of a particular security is the effect that the security has on the entire portfolio. By "diversified portfolio" we mean that each investor's portfolio is representative if the market as a whole and that the portfolio Beta is 1.0. A security's Beta indicate how closely the security's returns move with from a diversified portfolio. A beta of 1.0 for a given security means that, if the total value of securities in the market moves up by 10 percent, the stock's price will also move up, on the average by 10 percent. If security has a beta of 2.0, its price will, on the whole, rises or falls by 20 percent when the market rises or falls by 10 percent. A share with –0.5 percent beta will rises by 10 percent, when the market falls by 20 percent.

A beta of any portfolio of securities is the weighted average of the betas of the securities, where the weights are the proportions of investments in each security. Adding a high beta (beta greater than 1.0) security to a diversified portfolio increase the portfolio's risk, and adding a low beta (beta less than zero) security to a diversified security reduces the portfolio's risk.

 How is beta determined ? The beta co-efficient for a security (or asset) can be found by examining security's historical returns relative to the return of the market. As it is, not feasible to take all securities, a sample of securities is used. The Capital Asset Pricing Model (CAPM) uses these beta co-efficient to estimate the required rate of return on the securities. The CAPM, specifies that the required rate on the share depends upon its beta.
The relationship is :
Ke = riskless rate + risk premium x beta
where,
Ke = expected rate of return.
The current rate on government securities can be used as a riskless rate. The difference between the long-run average rate of returns between shares and government securities may represent the risk premium. During 1926-1981, this was estimated in USA to be 6 percent. Beta co-efficient are provided by the published date or can be independently estimated.

The beta for Pan Am's stock was estimated by Value Line to be 0.95 in 1984. Long-term government bond rates were about 12 percent in November 1984.

Thus the required rate of return on Pan Am's stock in November 1984 was –

Required Rate = 12% + 6% * 0.95 = 17.7 %

The use of beta to measure the cost of equity capital is definitely a better approach. The major reason is that the method incorporates risk analysis, which other methods do not. However, its application remains limited perhaps because it is tedious to calculate Beta value.

COST OF RETAINED EARNINGS

Some authors do not consider it necessary to calculate separately cost of retained earnings. They say that the cost of retained earnings is included in the cost of equity share capital. They say that the existing share price is used to determine cost of equity capital and this price includes the impact of dividends and retained earnings. There are authorities who also suggest that cost of retained earnings is to be determined separately.

Two alternative approaches are there :

i)   One is to regard cost of equity capital as the cost of retained earnings.

ii) The concept of external yields as suggested by Ezra Soloman. It assures investment of retained earnings in another firm. Symbolically

$$\text{Cost of Retained Earnings} = \left(\frac{D1}{Po} + G \right)(1 - TR)(1 - B)$$

$$= Ke\,(1 - TR)(1 - B)$$

where

Ke = Cost of equity capital based on dividends growth method

TR = Shareholder's Tax Rate

B = Percentage Brokerage Cost

For example, A firm's cost of equity capital is 12% and tax rate of majority of shareholders is 30%. Brokerage is 3%

= 12% (1 – 30%) (1 – 3%)

= 12 * .70 * .97

= 8.15%

WEIGHTED COST OF CAPITAL

Weighted cost of capital is also called as composite cost of capital, overall cost of capital, weighted marginal cost of capital, combined cost of debt and equity etc. It comprises the costs of various components of financing. These components are weighted according to their relative proportions in the total capital.

CHOICE OF WEIGHTS

The weights to be employed can be book value, market values, historic or target. Book value weights are based on the accounting values to assess the proportion of each type of capital in the firm's structure. Market value weights measure the proportion of each type of financing at its market value. Market value weights are preferred because they approximate the current value of various instruments of finance employed by the company.

Historic weights can be book or market weights based on actual data. Such weights however would represent actual rather than desired proportions of various types of capital in the capital structure. Target weights, which can also be based on book or market values, reflect the

desired capital structure proportions. If the firm's historic capital structure is not much different from `optimal' or desired capital structure, the cost of capital in both the cases is mostly similar. However, from a strictly theoretical point of view, the target market value weighting scheme should be preferred.

Marginal weights are determined on the basis of financing mix in additional new capital to be raised for investments. The new capital to be raised is marginal capital. The propositions of new capital raised will be the marginal weights.

Calculating The Weighted Cost of Capital : A Few Examples

In this subsections, two problems are solved :

Illustration No. 8 : A firm has the following capital structure and after tax costs for the different sources of funds used :

Source of Funds After	Amount Rs.	Proportion %	tax cost %
Debt	40,00,000	20	4.50
Preference Shares	20,00,000	10	9.00
Equity Shares	60,00,000	30	11.00
Retained Earnings	80,00,000	40	10.00
	2,00,00,000	100	

Calculate cost of weighted capital by using book value method.

Solution :

Method of Financing	Proportion %	Cost %	Weighted cost
Debt	20	4.50	0.90
Preference Shares	10	9.00	0.90
Equity Shares	30	11.00	3.30
Retained Earnings	40	10.00	4.00
			9.10%

Illustration 9 : M. Ltd. is a consumer products company with well-established brand names. The cost of capital is estimated at the end of 2001 for use in evaluating investment proposals in 2002. The data is as follows :

Financial data for M Ltd.

Source	Book Value in Rs. 0000	Market Value in Rs. 0000	Current Interest Rate %
Debentures (7.5%)	45	29	13.2
Debentures (9.5%)	50	42	13.2
Debentures (14%)	75	78	13.2
Other debt Total	210	192	13.2
Total debt	380	341	13.2
Preference Shares (7%)	20	10	14.0
Equity Shares	720	824	

Equity Share Data
Years

	1996	**1997**	**1998**	**1999**	**2000**	**2001**
Dividend per Share	1.45	1.60	1.77	2.05	2.28	2.48
Earnings per share	2.97	3.73	4.21	4.83	4.86	4.95
Price per share	24.0					50.0

Explanatory Notes

• Interest rates on the three debentures issues were set at the rate (13.2%) on the recently issued debentures of the firm which is selling close to par. This was considered to be the best estimate.
• Other debt include different types of loans from financial institutions and other privately placed debentures.
• Market value is based on interest rates provided in the firm's annual report.
• Preference share is Rs. 100 par : current market price is s. 50 per share.

Since the firm's dividend and earnings have been growing steadily since 1996, the constant growth model can be used to estimate cost of equity. Through dividends have growth at a slightly higher rate than earnings, one may assume that shareholders would expect them to grow at the same earnings (10.8%). Also assume, on the basis of the past record that the shareholders expect a dividend of Rs. 2.60 in 2002. Calculate cost of capital.

Solution :

$$Ke = \frac{D}{P} + g$$

$$= \frac{Rs.\ 2.60}{Rs.\ 50} + 0.108$$

$$= 16\%$$

If the investors expect the dividends to grow at the higher rate (11.3%), the cost of equity capital works out to 16.5%.

Applying the beta method, we obtain a somewhat higher number. Beta for M Ltd. is assumed to be 0.85. Interest rate on government bonds (riskless rate) in 2001 would be say, 12 percent. The market risk premium is 6%. Thus

$$Ke = \text{Riskless rate} + \text{Risk premium} * \text{beta}$$
$$= 12\% + 6\% * 0.85$$
$$= 17.1\%$$

Thus the cost of capital for M Ltd.

	Amount Rs.	Weight	Cost	Weight * Cost
Debt	341	0.29	7.1	2.1
Preference Shares	10	0.01	14.0	0.1
Equity Shares	824	0.70	17.0	11.9
Total	1175	1.00	17.0	14.9

Weighted Average Cost of Capital : 14.1%

Explanation
 • Market value of debt, preference and equity shares are used.
• Current interest rate on debt is adjusted for tax rate of 46 percent, which is the firm's effective rate 13.2% (1-0.46) = 7.1%.
• Current preference dividend rate of 14% is used.

Some Misconceptions about Cost of Capital
The cost of capital is a central concept in financial management linking the investment and financing decisions. A few misconceptions in this regard are as follows:
i)   the concept of cost of capital is academic and impractical.
ii)   It is equal to the dividend rate.
iii)   Retained earnings are either cost free or cost significantly less than external equity.
iv)   Depreciation has no cost.
v)   The cost of capital can be defined in terms of an accounting based manner.
vi)   If a project is heavily financed by debt, its weighted average cost of capital is low.