

(ii) Expected price of bond in the market.

Solution:

(i) Forward Rate

$$\begin{aligned}
 1 \text{ year} &= 12\% \\
 2^{\text{nd}} \text{ Year} &= 12 - 0.75 = 11.25\% \\
 3^{\text{rd}} \text{ year} &= 11.25 - 0.5 = 10.75\%
 \end{aligned}$$

$$\begin{aligned}
 IV_0 &= \frac{\text{₹ } 90}{1.12} + \frac{\text{₹ } 90}{(1.12)(1.1125)} + \frac{\text{₹ } 1,090}{(1.12)(1.1125)(1.1075)} \\
 &= \text{₹ } 942.47
 \end{aligned}$$

(ii) Expected Price of Bond

$$\begin{aligned}
 &= \text{₹ } 942.47 \times 1.02 \\
 &= 961.32
 \end{aligned}$$

Question – 32

ABC Ltd. wants to issue 9% Bonds redeemable in 5 years at its face value of ₹ 1,000 each. The annual spot yield curve for similar risk class of Bond is as follows:

Year	Interest Rate
1	12%
2	11.62%
3	11.33%
4	11.06%
5	10.80%

- (i) Evaluate the expected market price of the Bond if it has a Beta value of 1.10 due to its popularity because of lesser risk.
- (ii) Interpret the nature of the above yield curve and reasons for the same.

Note: Use PV Factors upto 4 decimal points and value in ₹ upto 2 decimal points.

(MTP April – 2021)

Solution:

(i) Market price

$$= \frac{₹ 90}{(1.12)^1} + \frac{₹ 90}{(1.1162)^2} + \frac{₹ 90}{(1.1133)^3} + \frac{₹ 90}{(1.1106)^4} + \frac{₹ 1,090}{(1.1080)^5}$$

$$= ₹ 929.70$$

Expected Price = ₹ 929.70 × 1.10

$$= ₹ 1,022.67$$

(ii) Inverted yield curve due to upcoming recession.

Question – 33

The following is the Yield structure of AAA rated debenture:

Period	Yield (%)
3 Months	8.5%
6 Months	9.25
1 Year	10.50
2 Years	11.25
3 Years and above	12.00

- (i) Based on the expectation theory calculate the implicit one-year forward rates in year 2 and year 3.
- (ii) If the interest rate increases by 50 basis points, what will be the percentage change in the price of the bond having a maturity of 5 years? Assume that the bond is fairly priced at the moment at ₹ 1,000.

Solution:

(i) Forward Rate

1 year FR in year 2

$$= \frac{(1.1125)^2}{1.1050} = 12\%$$

1 year FR in year 3

$$= \left[\frac{(1.12)^3}{(1.1125)^2} - 1 \right] \times 100 = 13.52\%$$

(ii) R.V. = 1,000 (1.12)⁵ = 1,762.34

$$\begin{aligned} \text{If yield } (12 + 0.5) &= 12.5\% \\ &= \frac{1762.34}{(1.125)^5} = ₹ 977.97 \end{aligned}$$

% Decrease in Bond Price

$$= \frac{1,000 - 977.97}{1,000} \times 100 = 2.20\%$$

Question – 34

Following are the yields on Zero Coupon Bonds (ZCB) having a face value of ₹ 1,000 :

Maturity (Years)	Yield to Maturity (YTM)
1	10%
2	11%
3	12%

Assume that the term structure of interest rate will remain the same.

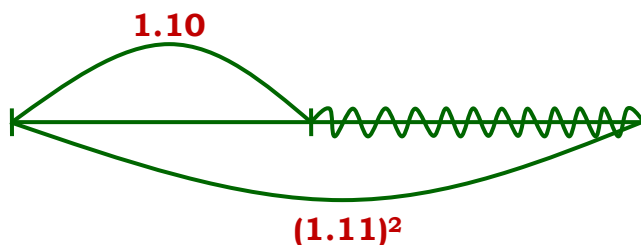
You are required to

- (i) Calculate the implied one year forward rates
- (ii) Expected Yield to Maturity and prices of one year and two year Zero Coupon bonds at the end of the first year.

(Exam January – 2021)

Solution:

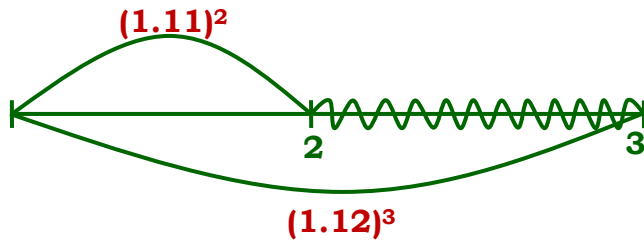
- (i) **1 year FR after 1 year**



$$= \left[\frac{(1.11)^2}{1.10} - 1 \right] \times 100$$

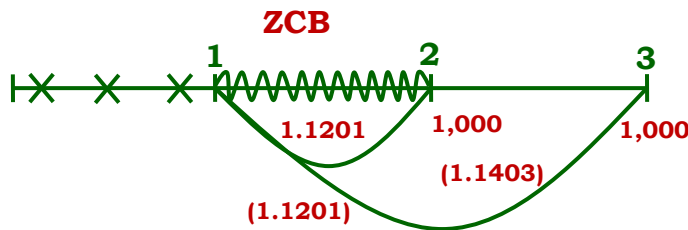
= 12.01%

(ii) 1 year FR after 2 years



$$= \left[\frac{(1.12)^3}{(1.11)^2} - 1 \right] \times 100$$

= 14.03%



1 year ZCB

Price at the end of year 1

$$= \frac{\text{₹ } 1,000}{1.1201}$$

= ₹ 892.78

Expected yield = 12.01%

1 year ZCB

$$\text{Price} = \frac{\text{₹ } 1,000}{(1.1403)(1.1201)}$$

= 782.93

= 782.93 (1 + r)²

= 1,000

$$= \left(\frac{\text{₹ } 1,000}{782.93} \right)^{1/2}$$

$$= 13.02\%$$

DIVIDEND GROWTH MODEL OR, DIVIDEND DISCOUNT MODEL OR, GORDON'S MODEL

Question – 35

A company has a book value per share of ₹ 137.80. Its return on equity is 15% and it follows a policy of retaining 60% of its earnings. If the Opportunity Cost of Capital is 18%, compute is the price of the share today using both Dividend Growth Model and Walter's Model.

(SM TYK – 01)

Solution:

$$\begin{aligned} \text{BVPS} &= 137.80 \\ \text{EPS} &= 137.80 \times 15\% \\ &= 20.67 \text{ [Expected EPS]} \\ D_1 &= 20.67 \times 40\% \\ &= \text{₹ } 8.268 \\ g &= b \times r \\ &= 0.60 \times 0.15 = 0.09 \end{aligned}$$

Gordon's Model

$$\begin{aligned} P_0 &= \frac{D_1}{K_e - g} \\ &= \frac{8.268}{0.18 - 0.09} \\ &= \text{₹ } 91.87 \end{aligned}$$

Walter's Model

$$P/E = \frac{\text{MPS}}{\text{EPS}}$$

No Growth Model

$$K_e = \frac{\text{EPS}}{\text{MPS}}$$

$$K_e = \frac{\text{EPS}}{\text{EPS} \times \text{P/E}}$$

$$K_e = \frac{1}{\text{P/E Ratio}}$$

$$P_0 = \frac{8.268 + (20.67 - 8.268) \frac{0.15}{0.18}}{0.18}$$

$$= ₹ 103.35$$

Question – 36

ABC Ltd. has been maintaining a growth rate of 10 percent in dividends. The company has paid dividend @ ₹3 per share. The rate of return on market portfolio is 12 percent and the risk free rate of return in the market has been observed as 8 percent. The Beta co-efficient of company's share is 1.5.

You are required to calculate the expected rate of return on company's shares as per CAPM model and equilibrium price per share by dividend growth model.

(SM TYK – 08)

Solution:

CAPM Equation

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

$$= 8 + (12 - 8) 1.5$$

$$= 14\%$$

EQUILIBRIUM PRICE

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

$$= \frac{3 (1.10)}{0.14 - 0.10}$$

$$= ₹ 82.50$$

Question – 37

A Company pays a dividend of ₹ 2.00 per share with a growth rate of 7%. The risk-free rate is 9% and the market rate of return is 13%. The Company has a beta factor of 1.50. However, due to a decision of the Finance Manager, beta is likely to increase to 1.75. Find out the present as well as the likely value of the share after the decision.

(SM TYK – 09)

Solution:**Present Value**

$$\begin{aligned}K_e &= R_f + (R_m - R_f) \beta \\ &= 9 + (13 - 9) 1.5 \\ &= 15\%\end{aligned}$$

$$\begin{aligned}P_0 &= \frac{D_1}{K_e - g} \\ &= \frac{2 (1.07)}{0.15 - 0.07} \\ &= ₹ 26.75\end{aligned}$$

Likely Value of Shares

$$\begin{aligned}K_e &= R_f + (R_m - R_f) \beta \\ &= 9 + (13 - 9) 1.75 \\ &= 16\%\end{aligned}$$

$$\begin{aligned}P_0 &= \frac{D_1}{K_e - g} \\ &= \frac{2 (1.07)}{0.16 - 0.07} \\ &= ₹ 23.78\end{aligned}$$

Question – 38

Shares of Voyage Ltd. are being quoted at a price-earning ratio of 8 times. The company retains 45% of its earnings which are ₹ 5 per share.

You are required to compute

- (1) The cost of equity to the company if the market expects a growth rate of 15% p.a.
- (2) If the anticipated growth rate is 16% per annum, calculate the indicative market price with the same cost of capital.
- (3) If the company's cost of capital is 20% p.a. & the anticipated growth rate is 19% p.a., calculate the market price per share.

(SM TYK – 11)

Solution:**(1) Cost of Equity**

$$\begin{aligned}\text{Retention Ratio (b)} &= 45\% \\ \text{EPS} &= \frac{5}{45\%} = ₹ 11.11 \\ \text{D}_1 &= ₹ 11.11 - ₹ 5 = ₹ 6.11 \\ \text{P}_0 \text{ (MPS)} &= \text{EPS} \times \text{P/E} \\ &= 11.11 \times 8 = 88.88 \\ \text{K}_e &= \frac{\text{D}_1}{\text{P}_0} + g \\ &= \frac{6.11}{88.88} + 0.15 \\ &= 21.87\%\end{aligned}$$

(2) Market Price

$$\text{P}_0 = \frac{\text{D}_1}{\text{K}_e - g} + g$$

$$= \frac{6.11}{0.2187 - 0.16} = ₹ 104.09$$

(3) Market Price

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

$$= \frac{6.11}{0.20 - 0.19} = ₹ 611$$

Question – 39

M/s X Ltd. has paid a dividend of ₹ 2.5 per share on a face value of ₹ 10 in the financial year ending on 31st March, 2009. The details are as follows:

Current market price of share	₹ 60
Growth rate of earnings and dividends	10%
Beta of share	0.75
Average market return	15%
Risk free rate of return	9%

Calculate the intrinsic value of the share.

(SM TYK – 13)

Solution:

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

$$= 9 + (15 - 9) 0.75$$

$$= 13.5\%$$

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

$$= \frac{2.5 (1.10)}{0.135 - 0.10}$$

$$= ₹ 78.57$$

Question – 40

A company has an EPS of ₹ 2.5 for the last year and the DPS of ₹ 1. The earnings is expected to grow at 2% a year in long run. Currently it is trading at 7 times its earnings. If the required rate of return is 14%, compute the following:

- (i) An estimate of the P/E ratio using Gordon growth model.
- (ii) The Long-term growth rate implied by the current P/E ratio.

(MTP March – 2021)

Solution:

(i) Implicit P/E Ratio

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

$$= \frac{1 (1.02)}{0.14 - 0.02} = ₹ 8.50$$

$$P/E = \frac{MPS}{EPS} = \frac{8.50}{2.50} = 3.4 \text{ times}$$

(ii) Implicit Growth Rate

$$MPS (P_0) = EPS \times P/E$$

$$= 2.50 \times 7 = 17.50$$

$$17.50 = \frac{1 (1 + g)}{0.14 - g} = ₹ 8.50$$

$$2.45 - 17.50 g = 1 + 1g$$

$$g = 7.84\%$$

Question – 41

Following are the details of X Ltd. and Y Ltd.:

Particulars	X Ltd.	Y Ltd.
Dividend per Share	₹ 4	₹ 4
Growth Rate	10%	10%
Beta	0.9	1.2