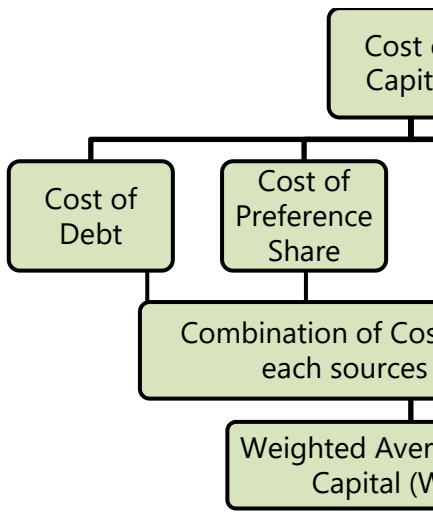
CHAPTER 4

COST OF CAPITAL

LEARNING OUTCOMES

- Discuss the need and sources of finance of a business entity.
- Discuss the meaning of cost of capital for raising fund from different sources of finance.
- Measure cost of individual components of capital.
- Calculate weighted cost of capital, marginal cost of capital and using Effective Interest Rate (EIR) method.

CHAPTER OVERVIEW



4.1 INTRODUCTION

We know that the basic task of a finance manager is procurement of funds and its effective utilization. Whereas objective of financial management is maximization of wealth. Here wealth or value is equal to performance divided by expectations.

Therefore, the finance manager is required to select **such a capital structure** in which expectation of investors is minimum hence shareholders' wealth is maximum. For that purpose, first he needs to calculate cost of various sources of finance. In this chapter we will learn to calculate cost of debt, cost of preference shares, cost of equity shares, cost of retained earnings and also overall cost of capital.

4.2 MEANING OF COST OF CAPITAL

Cost of capital is the return expected by the providers of capital (i.e. shareholders, lenders and the debt-holders) to the business as a compensation for their contribution to the total capital. When an entity (corporate or others) procured finances from either source as listed above, it has to pay some additional amount of money besides the principal amount. The additional money paid to these financiers may be either one off payment or regular payment at specified intervals. This additional money paid is said to be the cost of using the capital and it is called the cost of capital. This cost of capital expressed in rate is used to discount/ compound the cashflow or stream of cashflows. Cost of capital is also known as 'cut-off' rate, 'hurdle rate', 'minimum rate of return' etc. It is used as a benchmark for:

- Framing debt policy of a firm.
- Taking Capital budgeting decisions.

4.3 SIGNIFICANCE OF THE COST OF CAPITAL

The cost of capital is important to arrive at correct amount and helps the management or an investor to take an appropriate decision. The correct cost of capital helps in the following decision making:

(i) Evaluation of investment options: The estimated benefits (future cashflows) from available investment opportunities (business or project) are converted into the present value of benefits by **discounting them with the relevant cost of capital**. Here it is pertinent to mention that every

investment option may have different cost of capital hence it is very important to use the cost of capital which is relevant to the options available.

(ii) **Financing Decision:** When a finance manager has to choose one of the two sources of finance, he can simply compare their cost and choose the source which has lower cost. Besides cost, he also considers financial risk and control.

(iii) **Designing of optimum credit policy:** While appraising the credit period to be allowed to the customers, the cost of allowing credit period is compared against the benefit/ profit earned by providing credit to customer of segment of customers. Here cost of capital is used to arrive at the present value of cost and benefits received.

4.4 DETERMINATION OF THE COST OF CAPITAL

Cost is not the amount which the company plans to pay or actually pays, rather than it is the expectation of stakeholders. Here, stakeholders includes providers of capital (shareholders, debenture holder, money lenders etc.), intermediaries (brokers, underwriters, merchant bankers etc.), and Government (for taxes).

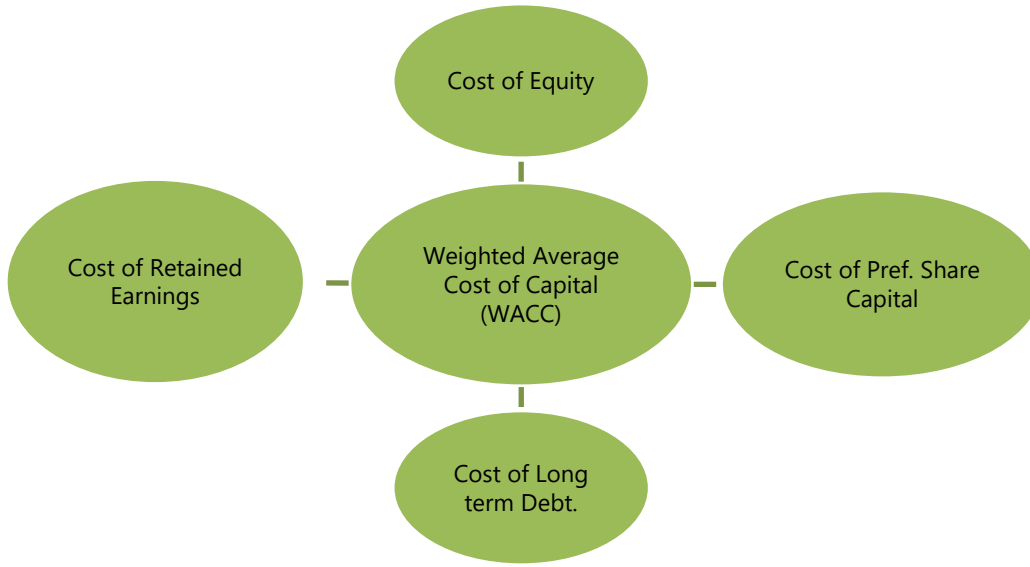
For example, if the company issues 9% coupon debentures but expectation of investors is 10% then investors will subscribe it at discount and not at par. Hence cost to the company will not be 9%, rather than it will be 10%. Besides giving return to investors, company will also have to give commission, brokerage, fees etc. to intermediaries for issue of debentures. It will increase cost of capital above 10%. On the other hand, payment of interest is a deductible expense under the Income Tax Act hence, it will reduce cost of capital to the company. Cost of any sources of finance is expressed in terms of percentage per annum. To calculate cost first of all we should identify various cash flows like:

1. Inflow of amount received at the beginning.
2. Outflows of payment of interest, dividend, redemption amount etc.
3. Inflow of tax benefit on interest or Outflow of payment of dividend tax.

Thereafter we can use trial & error method to arrive at a rate where present value of outflows is equal to present value of inflows. That rate is basically IRR. In investment decisions, IRR indicates income because there we have initial outflow

followed by series of inflows. In cost of capital chapter, this **IRR represents cost**, because here we have initial inflow followed by series of net outflows.

Alternatively, we can use shortcut formulas. Though these shortcut formulas are easy to use but they give approximate answer and not the exact answer. We will discuss the cost of capital of each source of finance separately.



4.5 COST OF LONG-TERM DEBT (K_d)

External borrowings or debt instruments do no confers ownership to the providers of finance. The providers of the debt fund do not participate in the affairs of the company but enjoys the charge on the profit before taxes. Long term debt includes long term loans from the financial institutions, capital from issuing debentures or bonds etc. (In Chapter-2, we had already discussed in detail about the sources of long-term debt.)

The calculation of cost of loan from a financial institution is similar to that of redeemable debentures. Here, we will confine our discussion of cost of debt to debentures or bonds only.

4.5.1 Features of debentures or bonds:

(i) **Face Value**: Debentures or bonds are denominated with some value, this denominated value is called face value of the debenture. Interest is calculated on the face value of the debenture. E.g. if a company issue 9%

non- convertible debentures of ₹ 100 each, this means the face value is ₹ 100 and the interest @ 9% will be calculated on this face value.

(ii) Interest (Coupon) Rate: Each debenture bears a fixed interest (coupon) rate (except Zero coupon bond and Deep discount bond). Interest (coupon) rate is applied to face value of debenture to calculate interest, which is payable to the holders of debentures periodically (annually, semi-annually, etc.).

(iii) Maturity period: Debentures or Bonds has a fixed maturity period for redemption. However, in case of irredeemable debentures maturity period is not defined and it is taken as infinite.

(iv) Redemption Value: Redeemable debentures or bonds are redeemed on its specified maturity date. Based on the debt covenants, the redemption value is determined. Redemption value may vary from the face value of the debenture.

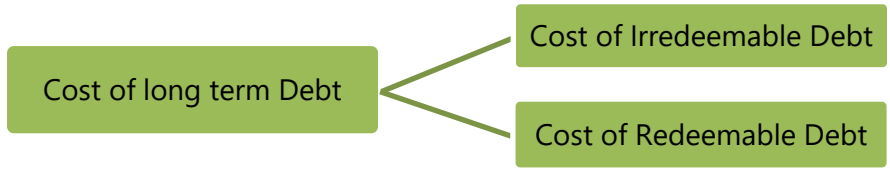
(v) Benefit of tax shield: The payment of interest to the debenture holders are allowed as expenses for the purpose of corporate tax determination. Hence, interest paid to the debenture holders save the tax liability of the company. Saving in the tax liability is also known as tax shield. The example given below will show you how interest paid by a company reduces the tax liability:

Example - 1: There are two companies namely X Ltd. and Y Ltd. The capital of the X Ltd. is fully financed by the equity shareholders whereas Y Ltd. uses debt fund as well. Given below is the profitability statement of both the companies:

	X Ltd. (₹ in lakh)	Y Ltd. (₹ in lakh)
Earnings before interest and taxes (EBIT)	100	100
Interest paid to debenture holders	-	(40)
Profit before tax (PBT)	100	60
Tax @ 35%	**(35)**	**(21)**
Profit after tax (PAT)	65	39

A comparison of the two companies shows that an interest payment of ₹ 40 by the Y Ltd. results in a tax shield (tax saving) of ₹ 14 lakh (₹ 40 lakh paid as interest × 35% tax rate). Therefore, the effective interest is ₹ 26 lakh only.

Based on redemption (repayment of principal) on maturity the debts can be categorised into two types (i) Irredeemable debts and (ii) Redeemable debts.



4.5.2 Cost of Irredeemable Debentures

The debentures which are not redeemed by the issuer of the debentures is known as irredeemable debentures. Cost of debentures not redeemable during the life time of the company is calculated as below:

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

Where,

K_d	=	Cost of debt after tax
I	=	Annual interest payment
NP	=	Net proceeds of debentures or Current market price
t	=	Tax rate

Net proceeds means issue price less issue expenses or floatation cost (defined below). If issue price is not given, then students can assume it to be equal to current market price. If issue expenses are not given, then simply assume it to be equal to zero.

Floatation Cost: The new issue of a security (debt or equity) involves some expenditure in the form of underwriting or brokerage fees, legal and administrative charges, registration fees, printing expenses etc. The sum of all these costs is known as floatation cost. This expenditure is incurred to make the securities available to the investors. Floatation cost is adjusted to arrive at net proceeds for the calculation of cost of capital.

Suppose a company issues 1,000, 15% debentures of the face value of ₹ 100 each at a discount of ₹ 5. Further suppose that the under-writing and other costs are ₹ 5,000 for the total issue. Thus ₹ 90,000 is actually realised, i.e., ₹ 1,00,000 minus

₹ 5,000 as discount and ₹ 5,000 as under-writing expenses. The interest per annum of ₹ 15,000 is therefore the cost of ₹ 90,000, actually received by the company. This is because interest is charged on profit and every year the company will save ₹ 7,500 as tax, assuming that the income tax rate is 50%. Hence the after-tax cost of ₹ 90,000 is ₹ 7,500 which comes to 8.33%.

ILLUSTRATION 1

Five years ago, Sona Limited issued 12 per cent irredeemable debentures at ₹ 103, at ₹ 3 premium to their par value of ₹ 100. The current market price of these debentures is ₹ 94. If the company pays corporate tax at a rate of 35 per cent CALCULATE its current cost of debenture capital?

SOLUTION

Cost of irredeemable debenture:

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

$$K_d = \frac{₹\ 12}{₹\ 94}(1-0.35) = 0.08297 \text{ or } 8.30\%$$

4.5.3 Cost of Redeemable Debentures (using approximation method)

The cost of redeemable debentures will be calculated as below:

$$\text{Cost of Redeemable Debenture } (K_d) = \frac{I(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}}$$

Where,

I = Interest payment

NP = Net proceeds or Current market price

RV = Redemption value of debentures

t = Tax rate applicable to the company

n = Remaining life of debentures

The above formula to calculate cost of debt is used where only interest on debt is tax deductible. Sometime, debts are issued at discount and/ or redeemed at a premium. If discount on issue and/ or premium on redemption are tax deductible, the following formula can be used to calculate the cost of debt:

$$\text{Cost of Redeemable Debenture } (K_d) = \frac{I + \frac{(RV - NP)}{n}}{\frac{(RV + NP)}{2}}(1 - t)$$

In absence of any specific information, students may use any of the above formulae to calculate the Cost of Debt (K_d) with logical assumption.

Above formulas give approximate value of cost of debt. In these formulas, higher the difference between RV and NP, lower the accuracy of answer. Therefore, one should not use these formulas if difference between RV and NP is very high. Also, these formulas are not suitable in case of gradual redemption of bonds.

ILLUSTRATION 2

A company issued 10,000, 10% debentures of ₹ 100 each at a premium of 10% on 1.4.2017 to be matured on 1.4.2022. The debentures will be redeemed on maturity. COMPUTE the cost of debentures assuming 35% as tax rate.

SOLUTION

The cost of debenture (K_d) will be calculated as below:

$$\text{Cost of debenture } (K_d) = \frac{I(1 - t) + \frac{(RV - NP)}{n}}{\frac{(RV + NP)}{2}}$$

I = Interest on debenture = 10% of ₹ 100 = ₹ 10

NP = Net Proceeds = 110% of ₹ 100 = ₹ 110

RV = Redemption value = ₹ 100

n = Period of debenture = 5 years

t = Tax rate = 35% or 0.35

$$K_d = \frac{₹\,10(1 - 0.35) + \frac{(₹\,100 - ₹\,110)}{5 \text{ years}}}{\frac{(₹\,100 + ₹\,110)}{2}}$$

$$\text{Or, } K_d = \frac{₹10 \times 0.65 - ₹2}{₹105} = \frac{₹\,4.5}{₹\,105} = 0.0428 \text{ or } 4.28\%$$

ILLUSTRATION 3

A company issued 10,000, 10% debentures of ₹ 100 each at par on 1.4.2012 to be matured on 1.4.2022. The company wants to know the cost of its existing debt on 1.4.2017 when the market price of the debentures is ₹ 80. COMPUTE the cost of existing debentures assuming 35% tax rate.

SOLUTION

$$\text{Cost of debenture } (K_d) = \frac{I(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}}$$

I = Interest on debenture = 10% of ₹ 100 = ₹ 10

NP = Current market price = ₹ 80

RV = Redemption value = ₹ 100

n = Period of debenture = 5 years

t = Tax rate = 35% or 0.35

$$K_d = \frac{₹10(1-0.35)+\frac{(₹100-₹80)}{5\text{ years}}}{\frac{(₹100+₹80)}{2}}$$

$$\text{Or, } K_d = \frac{₹10\times0.65+₹4}{₹90} = \frac{₹10.5}{₹90} = 0.1166 \text{ or } 11.67\%$$

4.5.3.1 Cost of Debt using Present value method [Yield to maturity (YTM) approach]

The cost of redeemable debt (K_d) is also calculated by discounting the relevant cash flows using Internal rate of return (IRR). (The concept of IRR is discussed in the Chapter 7 - Investment Decisions). Here, YTM is the annual return of an investment from the current date till maturity date. So, YTM is the internal rate of return at which current price of a debt equals to the present value of all cash-flows.

The relevant cash flows are as follows:

Year	Cash flows
0	Net proceeds in case of new issue/ Current market price in case of existing debt (NP or P_0)

1 to n	Interest net of tax [I(1-t)]
n	Redemption value (RV)

Steps to calculate relevant cash flows:

Step-1: Identify the cash flows.

Step-2: Calculate NPVs of cash flows as identified above using two discount rates (guessing).

Step-3: Calculate IRR.

Example - 2: A company issued 10,000, 10% debentures of ₹ 100 each on 1.4.2013 to be matured on 1.4.2018. The company wants to know the current cost of its existing debt if the market price of the debentures is ₹ 80, assuming 35% tax rate.

Step-1: Identification of relevant cash flows

Year	Cash flows
0	Current market price (P_0) = ₹ 80
1 to 5	Interest net of tax [I(1-t)] = 10% of ₹ 100 (1-0.35) = ₹ 6.5
5	Redemption value (RV) = Face value i.e. ₹ 100

Step- 2: Calculation of NPVs at two discount rates

Year	Cash flows (₹)	Discount factor @ 10% (L)	Present Value (₹)	Discount factor @ 15% (H)	Present Value (₹)
0	80	1.000	(80.00)	1.000	(80.00)
1 to 5	6.5	3.791	24.64	3.352	21.79
5	100	0.621	62.10	0.497	49.70
NPV			+6.74		-8.51

Step- 3: Calculation of IRR

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H-L) = 10\% + \frac{6.74}{6.74-(-8.51)}(15\%-10\%) = 12.21\%$$

YTM or present value method is a superior method of determining cost of debt of company to approximation method and it is also preferred in the field of finance.

We may keep in mind that in the above formula, **higher the difference between H and L, lower the accuracy** of answer.

ILLUSTRATION 4

Institutional Development Bank (IDB) issued Zero interest deep discount bonds of face value of ₹ 1,00,000 each issued at ₹ 2,500 & repayable after 25 years. COMPUTE the cost of debt if there is no corporate tax.

SOLUTION

Here,

Redemption Value (RV)= ₹ 1,00,000

Net Proceeds (NP) = ₹ 2,500

Interest = 0

Life of bond = 25 years

There is huge difference between RV and NP, therefore, in place of approximation method, we should use trial & error method.

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

$1,00,000 = 2,500 \times (1+r)^{25}$

$40 = (1+r)^{25}$

Trial 1: r = 15%, $(1.15)^{25} = 32.919$

Trial 2: r = 16%, $(1.16)^{25} = 40.874$

Here:

L = 15%, H = 16%

$NPV_L = 32.919-40 = -7.081$

$NPV_H = 40.874-40 = +0.874$

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

$$=15\%+\frac{-7.081}{-7.081-(0.874)}\times(16\%-15\%)= 15.89\%$$

4.5.3.2 Amortisation of Bond

A bond may be amortised every year i.e., principal is repaid every year rather than at maturity. In such a situation, the principal will go down with annual payments and interest will be computed on the outstanding amount. The cash flows of the bonds will be uneven.

The formula for determining the value of a bond or debenture that is amortised every year is as follows:

$$V_B = \frac{C_1}{(1+K_d)^1} + \frac{C_2}{(1+K_d)^2} + ... + \frac{C_n}{(1+K_d)^n}$$

$$V_B = \sum_{t=1}^{n} \frac{C_t}{(1+K_d)^t}$$

ILLUSTRATION 5

RBML is proposing to sell a 5-year bond of ₹ 5,000 at 8 per cent rate of interest per annum. The bond amount will be amortised equally over its life. CALCULATE the bond's present value for an investor if he expects a minimum rate of return of 6 per cent?

SOLUTION

The amount of interest will go on declining as the outstanding amount of bond will be reducing due to amortisation. The amount of interest for five years will be:

First year: ₹ 5,000 × 0.08 = ₹ 400;

Second year: (₹ 5,000 – ₹ 1,000) × 0.08 = ₹ 320;

Third year: (₹ 4,000 – ₹ 1,000) × 0.08 = ₹ 240;

Fourth year: (₹ 3,000 – ₹ 1,000) × 0.08 = ₹ 160; and

Fifth year: (₹ 2,000 – ₹ 1,000) × 0.08 = ₹ 80

The outstanding amount of bond will be zero at the end of fifth year.

Since RBML will have to return ₹ 1,000 every year, the outflows every year will consist of interest payment and repayment of principal as follows:

First year: ₹ 1,000 + ₹ 400 = ₹ 1,400;

Second year: ₹ 1,000 + ₹ 320 = ₹ 1,320;

Third year: ₹ 1,000 + ₹ 240 = ₹ 1,240;

Fourth year: ₹ 1,000 + ₹ 160 = ₹ 1,160; and

Fifth year: ₹ 1,000 + ₹ 80 = ₹ 1,080

The above cash flows of all five years will be discounted with the cost of capital. Here, cost of capital will be the minimum expected rate of return i.e. 6%.

Value of the bond is calculated as follows:

$$V_B = \frac{₹1,400}{(1.06)^1} + \frac{₹1,320}{(1.06)^2} + \frac{₹1,240}{(1.06)^3} + \frac{₹1,160}{(1.06)^4} + \frac{₹1,080}{(1.06)^5}$$

$$= \frac{₹1,400}{1.06} + \frac{₹1,320}{1.1236} + \frac{₹1,240}{1.1910} + \frac{₹1,160}{1.2624} + \frac{₹1,080}{1.3382}$$

= ₹ 1,320.75 + ₹ 1,174.80 + ₹ 1,041.14 + ₹ 918.88 + ₹ 807.05 = ₹ 5,262.62

4.5.4 Cost of Convertible Debentures

The holders of the convertible debentures has the option to either get the debentures redeemed into the cash or get specified numbers of company's shares in lieu of cash. The calculation of cost of convertible debentures are very much similar to that of redeemable debentures. While determining the redemption value of the debentures, it is assumed that all the debenture holders will choose the option which has the higher value and accordingly, it will be considered to calculate the cost of debentures.

Example – 3 : A company issued 10,000, 15% Convertible debentures of ₹ 100 each with a maturity period of 5 years. At maturity, the debenture holders will have an option to convert the debentures into equity shares of the company in the ratio of 1:10 (10 shares for each debenture). The current market price of the equity shares is ₹ 12 each and historically the growth rate of the shares is 5% per annum. Compute the cost of debentures assuming 35% tax rate.

Determination of Redemption value:

Higher of

(i) The cash value of debentures = ₹ 100

(ii) Value of equity shares = 10 shares × ₹ 12 $(1+0.05)^5$

= 10 shares × 15.312 = ₹ 153.12

₹ 153.12 will be taken as redemption value as it is higher than the cash option and is more attractive to the investors.

Calculation of Cost of Convertible debenture (using approximation method):

$$K_d = \frac{I(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}} = \frac{15(1-0.35)+\frac{(153.12-100)}{5}}{\frac{(153.12+100)}{2}} = \frac{9.75+10.62}{126.53} = 16.09\%$$

Alternatively:

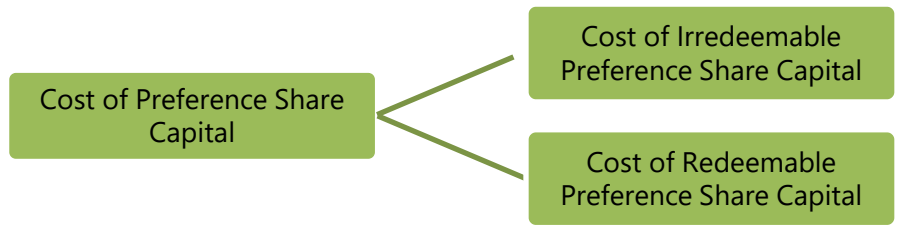
Calculation of Cost of Convertible debenture (using present value method):

Year	Cash flows (₹)	Discount factor @ 15% (L)	Present Value (₹)	Discount factor @ 20% (H)	Present Value (₹)
0	100	1.000	(100.00)	1.000	(100.00)
1 to 5	9.75	3.352	32.68	2.991	29.16
5	153.12	0.497	76.10	0.402	61.55
NPV			+8.78		-9.29

$$IRR = L+\frac{NPV_L}{NPV_L-NPV_H}(H-L) = 15\%+\frac{8.78}{8.78-(-9.29)}(20\%-15\%) = 0.17429 \text{ or } 17.43\%$$

4.6 COST OF PREFERENCE SHARE CAPITAL (K_p)

The preference shareholders are paid dividend at a specified rate on face value of preference shares. Payment of dividend to the preference shareholders are not mandatory but are given priority over the equity shareholder. The payment of dividend to the preference shareholders are not charged as expenses but treated as an appropriation of after-tax profit. Hence, dividend paid to preference shareholders does not reduce the tax liability of the company. Like the debentures, Preference share capital can also be categorised as redeemable and irredeemable.



4.6.1 Cost of Irredeemable Preference Shares

The cost of irredeemable preference shares is similar to the calculation of perpetuity. The cost of irredeemable preference share is calculated by dividing the preference dividend with the current market price or net proceeds from the issue. The cost of irredeemable preference share is as below:

$$\text{Cost of Irredeemable Preference Shares } (K_P) = \frac{PD}{P_0}$$

Where,

PD = Annual preference dividend

P_0 = Net proceeds from issue of preference shares

Net proceeds means issue price less issue expenses or floatation cost. If issue price is not given, then students can assume it to be equal to current market price. If issue expenses are not given, then simply assume it to be equal to zero.

ILLUSTRATION 6

XYZ & Co. issues 2,000 10% preference shares of ₹ 100 each at ₹ 95 each. CALCULATE the cost of preference shares.

SOLUTION

$$K_P = \frac{PD}{P_0}$$

$$K_p = \frac{(10 \times 2{,}000)}{(95 \times 2{,}000)} = \frac{10}{95} = 0.1053 \text{ or } 10.53\%$$

ILLUSTRATION 7

If R Energy is issuing preferred stock at ₹ 100 per share, with a stated dividend of ₹ 12, and a floatation cost of 3% then, CALCULATE the cost of preference share?

SOLUTION

Here, Net Proceeds (P_o) will be issue price less floatation cost.

P_o = ₹ 100 - 3% of ₹ 100 = ₹ 97

$$K_p = \frac{PD}{P_o}$$

$$= \frac{₹\ 12}{₹\ 97} = 0.1237 \text{ or } 12.37\%$$

4.6.2 Cost of Redeemable Preference Shares

Preference shares issued by a company which are redeemed on its maturity is called as redeemable preference shares. Cost of redeemable preference share is similar to the cost of redeemable debentures with the exception that the dividends paid to the preference shareholders are not tax deductible. Cost of preference capital is calculated as follows:

$$\text{Cost of Redeemable Preference Shares } (K_p) = \frac{PD + \frac{(RV - NP)}{n}}{\frac{(RV + NP)}{2}}$$

Where,

PD	=	Annual preference dividend
RV	=	Redemption value of preference shares
NP	=	Net proceeds from issue of preference shares
n	=	Remaining life of preference shares

Net proceeds mean issue price less issue expenses or floatation cost. If issue price is not given, then students can assume it to be equal to current market price. If issue expenses are not given, then simply assume it to be equal to zero.

The cost of redeemable preference shares can also be calculated as the discount rate that equates the net proceeds of the sale of preference shares with the present value of the future dividends and principal payments.

ILLUSTRATION 8

XYZ Ltd. issues 2,000 10% preference shares of ₹ 100 each at ₹ 95 each. The company proposes to redeem the preference shares at the end of 10th year from the date of issue. CALCULATE the cost of preference share?

SOLUTION

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

$$K_p = \frac{10 + \left(\frac{100 - 95}{10}\right)}{\left(\frac{100 + 95}{2}\right)} = 0.1077 \text{ or } 10.77\% \text{ (approx.)}$$

4.7 COST OF EQUITY SHARE CAPITAL (K_e)

Just like any other source of finance, cost of equity is expectation of equity shareholders. We know that the value is performance divided by expectations. If we know the value and performance, then we can calculate expectation as a balancing figure.

Here, performance means the amount paid by the company to investors, like interest, dividend, redemption price etc. In case of debentures and preference shares, amount of interest or dividend is fixed but in case of equity shares it is uncertain.

Therefore, there is not a single method to calculate cost of equity but different methods which depends on various factors like:

1) If dividend is expected to be constant, then **dividend price approach** should be used.

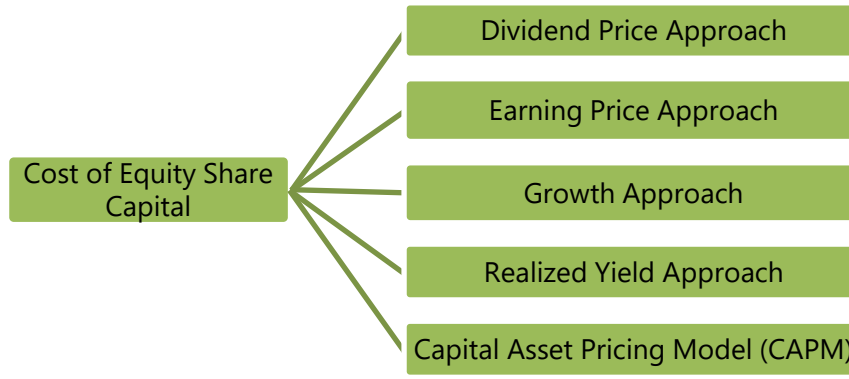
2) If earning per share is expected to be constant, then **earning price approach** should be used.

3) If dividend and earning are expected to grow at a constant rate, then **growth approach (Gordon's model)** should be used.

4) If it is difficult to forecast future, then **realised yield approach** should be used, which looks into past.

5) All the above methods calculate the cost of equity as a balancing figure. When the cost of equity or expectation of investors is dependent on risk i.e., Higher the risk, higher the expectations and vice versa, then **Capital asset pricing model (CAPM)** should be used, which is based on risk.

Different methods employed to compute the cost of equity share capital are:



4.7.1 Dividend Price Approach

This is also known as Dividend Valuation Model. This model makes an assumption that the dividend per share is expected to remain constant forever. Here, cost of equity capital is computed by dividing the expected dividend by market price per share as follows:

$$\text{Cost of Equity } (K_e) = \frac{D}{P_0}$$

Where,

K_e = Cost of equity

D = Expected dividend (also written as D_1)

P_0 = Market price of equity (ex- dividend)

4.7.2 Earnings Price Approach

The advocates of this approach co-relate the earnings of the company with the market price of its share. Accordingly, the cost of equity share capital would be based upon the expected rate of earnings of a company. The argument is that each investor expects a certain amount of earnings, whether distributed or not from the company in whose shares he invests. Thus, if an investor expects that the company in which he is going to subscribe for shares should have at least a 20% rate of earning, the cost of equity share capital can be construed on this basis. Suppose the company is expected to earn 30% the investor will be prepared to pay ₹ 150 $\left(\frac{30}{20}\times 100\right)$ for each share of ₹ 100.

Earnings Price Approach:

$$\text{Cost of Equity } (K_e) = \frac{E}{P}$$

Where,

E = Current earnings per share

P = Market price per share

This approach assumes that the earnings per share will remain constant forever. The Earning Price Approach is similar to the dividend price approach; only it seeks to nullify the effect of changes in the dividend policy.

4.7.3 Growth Approach or Gordon's Model

As per this approach, the rate of dividend growth remains constant. Where, earnings, dividends and equity share price all grow at the same rate, the cost of equity capital may be computed as follows:

$$\text{Cost of Equity } (K_e) = \frac{D_1}{P_0} + g$$

Where,

D_1 = $[D_0 (1+ g)]$ i.e. next expected dividend

P_0 = Current Market price per share

g = Constant Growth Rate of Dividend

In case of newly issued equity shares where floatation cost is incurred, the cost of equity share with an estimation of constant dividend growth is calculated as below:

$$\text{Cost of Equity } (K_e) = \frac{D_1}{P_0 - F} + g$$

Where, F = Flotation cost per share

Dividend Discount Model with variable growth rate is explained in chapter 9 - Dividend Decisions.

ILLUSTRATION 9

A company has paid dividend of ₹ 1 per share (of face value of ₹ 10 each) last year and it is expected to grow @ 10% every year. CALCULATE the cost of equity if the market price of share is ₹ 55.

SOLUTION

$$K_e = \frac{D_1}{P_0} + g = \frac{₹\,1(1+0.1)}{₹\,55} + 0.1 = 0.12 \text{ or } 12\%$$

Estimation of Growth Rate

The calculation of 'g' (the growth rate) is an important factor in calculating cost of equity share capital. Generally, two methods are used to determine the growth rate, as discussed below:

(i) Average Method

$$\text{Current Dividend } (D_0) = D_n(1+g)^n$$

or

$$\text{Growth rate} = \sqrt[n]{\frac{D_0}{D_n}} - 1$$

Where,

D_0 = Current dividend,

D_n = Dividend in n years ago

Growth rate can also be found as follows:

Step-I: Divide D_0 by D_n, find out the result, then refer the FVIF table.

Step-II: Find out the result found at Step-I in corresponding year's row.

Step-III: See the interest rate for the corresponding column. This is the growth rate.

Example - 4: The current dividend (D_0) is ₹ 16.10 and the dividend 5 year ago was ₹10. The growth rate in the dividend can found out as follows:

Step-I: Divide D_0 by D_n i.e. ₹ 16.10 ÷ ₹ 10 = 1.61

Step-II: Find out the result found at Step-I i.e. 1.61 in corresponding year's row i.e. 5th year.

Step-III: See the interest rate for the corresponding column which is 10%. Therefore, growth rate (g) is 10%.

(ii) Gordon's Growth Model

Unlike the Average method, Gordon's growth model attempts to derive a future growth rate. As per this model, increase in the level of investment will give rise to an increase in future dividends. This model takes Earnings retention rate (b) and rate of return on investments (r) into account to estimate the future growth rate.

It can be calculated as below:

$$\text{Growth (g)} = b \times r$$

Where,

b = earnings retention rate*

r = rate of return on fund invested

*Proportion of earnings available to equity shareholders which is not distributed as dividend.

(This Model is discussed in detail in chapter 9 - Dividend Decisions.)

4.7.4 Realized Yield Approach

According to this approach, the average rate of return realized in the past few years is historically regarded as 'expected return' in the future**.** It computes cost of equity based on the past records of dividends actually realised by the equity shareholders. Though, this approach provides a single mechanism of calculating cost of equity, it has unrealistic assumptions like risks faced by the company remain same; the shareholders continue to expect the same rate of return; and the reinvestment opportunity cost (rate) of the shareholders is same as the realised yield. If the earnings do not remain stable, this method is not practical.

ILLUSTRATION 10

Mr. Mehra had purchased a share of Alpha Limited for ₹ 1,000. He received dividend for a period of five years at the rate of 10 percent. At the end of the fifth year, he sold the share of Alpha Limited for ₹ 1,128. You are required to COMPUTE the cost of equity as per realised yield approach.

SOLUTION

We know that as per the realised yield approach, cost of equity is equal to the realised rate of return. Therefore, it is important to compute the internal rate of return by trial and error method. This realised rate of return is the discount rate which equates the present value of the dividends received in the past five years plus the present value of sale price of ₹ 1,128 to the purchase price of ₹ 1,000. The discount rate which equalises these two is 12 percent approximately. Let us look at the table given for a better understanding:

Year	Dividend (₹)	Sale Proceeds (₹)	Discount Factor @ 12%	Present Value (₹)
1	100	-	0.893	89.3
2	100	-	0.797	79.7
3	100	-	0.712	71.2
4	100	-	0.636	63.6
5	100	-	0.567	56.7
6	Beginning	1,128	0.567	639.576
				1,000.076

We find that the purchase price of Alpha Limited's share was ₹ 1,000 and the present value of the past five years of dividends plus the present value of the sale price at the discount rate of 12 per cent is ₹ 1,000.076. Therefore, the realised rate of return may be taken as 12 percent. This 12 percent is the cost of equity.

ILLUSTRATION 11

CALCULATE the cost of equity from the following data using realized yield approach:

Year	***1***	***2***	***3***	***4***	***5***
Dividend per share (₹)	*1.00*	*1.00*	*1.20*	*1.25*	*1.15*
Price per share (at the beginning) (₹)	*9.00*	*9.75*	*11.50*	*11.00*	*10.60*

SOLUTION

In this question, we will first calculate the yield for last 4 years and then will calculate it's geometric mean.

Yield for last 4 years:

$$1+Y_1 = \frac{D_1+P_1}{P_0} = \frac{1+9.75}{9} = 1.1944$$

$$1+Y_2 = \frac{D_2+P_2}{P_1} = \frac{1+11.50}{9.75} = 1.2821$$

$$1+Y_3 = \frac{D_3+P_3}{P_2} = \frac{1.2+11}{11.5} = 1.0609$$

$$1+Y_4 = \frac{D_4+P_4}{P_3} = \frac{1.25+10.60}{11} = 1.0772$$

Geometric mean:

$$K_e = [(1+Y_1)\times(1+Y_2)\times.....(1+Y_n)]^{1/n}-1$$

$$K_e = [1.1944\times1.2821\times1.0609\times1.0772]^{1/4}-1 = 0.15 = 15\%$$

4.7.5 Capital Asset Pricing Model (CAPM) Approach

CAPM model describes the risk-return trade-off for securities. It describes the linear relationship between risk and return of securities.

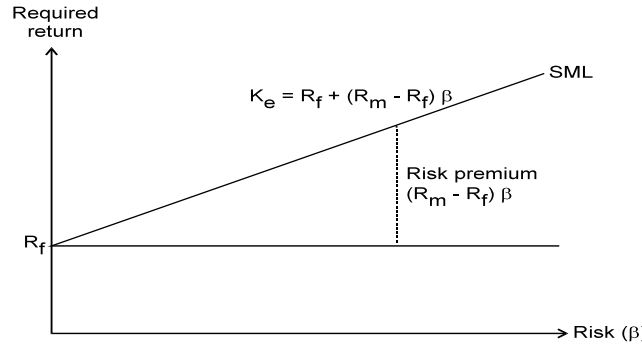
The risk to which a security is exposed, can be classified into two groups:

(i) **Unsystematic Risk:** This is also called company specific risk as the risk is related with the company's performance. This type of risk can be reduced or eliminated by diversification of the securities portfolio. This is also known as diversifiable risk.

(ii) **Systematic Risk:** It is the macro-economic or market specific risk under which a company operates. This type of risk cannot be eliminated by the diversification hence, it is non-diversifiable. The examples are inflation, Government policy, interest rate etc.

As diversifiable risk can be eliminated by an investor through diversification, the non-diversifiable risk is the risk which cannot be eliminated; therefore, a business should be concerned as per CAPM method, solely with non-diversifiable risk.

The non-diversifiable risks are assessed in terms of beta coefficient (b or β) through fitting regression equation between return of a security and the return on a market portfolio.



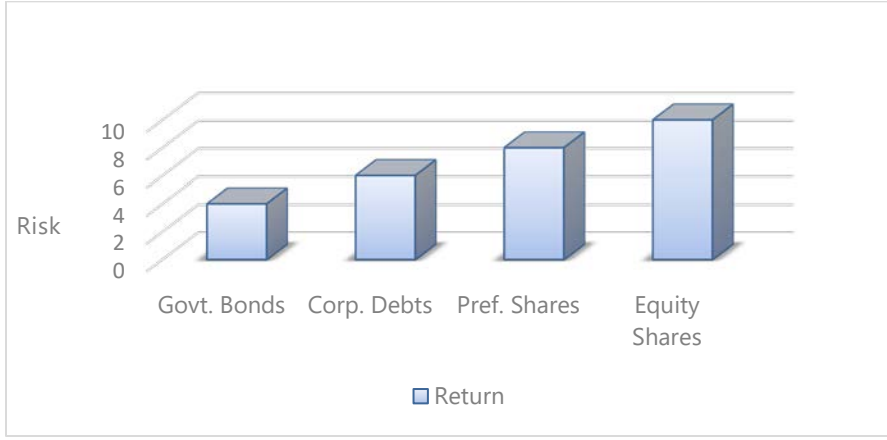
Cost of Equity under CAPM

Thus, the cost of equity capital can be calculated under this approach as:

Cost of Equity (K_e) = R_f + ß (R_m − R_f)

Where,

K_e	=	Cost of equity capital
R_f	=	Risk free rate of return
ß	=	Beta coefficient
R_m	=	Rate of return on market portfolio
$(R_m - R_f)$	=	Market risk premium



Risk Return relationship of various securities

Therefore, Required rate of return = Risk free rate + Risk premium

- The idea behind CAPM is that the investors need to be compensated in two ways - (i) Time value of money and (ii) Risk.
- The time value of money is represented by the risk-free rate in the formula and compensates the investors for placing money in any investment over a period of time.
- The other half of the formula represents risk and calculates the amount of compensation the investor needs for taking on additional risk. This is calculated by taking a risk measure (beta) which compares the returns of the asset to the market over a period of time and compares it with the market premium.

The CAPM says that the expected return of a security or a portfolio equals the rate on a risk-free security plus risk premium. If this expected return does not meet or beat the required return, then the investment should not be undertaken.

The shortcomings of this approach are:

(a) Estimation of beta with historical data is unrealistic; and

(b) Market imperfections may lead investors to unsystematic risk.

Despite these shortcomings, the CAPM is useful in calculating cost of equity, even when the firm is suffering losses.

The basic factor behind determining the cost of equity share capital is to measure the expectation of investors from the equity shares of that particular company. Therefore, the whole question of determining the cost of equity shares hinges upon the factors which go into the expectations of particular group of investors in a company of a particular risk class.

ILLUSTRATION 12

CALCULATE the cost of equity capital of H Ltd., whose risk-free rate of return equals 10%. The firm's beta equals 1.75 and the return on the market portfolio equals to 15%.

SOLUTION

$K_e = R_f + ß (R_m - R_f)$

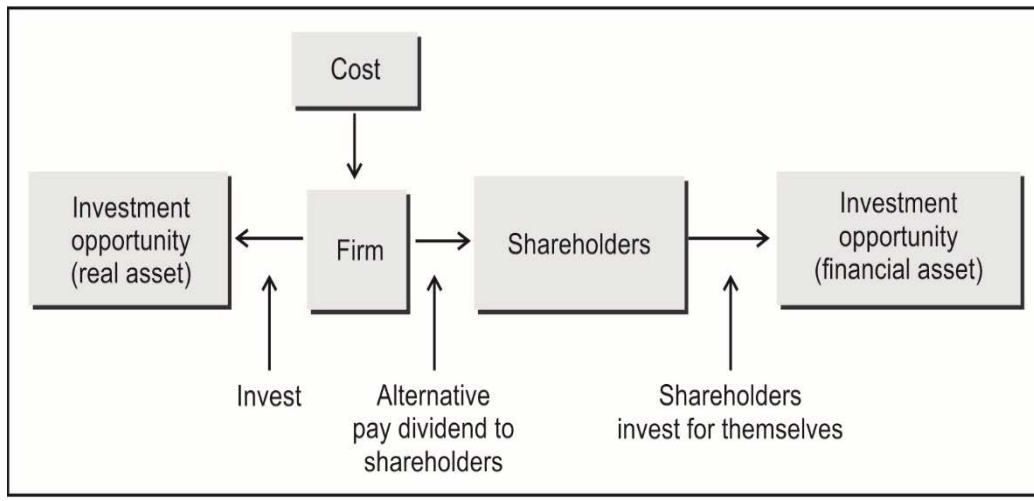
$K_e = 0.10 + 1.75 (0.15 - 0.10)$

$= 0.10 + 1.75 (0.05) = 0.1875$ or 18.75%

4.8 COST OF RETAINED EARNINGS (K_r)

Like other sources of fund, retained earnings also involves cost. It is the opportunity cost of dividends foregone by shareholders.

The given below figure depicts how a company can either keep or reinvest cash or return it to the shareholders as dividends. (Arrows represent possible cash flows or transfers.) If the cash is reinvested, the opportunity cost is the expected rate of return that shareholders could have obtained by investing in financial assets.



Cost of Retained Earnings

The cost of retained earnings is often used interchangeably with the cost of equity, as cost of retained earnings is nothing but the expected return of the shareholders from the investment in shares of the company. However, normally cost of equity remains higher than the cost of retained earnings, due to issue of shares at a price lower than current market price and floatation cost.

Formulas used for calculation of cost of retained earnings are same as formulas used for calculation of cost equity:

Dividend Price method: $K_r = \frac{D}{P}$

Earning Price method: $K_r = \frac{EPS}{P}$

Growth method: $K_r = \frac{D_1}{P_0} + g$

For the calculation of K_e : P = net proceeds realized = issue price less floatation cost. But for calculation of K_r : P = current market price. However, sometimes issue price may also be used. The concept of Floatation cost is not used for the calculation of cost of retained earnings.

ILLUSTRATION 13

Face value of equity shares of a company is ₹ 10, while current market price is ₹ 200 per share. Company is going to start a new project, and is planning to finance it partially by new issue and partially by retained earnings. You are required to CALCULATE cost of equity shares as well as cost of retained earnings if issue price will be ₹ 190 per share and floatation cost will be ₹ 5 per share. Dividend at the end of first year is expected to be ₹ 10 and growth rate will be 5%.

SOLUTION

$$K_r = \frac{D_1}{P_0} + g = \frac{10}{200} + 0.05 = 10\%$$

$$K_e = \frac{D_1}{P_0} + g = \frac{10}{190\text{-}5} + 0.05 = 10.41\%$$

If personal income tax is also considered then a shortcut formula may be as follows:

$K_r = K_e (1-t_p)(1-f)$

Here t_p is rate of personal income tax on dividend and "f" is rate of flotation cost.

Here, personal income tax means income tax payable on dividend income by equity shareholders.

Example - 5: Cost of equity of a company is 20%. Rate of floatation cost is 5%. Rate of personal income tax is 30%. Calculate cost of retained earnings.

Solution:

$K_r = K_e (1-t_p)(1-f) = 20\% \times (1-0.30) \times (1-0.05) = 13.3\%$

ILLUSTRATION 14

ABC Company provides the following details:

D_0 = ₹ 4.19 P_0 = ₹ 50 g = 5%

CALCULATE the cost of retained earnings.

SOLUTION

$$K_r = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$$

$$= \frac{₹4.19(1+0.05)}{₹50} + 0.05$$

$$= 0.088 + 0.05 = 13.8\%$$

ILLUSTRATION 15

ABC Company provides the following details:

$R_f = 7\%$ $\beta = 1.20$ $R_m - R_f = 6\%$

CALCULATE the cost of retained earnings based on CAPM method.

SOLUTION

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

$$= 7\% + 1.20 (6\%) = 7\% + 7.20$$

$$K_r = 14.2\%$$

4.9 EFFECTIVE INTEREST RATE (EIR) METHOD:

After the introduction to Effective Interest Rate Method under Ind AS 109, one should be familiar with this concept as well. Though the students will study this concept and the standard in detail in the subject of Accounting/Financial reporting, a brief and relevant part of it, is stated here for reference only.

Definition of 'Effective Interest Method': It is 'the rate that exactly discounts estimated future cash payments or receipts through the expected life of the financial asset or financial liability to the gross carrying amount of a financial asset or to the amortised cost of a financial liability. When calculating the effective interest rate, an entity shall estimate the expected cash flows by considering all the contractual terms of the financial instrument (for example, prepayment, extension, call and similar options) but shall not consider the expected credit losses (ECL). The calculation includes all fees and points paid or received between parties to the contract that are an integral part of the effective interest rate, transaction costs, and all other premiums or discounts. There is a presumption that the cash flows and the expected life of a group of similar financial instruments can be estimated reliably. However, in those rare cases when

it is not possible to reliably estimate the cash flows or the expected life of a financial instrument (or group of financial instruments), the entity shall use the contractual cash flows over the full contractual term of the financial instrument (or group of financial instruments).'

Application of EIR Method: For floating (variable)-rate financial assets or financial liabilities, periodic re-estimation of cash flows to reflect the movements in the market rates of interest alters the effective interest rate. If the floating (variable)-rate financial asset or financial liability is recognized initially at an amount equal to the principal receivable or payable on maturity, re-estimating the future interest payments normally has no significant effect on the carrying amount of the asset or the liability.

So, depending on Materiality, an appropriate approach for amortisation can be determined. If the amount of transaction costs, premiums or discount is not significant the straight-line amortisation can be done. If the amounts are significant, EIR rate for amortising these amounts may be applied.

4.10 WEIGHTED AVERAGE COST OF CAPITAL (WACC)

To balance financial risk, control over the company and cost of capital, a company usually does not procure entire fund from a single source, rather it makes a mix of various sources of finance. Hence, cost of total capital will be equal to weighted average of cost of individual sources of finance.

WACC is also known as the overall cost of capital which includes the cost of different sources of capital as explained above. WACC of a company depends on the capital structure of a company. It weighs the cost of capital of a particular source of capital with its proportion to the total capital. Thus, weighted average cost of capital is the weighted average after-tax costs of the individual components of firm's capital structure. That is, the after-tax cost of each debt and equity is calculated separately and added together to a single overall cost of capital

The steps to calculate WACC is as follows:

Step 1: Calculate the total capital from all the sources of capital.

(Long-term debt capital + Pref. Share Capital + Equity Share Capital + Retained Earnings)

Step 2: Calculate the proportion (or %) of each source of capital to the total capital.

$$\left(\frac{\text{Equity Share Capital (for example)}}{\text{Total Capital (as calculated in Step1 above)}}\right)$$

Step 3: Multiply the proportion as calculated in Step 2 above with the respective cost of capital.

(K_e × Proportion (%) of equity share capital (for example) calculated in Step 2 above)

Step 4: Aggregate the cost of capital as calculated in Step 3 above. This is the WACC.

(K_e + K_d + K_p + K_s as calculated in Step 3 above)

Example - 6:

Calculation of WACC

Source of Capital	Cost of capital	% of total capital	Total
Retained Earnings	10% (K_r)	25% (W_r)	2.50% (K_r × W_r)
Equity Share Capital	11% (K_e)	10% (W_e)	1.10% (K_e× W_e)
Preference Share Capital	9% (K_p)	15% (W_p)	1.35% (K_p× W_p)
Long term debts	6% (K_d)	50% (W_d)	3.00% (K_d× W_d)
Total (WACC)			7.95%

The cost of weighted average method is preferred because the proportions of various sources of funds in the capital structure are different. To be representative, therefore, cost of capital should take into account the relative proportions of different sources of finance.

Securities analysts employ WACC all the time when valuing and selecting investments. In discounted cash flow analysis, WACC is used as the discount rate applied to future cash flows for deriving a business' net present value. WACC can be used as a hurdle rate against which to assess return on investment capital performance. Investors use WACC as a tool to decide whether or not to invest. The WACC represents the minimum rate of return at which a company produces

value for its investors. Let's say, if a company produces a return of 20% and has a WACC of 11%. By contrast, the company's return is less than WACC meaning the company is shedding value, which indicates that investors should put their money elsewhere.

Therefore, WACC serves as a useful reality check for investors.

4.10.1 Choice of weights

There is a choice weights between the book value (BV) and market value (MV).

Book Value (BV): Book value weights is operationally easy and convenient. While using BV, reserves such as share premium and retained profits are included in the BV of equity, in addition to the nominal value of share capital. Here, the value of equity will generally not reflect historic asset values, as well as the future prospects of an organisation.

Market Value (MV): Market value weight is more correct and represent a firm's capital structure. **It is preferable to use MV weights for the equity**. While using MV, reserves such as share premium and retained profits are ignored as they are in effect incorporated into the value of equity. It represents existing conditions and also take into consideration the impacts of changing market conditions and the current prices of various security. Similarly, in case of debt, MV is better to be used rather than the BV of the debt, though the difference may not be very significant.

There is no separate market value for retained earnings. Market value of equity shares represents both paid up equity capital and retained earnings. But cost of equity is not same as cost of retained earnings. Hence to give market value weights, market value of equity shares should be apportioned in the ratio of book value of paid up equity capital and book value of retained earnings.

ILLUSTRATION 16

Cost of equity of a company is 10.41% while cost of retained earnings is 10%. There are 50,000 equity shares of ₹ 10 each and retained earnings of ₹ 15,00,000. Market price per equity share is ₹ 50. Calculate WACC using market value weights if there are no other sources of finance.

SOLUTION

Book value of paid up equity capital = ₹ 5,00,000

Book value of retained earnings = ₹ 15,00,000

Ratio of Paid up equity capital & retained earnings = 5,00,000:15,00,000 = 1:3

Market value of paid up equity capital & retained earnings = ₹ 50,000 x ₹ 50

= ₹ 25,00,000

Market value of paid up equity capital = ₹ 25,00,000 x ¼ = ₹ 6,25,000

Market value of retained earnings = ₹ 25,00,000 x ¾ = ₹ 18,75,000

Calculation of WACC using market value weights

Source of capital	Market Value	Weights	Cost of capital	WACC (K_o)
	(₹)	(a)	(b)	(c) = (a)×(b)
Equity shares	6,25,000	0.25	0.1041	0.0260
Retained earnings	18,75,000	0.75	0.1000	0.0750
	25,00,000	1.000		0.1010

WACC (K_o) = 0.1010 or 10.10%

ILLUSTRATION 17

CALCULATE the WACC using the following data by using:

(a) Book value weights

(b) Market value weights

The capital structure of the company is as under:

	(₹)
Debentures (₹ 100 per debenture)	*5,00,000*
Preference shares (₹ 100 per share)	*5,00,000*
Equity shares (₹ 10 per share)	*10,00,000*
	20,00,000

The market prices of these securities are:

Debentures *₹ 105 per debenture*

Preference shares *₹ 110 per preference share*

Equity shares *₹ 24 per equity share*

Additional information:

(1) ₹ 100 per debenture redeemable at par, 10% coupon rate, 4% floatation costs, 10-year maturity.

(2) ₹ 100 per preference share redeemable at par, 5% coupon rate, 2% floatation cost and 10-year maturity.

(3) Equity shares has ₹ 4 floatation cost and market price of ₹ 24 per share.

The next year expected dividend is ₹ 1 with annual growth of 5%. The firm has practice of paying all earnings in the form of dividend.

Corporate tax rate is 30%. Use YTM method to calculate cost of debentures and preference shares.

SOLUTION

(i) Cost of Equity (K_e)

$$= \frac{D_1}{P_0 - F} + g = \frac{₹1}{₹24 - ₹4} + 0.05 = 0.1 \text{ or } 10\%$$

(ii) Cost of Debt (K_d)

Current market price (P_0) – floatation cost = I(1-t) × PVAF(r,10) + RV×PVIF(r,10)

₹ 105 – 4% of ₹ 105 = ₹ 10(1-0.3) × PVAF (r,10) + ₹ 100×PVIF (r,10)

Calculation of NPV at discount rate of 5% and 7%

Year	Cash flows (₹)	Discount factor @ 5%	Present Value (₹)	Discount factor @ 7%	Present Value (₹)
0	100.8	1.000	(100.8)	1.000	(100.8)
1 to 10	7	7.722	54.05	7.024	49.17
10	100	0.614	61.40	0.508	50.80
NPV			+14.65		-0.83

Calculation of IRR

$$\text{IRR} = 5\% + \frac{14.65}{14.65 - (-0.83)}(7\% - 5\%) = 5\% + \frac{14.65}{15.48}(7\% - 5\%) = 6.89\%$$

Cost of Debt (K_d) = 6.89%

(iii) Cost of Preference shares (K_p)

Current market price (P_0) – floatation cost = PD × PVAF (r,10) + RV × PVIF (r,10)

₹ 110 – 2% of ₹ 110 = ₹ 5 × PVAF (r,10) + ₹ 100 × PVIF (r,10)

Calculation of NPV at discount rate of 3% and 5%

Year	Cash flows (₹)	Discount factor @ 3%	Present Value (₹)	Discount factor @ 5%	Present Value (₹)
0	107.8	1.000	(107.8)	1.000	(107.8)
1 to 10	5	8.530	42.65	7.722	38.61
10	100	0.744	74.40	0.614	61.40
NPV			+9.25		-7.79

Calculation of IRR

$$IRR = 3\% + \frac{9.25}{9.25-(-7.79)}(5\%-3\%) = 3\% + \frac{9.25}{17.04}(5\%-3\%) = 4.08\%$$

Cost of Preference Shares (K_p) = 4.08%

(a) Calculation of WACC using book value weights

Source of capital	Book Value	Weights	After tax cost of capital	WACC (K_o)
	(₹)	(a)	(b)	(c) = (a)×(b)
10% Debentures	5,00,000	0.25	0.0689	0.01723
5% Preference shares	5,00,000	0.25	0.0408	0.0102
Equity shares	10,00,000	0.50	0.10	0.05000
	20,00,000	1.00		0.07743

WACC (K_o) = 0.07743 or 7.74%

(b) Calculation of WACC using market value weights

Source of capital	Market Value	Weights	After tax cost of capital	WACC (K_o)
	(₹)	(a)	(b)	(c) = (a)×(b)
10% Debentures (₹105× 5,000)	5,25,000	0.151	0.0689	0.0104
5% Preference shares (₹110× 5,000)	5,50,000	0.158	0.0408	0.0064
Equity shares (₹24× 1,00,000)	24,00,000	0.691	0.10	0.0691
	34,75,000	1.000		0.0859

WACC (K_o) = 0.0859 or 8.59%

4.11 MARGINAL COST OF CAPITAL

The marginal cost of capital may be defined as the cost of raising an additional rupee of capital. Since the capital is raised in substantial amount in practice, marginal cost is referred to as the cost incurred in raising new funds. Marginal cost of capital is derived, when the average cost of capital is **calculated using the marginal weights**.

The marginal weights represent the proportion of funds the firm intends to employ. Thus, the problem of choosing between the book value weights and the **market value weights** does not arise in the case of marginal cost of capital computation.

To calculate the marginal cost of capital, the intended financing proportion should be applied as weights to marginal component costs. The marginal cost of capital should, therefore, be calculated in the composite sense. When a firm raises funds in proportional manner and the component's cost remains unchanged, there will be no difference between average cost of capital (of the total funds) and the marginal cost of capital. The component costs may remain constant upto certain level of funds raised and then start increasing with amount of funds raised.

For example, the cost of debt may remain 7% (after tax) till ₹ 10 lakhs of debt is raised, between ₹ 10 lakhs and ₹ 15 lakhs, the cost may be 8% and so on.

Similarly, if the firm has to use the external equity when the retained profits are not sufficient, the cost of equity will be higher because of the floatation costs. When the components cost start rising, the average cost of capital will rise and the marginal cost of capital will however, rise at a faster rate.

ILLUSTRATION 18

ABC Ltd. has the following capital structure, which is considered to be optimum as on 31st March, 2022.

	(₹)
14% Debentures	*30,000*
11% Preference shares	*10,000*
Equity Shares (10,000 shares)	*1,60,000*
	2,00,000

The company share has a market price of ₹ 23.60. Next year dividend per share is 50% of year 2021 EPS. Following is the uniform trend of EPS for the preceding 10 years which is expected to continue in future:

Year	EPS (₹)	Year	EPS (₹)
2012	*1.00*	*2017*	*1.61*
2013	*1.10*	*2018*	*1.77*
2014	*1.21*	*2019*	*1.95*
2015	*1.33*	*2020*	*2.15*
2016	*1.46*	*2021*	*2.36*

The company issued new debentures carrying 16% rate of interest and the current market price of debenture is ₹ 96.

Preference shares of ₹ 9.20 (with annual dividend of ₹ 1.1 per share) were also issued. The company is in 50% tax bracket.

(A) CALCULATE after tax:

(i) Cost of new debt

(ii) Cost of new preference shares

(iii) Cost of new equity share (assuming new equity from retained earnings)

(B) CALCULATE marginal cost of capital when no new shares are issued.

(C) DETERMINE the amount that can be spent for capital investment before new ordinary shares must be sold. Assuming that the retained earnings for next year's investment is 50 percent of 2021.

(D) COMPUTE marginal cost of capital when the fund exceeds the amount calculated in (C), assuming new equity is issued at ₹ 20 per share?

SOLUTION

(A) (i) Cost of new debt

$$K_d = \frac{I(1-t)}{P_0}$$

$$= \frac{16\,(1-0.5)}{96} = 0.0833$$

(ii) Cost of new preference shares

$$K_p = \frac{PD}{P_0} = \frac{1.1}{9.2} = 0.12$$

(iii) Cost of new equity shares

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

$$= \frac{1.18}{23.60} + 0.10 = 0.05 + 0.10 = 0.15$$

Calculation of g when there is a uniform trend (on the basis of EPS)

$$= \frac{EPS\,(2013) - EPS\,(2012)}{EPS\,(2012)} = \frac{₹\,1.10 - ₹\,1.00}{₹\,1.00} = 0.10 \text{ or } 10\%$$

Calculation of D_1

D_1 = 50% of 2021 EPS = 50% of 2.36 = ₹ 1.18

(B) Calculation of marginal cost of capital

Type of Capital	Proportion	Specific Cost	Product
(1)	(2)	(3)	(2) × (3) = (4)
Debenture	0.15	0.0833	0.0125
Preference Share	0.05	0.1200	0.0060
Equity Share	0.80	0.1500	0.1200
Marginal cost of capital			**0.1385**

(C) The company can spend the following amount without increasing marginal cost of capital and without selling the new shares:

Retained earnings = 50% of EPS of 2021 × outstanding equity shares

= 0.50 × ₹ 2.36 × 10,000 shares = ₹ 11,800

The ordinary equity (Retained earnings in this case) is 80% of total capital

So, ₹ 11,800 = 80% of Total Capital

$$\therefore \text{Capital investment before issuing equity shares} = \frac{₹\,11,800}{0.80} = ₹\,14,750$$

(D) If the company spends in excess of ₹ 14,750, it will have to issue new equity shares at ₹ 20 per share.

$$\therefore \text{The cost of new issue of equity shares will be} = \frac{D_1}{P_0} + g = \frac{₹\,1.18}{20} + 0.10 = 0.159$$

The marginal cost of capital will be:

Type of Capital	Proportion	Specific Cost	Product
(1)	(2)	(3)	(2) × (3) = (4)
Debentures	0.15	0.0833	0.0125
Preference Shares	0.05	0.1200	0.0060
Equity Shares (New)	0.80	0.1590	0.1272
			0.1457

SUMMARY

- **Cost of Capital:** In simple terms, Cost of capital refers to the discount rate that is used in determining the present value of the estimated future cash proceeds of the business/new project and eventually deciding whether the business/new project is worth undertaking or now. It is also the minimum rate of return that a firm must earn on its investment which will maintain the market value of share at its current level. It can also be stated as the opportunity cost of an investment, i.e., the rate of return that a company would otherwise be able to earn at the same risk level as the investment that has been selected.
- **Measurement of Specific Cost of Capital for each source of Capital:** The first step in the measurement of the cost of the capital of the firm is the

calculation of the cost of individual sources of raising funds. From the viewpoint of capital budgeting decisions, the long term sources of funds are relevant as they constitute the major sources of financing the fixed assets. In calculating the cost of capital, therefore the focus on long-term funds and which are:-

Long term debt (including Debentures)

Preference Shares

Equity Capital

Retained Earnings

- **Weighted Average Cost of Capital:** WACC (weighted average cost of capital) represents the investors' opportunity cost of taking on the risk of putting money into a company. Since every company has a capital structure i.e. what percentage of funds comes from retained earnings, equity shares, preference shares, debt and bonds, so by taking a weighted average, it can be seen how much cost/interest the company has to pay for every rupee it borrows/invest. WACC can be calculated on the basis of Book Value (BV) weights or Market Value (MV) weights.
- **Marginal cost of capital:** It may be defined as the cost of raising an additional rupee of capital. Since the capital is raised in substantial amount in practice, marginal cost is referred to as the cost incurred in raising new funds. Marginal cost of capital is derived, when the average cost of capital is calculated using the marginal weights. The marginal weights represent the proportion of funds the firm intends to employ.

TEST YOUR KNOWLEDGE

MCQs based Questions

1. Which of the following is not an assumption of the capital asset pricing model (CAPM)?

   (a) The capital market is efficient.

   (b) Investors lend or borrow at a risk-free rate of return.

   (c) Investors do not have the same expectations about the risk and return.

   (d) Investor's decisions are based on a single-time period.

2. Given: risk-free rate of return = 5 %; market return = 10%; cost of equity = 15%; value of beta (β) is:

   (a) 1.9

   (b) 1.8

   (c) 2.0

   (d) 2.2

3. _____may be defined as the cost of raising an additional rupee of capital:

   (a) Marginal cost of capital

   (b) Weighted Average cost of capital

   (c) Simple Average cost of capital

   (d) Liquid cost of capital

4. Which of the following cost of capital requires to adjust taxes?

   (a) Cost of Equity Share

   (b) Cost of Preference Shares,

   (c) Cost of Debentures

   (d) Cost of Retained Earnings

5. Marginal Cost of capital is the cost of:

   (a) Additional Revenue

   (b) Additional Funds

   (c) Additional Interests

   (d) None of the above

6. In order to calculate Weighted Average Cost of Capital, weights may be based on:

   (a) Market Values

   (b) Target Values

   (c) Book Values

   (d) Anyone of the above

7. Firm's Cost of Capital is the average cost of:

   (a) All sources of finance

   (b) All Borrowings

   (c) All share capital

   (d) All Bonds & Debentures

8. A company has a financial structure where equity is 70% of its total debt plus equity. Its cost of equity is 10% and gross loan interest is 5%. Corporation tax is paid at 30%. What is the company's weighted average cost of capital (WACC)?

   (a) 7.55%

   (b) 7.80%

   (c) 8.70%

   (d) 8.05%

9. The cost of equity capital is all of the following except:

   (a) The minimum rate that a firm should earn on the equity-financed part of an investment.

   (b) A return on the equity-financed portion of an investment that, at worst, leaves the market price of the stock unchanged.

   (c) By far, the most difficult component cost to estimate.

   (d) Generally, lower than the before-tax cost of debt.

10. What is the overall (weighted average) cost of capital when the firm has ₹ 20 crores in long-term debt, ₹ 4 crores in preferred stock, and ₹ 16 crores in equity shares? The before-tax cost for debt, preferred stock, and equity capital are 8%, 9%, and 15%, respectively. Assume a 50% tax rate.

    (a) 7.60%

    (b) 6.90%

    (c) 7.30%

    (d) 8.90%

Theoretical based Questions

1. DISCUSS the meaning of weighted average cost of capital? ILLUSTRATE with an example.

2. DISCUSS the dividend price approach, and earnings price approach to estimate cost of equity capital.
3. What is the DIFFERENCE between Book Value and Market Value weights?
4. DISCUSS Marginal Cost of Capital?
5. EXPLAIN YTM approach of calculating Cost of Debt.
6. DISCUSS the meaning of Amortisation of Bond?

Practical Problems

1. Gamma Limited has 5,00,000, ₹ 1 ordinary shares whose current ex-dividend market price is ₹ 1.50 per share. The company has just paid a dividend of 27 paise per share, and dividends are expected to continue at this level for some time. If the company has no debt capital, COMPUTE the weighted average cost of capital?
2. The following details are provided by the GPS Limited:

	(₹)
Equity Share Capital	65,00,000
12% Preference Share Capital	12,00,000
15% Redeemable Debentures	20,00,000
10% Convertible Debentures	8,00,000

The cost of equity capital for the company is 16.30% and income tax rate for the company is 30%.

You are required to CALCULATE the Weighted Average Cost of Capital (WACC) of the company.

3. ABC Company's equity share is quoted in the market at ₹ 25 per share currently. The company pays a dividend of ₹ 2 per share and the investor's market expects a growth rate of 6% per year.

You are required to:

(i) CALCULATE the company's cost of equity capital.

(ii) If the company issues 10% debentures of face value of ₹ 100 each and realises ₹ 96 per debenture while the debentures are redeemable after

12 years at a premium of 12%, CALCULATE cost of debenture using YTM?

Assume Tax Rate to be 50%.

4. Masco Limited wishes to raise additional finance of ₹ 10 lakhs for meeting its investment plans. It has ₹ 2,10,000 in the form of retained earnings available for investment purposes. Further details are as following:

(1)	Debt / Equity mix	3:7
(2)	Cost of debt:	
	Upto ₹ 1,80,000	10% (before tax)
	Beyond ₹ 1,80,000	16% (before tax)
(3)	Earnings per share	₹ 4
(4)	Dividend pay out	50% of earnings
(5)	Expected growth rate of dividend	10%
(6)	Current market price per share	₹ 44
(7)	Tax rate	50%

You are required to:

(a) DETERMINE the pattern for raising the additional finance.

(b) DETERMINE the post-tax average cost of additional debt.

(c) DETERMINE the cost of retained earnings and cost of equity.

(d) COMPUTE the overall weighted average after tax cost of additional finance.

5. DETERMINE the cost of capital of Best Luck Limited using the book value (BV) and market value (MV) weights from the following information:

Sources	Book Value (₹)	Market Value (₹)
Equity shares	1,20,00,000	2,00,00,000
Retained earnings	30,00,000	-
Preference shares	36,00,000	33,75,000
Debentures	9,00,000	10,40,000

Additional information:

I. Equity: Equity shares are quoted at ₹ 130 per share and a new issue priced at ₹ 125 per share will be fully subscribed; flotation costs will be ₹ 5 per share.

II. Dividend: During the previous 5 years, dividends have steadily increased from ₹ 10.60 to ₹ 14.19 per share. Dividend at the end of the current year is expected to be ₹ 15 per share.

III. Preference shares: 15% Preference shares with face value of ₹ 100 would realise ₹ 105 per share.

IV. Debentures: The company proposes to issue 11-year 15% debentures but the yield on debentures of similar maturity and risk class is 16%; flotation cost is 2%.

V. Tax: Corporate tax rate is 35%. Ignore dividend tax.

Floatation cost would be calculated on face value.

6. Kalyanam Ltd. has an operating profit of ₹ 34,50,000 and has employed Debt which gives total Interest Charge of ₹ 7,50,000. The firm has an existing Cost of Equity and Cost of Debt as 16% and 8% respectively. The firm has a new proposal before it, which requires funds of ₹ 75 Lakhs and is expected to bring an additional profit of ₹ 14,25,000. To finance the proposal, the firm is expecting to issue an additional debt at 8% and will not be issuing any new equity shares in the market. Assume no tax culture.

   You are required to CALCULATE the Weighted Average Cost of Capital (WACC) of Kalyanam Ltd.:

   (i) Before the new Proposal

   (ii) After the new Proposal.

ANSWERS/SOLUTIONS

Answers to the MCQs based Questions

1. (c) **2.** (c) **3.** (a) **4.** (c) **5.** (b) **6.** (d)
7. (a) **8.** (d) **9.** (d) **10.** (d)

Answers to the Theoretical Questions

1. Please refer paragraph 4.10

2. Please refer paragraph 4.7.1

3. Please refer paragraph 4.10.1

4. Please refer paragraph 4.11

5. Please refer paragraph 4.5.3.1

6. Please refer paragraph 4.5.3.2

Answers to the Practical Problems

1. Market value of equity, E = 5,00,000 shares × ₹ 1.50 = ₹ 7,50,000

Market value of debt, D = Nil

Cost of equity capital, $K_e = \frac{D_1}{P_0} = \frac{₹0.27}{₹1.50} = 0.18$

Since there is no debt capital, WACC = K_e = 18 per cent.

2. **Calculation of Weighted Average Cost of Capital (WACC)**

Source	Amount (₹)	Weight	Cost of Capital after tax	WACC
Equity Capital	65,00,000	0.619	0.163	0.1009
12% Preference Capital	12,00,000	0.114	0.120	0.0137
15% Redeemable Debentures	20,00,000	0.190	0.105*	0.020
10% Convertible Debentures	8,00,000	0.076	0.070**	0.0053
Total	1,05,00,000	1.0000		0.1399

* Cost of 15% Redeemable Debentures (after tax) = 15 (1 – 0.30)

= 10.5% or 0.105

** Cost of 10% Convertible Debentures (after tax) = 10 (1 – 0.30)= 7% or 0.070

Weighted Average Cost of Capital (WACC) = 0.1399 = 13.99%

(Note: In the above solution, the Cost of Debentures has been computed without considering the impact of special features i.e. redeemability and convertibility in absence of requisite information.)

3. (i) Cost of Equity Capital (K_e):

$$K_e = \frac{\text{Expected dividend per share}(D_1)}{\text{Market price per share}(P_0)} + \text{Growth rate}(g)$$

$$= \frac{₹\ 2 \times 1.06}{₹\ 25} + 0.06 = 0.1448 \text{ or } 14.48\%$$

(ii) Cost of Debenture (K_d):

Using Present Value method (YTM)

Identification of relevant cash flows

Year	Cash flows
0	Current market price (P_0) = ₹ 96
1 to 12	Interest net of tax [I(1-t)] = 10% of ₹ 100 (1 – 0.5) = ₹ 5
12	Redemption value (RV) = ₹ 100 (1.12) = ₹ 112

Calculation of Net Present Values (NPV) at two discount rates

Year	Cash flows (₹)	Discount factor @ 5% (L)	Present Value (₹)	Discount factor @ 10% (H)	Present Value (₹)
0	(96)	1.000	(96.00)	1.000	(96.00)
1 to 12	5	8.863	44.32	6.814	34.07
12	112	0.557	62.38	0.319	35.73
NPV			+10.7		-26.2

Calculation of IRR

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

$$= 5\% + \frac{10.7}{10.7 - (-26.2)}(10\% - 5\%) = 5\% + \frac{53.5}{36.9} = 6.45\%$$

Therefore, K_d = 6.45%

4. (a) Pattern for raising the additional finance:

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

The capital structure after raising additional finance:

		(₹)
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 ₹ 1,80,000 = 10% (1 – 0.5) = 5% or 0.05

On ₹ 1,20,000 = 16% (1 – 0.5) = 8% or 0.08

Average Cost of Debt

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

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

$$K_e \text{ or } K_r = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$$

Where,

D_0 = Dividend paid = 50% of EPS = 50% × ₹ 4 = ₹ 2

g = Growth rate = 10%

P_0 = Current market price per share = ₹ 44

$$\text{So, } K_e \text{ or } K_r = \frac{₹\ 2\,(1+0.10)}{₹\ 44} + 0.10 = \frac{₹\ 2.2}{₹\ 44} + 0.10 = 0.05 + 0.10 = 0.15 \text{ or } 15\%$$

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

Particulars	Amount (₹)	Weights	Cost of funds	Weighted Cost (%)
Equity (including retained earnings)	7,00,000	0.70	15%	10.5
Debt	3,00,000	0.30	6.2%	1.86
WACC	10,00,000			**12.36**

5. (i) Cost of Equity $(K_e) = \frac{D_1}{P_0 - F} + g = \frac{₹15}{₹125 - ₹5} + 0.06^*$

$K_e = 0.125 + 0.06 = 0.185$

*Calculation of g:

$₹ 10.6(1+g)^5 = ₹ 14.19$

Or, $(1+g)^5 = \frac{14.19}{10.6} = 1.338$

Table (FVIF) suggests that ₹ 1 compounds to ₹ 1.338 in 5 years at the compound rate of 6 percent. Therefore, g is 6 per cent.

(ii) Cost of Retained Earnings $(K_r) = \frac{D_1}{P_0} + g = \frac{₹\ 15}{₹\ 125} + 0.06 = 0.18$

(iii) Cost of Preference Shares $(K_p) = \frac{PD}{P_0} = \frac{₹\ 15}{₹\ 105} = 0.1429$

(iv) Cost of Debentures $(K_d) = \frac{I(1-t) + \left(\frac{RV - NP}{n}\right)}{\frac{RV + NP}{2}}$

$$= \frac{₹\ 15(1-0.35) + \left(\frac{₹\ 100 - ₹\ 91.75^*}{11 \text{years}}\right)}{\frac{₹\ 100 + ₹\ 91.75^*}{2}}$$

$$= \frac{₹\ 15 \times 0.65 + ₹\ 0.75}{₹\ 95.875} = \frac{₹ 10.5}{₹ 95.875} = 0.1095$$

*Since yield on similar type of debentures is 16 per cent, the company would be required to offer debentures at discount.

Market price of debentures (approximation method)

= ₹ 15 ÷ 0.16 = ₹ 93.75

Sale proceeds from debentures = ₹ 93.75 – ₹ 2 (i.e., floatation cost) = ₹91.75

Market value (P_0) of debentures can also be found out using the present value method:

P_0 = Annual Interest × PVIFA (16%, 11 years) + Redemption value × PVIF (16%, 11 years)

P_0 = ₹ 15 × 5.029 + ₹ 100 × 0.195

P_0 = ₹ 75.435 + ₹ 19.5 = ₹ 94.935

Net Proceeds = ₹ 94.935 – 2% of ₹ 100 = ₹ 92.935

Accordingly, the cost of debt can be calculated

Total Cost of capital [BV weights and MV weights]

(Amount in (₹) lakh)

Source of capital	Weights		Specific Cost (K)	Total cost	
	BV	MV		(BV × K)	(MV × K)
Equity Shares	120	160*	0.1850	22.2	29.6
Retained Earnings	30	40*	0.1800	5.4	7.2
Preference Shares	36	33.75	0.1429	5.14	4.82
Debentures	9	10.4	0.1095	0.986	1.139
Total	195	244.15		33.73	42.76

*Market Value of equity has been apportioned in the ratio of Book Value of equity and retained earnings i.e., 120:30 or 4:1.

Weighted Average Cost of Capital (WACC):

Using Book Value $= \frac{₹\,33.73}{₹\,195} = 0.1729$ or 17.29%

Using Market Value $= \frac{₹\,42.76}{₹\,244.15} = 0.1751$ or 17.51%

6. Workings:

(a) **Value of Debt** $= \frac{\text{Interest}}{\text{Cost of debt } (K_d)}$

$= \frac{₹\ 7,50,000}{0.08} = ₹\ 93,75,000$

(b) **Value of equity capital** $= \frac{\text{Operating profit - Interest}}{\text{Cost of equity } (K_e)}$

$= \frac{₹\ 34,50,000 - ₹\ 7,50,000}{0.16} = ₹\ 1,68,75,000$

(c) **New Cost of equity (K_e) after proposal**

$= \frac{\text{Increased Operating profit - Interest on Increased debt}}{\text{Equity capital}}$

$= \frac{(₹\ 34,50,000 + ₹\ 14,25,000) - (₹\ 7,50,000 + ₹\ 6,00,000)}{₹\ 1,68,75,000}$

$= \frac{₹\ 48,75,000 - ₹\ 13,50,000}{₹\ 1,68,75,000} = \frac{₹\ 35,25,000}{₹\ 1,68,75,000} = 0.209 \text{ or } 20.9\%$

(i) Calculation of Weighted Average Cost of Capital (WACC) before the new proposal

Sources	Amount (₹)	Weight	Cost of Capital	WACC
Equity	1,68,75,000	0.6429	0.160	0.1029
Debt	93,75,000	0.3571	0.080	0.0286
Total	**2,62,50,000**	**1**		**0.1315 or 13.15 %**

(ii) Calculation of Weighted Average Cost of Capital (WACC) after the new proposal

Sources	Amount (₹)	Weight	Cost of Capital	WACC
Equity	1,68,75,000	0.5000	0.209	0.1045
Debt	1,68,75,000	0.5000	0.080	0.0400
Total	**3,37,50,000**	**1**		**0.1445 or 14.45 %**