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SECURITY VALUATION

PART A

EQUITY VALUATION

Question 1.

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 6 Marks May '20)

Answer:

- (i) Estimation of P/E Ratio using Gordon Growth Model

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

$$0.14 = \frac{1(1.02)}{P} + 0.02$$

$$P = ₹ 8.50$$

$$PE \text{ Ratio} = \frac{₹ 8.50}{₹ 2.50} = 3.40$$

- (ii) Long Term Growth Rate implied

Based on Current PE Ratio, the price per share = ₹ 2.50 × 7 Times = ₹17.50

We know that

$$P = \frac{D_0(1 + g)}{(K_e - g)}$$

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

$$g = 0.0784 \text{ i.e. } 7.84\%$$

Question 2.

Eager Ltd. has a market capitalization of ₹ 1,500 crores and the current market price of its share is ₹ 1,500. It made a PAT of ₹200 crores and the Board is considering a proposal to buy back 20% of the shares at a premium of 10% to the current market price. It plans to fund this through a 16% bank loan. The company's corporate tax rate is 30%. Calculate the post buy back Earnings Per Share (EPS).

(MTP 4 Marks Mar'21)

Answer:

Existing No. of Equity Shares	=	$\frac{\text{₹ 1500 Crore}}{\text{₹ 1,500}}$	= 1 Crore
No. of shares to be brought back	=	1 Crore x 0.20	= 20 Lakh
Price at which share to be bought back	=	₹ 1,500 + 10% of ₹ 1,500	= ₹ 1,650
Amount required for Buyback Shares	=	₹ 1,650 x 20 Lakh	= ₹ 330 Crore
Amount of loan @ 16%	=	₹330 Crore	
Statement showing Post Buyback EPS			

Profit before tax $\left(\frac{\text{₹200 Crore}}{0.70} \right)$	₹285.7143 crore
Less: Interest on loan (₹330 Crore x 16%)	₹ 52.8000 crore
Profit before Tax	₹232.9143 crore
Tax	₹69.8743 crore
Profit after Tax (PAT)	₹163.0400 crore
No. of Shares Post buyback	₹80 Lakh
EPS (Post Buyback) $\left(\frac{\text{₹163.0400 Crore}}{80.00 \text{ Lakh}} \right)$	₹203.80

Question 3.

Snake Ltd. is taking over Lizard Ltd, both are listed companies. The PE Ratio of Lizard Ltd. has been low as 4 and high as 7 and is currently 5. Lizard Ltd.'s previous year EPS was ₹ 3.40 and current expected EPS this year to be ₹ 4.00. Determine the different range of values of shares using P/E Model.

(MTP 6 Marks Nov 21)

Answer:

The range of values using P/E Ratio and EPS either historic or projected are as follows:

EPS	Value (₹)	P/E Ratio	Value	Value of Shares
Historic	3.40	Lowest	4	13.60
Historic	3.40	Current	5	17.00
Historic	3.40	Highest	7	23.80
Expected	4.00	Lowest	4	16.00
Expected	4.00	Current	5	20.00
Expected	4.00	Highest	7	28.00

Question 4.

Aggressive Ltd. is proposing to fund its expansion plan of ₹12 crore by making a rights issue. The current market price (CMP) is ₹40. The Board is willing to offer a discount of 20% on the CMP for the rights issue. The Board is also desirous that the fall in Ex-right price of the shares be restricted to 10% of CMP.

CALCULATE:

The number of new equity shares to be offered for each rights held,

Theoretical value of right and

The total number of equity shares to be issued.

(MTP 4 Marks Oct '22)

Answer:

(1) Number of new equity shares to be offered for each rights head

Subscription Price = ₹ 40 × 0.80 = ₹32 per share

Ex Right Price to be restricted to = ₹40 × 0.90 = ₹36

Let R be the ratio in which right share to be issued then

$$₹ 36 = \frac{₹40 + ₹32 \times R}{1 + R}$$

$$36 + 36R = ₹ 40 + 32 R$$

$$R = 1$$

Thus, 1 equity share be offered for each share held.

(2) Theoretical Value of right = ₹ 36 – ₹ 32 = ₹ 4

(3) No. of equity share to be issued = $\frac{₹12 \text{ crore}}{₹ 32}$ 37,50,000 or 0.375 crore shares

Question 5

Mr. A is holding 1000 shares of face value of 100 each of M/s. ABC Ltd. He wants to hold these shares for long term and have no intention to sell.

On 1st January 2020, M/s XYZ Ltd. has made short sales of M/s. ABC Ltd.'s shares and approached Mr. A to lend his shares under Stock Lending Scheme with following terms:

- (i) Shares to be borrowed for 3 months from 01-01-2020 to 31-03-2020,
- (ii) Lending Charges/Fees of 1% to be paid every month on the closing price of the stock quoted in Stock Exchange and
- (iii) Bank Guarantee will be provided as collateral for the value as on 01-01-2020.

Other Information:

- (i) Cost of Bank Guarantee is 8% per annum,
- (ii) On 29-02-2020 M/s ABC Ltd.'s share quoted in Stock Exchange on various dates are as follows:

Date	Share Price in Scenario-1 Bullish	Share Price in Scenario -2 Bullish
01-01-2020	1000	1000
31-01-2020	1020	980
29-02-2020	1040	960
31-03-2020	1050	940

You are required to find out:

- (i) Earning of Mr. A through Stock Lending Scheme in both the scenarios,
- (ii) Total Earnings of Mr. A during 01-01-2020 to 31-03-2020 in both the scenarios,
- (iii) What is the Profit or loss to M/s. XYZ by shorting the shares using through Stock Lending Scheme in both the scenarios?

(RTP May 22)

Answer:

Earnings of Mr. A through stock lending scheme

		Scenario 1	Scenario 2
(i)	Lending fee		
	31-01-20 1020 × 1% and 980 × 1%	10.20	9.80
	29-02-20 1040 × 1% and 960 × 1%	10.40	9.60
	31-03-20 1050 × 1% and 940 × 1%	10.50	9.40
	Earnings from lending per share (A)	31.10	28.80
	Total No. of Shares	1000	1000
	Total Earning from Lending	31,100	28,800

(ii)	Dividend income per Share (B)	25.00	25.00
	Total earnings per share (A) + (B)	56.10	53.80
	Total No. of Shares	1000	1000
	Total Earnings	56,100	53,800
(iii)	Gain on shortening the shares (1,050 - 1,000) and (1,000-940)	(50.00)	60.00
	Lending fees paid	(31.10)	(28.80)
	Bank guarantee charges @ 8%	(20.00)	(20.00)
	Gain Per Share	(101.10)	11.20
	Total No. of Shares	1000	1000
	Total Gain on shortening the shares	(1,01,100)	11,200

Question 6

The shares of G Ltd. are currently being traded at ₹ 46. The company published its results for the year ended 31st March 2019 and declared a dividend of ₹5. The company made a return of 15% on its capital and expects that to be the norm in which it operates. G Ltd. Also expects the dividends to grow at 10% for the first three years and thereafter at 5%.

(8 Marks)

You are required to advise whether the share of the company is being traded at a premium or discount.

PVIF @ 15% for the next 3 years is 0.870, 0.756 and 0.658 respectively.

(PYP 8 Marks May '19)

Answer:

Expected dividend for next three years

Year 1 (D1) = 5(1.1) = 5.5

Year 2 (D2) = 5.5 (1.1) = 6.05

Year 3 (D3) = 6.05(1.1) = 6.655

Required Rate (K_e) = 15% Present Value of Dividends

= 5.5(0.870) + 6.05(0.756) + 6.655(0.658)

= 4.785 + 4.578 + 4.379

= 13.74

Now, PV at growth rate of 5%

$$P_3 = \frac{D_4}{K_e - g}$$

$$= \frac{6.655(1.05)}{0.15 - 0.05} = \frac{6.988}{0.1} = 69.88$$

Therefore, $P_0 = 69.88 \times 0.658 = 45.98$

Now, adding the PV of dividend at two different growth rates,
we get, $13.74 + 45.98 = 59.72$

Hence, it is clear that shares are being traded at discount i.e. undervalued because intrinsic value of share is more than the market price.

EXAMINERS COMMENTS ON THE PERFORMANCE OF EXAMINEES:

In this question, overall performance of the examinees was good as it was a simple problem and most of the examinees were able to solve this correctly. However, few examinees wrongly calculated Terminal Value at per Growth Model.

Question 7

An investor is considering to purchase the equity shares of LX Ltd., whose current market price (CMP) is ₹ 112. The company is proposing a dividend of ₹ 4 for the next year. LX Ltd. is expected to grow @ 20 per cent per annum for the next four years. The growth will decline linearly to 16 per cent per annum after first four years. Thereafter, it will stabilise at 16 per cent per annum infinitely. The Investor requires a return of 20 per cent per annum.

You are required

- To calculate the intrinsic value of the share of LX Ltd.
- Whether it is worth to purchase the share at this price.

Period	1	2	3	4	5	6	7
PVIF (20%, n)	0.833	0.694	0.579	0.482	0.402	0.335	0.279

(PYP 8 Marks Nov'20)

Answer:

$$D_1 = ₹ 4$$

$$D_2 = ₹ 4 (1.20) = ₹ 4.80$$

$$D_3 = ₹ 4 (1.20)^2 = ₹ 5.76$$

$$D_4 = ₹ 4 (1.20)^3 = ₹ 6.91$$

$$D_5 = ₹ 6.91 (1.19) = ₹ 8.22$$

$$D_6 = ₹ 6.91 (1.19) (1.18) = ₹ 9.70$$

$$D_7 = ₹ 6.91 (1.19) (1.18) (1.17) = ₹ 11.35$$

$$D_8 = ₹ 6.91 (1.19) (1.18) (1.17) (1.16) = ₹ 13.17$$

$$P = \frac{D_1}{(1+K_e)} + \frac{D_2}{(1+K_e)^2} + \frac{D_3}{(1+K_e)^3} + \frac{D_4}{(1+K_e)^4} + \frac{D_5}{(1+K_e)^5} + \frac{D_6}{(1+K_e)^6} + \frac{D_7}{(1+K_e)^7} + \frac{TV}{(1+K_e)^7}$$

$$TV = \frac{D_8}{K_e - g} = \frac{13.17}{0.20 - 0.16} = ₹ 329.25$$

$$P = \frac{4.00}{(1+0.20)} + \frac{4.80}{(1+0.20)^2} + \frac{5.76}{(1+0.20)^3} + \frac{6.91}{(1+0.20)^4} + \frac{8.22}{(1+0.20)^5} + \frac{9.70}{(1+0.20)^6} + \frac{11.35}{(1+0.20)^7} + \frac{329.25}{(1+0.20)^7}$$

$$= 4.00 \times 0.833 + 4.80 \times 0.694 + 5.76 \times 0.579 + 6.91 \times 0.482 + 8.22 \times 0.402 + 9.70 \times 0.335 + 11.35 \times 0.279 + 329.25 \times 0.279$$

(i) Intrinsic Value = ₹ 114.91

(ii) As Intrinsic Value of the share is higher than its selling price of ₹ 112, it is underpriced and can be acquired. However, other factors need to be taken into consideration since difference is only slightly higher.

Question 8

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
Current Market Price per Share	₹ 150	₹ 70

Other Information:

Risk Free Rate of Return	7%
Market Rate of Return	14%

(i) Calculate the price of shares of both the companies.

(ii) Write the comment on the valuation on the basis of price calculated and current market price.

(iii) As an investor what course of action should be followed?

(PYP 8 Marks, Dec '21)

Answer:

(a) (i) Calculation of Prices of shares of both companies.

	X Ltd.	Y Ltd.
Beta	0.9	1.20
Cost of Equity using CAPM	7% + 0.9 [14% - 7%] = 13.30%	7% + 1.20 [14% - 7%] = 15.40%
Growth Rate	10%	10%
Price of share	$\frac{4 \times 1.10}{0.133 - 0.10} = \frac{4.40}{0.033}$ = ₹ 133.33	$\frac{4 \times 1.10}{0.154 - 0.10} = \frac{4.40}{0.054}$ = ₹ 81.48

(ii) and (iii)

Name of Company	Current Market Price	Value of the Share	Valuation	Action of the Investor
X Ltd.	₹ 150.00	₹ 133.33	Overvalued/ Overpriced	Not to Invest / to be sold
Y Ltd.	₹ 70.00	₹ 81.48	Undervalued/ Under-priced	Invest / to be purchased

Alternatively, if the given figure of Dividend is considered as dividend expected (D1) then solution will be as follows :

	X Ltd.	Y Ltd.
Beta	0.9	1.20
Cost of Equity using CAPM	7% + 0.9 [14% - 7%] = 13.30%	7% + 1.20 [14% - 7%] = 15.40%
Growth Rate	10%	10%
Price of share	$\frac{4.00}{0.133 - 0.10} = \frac{4.00}{0.033}$ = ₹ 121.21	$\frac{4.00}{0.154 - 0.10} = \frac{4.00}{0.054}$ = ₹ 74.07

(ii) and (iii)

Name of Company	Current Market Price	Value of the Share	Valuation	Action of the Investor
X Ltd.	₹ 150.00	₹ 121.21	Overvalued/ Overpriced	Not to Invest / to be sold
Y Ltd.	₹ 70.00	₹ 74.07	Undervalued/ Under-priced	Invest / to be purchased

EXAMINERS' COMMENTS ON THE PERFORMANCE OF EXAMINERS :

Goods performance has been noticed in this question on security valuation.

Question 9

AB Industries has Equity Capital of ₹ 12 Lakhs, total Debt of ₹ 8 takhs, and annual sales of ₹ 30 Lakhs.

Two mutually exclusive proposals are under consideration for the next year. The details of the proposals as under:

Particulars	Proposal no. 1	Proposal no. 2
Target Assets to Sales Ratio	0.65	0.62
Target Net Profit Margin (%)	4	5
Target Debt Equity Ratio (DER)	2:3	4:1
Target Retention Ratio (of Earnings) (%)	75	-
Annual Dividend (₹ In Lakhs)	-	0.30
New Equity Ralsed (₹ in Lakhs)	-	1

You are required to calculate sustainable growth rate for both the proposals.

(PYP 8 Marks Nov '20)

Answer:
Sustainable Growth Rate under Proposal 1

Sales (Given)		₹ 30 Lakhs
Total Assets	₹ 30 Lakhs × 0.65	₹ 19.50 Lakhs
Net Profits	₹ 30 Lakhs × 4%	₹ 1.20 Lakhs
Equity Multiplier	Equity = 12 Lakhs Equity + Debt 12 Lakhs + 8 Lakhs	0.6
ROE	$\frac{1.20 \text{ Lakhs}}{19.50 \text{ Lakhs}} \times 0.60 \times 100$ Sustainable Growth Rate = ROE × Retention Ratio = 3.69% × 0.75 = 2.77%	3.69%

Sustainable Growth Rate under Proposal 2

New equity = ₹ 12 Lakhs + ₹ 1 Lakh = ₹ 13 Lakhs New Debt = ₹ 13

Lakhs × 4 = ₹ 52 Lakhs

Total Assets = ₹ 13 Lakhs + ₹ 52 Lakhs = ₹ 65 Lakhs

Total Assets to Sales Ratio (Given) 0.62

Sales ₹ 65 Lakhs / 0.62 ₹ 104.84 Lakhs

Net Profit ₹ 104.84 Lakhs × 5% ₹ 5.242 Lakhs

$$\begin{aligned}\text{Equity Multiplier} &= \frac{\text{Equity}}{\text{Equity} + \text{Debt}} = \frac{13 \text{ Lakhs}}{13 \text{ Lakhs} + 52 \text{ Lakhs}} = 0.2 \\ \text{ROE} &= \frac{5.242 \text{ Lakhs}}{65 \text{ Lakhs}} \times 0.20 \times 100 = 1.613\% \\ \text{Retention Ratio} &= \frac{5.242 \text{ Lakhs} - 0.30 \text{ Lakhs}}{5.242 \text{ Lakhs}} = 0.943 \\ \text{Sustainable Growth Rate} &= \text{ROE} \times \text{Retention Ratio} \\ &= 1.613\% \times 0.943 = 1.52\%\end{aligned}$$

Question 10

High Growth Ltd. (HGL) was having an excellent growth over a number of years. The Board of Directors is considering a proposal to reward its shareholders by buying back 20% shares at a premium. The premium is to be paid by raising a loan from the Bank. The interest on loan is to be serviced by internal accruals as supported by the financials of HGL. The company has a market capitalization of ₹15,000 crore and the current Earnings Per Share (EPS) is ₹600 with a Price Earnings Ratio (PER) of 25. The Board expects a post buy back Market Price per Share (MPS) of ₹10,000. The PER, post buy back, will remain the same. The loan can be availed at an interest rate of 16% p.a.

Applicable corporate tax rate is 30%. You are required to calculate:

- The interest amount which can be paid for availing the bank loan.
- The loan amount to be raised.
- Buy back premium per share.

(PYP 10 Marks May (23))

Answer:

- The interest amount which can be paid for availing the bank loan

$$\text{Current Market Price per share} = ₹ 600 \times 25 = ₹ 15,000$$

$$\begin{aligned}\text{No. of Shares before Buyback} &= \frac{\text{Market Capitalisation}}{\text{Market Price of Share}} \\ &= \frac{15,000 \text{ Crore}}{15,000} = 1 \text{ Crore}\end{aligned}$$

$$\text{No. of Shares proposed to buyback} = 20\% \text{ of } 1 \text{ Crore} = 20 \text{ Lakh}$$

$$\text{Total No. of Share after Buyback} = 1 \text{ Crore} - 20 \text{ Lakh} = 80 \text{ Lakh}$$

$$\text{Post Buy back Market Price per share} = ₹ 10,000$$

$$\text{PE Ratio} = 25$$

$$\text{Post Buyback EPS} = \frac{10000}{25} \\ = ₹ 400$$

$$\text{EAT before Buyback} = ₹ 600 \times 1 \text{ Crore} \\ = ₹ 600 \text{ Crore}$$

$$\text{EBT before Buyback} = \frac{600}{(1-0.30)} \\ = 857.1429 \text{ Crore}$$

$$\text{EAT after Buyback} = ₹ 400.0 \times 80 \text{ Lakh} \\ = ₹ 320 \text{ Crore}$$

$$\text{EBT after Buyback} = \frac{320}{(1-0.30)} \\ = 457.1429 \text{ Crore}$$

Interest which can be paid for availing bank loan:

EBT before Buyback	₹ 857.1429 Crore
(-) EBT after Buyback	₹ 457.1429 Crore
	₹ 400.0000 Crore

Alternatively, it can also be computed as follows :

Pre-Buy back Market Capitalization (A)	₹ 15000 Crore
Pre-Buy back EPS (B)	₹ 600
Pre-Buy back PER (C)	25
Pre-Buy back Market Price per share (₹ 600 × 5) D = B × C	₹ 15000
Pre-Buy back No. of Shares (A) / (D)	1 Crore
Post Buy back EPS (A) (₹ 10000 / 25)	₹ 400
Post Buy back No. of Shares (B)	80 Lakh
Post Buy back Earning (C) = (A) X (B)	₹ 320 Crore
Post Buy back Earning 1 Crore X ₹ 600 (D)	₹ 600 Crore
Post Tax Earning available for interest payment (D) – (C)	₹ 280 Crore
Pre Tax Amount of Interest $\frac{280 \text{ crore}}{1-0.30}$	₹ 400 Crore

(ii) Loan Amount raised = $\frac{400 \text{ crore}}{0.16} = 25000 \text{ crore}$

(iii) Buyback premium per share

Amount of loan for buyback of 20% Shares = ₹ 2500 crore

No. of Shares Buyback = 20 Lakh

Buyback price per Share = ₹ 2500 Crore / 20 Lakh = ₹ 12500

Market price after Buyback = ₹ 10000

Buyback Premium per share = ₹ 12500 – ₹ 10000 = ₹ 2500

Alternatively, it can also be computed as follows:

Amount of loan (A)	₹ 2500 Crore
No. of Shares to be bought back (B)	20 Lakh
Price Per Share to be paid (C) = (A) / (B)	₹ 12,500
Post Buy back Share Price (D)	₹ 10,000
Buy Back Premium per share (C) – (D)	₹ 2500

Question 11

An investor is considering purchasing equity shares of Alpha Ltd., whose current Market price is ₹172.45. The company is proposing a dividend of ₹6 for the year ending 31st March, 2024. Alpha Ltd. is expected to grow @ 20 percent per annum for the next four years. Thereafter, the growth, over the next three years, will decline linearly by 100 basis points per annum. Thereafter, it will stabilize at a certain growth rate per annum infinitely. The required rate of return for the investor is 20%.

Dividend value is to be taken in 2 decimal points only.

You are required:

(i) To calculate the stable growth rate of Alpha Ltd. after the end of 7 years.

To advise whether it is worth to purchase the share at this price if the investor has a stable target growth rate of 15% per annum.

(PYP 8 Marks May '23)

Period	1	2	3	4	5	6	7
PVIF (20%, t)	0.8333	0.6944	0.5787	0.4823	0.4019	0.3349	0.2791

Answer:

Working Notes :

$$D_1 = ₹ 6$$

$$D_2 = 6 (1.20) = ₹ 7.20$$

$$D_3 = 6 (1.20)^2 = ₹ 8.64$$

$$D_4 = 6 (1.20)^3 = ₹ 10.37$$

$$D_5 = 10.37 (1.19) = ₹ 12.34$$

$$D_6 = 10.37 (1.19) (1.18) = ₹ 14.56$$

$$D_7 = 10.37 (1.19) (1.18) (1.17) = ₹ 17.04$$

Price at the end of 7th year

Year	Dividend (₹)	PVF@20%	PV (₹)
1	6.00	0.8333	5.00
2	7.20	0.6944	5.00
3	8.64	0.5787	5.00
4	10.37	0.4823	5.00
5	12.34	0.4019	4.96
6	14.56	0.3349	4.88
7	17.04	0.2791	4.76
Total			34.60

Current Market Price	₹ 172.45
Less : PV of Dividends upto the year ending 7th year	₹ 34.60
PV of Expected Market Price at the end of the 7th year	₹ 137.85

$$\text{Let } g \text{ be growth rate then : } 137.85 = \frac{17.04 (1+g)}{0.20.g} \times 0.2791$$

$$g = 0.16 \text{ i.e. } 16\%$$

Thus, the stable growth rate after the end of the 7 years shall be 16%.

Since growth rate is more than target growth rate it is worth to purchase the share.

Question 12

Mr. Amit is happy with the investment in a company as it is paying good dividend for the last few years. Last year it paid a dividend of ₹ 2 per share. The share is currently trading at ₹ 150 per share. He is of view that if he applies dividend discount model, the share is undervalued. As a financial expert examine his view that dividend discount model represents the fair value.

You being an expert is required to evaluate the market value of the share of the company.

Profit after tax of the company	₹ 290 crores
Equity capital of company	₹ 1,300 crores
Par value of share	₹ 40 each
Debt ratio of company (Debt/ Debt + Equity)	27%
Long run growth rate of the company	8%
Beta 0.1; risk free interest rate	8.7%
Market returns	10.3%
Capital expenditure per share	₹ 47
Depreciation per share	₹ 39
Change in Working capital	₹ 3.45 per share

Note: Round off figures (e.g. EPS etc.) up to 2 decimal points.

(RTP May'24) (SM)

Answer :

$$\text{No. of Shares} = \frac{\text{₹ 1,300 crores}}{\text{₹ 40}} = 32.50 \text{ Crores}$$

$$\text{EPS} = \frac{\text{PAT}}{\text{No. of shares}} = ₹ 8.92$$

Calculation of value per share using free cash flow to equity as basis :

$$\text{FCFE} = \text{Net income} - [(1-b) (\text{capex} - \text{dep}) + (1-b) (\Delta \text{WC})]$$

$$\begin{aligned} \text{FCFE} &= 8.92 - [(1-0.27) (47-39) + (1-0.27) (3.45)] \\ &= 8.92 - [5.84 + 2.52] \\ &= ₹ 0.564 \end{aligned}$$

$$\begin{aligned} \text{Cost of Equity (K}_e\text{)} &= R_f + \beta (R_m - R_f) \\ &= 8.7 + 0.1 (10.3 - 8.7) \\ &= 8.86\% \end{aligned}$$

$$P_0 = \frac{FCFE (1+g)}{K_e - g} = \frac{0.56 (1.08)}{0.0886 - 0.08} = \frac{0.6048}{0.0086} = ₹ 70.33$$

Calculation of value per share using dividend discount model:

$$P_0 = \frac{D_0 (1+g)}{K_e - g} = \frac{2(1.08)}{0.0886 - 0.08} = \frac{2.16}{0.0086} = ₹ 251.16$$

From the above we can see that value per share on the basis of dividend discount model is more than the value per share on the basis of free cash flow to equity model.

In the dividend discount model, the analyst considers the stream of expected dividends to value the company's stock. It is assumed that the company follows a consistent dividend payout ratio which can be less than the actual cash available with the firm.

A stock's intrinsic value based on the dividend discount model may not represent the fair value for the shareholders because dividends are distributed in the form of cash from profits. In case the company is maintaining healthy cash in its balance sheet then it means that dividend pay-out is low which could result in undervaluation of the stock.

In the case of free cash flow to equity model a stock is valued on the cash flow available for distribution after all the reinvestment needs of capex and incremental working capital are met. Thus, using the free cash flow to equity model provides a better measure for valuations in comparison to the dividend discount model. Thus, the view of Mr. Amit that dividend discount model represents the fair value is incorrect. The share is not under-valued rather it is overvalued if we take "free cash flow to equity model" into consideration.

Question 13

Pragya Limited has issued 75,000 equity shares of ₹ 10 each. The current market price per share is ₹ 24. The company has a plan to make a rights issue of one new equity share at a price of ₹ 16 for every four share held.

You are required to:

- Calculate the theoretical post-rights price per share;
- Calculate the theoretical value of the right alone;
- Show the effect of the rights issue on the wealth of a shareholder, who has 1,000 shares assuming he sells the entire rights; and
- Show the effect, if the same shareholder does not take any action and ignores the issue.

Answer :

- Calculation of theoretical Post-rights (ex-right) price per share:

$$\text{Ex-right value} = \frac{MN + SR}{N + R}$$

Where,

M = Market price,

N = Number of old shares for a right share

S = Subscription price

R = Right share offer

$$= \left[\frac{(\text{₹}24 \times 4) + (\text{₹}16 \times 1)}{4 + 1} \right] = \text{₹}22.40$$

(ii) Calculation of theoretical value of the rights alone:

= Ex-right price – Cost of rights share

= ₹ 22.40 – ₹16 = ₹ 6.40

Or = $\frac{\text{₹}22.40 + \text{₹}16}{4} = \text{₹}1.60$

(iii) Calculation of effect of the rights issue on the wealth of a shareholder who has 1,000 shares assuming he sells the entire rights:

	₹
(a) Value of shares before right issue (1,000 shares × ₹ 24)	24,000
(b) Value of shares after right issue (1,000 shares × ₹ 22.40)	22,400
Add: Sale proceeds of rights renunciation (250 shares × ₹ 6.40)	1,600
	24,000

There is no change in the wealth of the shareholder even if he sells his right.

(iv) Calculation of effect if the shareholder does not take any action & ignores the issue:

	₹
Value of shares before right issue (1,000 shares × ₹ 24)	24,000
Less: Value of shares after right issue (1,000 shares × ₹ 22.40)	22,400
Loss of wealth to shareholders, if rights ignored	1,600

Question 14

On the basis of the following information:

Current dividend (Do)	₹ 2.50
Discount rate (k)	10.5%
Growth rate (g)	2%

- (i) Calculate the present value of stock of ABC Ltd.
(ii) Is its stock overvalued if stock price is ₹ 35, ROE = 9% and EPS = ₹ 2.25? Show detailed calculation. Using PE Multiple Approach and Earning Growth Model.

Answer :

(i) $V(E) = \frac{2.50(1.02)}{0.105-0.02} = ₹ 30/-$

- (ii) (A) Value of stock under the PE Multiple Approach

Particulars	
Actual Stock Price	₹ 35.00
Return on equity	9%
EPS	₹ 2.25
PE Multiple (1/Return on Equity) = 1/9%	11.11
Market Price per Share	₹ 25.00

Since, Actual Stock Price is higher, hence it is overvalued.

- (B) Value of the Stock under the Earnings Growth Model

Particulars	
Actual Stock Price	₹ 35.00
Return on equity	9%
EPS [E ₀]	₹ 2.25
Growth Rate	2%
Market Price per Share $\frac{E_1}{K_e - g}$ $= ₹ = \frac{2.25 + 2\%}{9\% - 2\%}$	₹ 32.79

Since, Actual Stock Price is higher, hence it is overvalued.

Question 15

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.

Answer :

The company earnings and dividend per share after a year are expected to be:

$$\text{EPS} = ₹ 137.8 \times 0.15 = ₹ 20.67$$

$$\text{Dividend} = 0.40 \times 20.67 = ₹ 8.27$$

The growth in dividend would be:

$$g = 0.6 \times 0.15 = 0.09$$

Perpetuale growth model Formula:

$$P_0 = \frac{\text{Dividend}}{K_e - g}$$

$$P_0 = \frac{8.27}{0.18 - 0.09}$$

$$P_0 = ₹ 91.89$$

Alternative Solution:

However, in case a student follows Walter's approach as against continuous growth model given in previous solution the answer of the question works out to be different. This can be shown as follow:

Given data:

Book value per share = ₹ 137.80

Return on equity = 15%

Dividend Payout = 40%

Cost of capital = 18%

$$\therefore \text{EPS} = ₹ 137.80 \times 15\%$$

$$= ₹ 20.67$$

$$\therefore \text{Dividend} = ₹ 20.67 \times 40\% = ₹ 8.27$$

Walter's approach showing relationship between dividend and share price can be expressed by the following formula

$$VC = \frac{D + \frac{R_a}{R_c}(E-D)}{R_c}$$

Where,

VC = Market Price of the ordinary share of the company.

Ra = Return on internal retention i.e. the rate company earns on retained profits.

RC = Capitalisation rate i.e. the rate expected by investors by way of return from particular category of shares.

E = Earnings per share.

D = Dividend per share.

Hence, $8.27 + \frac{.15}{.18}(20.67 - 8.27)$

VC = $\frac{.18}{.18}$

= $\frac{18.60}{.18}$

= ₹ 103.35

Question 16

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

You are required to compute

- The cost of equity to the company if the market expects a growth rate of 15% p.a.
- If the anticipated growth rate is 16% per annum, calculate the indicative market price with the same cost of capital.
- 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.

Answer :

(i) Cost of Capital

Retained earnings (45%)	₹ 5 per share
Dividend (55%)	₹ 6.11 per share
EPS (100%)	₹ 11.11 per share
P/E Ratio	8 times
Market price	₹ 11.11 × 8 = ₹ 88.88

Cost of equity capital

$$= \left[\frac{\text{Div}}{\text{Price}} \times 100 \right] + \text{Growth \%} = \frac{₹ 6.11}{₹ 88.88} \times 100 + 15\% = 21.87\%$$

$$(ii) \text{ Market Price} = \left[\frac{\text{Dividend}}{\text{Cost of Capital(\%)} - \text{Growth Rate (\%)}} \right]$$

$$= \frac{₹ 6.11}{(21.87 - 16)\%}$$

$$= ₹ 104.08 \text{ per share}$$

$$(iii) \text{ Market Price} = \frac{₹ 6.11}{(20 - 19)\%}$$

$$= ₹ 611.00 \text{ per share}$$

Alternative Solution

As in the question the sentence "The company retains 45% of its earnings which are ₹ 5 per share" amenable to two interpretations i.e. one is ₹ 5 as retained earnings (45%) and another is ₹ 5 is EPS (100%). Alternative solution is as follows:

(1) Cost of capital

EPS (100%) ₹ 5 per share

Retained earnings (45%) ₹ 2.25 per share®

Dividend (55%) ₹ 2.75 per share

P/E Ratio 8 times

Market Price ₹ 5 × 8 = ₹ 40

Cost of equity capital

$$= \left[\frac{\text{Div}}{\text{Price}} \times 100 \right] + \text{Growth \%} = \frac{₹ 2.75}{₹ 40.00} \times 100 + 15\% = 21.87\%$$

$$(2) \text{ Market Price} = \left[\frac{\text{Dividend}}{\text{Cost of Capital(\%)} - \text{Growth Rate (\%)}} \right]$$

$$= \frac{₹ 2.75}{(21.87 - 16)\%} = ₹ 46.85 \text{ per share}$$

$$(3) \text{ Market Price} = \frac{₹ 2.75}{(20 - 19)\%} = ₹ 275.00 \text{ per share}$$

Question 17

Following Financial data are available for PQR Ltd. for the year 2008:

	(₹ in lakh)
8% debentures	125
10% bonds (2007)	50
Equity shares (₹ 10 each)	100
Reserves and Surplus	300
Total Assets	600
Assets Turnovers ratio	1.1
Effective interest rate	8%
Effective tax rate	40%
Operating margin	10%
Dividend payout ratio	16.67%
Current market Price of Share	₹ 14
Required rate of return of investors	15%

You are required to:

- Draw income statement for the year
- Calculate its sustainable growth rate of earnings
- Calculate the fair price of the Company's share using dividend discount model, and
- What is your opinion on investment in the company's share at current price?

Answer :
Workings:

Asset turnover ratio = 1.1

Total Assets = ₹ 600

Turnover ₹ 600 lakhs × 1.1 = ₹ 660 lakhs

Effective interest rate = $\frac{\text{Interest}}{\text{Liabilities}}$ = 8%

Liabilities = ₹ 125 lakhs + 50 lakhs = 175 lakh

Interest = ₹ 175 lakhs × 0.08 = ₹ 14 lakh

Operating Margin = 10%

Hence operating cost = (1 - 0.10) ₹ 660 lakhs = ₹ 594 lakh

Dividend Payout = 16.67%

Tax rate = 40%

(i) Income statement

	(` Lakhs)
Sale	660
Operating Exp	594
EBIT	66
Interest	14
EBT	52
Tax @ 40%	20.80
EAT	31.20
Dividend @ 16.67%	5.20
Retained Earnings	26.00

(ii) $SGR = ROE (1 - b)$

$$ROE = \frac{PAT}{NW} \text{ and } NW = ₹ 100 \text{ Lakh} + ₹ 300 \text{ Lakh} = 400 \text{ Lakh}$$

$$ROE = \frac{₹ 31.2 \text{ lakhs}}{₹ 400 \text{ lakhs}} \times 100 = 7.8\%$$

$$SGR = 0.078(1 - 0.1667) = 6.5\% \text{ or } \frac{0.078 \times 0.8333}{1 - 0.078 \times 0.8333} = 6.95\%$$

(iii) Calculation of fair price of share using dividend discount model

$$P_0 = \frac{D_0(1+g)}{K_e - g}$$

$$\text{Dividends} = \frac{₹ 5.2 \text{ Lakhs}}{₹ 10 \text{ Lakhs}} = ₹ 0.52$$

$$\text{Growth Rate} = 6.5\% \text{ or } 6.95\%$$

$$\begin{aligned} \text{Hence } P_0 &= \frac{₹ 0.52 (1 + 0.065)}{0.15 - 0.065} = \frac{₹ 0.5538}{0.085} = ₹ 6.51 \text{ or } \frac{0.52(1 + 0.0695)}{0.15 - 0.0695} \\ &= \frac{₹ 0.5561}{0.0805} = ₹ 6.91 \end{aligned}$$

(iv) Since the current market price of share is ₹ 14, the share is overvalued. Hence the investor should not invest in the company.

Question 18

X Limited, just declared a dividend of ₹ 14.00 per share. Mr. B is planning to purchase the share of X Limited, anticipating increase in growth rate from 8% to 9%, which will continue for three years. He also expects the market price of this share to be ₹ 360.00 after three years.

You are required to determine:

- the maximum amount Mr. B should pay for shares, if he requires a rate of return of 13% per annum.
- the maximum price Mr. B will be willing to pay for share, if he is of the opinion that the 9% growth can be maintained indefinitely and require 13% rate of return per annum.
- the price of share at the end of three years, if 9% growth rate is achieved and assuming other conditions remaining same as in (ii) above.

Calculate rupee amount up to two decimal points.

	Year-1	Year-2	Year-3
FVIF @ 9%	1.090	1.188	1.295
FVIF @ 13%	1.130	1.277	1.443
PVIF @ 13%	0.885	0.783	0.693

Answer :

- Expected dividend for next 3 years.

Year 1 (D_1) ₹ 14.00 (1.09) = ₹ 15.26

Year 2 (D_2) ₹ 14.00 (1.09)² = ₹ 16.63

Year 3 (D_3) ₹ 14.00 (1.09)³ = ₹ 18.13

Required rate of return = 13% (K_e)

Market price of share after 3 years = (P_3) = ₹ 360

The present value of share

$$P_0 = \frac{D_1}{(1 + K_e)} + \frac{D_2}{(1 + K_e)^2} + \frac{D_3}{(1 + K_e)^3} + \frac{P_3}{(1 + K_e)^3}$$

$$P_0 = \frac{15.26}{(1 + 0.13)} + \frac{16.63}{(1 + 0.13)^2} + \frac{18.13}{(1 + 0.13)^3} + \frac{360}{(1 + 0.13)^3}$$

$$P_0 = 15.26(0.885) + 16.63(0.783) + 18.13(0.693) + 360(0.693)$$

$$P_0 = 13.50 + 13.02 + 12.56 + 249.48$$

$$P_0 = ₹ 288.56$$

(ii) If growth rate 9% is achieved for indefinite period, then maximum price of share should Mr. A willing be to pay is

$$P_0 = \frac{D_1}{(K_e - g)} = \frac{₹ 15.26}{0.13 - 0.09} = \frac{₹ 15.26}{0.04} = ₹ 381.50$$

(iii) Assuming that conditions mentioned above remain same, the price expected after 3 years will be:

$$P_3 = \frac{D_4}{K_e - g} = \frac{D_3 (1.09)}{0.13 - 0.09} = \frac{18.13 \times 1.09}{0.04} = \frac{19.76}{0.04} = ₹ 494$$

Question 19

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.

Answer :

CAPM formula for calculation of Expected Rate of Return is :

$$\begin{aligned} ER &= R_f + \beta (R_m - R_f) \\ &= 8 + 1.5 (12 - 8) \\ &= 8 + 1.5 (4) \\ &= 8 + 6 \\ &= 14\% \text{ or } 0.14 \end{aligned}$$

Applying Dividend Growth Model for the calculation of per share equilibrium price:

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

$$0.14 = \frac{3(1.10)}{P_0} + 0.10$$

$$0.14 - 0.10 = \frac{3.30}{P_0}$$

$$0.04 P_0 = 3.30$$

$$P_0 = \frac{3.30}{0.04} = ₹ 82.50$$

Per share equilibrium price will be ₹ 82.50.

Question 20

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.

Answer :

In order to find out the value of a share with constant growth model, the value of K_e should be ascertained with the help of 'CAPM' model as follows:

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

Where,

$$K_e = \text{Cost of equity}$$

$$R_f = \text{Risk free rate of return}$$

$$\beta = \text{Portfolio Beta i.e. market sensitivity index}$$

$$K_m = \text{Expected return on market portfolio}$$

By substituting the figures, we get

$$K_e = 0.09 + 1.5 (0.13 - 0.09) = 0.15 \text{ or } 15\%$$

and the value of the share as per constant growth model is

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

Where,

$$P_0 = \text{Price of a share}$$

$$D_1 = \text{Dividend at the end of the year 1}$$

$$K_e = \text{Cost of equity}$$

$$G = \text{growth}$$

$$P_0 = \frac{2.00}{(K_e - g)} = ₹ 25.00$$

$$P_0 = \frac{2.00}{0.15 - 0.07} = ₹ 25.00$$

Alternatively it can also be found as follows:

$$\frac{2.00 (1.07)}{0.15 - 0.07} = ₹ 26.75$$

However, if the decision of finance manager is implemented, the beta (β) factor is likely to

increase to 1.75 therefore, K_e would be

$$\begin{aligned}K_e &= R_f + \beta (K_m - R_f) \\&= 0.09 + 1.75 (0.13 - 0.09) = 0.16 \text{ or } 16\%\end{aligned}$$

The value of share is

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

$$P_0 = \frac{2.00}{0.16 - 0.07} = ₹ 22.22$$

Alternatively it can also be found as follows:

$$\frac{2.00(1.07)}{0.16 - 0.07} = ₹ 23.78$$

PART B
BOND VALUATION
Question 1

The Following data are available for three bonds A, B and C. These bonds are used by a bond portfolio manager to fund an outflow scheduled in 6 years. Current yield is 9%. All bonds have face value of ₹ 100 and will be redeemed at par. Interest is payable annually.

Bond	Maturity (Years)	Coupon rate
A	10	10%
B	8	11%
C	5	9%

- Calculate the duration of each bond.
- Advise the percentage amount to bond portfolio manager to be invested in bonds B and C to immunise the portfolio and he has been asked to keep 45% of the portfolio money in Bond A.
- Evaluate whether the portfolio is still immunized if after the portfolio has been formulated, an interest rate change occurs, increasing the yield to 11%. The new duration of bonds are: Bond A=7.15 years, Bond B 6.03 Years and Bond C-4.27 years.
- Advise the new percentage of B and C bonds that are needed to immunize the portfolio. Bond A remaining at 45% of the portfolio.

Present values be used as follows:

Present values	t1	t2	t3	t4	t5
PVIF _{0.09, t}	0.917	0.842	0.772	0.708	0.650

Present values	t6	t7	t8	t9	t10
PVIF _{0.09, t}	0.596	0.547	0.502	0.460	0.4224

(MTP 12 Marks March '21, PYP 12 Marks Nov '18)

Answer:

(i) Calculation of Bond Duration

Bond A

Year	Cash Flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (years)
1	10	0.917	9.17	0.086	0.086
2	10	0.842	8.42	0.079	0.158
3	10	0.772	7.72	0.073	0.219
4	10	0.708	7.08	0.067	0.268
5	10	0.650	6.50	0.061	0.305
6	10	0.596	5.96	0.056	0.336
7	10	0.547	5.47	0.051	0.357
8	10	0.502	5.02	0.047	0.376
9	10	0.460	4.60	0.043	0.387
10	110	0.4224	46.46	0.437	4.370
			106.40	1.000	6.862

Duration of the bond is 6.862 years or 6.86 year

Bond B

Year	Cash Flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (years)
1	11	0.917	10.087	0.091	0.091
2	11	0.842	9.262	0.083	0.166
3	11	0.772	8.492	0.076	0.228
4	11	0.708	7.788	0.070	0.280
5	11	0.650	7.150	0.064	0.320
6	11	0.596	6.556	0.059	0.354
7	11	0.547	6.017	0.054	0.378
8	11	0.502	55.772	0.502	4.016
			111.224	1.000	5.833

Duration of the bond B is 5.833 years or 5.84 years

Bond C

Year	Cash Flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (years)
1	9	0.917	8.253	0.082	0.082
2	9	0.842	7.578	0.076	0.152
3	9	0.772	6.948	0.069	0.207
4	9	0.708	6.372	0.064	0.256
5	109	0.650	70.850	0.709	3.545
			100.00	1.000	4.242

Duration of the bond C is 4.242 years or 4.24 years

(ii) Amount of Investment required in Bond and C

Period required to be immunized	6.000 Year
Less: Period covered from Bond A	3.087 Year
To be immunized from B and C	2.913 Year

Let proportion of investment in Bond B and C is b and c respectively,

then $b + c = 0.55(1)$

$5.883b + 4.242c = 2.913(2)$

On solving these equations, the value of b and c comes 0.3534 or 0.3621 and 0.1966 or 0.1879 respectively and accordingly, the % of investment of B and C is 35.34% or 36.21% and 19.66% or 18.79% respectively.

(iii) With revised yield the Revised Duration of Bond stands

$0.45 \times 7.15 + 0.36 \times 6.03 + 0.19 \times 4.27 = 6.20$ year

No portfolio is not immunized as the duration of the portfolio has been increased from 6 years to 6.20 years.

(iv) New percentage of B and C bonds that are needed to immunize the portfolio.

Period required to be immunized	6.0000 Year
Less: Period covered from Bond A	3.2175 Year
To be immunized from B and C	2.7825 Year

Let proportion of investment in Bond and C is b and c respectively, then $b + c = 0.55$

$6.03b + 4.27c = 2.7825$ $b = 0.2466$

On solving these equations, the value of b and c comes 0.2466 and 0.3034 respectively and accordingly, the % investment of B and C is 24.66% or 25% and 30.34% or 30.00% respectively.

Question 2

A hypothetical company ABC Ltd. issued a 10% Debenture (Face Value of ₹ 1000) of the duration of 10 years, currently trading at ₹ 850 per debenture. The bond is convertible into 50 equity shares currently quoted at ₹ 17 per share.

If yield on equivalent comparable bond is 11.80%, then calculate the spread of yield of the above bond from this comparable bond.

The relevant present value table is as follows.

Present values	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10
PVIF _{0.11, t}	0.901	0.812	0.731	0.659	0.593	0.535	0.482	0.434	0.391	0.352
PVIF _{0.13, t}	0.885	0.783	0.693	0.613	0.543	0.480	0.425	0.376	0.333	0.295

(MTP 7 Marks April 19, MTP 5 Marks Mar'18, RTP Nov 19)

Answer:

Conversion Price = ₹ 50 × 17 = ₹ 850

Intrinsic Value = ₹ 850

Accordingly the yield (r) on the bond shall be:

$$₹ 850 = ₹ 100 \text{ PVAF}(r, 10) + ₹ 1000 \text{ PVF}(r, 10)$$

Let us discount the cash flows by 11%

$$850 = 100 \text{ PVAF}(11\%, 10) + 1000 \text{ PVF}(11\%, 10)$$

$$850 = 100 \times 5.890 + 1000 \times 0.352$$

$$= 91$$

Now let us discount the cash flows by 13%

$$850 = 100 \text{ PVAF}(13\%, 10) + 1000 \text{ PVF}(13\%, 10)$$

$$850 = 100 \times 5.426 + 1000 \times 0.295$$

$$= -12.40$$

Accordingly, IRR

$$11\% + \frac{90.90}{90.90 - (-12.40)} \times (13\% - 11\%)$$

$$11\% + \frac{90.90}{103.30} \times (13\% - 11\%)$$

$$= 12.76$$

The spread from comparable bond = 12.76% - 11.80% = 0.96%

Question 3

M/s Trans India Ltd. is contemplating calling ₹ 3 crores of 30 years, ₹ 1,000 bond issued 5 years ago with a coupon interest rate of 14 per cent. The bonds have a call price of ₹1,140 and had initially collected proceeds of ₹2.91 crores due to a discount of ₹30 per bond. The initial floating cost was ₹3,60,000. The Company intends to sell ₹3 crores of 12 per cent coupon rate, 25 years bonds to raise funds for retiring the old bonds. It proposes to sell the new bonds at their par value of ₹1,000. The estimated floatation cost is ₹4,00,000. The company is paying 40% tax and its after tax cost of debt is 8 per cent. As the new bonds must first be sold and their proceeds, then used to retire old bonds, the company expects a two months period of overlapping interest during which interest must be paid on both the old and new bonds. Evaluate the feasibility of refunding bonds?

(MTP 10 Marks Nov 21)

Answer:

NPV for bond refunding

	₹
PV of annual cash flow savings (W.N. 2)	
(3,49,600 × PVIFA 8%, 25) i.e. 10.675	37,31,980
Less: Initial investment (W.N.1)	29,20,000
NPV	8,11,980

Recommendation : Refunding of bonds is recommended as NPV is positive.

Working Notes:

(1) Initial investment:		
(a) Call premium		
Before tax $(1,140 - 1,000) \times 30,000$	42,00,000	
Less tax @ 40%	16,80,000	
After tax cost of call prem.	25,20,000	
(b) Floatation cost 4,00,000		
(c) Overlapping interest		
Before tax $(0.14 \times \frac{2}{12} \times 3 \text{ crores})$	7,00,000	
Less : tax @ 40%	2,80,000	4,20,000
(d) Tax savings on unamortised discount on old bond		
$\frac{25}{30} \times 9,00,000 \times 0.4$ (3,00,000)		

(e) Tax savings from unamortised floatation		
Cost of old bond $\frac{25}{30} \times 3,60,000 \times 0.4$		(1,20,000)
		29,20,000
(2) Annual cash flow savings:		
(a) Old bond		
(i) Interest cost (0.14×3 crores)	42,00,000	
Less tax @ 40%	16,80,000	25,20,000
(ii) Tax savings from amortization of discount $\frac{9,00,000}{30} \times 0.4$		(12,000)
(iii) Tax savings from amortization of floatation cost $\frac{3,60,000}{30} \times 0.4$		(4,800)
Annual after tax cost payment under old Bond (A)		25,03,200
(b) New bond		
(i) Interest cost before tax (0.12×3 crores)		36,00,000
Less tax @ 40%		14,40,000
After tax interest		21,60,000
(ii) Tax savings from amortization of floatation cost $(0.4 \times \frac{4,00,000}{25})$		(6,400)
Annual after tax payment under new Bond (B)		21,53,600
Annual Cash Flow Savings (A) – (B)		3,49,600

Question 4

The Following is the data related to 9% Fully convertible (into Equity Shares) debentures issued by Delta Ltd.

Market Price of 9% Debenture	₹ 1,000
Conversion Ratio (No. of Shares)	25
Straight Value of 9% Debentures	₹ 800
Market price of equity share on the date of conversion	₹ 30
Expected Dividend per share	₹1

ANALYSE the value of Debenture both from cost and payback period angle for an investor who is considering to adopt the route of conversion to acquire the shares of the company
(MTP 10 Marks, April'22)

Answer:

Working Notes:

(i) **Conversion Value of Debenture**

$$\begin{aligned} &= \text{Market Price of one Equity Share} \times \text{Conversion Ratio} \\ &= ₹ 30 \times 25 = ₹ 750 \end{aligned}$$

(ii) **Market Conversion Price**

$$\begin{aligned} &= \frac{\text{Market Price of Convertible Debenture}}{\text{Conversion Ratio}} \\ &= \frac{1000}{25} = ₹ 40 \end{aligned}$$

(iii) **Conversion Premium per share**

$$\begin{aligned} &\text{Market Conversion Price} - \text{Market Price of Equity Share} \\ &= ₹ 40 - ₹ 30 = ₹ 10 \end{aligned}$$

(iv) **Favourable income differential per share**

$$\begin{aligned} &= \frac{\text{Coupon Interest from Debenture} - \text{Conversion Rate} \times \text{Dividend Per Share}}{\text{Conversion Ratio}} \\ &= \frac{90 - 25 \times 1}{25} = ₹ 2.6 \end{aligned}$$

(v) **Premium payback period**

$$\begin{aligned} &= \frac{\text{Conversion premium per Share}}{\text{Favourable Income Differential Per Share}} \\ &= \frac{10}{2.6} \\ &= 3.85 \text{ year} \end{aligned}$$

Analysis: Thus from above it can be analysed that:

- The Conversion Value of Debenture is less than the Market Value of Debenture because the Coupon Interest Rate is higher than Yield as Straight Value is somewhat near about the conversion value.

- If the investor adopts the route of Convertible Debenture for acquiring shares he/she will have to pay premium over the market price.
- So far as the recovery of the premium paid for acquiring one share is concerned approximate it will take about 4 years.
- However, in case if the market price of the share is increased then of course the premium will be reduced and hence the payback period. Reverse will happen in case if the prices of the share goes below ₹ 30 per share.

Question 5

The following data are available for a bond:

Face Value	₹10,000 to be redeemed at par on maturity
Coupon rate	8.5%
Years to Maturity	5 years
Yield to Maturity (YTM)	10%

EVALUATE the change in the expected market price of the Bond, if there is a decrease in the YTM by 200 basis points based on

- By Macaulay's Duration after making Convexity Adjustment.
- By Intrinsic Value Method,

Given

Years	1	2	3	4	5
PVIF (10%, n)	0.909	0.826	0.751	0.683	0.621
PVIF (8%, n)	0.926	0.857	0.794	0.735	0.681

(MTP 8 Marks, April'22)

Answer:

Working Notes:

(1) **Current Market Price of Bond**

$$\begin{aligned}
 &= ₹ 850 (\text{PVIFA } 10\%, 5) + ₹ 10,000 (\text{PVIF } 10\%, 5) \\
 &= ₹ 850 (3.79) + ₹ 10,000 (0.621) \\
 &= ₹ 3,221.50 + ₹ 6,210 \\
 &= ₹ 9,431.5
 \end{aligned}$$

(2) Macaulay's Duration

Year	Cash Flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (years)
1	850	0.909	772.65	0.082	0.082
2	850	0.826	702.10	0.074	0.148
3	850	0.751	638.35	0.068	0.204
4	850	0.683	580.55	0.062	0.248
5	10,850	0.621	6737.85	0.714	3.57
			9431.50	1.000	4.252

Duration of the Bond is 4.252 years

(3) Volatility of Bond

$$= \frac{\text{Duration}}{(1 + \text{YTM})} = \frac{4.252}{1.10} = 3.865$$

Convexity of Bond

$$C^* \times (\Delta Y)^2 \times 100$$

$$C^* = \frac{V_+ + V_- - 2V_0}{2V_0(Y)^2}$$

Year	Cash Flow	P.V. @ 8%		P.V @ 12%	
1	850	0.926	787.10	0.892	758.20
2	850	0.857	728.45	0.797	677.45
3	850	0.794	674.90	0.712	605.20
4	850	0.735	624.75	0.636	540.60
5	10,850	0.681	7388.85	0.567	6,151.95
			10204.05		8,733.40

$$C^* = \frac{10,204.05 + 8,733.40 - 2 \times 9,431.50}{2 \times 9,431 \times (0.02)^2}$$

$$= \frac{74.45}{7.5452}$$

Convexity of Bond = $9.867 \times (0.02)^2 \times 100 = 0.395\%$

(i) The expected market price if there is a decrease in YTM by 200 basis points using Macaulay's Duration

$$\% \text{ Change in Price of Bond } 3.865 \times 2\% + 0.395\% = 8.125\%$$

$$\text{Change in Expected Market Price ₹ } 9431.50 \times (8.125/100) = ₹ 766.31$$

$$\text{Hence expected market price is ₹ } 9431.50 + 766.31 = 10,197.81$$

- (ii) The expected market price if there is a decrease in YTM by 200 basis points using intrinsic Value method

Intrinsic Value at YTM of 10%	₹ 9,431.50
Intrinsic Value at YTM of 8%	₹ 10,204.05
Price increased by	₹ 772.55

Hence, expected market price is ₹ 10,204.05 Evaluation: Thus, from above it can be evaluated that duration combined with the convexity adjustment does a better job of estimating the sensitivity of a bond's price change.

Question 6

The Bank BK enters into a Repo for 9 days with Bank NE in 6% Government bonds 2022 for an amount 2 crore. The other relevant details are as follows:

First Leg Payment (Start Proceed)	₹ 2,00,06,750
Second Leg Payment (Repayment Proceed)	₹ 2,00,31,759
Initial Margin	1.25%
Days of accrued interest	240

Assume 360 days in a year.

CALCULATE:

Repo Rate

Dirty Price and Clean Price

(MTP 4 Marks Oct (22))

Answer :

$$(1) \text{ Second Leg} = \text{Start Proceed} \times \left[1 + \text{Repo Rate} \times \frac{\text{No. of Days}}{360} \right]$$

$$₹ 2,00,31,759 = ₹ 2,00,06,750 \times \left[1 + \text{Repo Rate} \times \frac{9}{360} \right]$$

$$1.00125 = \left[1 + \text{Repo Rate} \times \frac{9}{360} \right]$$

$$\begin{aligned} \text{Repo Rate} &= 0.05 \\ &= 5\% \end{aligned}$$

$$\begin{aligned} (2) \text{ First Leg (Start Proceed)} &= \text{Nominal Value} \times \frac{\text{Dirty Price}}{100} \times \frac{100 - \text{Initial Margin}}{100} \\ ₹ 2,00,06,750 &= ₹ 2,00,00,000 \times \frac{\text{Dirty Price}}{100} \times \frac{100 - 1.25}{100} \\ 10003.375 &= 98.75 \times \text{Dirty Price} \\ \text{Dirty Price} &= ₹ 101.30 \end{aligned}$$

$$\begin{aligned}
 (3) \quad \text{Dirty Price} &= \text{Clean Price} + \text{Interest Accrued} \\
 101.30 &= \text{Clean Price} + 100 \times \frac{240}{360} \times 6\% \\
 \text{Clean Price} &= ₹ 97.30
 \end{aligned}$$

Question 7

An investor has recently purchased substantial number of 7 year 6.75% ₹1,000 bond with 5% premium payable on maturity at a required Yield to Maturity (YTM) of 9%. However, due to a financial crunch he is looking to sell these bonds and has got a proposal from another investor, who is willing to purchase these bonds by shelling out a maximum amount of ₹897 per bond. Investors follow intrinsic value method for valuation of bonds.

(i) You are required to determine

- (1) The Market Price, Duration and Volatility of the bond and
- (2) Required YTM of the new investor

(ii) What is relationship between the price of the bond and YTM?

Period (t)	1	2	3	4	5	6	7
PVIF (9%, t)	0.917	0.842	0.772	0.708	0.650	0.596	0.547

Answer:

(i) (1) (a) Market Price of Bond

$$\begin{aligned}
 &= 1,000 \times 6.75\% \times (\text{PVIFA}) 9\%, 7) + 1,050 \times (\text{PVIF } 9\%, 7) \\
 &= 67.50 \times 5.032 + 1050 \times 0.547 \\
 &= 339.66 + 574.35 = ₹ 914.01
 \end{aligned}$$

(b) Duration of Bond

Year	Cash flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (years)
1	67.50	0.917	61.898	0.0677	0.0677
2	67.50	0.842	56.835	0.0622	0.1244
3	67.50	0.772	52.110	0.0570	0.1710
4	67.50	0.708	47.790	0.0523	0.2092
5	67.50	0.650	43.875	0.0480	0.2400
6	67.50	0.596	40.230	0.0440	0.2640
7	1117.50	0.547	611.273	0.6688	4.6816
			914.011		5.7579

Duration of the Bond is 5.758 years.

Alternatively, as per Short Cut Method

$$D = \frac{1 + YTM}{YTM} - \frac{(1 + YTM) + t(c - YTM)}{C[(1 + YTM)^t - 1] + YTM}$$

Where YTM = Yield to Maturity c = Coupon Rate

t = Years to Maturity

$$= \frac{1.09}{0.09} - \frac{1.09 + 7(0.0675 - 0.09)}{0.0675[(1.09)^7 - 1] + 0.09} = 5.72$$

(c) Volatility of Bond

$$\text{Volatility} = \frac{\text{Duration}}{(1 + YTM)} = \frac{5.758}{1 + 0.09} = 5.28$$

(2) Required yield of new Investor

$$= 67.50 \text{ PVIAF}(r, 7) + 1050 \times \text{PVIF}(r, 7)$$

Now, let us discount the cash flow by 9% PV @ 9%

$$= 67.50 \times 5.032 + 1050 \times 0.547$$

$$= 339.66 + 574.35 = 914.01$$

$$\text{NPV @ 9\%} = 914.01 - 897 = ₹17.01$$

Since, NPV of bond is positive, We need to increase discount rate say 12%

$$= 67.50 \text{ PVIAF}(12\%, 7) + 1050 \times \text{PVIF}(12\%, 7)$$

$$= 67.50 \times [0.893 + 0.797 + 0.712 + 0.636 + 0.567 + 0.507 + 0.452] + 1050 \times 0.452$$

$$= 67.50 \times 4.564 + 474.60$$

$$= 308.07 + 474.60 = 782.67$$

$$\text{NPV @ 12\%} = 782.67 - 897 = -₹114.33$$

Now we use interpolation formula

$$k_e = LR + \frac{\text{NPV at LR}}{\text{NPV at LR} - \text{NPV at HR}} \times \Delta r$$

$$= 9\% + \frac{17.01}{17.01 - (-114.33)} \times 3\%$$

$$= 9\% + \frac{17.01}{131.34} \times 3\%$$

$$= 9\% + 0.39\%$$

$$= 9.39\%$$

(ii) Relationship between the price of the bond & YTM is opposite or inverse.

Question 8

Following information is related to the Convertible Bond of A Ltd. which is currently priced at ₹1060 per Bond:

- (i) Conversion Parity Price - ₹53
- (ii) Conversion Premium - 10.41667%
- (iii) Percentage of Downside Risk with respect to Straight Value of Bond - 12.766%

Calculate:

- (i) No. of shares on Conversion.
- (ii) Current Market Price Per Share of A Ltd.
- (iii) Straight Value of Bond

(MTP 6 Marks Oct '23)

Answer:

- (i) The No. of share on Conversion shall be computed as follows:

$$\text{Conversion Parity Price} = \frac{\text{Bond Price}}{\text{No. of Share on Conversion}}$$

$$₹53 = \frac{1060}{\text{No. of Share on Conversion}}$$

Accordingly, No. of shares of Conversion = 20

- (ii) To determine current Market Price Per Share of A Ltd. we shall use Conversion Premium as follows:

$$\text{Conversion Premium} = \frac{\text{Market Price of Bond} - \text{Conversion Value of Bond}}{\text{Conversion Value of Bond}}$$

$$0.1041667 = \frac{1060 - \text{Conversion Value of Bond}}{\text{Conversion Value of Bond}}$$

$$\text{Conversion Value of Bond} = ₹ 960$$

Since the No. of share on Conversion = 20

$$\text{The current market price of share of A Ltd. shall be} = \frac{960}{20} = ₹ 48 \text{ per share}$$

- (iii) To determine the Straight Value of Bond we shall use Percentage of Downside Risk as follows:

$$\text{Percentage of Downside Risk} = \frac{\text{Market Price of Bond} - \text{Straight Value of Bond}}{\text{Straight Value of Bond}}$$

$$0.12766 = \frac{1060 - \text{Straight Value of Bond}}{\text{Straight Value of Bond}}$$

$$\text{Straight Value of Bond} = ₹ 940 \text{ per Band}$$

Question 9

Today being 1st January 2019, Ram is considering to purchase an outstanding Corporate Bond having a face value of ₹ 1,000 that was issued on 1st January 2017 which has 9.5% Annual Coupon and 20 years of original maturity (i.e. maturing on 31st December 2027). Since the bond was issued, the interest rates have been on downside and it is now selling at a premium of ₹ 125.75 per bond. Determine the prevailing Interest on the similar type of Bonds if it is held till the maturity which shall be at Par.

(RTP Nov 20)

PV Factors:

	1	2	3	4	5	6	7	8	9
6%	0.943	0.890	0.840	0.792	0.747	0.705	0.665	0.627	0.592
8%	0.926	0.857	0.794	0.735	0.681	0.630	0.583	0.540	0.500

Answer:

To determine the prevailing rate of interest for the similar type of Bonds we shall compute the YTM of this Bond using IRR method as follows:

$$M = ₹ 1000$$

$$\text{Interest} = ₹ 95 (0.095 \times ₹ 1000) n = 9 \text{ years}$$

$$V_0 = ₹ 1125.75 (₹ 1,000 + ₹ 125.75)$$

YTM can be determined from the following equation.

$$₹ 95 \times \text{PVIFA} (\text{YTM}, 9) + ₹ 1000 \times \text{PVIF} (\text{YTM}, 9) = ₹ 1125.75$$

Let us discount the cash flows using two discount rates 8% and 10% as follows:

Year	Cash Flows	PVF @ 6%	PV @ 6%	PVF @ 8%	PV @ 8%
0	-1125.75	1	-1125.75	1	-1125.75
1	95	0.943	89.59	0.926	87.97
2	95	0.890	84.55	0.857	81.42
3	95	0.840	79.80	0.794	75.43
4	95	0.792	75.24	0.735	69.83
5	95	0.747	70.97	0.681	64.70
6	95	0.705	66.98	0.630	59.85
7	95	0.665	63.18	0.583	55.39
8	95	0.627	59.57	0.540	51.30
9	1095	0.592	648.24	0.500	547.50
			112.37		-32.36

Now we use interpolation formula

$$6.00\% + \frac{112.37}{112.37 - (-32.36)} \times 2.00\%$$

$$6.00\% + \frac{112.37}{144.73} \times 2.00\% = 6.00\% + 1.553\%$$

YTM = 7.553% say 7.55%

Thus, prevailing interest rate on similar type of Bonds shall be approx. 7.55%.

Question 10

From the following information, compute the effective rate of interest per annum as well as the total cost of funds to Nirmal Ltd., which is planning a Commercial Paper (CP) issue:

Issue Price of CP	₹ 4,87,750
Face Value	₹ 5,00,000
Maturity Period	3 Months
Issue Expenses:	
Brokerage	0.15% for 3 months
Rating Charges	0.55% p.a.
Stamp Duty	0.20% for 3 months

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(RTP May'23)

Answer:

$$\text{Normal Interest or Bond Equivalent Yield} = \left[\frac{F - P}{P} \right] \times \frac{12}{M} \times 100$$

Where

F = Face Value

P = Issue Price

$$= \frac{5,00,000 - 4,87,750}{4,87,750} \times \frac{12}{3} \times 100 = 0.025115 \times 4 \times 100 = 10.046 = 10.05\% \text{ p.a.}$$

$$= \text{Effective interest rate} = \left[1 + \frac{0.1005}{4} \right]^4 - 1 = 10.435\% \text{ p.a.}$$

Cost of Funds to the Company

Effective Interest	10.435%
Brokerage (0.150 x 4)	0.60%
Rating Charge	0.55%
Stamp duty (0.20 x 4)	0.80%
	12.385%

Question 11

The following data are available for a bond:

Face Value 10,000 to be redeemed at par on maturity Coupon rate 8.5 per cent per annum Years to Maturity 5 years Yield to Maturity (YTM) 10 per cent You are required to calculate:

- (i) Current market price of the Bond,
- (ii) Macaulay's Duration,
- (iii) Volatility of the Bond,
- (iv) Convexity of the Bond,
- (v) Expected market price if there is a decrease in the YTM by 200 basis points
 - (a) By Macaulay's Duration based estimate
 - (b) By Intrinsic Value Method.

Given

Years	1	2	3	4	5
PVIF (10%, n)	0.909	0.826	0.751	0.683	0.621
PVIF (8%, n)	0.926	0.857	0.794	0.735	0.681

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(RTP May 23, PYP 7 Marks Nov '20)

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Answer:

(i) **Current Market Price of Bond**

$$\begin{aligned}
 &= ₹ 850(\text{PVIFA } 10\%, 5) + ₹ 10,000 (\text{PVIF } 10\%, 5) \\
 &= ₹ 850(3.79) + ₹ 10,000 (0.621) \\
 &= ₹ 3,221.50 + ₹ 6,210 \\
 &= ₹ 9,431.5
 \end{aligned}$$

(ii) **Macaulay's Duration**

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (years)
1	850	0.909	772.65	0.082	0.082
2	850	0.826	702.10	0.074	0.148
3	850	0.751	638.35	0.068	0.204
4	850	0.683	580.55	0.062	0.248
5	10,850	0.621	6,737.85	0.714	3.57
			9431.50	1.000	4.252

Duration of the Bond is 4.252 years.

(iii) Volatility of Bond

$$\text{Volatility of Bond} = \frac{\text{Duration}}{(1 + \text{YTM})} = \frac{4.252}{1.10} = 3.865$$

(iv) Convexity of Bond

$$C^* \times (\Delta Y)^2 \times 100$$

$$C^* = V_+ + V_- - 2V_0$$

$$2V_0 (\Delta Y)^2$$

Year	Cash Flow	P.V. @ 8%		P.V. @ 12%	
1	850	0.926	787.10	0.892	758.20
2	850	0.857	728.45	0.797	677.45
3	850	0.794	674.90	0.712	605.20
4	850	0.735	624.75	0.636	540.60
5	10,850	0.681	7388.85	0.567	6,151.95
			10204.05		8,733.40

$$C^* = \frac{10,204.05 + 8,733.40 - 2 \times 9,431.50}{2 \times 9,431.50 \times (0.02)^2} = \frac{74.45}{7.5452} = 9.867$$

$$\text{Convexity of Bond} = 9.867 \times (0.02)^2 \times 100 = 0.395\%$$

(v) The expected market price if decrease in YTM by 200 basis points.

(A) By Macaulay's duration-based estimate

$$= ₹9431.50 \times 2 \left(\frac{3.865}{100} \right) = ₹ 729.05$$

Hence expected market price is ₹9431.50 + ₹729.05 = ₹10,160.55

Hence, the market price will increase.

(B) By Intrinsic Value method

Intrinsic Value at YTM of 10%	₹ 9,431.50
Intrinsic Value at YTM of 8%	₹ 10,204.05
Price increased by	₹ 772.55

Hence, expected market price is ₹ 10,204.05

Question 12

Mr. X wants to invest ₹1,00,000 in the 7 years 8% bonds in the market (Face Value ₹100) which were issued 2 years ago.

- (i) You are requested to advise him what is the maximum price for bonds to be paid in the following scenarios:
- (1) If Mr. X is expecting minimum 9% return on the bonds
 - (2) If Mr. X is expecting minimum 7% return on the bonds
 - (3) If the present rate of similar bonds issued is 8.25%
 - (4) If the present rate of similar bonds issued is 7.75%
- (ii) If the bonds are available at par and 1% is the transaction cost, what is the effective yield?
- (iii) Find the number of days required to breakeven transaction cost if the bonds are available at par and 2% is the transaction cost.

(PYP 8 Marks Nov 22)

Answer :

- (i) The Maximum price to be paid for bond

- (1) To have a return of 9% return on Bond.

$$= ₹ 100 \times \frac{8}{9} = ₹ 88.89$$

Alternative Answer

$$= \frac{8}{(1.09)^1} + \frac{8}{(1.09)^2} + \frac{8}{(1.09)^3} + \frac{8}{(1.09)^4} + \frac{108}{(1.09)^5}$$

$$= ₹ 7.34 + ₹ 6.73 + ₹ 6.18 + ₹ 5.67 + ₹ 70.19 = ₹ 96.11$$

- (2) To have a return of 7% return on Bond.

$$= ₹ 100 \times \frac{8}{7} = ₹ 114.29$$

Alternative Answer

$$= \frac{8}{(1.07)^1} + \frac{8}{(1.07)^2} + \frac{8}{(1.07)^3} + \frac{8}{(1.07)^4} + \frac{108}{(1.07)^5}$$

$$= ₹ 7.48 + ₹ 6.99 + ₹ 6.53 + ₹ 6.10 + ₹ 77.00$$

$$= ₹ 104.10$$

- (3) If present rate of similar bond issued is 8.25%

$$= \frac{8}{(1.0825)^1} + \frac{8}{(1.0825)^2} + \frac{8}{(1.0825)^3} + \frac{8}{(1.0825)^4} + \frac{108}{(1.0825)^5}$$

$$= ₹ 7.39 + ₹ 6.83 + ₹ 6.31 + ₹ 5.83 + ₹ 72.66 = ₹ 99.02$$

Alternative Answer

$$= ₹ 100 \times \frac{8}{7.75} = ₹ 103.23$$

(ii) Effective yield if transaction cost is 1% = $\frac{8}{101} \times 100 = 7.92$

(iii) No. of Days required for break even

$$= \frac{2\% \times 1,00,000}{1,00,000 \times \frac{8\%}{360}} = \frac{2,000}{22.22} = 90 \text{ days}$$

Alternatively, if 365 days used in calculation then answer will be as follows :

$$= \frac{2\% \times 1,00,000}{1,00,000 \times \frac{8\%}{365}} = \frac{2,000}{21.92} = 91.24 \text{ days say 91 Days}$$

Question 13

An investor, in the beginning of 2022, has purchased substantial number of 8 year 7.50%, ₹ 1000 bond with 5% premium on maturity at a required Yield to Maturity (YTM) of 8.50%. However, due to the continuing war in Europe, the inflation is running very high in the economies of the countries. The yield on the bonds is decreasing. The risk averse investor wants to protect himself from further loss and decides to sell the bonds in 2023. He has got a proposal from another investor who is willing to purchase these bonds by shelling out a maximum amount of ₹ 797.50 per bond.

(PYP 9 Marks May '23)

Investor follows intrinsic value method for valuation of the Bonds.

You are required to determine

- The Market price, Duration and Volatility of the bond.
- Will it be a right decision of the new investor if he is looking for Required Yield to Maturity (YTM) as 12% p.a.?

Period	1	2	3	4	5	6	7
PVIF (8.50%, n)	0.9217	0.8495	0.7829	0.7216	0.6650	0.6129	0.5649

Answer :

(A) Market Price of Bond

$$\begin{aligned}
 &= 1,000 \times 7.50\% \times (\text{PVIAF } 8.50\%, 7) + 1,050 \times (\text{PVIF } 8.5\%, 7) \\
 &= 75 \times 5.1185 + 1050 \times 0.5649 \\
 &= 383.89 + 593.15 = ₹ 977.04
 \end{aligned}$$

(B) Duration of Bond

Year	Cash Flow	P.V. @ 8.5%		Proportion of bond value	Proportion of bond value x time (years)
1	75	0.9217	69.128	0.071	0.071
2	75	0.8495	63.713	0.065	0.130
3	75	0.7829	58.718	0.060	0.180
4	75	0.7216	54.120	0.055	0.220
5	75	0.6650	49.875	0.051	0.255
6	75	0.6129	45.968	0.047	0.282
7	1125	0.5649	635.513	0.651	4.557
			977.035		5.695

Duration of the Bond is 5.695 Years.

Alternatively, it can also be calculated as follows :

Year (1)	Cash Flow (2)	PVF (3)	PV (4)	(1) × (4)
1	75	0.9217	69.13	69.13
2	75	0.8495	63.71	127.42
3	75	0.7829	58.72	176.16
4	75	0.7216	54.12	216.48
5	75	0.6650	49.88	249.40
6	75	0.6129	45.97	275.82
7	1125	0.5649	635.51	4448.57
			977.04	5562.98

Duration of the bond = $\frac{5562.98}{977.04} = 5.69$ years

(C) Volatility of bond-

$$\begin{aligned} \text{Volatility} &= \text{Duration} / (1 + \text{YTM}) \\ &= 5.695 / (1 + 0.085) = 5.249 \\ \text{Or} &= 5.69 / (1 + 0.085) = 5.24 \end{aligned}$$

PV of Bond @ 12% YTM

$$\begin{aligned} &= ₹ 75 \text{ PVIAF} (12\%, 7) + ₹ 1050 \times \text{PVIF} (12\%, 7) \\ &= ₹ 75 \times 4.5637 + ₹ 1050 \times 0.4523 \\ &= ₹ 342.28 + ₹ 474.92 = ₹ 817.20 \end{aligned}$$

Since, Intrinsic value of bond is ₹ 817.20 the decision of new investor is right at purchase price of ₹ 797.50.

Alternatively, it can also be solved as follows :

Price difference between Current Selling Price & Intrinsic Value	₹ 179.54
Increase in Yield justified $\left[\frac{\text{Price Difference} \times 100}{\text{Volatility} \times P_0} \right]$	3.50%
Justified YTM (8.50% + 3.50%)	12%

Thus, the decision of investor is right.

Question 14

ABC Ltd. has ₹ 300 million, 12 per cent bonds outstanding with six years remaining to maturity. Since interest rates are falling, ABC Ltd. is contemplating of refunding these bonds with a ₹ 300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be ₹ 6 million and the call premium is 4 per cent. ₹ 9 million being the unamortized portion of issue cost of old bonds can be written off no sooner the old bonds are called off. Marginal tax rate of ABC Ltd. is 30 per cent. You are required to analyse the bond refunding decision.

Answer:

1. Calculation of initial outlay:-	₹ (million)
a. Face value	300
Add:-Call premium	12
Cost of calling old bonds	312
b. Gross proceed of new issue	300
Less: Issue costs	6
Net proceeds of new issue	294
c. Tax savings on call premium and unamortized cost 0.30 (12 + 9)	6.3
∴ Initial outlay = ₹ 312 million – ₹ 294 million – ₹ 6.3 million = ₹ 11.7 million	

2. Calculation of net present value of refunding the bond:-

Saving in annual interest expenses	₹ (million)
$[300 \times (0.12 - 0.10)]$	6.00
Less:- Tax saving on interest and amortization	
$0.30 \times [6 + (9-6)/6]$	1.95
Annual net cash saving	4.05
PVIFA (7%, 6 years)	4.766
∴ Present value of net annual cash saving	₹ 19.30 million
Less:- Initial outlay	₹ 11.70 million
Net present value of refunding the bond	₹ 7.60 million
Decision: The bonds should be refunded	

Question 15

GHI Ltd., AAA rated company has issued, fully convertible bonds on the following terms, a year ago:

Face value of bond	₹ 1000
Coupon (interest rate)	8.5%
Time to Maturity (remaining)	3 years
Interest Payment	Annual, at the end of year
Principal Repayment	At the end of bond maturity
Conversion ratio (Number of shares per bond)	25
Current market price per share	₹ 45
Market price of convertible bond	₹ 1175

AAA rated company can issue plain vanilla bonds without conversion option at an interest rate of 9.5%.

Required:

Calculate as of today:

- Straight Value of bond.
- Conversion Value of the bond.
- Conversion Premium.
- Percentage of downside risk.

(v) Conversion Parity Price.

t	1	2	3
PVIF _{0.095, t}	0.9132	0.8340	0.7617

Answer:

(i) **Straight Value of Bond**

$$\begin{aligned}
 &= \text{Interest} \times \text{PVAF}_{(9.5\%, 3 \text{ yrs})} + \text{RV} \times \text{PVF}_{(9.5\%, 3 \text{ yrs})} \\
 &= ₹ 85 \times 2.5089 + ₹ 1,000 \times 0.7617 \\
 &= ₹ 213.26 + ₹ 761.70 \\
 &= ₹ 974.96
 \end{aligned}$$

(ii) **Conversion Value (Stock value of bond)**

$$\begin{aligned}
 &\text{Conversion Ratio} \times \text{MP of equity share} \\
 &= ₹ 45 \times 25 \text{ shares} \\
 &= ₹ 1125
 \end{aligned}$$

(iii) **Conversion Premium**

$$\begin{aligned}
 &= \text{Market conversion Price} - \text{MP conversion value} \\
 &= ₹ 1175 - ₹ 1125 = ₹ 50
 \end{aligned}$$

OR

$$= \frac{1175 - 1125}{1125}$$

$$= 4.44\%$$

(iv) **Percentage Downside Risk**

$$\begin{aligned}
 &= \frac{₹ 1175 - ₹ 974.96}{₹ 1175} \times 100 \\
 &= 17.02\%
 \end{aligned}$$

(v) **Conversion parity price**

$$= \frac{\text{Bond Price}}{\text{No. of shares of conversion}}$$

$$= \frac{₹ 1175}{25}$$

$$= ₹ 47$$

Question 16

The following data is related to 8.5% Fully Convertible (into Equity shares) Debentures issued by JAC Ltd. at V 1000.

Market Price of Debenture	₹ 900
Conversion Ratio	30
Straight Value of Debenture	₹ 700
Market Price of Equity share on the date of Conversion	₹ 25
Expected Dividend Per Share	₹ 1

You are required to calculate:

- Conversion Value of Debenture
- Market Conversion Price
- Conversion Premium per share
- Ratio of Conversion Premium
- Premium over Straight Value of Debenture
- Favourable income differential per share
- Premium pay back period

Answer:

- Conversion Value of Debenture

$$= \text{Market Price of one Equity Share} \times \text{Conversion Ratio}$$

$$= ₹ 25 \times 30 = ₹ 750$$

- Market Conversion Price

$$= \frac{\text{Market Price of Convertible Debenture}}{\text{Conversion Ratio}}$$

$$= \frac{₹ 900}{30} = ₹ 30$$

- Conversion Premium per share

$$\text{Market Conversion Price} - \text{Market Price of Equity Share}$$

$$= ₹ 30 - ₹ 25 = ₹ 5$$

- Ratio of Conversion Premium

$$\frac{\text{Conversion premium per share}}{\text{Market Price of Equity Share}} = \frac{₹ 5}{₹ 25} = 20\%$$

(e) Premium over Straight Value of Debenture

$$\frac{\text{Market Price of Convertible Bond} - \text{Straight Value of Bond}}{\text{Straight Value of Bond}} - 1 = \frac{₹ 900}{₹ 700} - 1 = 28.6\%$$

(f) Favourable income differential per share

$$\frac{\text{Coupon Interest from Debenture} - \text{Conversion Ratio} \times \text{Dividend Per Share}}{\text{Conversion Ratio}}$$

$$\frac{₹ 85 - 30 \times ₹ 1}{30} = ₹ 1.833$$

(g) Premium pay back period

$$\frac{\text{Conversion premium per share}}{\text{Favourable Income Differential Per Share}} = \frac{₹ 5}{₹ 1.833} = 2.73 \text{ years}$$

Question 17

A Ltd. has issued convertible bonds, which carries a coupon rate of 14%. Each bond is convertible into 20 equity shares of the company A Ltd. The prevailing interest rate for similar credit rating bond is 8%. The convertible bond has 5 years maturity. It is redeemable at par at ₹ 100. The relevant present value table is as follows.

Present values	t ₁	t ₂	t ₃	t ₄	t ₅
PVIF _{0.14, t}	0.877	0.769	0.675	0.592	0.519
PVIF _{0.08, t}	0.926	0.857	0.794	0.735	0.681

You are required to estimate:

(Calculations be made upto 3 decimal places)

- current market price of the bond, assuming it being equal to its fundamental value,
- minimum market price of equity share at which bond holder should exercise conversion option; and
- duration of the bond.

Answer:

CMP = PV of all Future CI's @ 8%

$$\text{Duration} = \frac{\sum \text{yr} \times \text{PV}}{\sum \text{PV}}$$

Yr	CI	DF @ 8%	PV	Yr x PV
1	14	0.926	12.964	12.964
2	14	0.857	11.998	23.996
3	14	0.794	11.116	33.348
4	14	0.735	10.29	41.16
5	114	0.681	77.634	388.17
			CMP = 124.002	499.638

$$\therefore, \text{Duration} = \frac{499.638}{124.002}$$

$$= 4.029 \text{ years}$$

$$(ii) \text{ Conversion Purity Price} = \frac{124.002}{20}$$

$$= ₹6.2$$

Question 18

XYZ company has current earnings of ₹ 3 per share with 5,00,000 shares outstanding. The company plans to issue 40,000, 7% convertible preference shares of ₹ 50 each at par. The preference shares are convertible into 2 shares for each preference shares held. The equity shares has a current market price of ₹ 21 per share.

- What is preference share's conversion value?
- What is conversion premium?
- Assuming that total earnings remain the same, calculate the effect of the issue on the basis earning per share
 - before conversion
 - after conversion
- If profit after tax increase by ₹ 1 million what will be the basic EPS
 - before conversion
 - on a fully diluted basis?

Answer:

- Conversion value of preference share**

Conversion Ratio x Market Price

$$2 \times ₹ 21 = ₹ 42$$

(ii) Conversion Premium

$$\frac{₹50}{₹42} - 1 = 19.05\%$$

(iii) Effect of the issue on basic EPS

	₹
Before Conversion	
Total (after tax) earnings ₹ 3 × 5,00,000	15,00,000
Dividend on Preference shares	1,40,000
Earnings available to equity holders	13,60,000
No. of shares	5,00,000
EPS	2.72
On Diluted Basis	
Earnings	15,00,000
No of shares (5,00,000 + 80,000)	5,80,000
EPS	2.59

(iv) EPS with increase in Profit

	₹
Before Conversion	
Earnings	25,00,000
Dividend on Pref. shares	1,40,000
Earning for equity shareholders	23,60,000
No. of equity shares	5,00,000
EPS	4.72
On Diluted Basis	
Earnings	25,00,000
No. of shows	5,80,000
EPS	4.31

Question 19

RBI sold a 91-day T-bill of face value of ₹ 100 at an yield of 6%. What was the issue price?

Answer:

Let the issue price be X

By the terms of the issue of the T-bills:

$$6\% = \frac{100 - x}{x} \times \frac{365}{91} \times 100$$

$$\frac{6 \times 91 \times x}{36,500} = (100 - x)$$

$$0.01496 x = 100 - x$$

$$x = \frac{100}{1.01496} = ₹ 98.53$$

Question 20

Wonderland Limited has excess cash of ₹ 20 lakhs, which it wants to invest in short term marketable securities. Expenses relating to investment will be ₹ 50,000.

The securities invested will have an annual yield of 9%.

The company seeks your advice

- (i) as to the period of investment so as to earn a pre-tax income of 5%. (discuss)
- (ii) the minimum period for the company to breakeven its investment expenditure overtime value of money.

Answer:

- (i) Pre-tax Income required on investment of 20,00,000

Let the period of Investment be 'P' and return required on investment 1,00,000
(20,00,000 × 5%)

Accordingly,

$$(\₹ 20,00,000 \times \frac{9}{100} \times \frac{P}{12}) - 50,000 = ₹ 1,00,000$$

$$P = 10 \text{ months}$$

- (ii) Break-Even its investment expenditure

$$(\₹ 20,00,000 \times \frac{9}{100} \times \frac{P}{12}) - 50,000 = 0$$

$$P = 3.33 \text{ months}$$

Question 21

Z Co. Ltd. issued commercial paper worth ₹10 crores as per following details:

Date of issue	: 16th January, 2019
Date of maturity	: 17th April, 2019
No. of days	: 91
Interest rate	: 12.04%

What was the net amount received 12.04% p.a. by the company on issue of CP? (Charges of intermediary may be ignored)

Answer:

The company had issued commercial paper worth 10 crores

No. of days Involved = 91 days

Interest rate applicable = 12.04 % p.a.

Interest for 91 days = $12.04\% \times \frac{91 \text{ Days}}{365 \text{ Days}} = 3.002\%$

= or 10 crores $\times \frac{3.002}{100 + 3.002} = 29,14,507$

= or 29.14507 Lakhs

∴ Net amount received at the time of issue :- 10.00 Crores - 0.29151 Crores
= 9.70849 Crores

Alternatively, it can also be computed as follows:

Price = $\frac{\text{₹ 10 Crores}}{\left(1 + 12.04\% \times \frac{91 \text{ Days}}{365 \text{ Days}}\right)} = \text{₹ 9.70855 Crores}$

Question 22

Bank A enter into a Repo for 14 days with Bank B in 10% Government of India Bonds 2028 @ 5.65% for ₹ 8 crore. Assuming that clean price (the price that does not have accrued interest) be ₹ 99.42 and initial Margin be 2% and days of accrued interest be 262 days. You are required to determine

- Dirty Price
- Repayment at maturity. (Consider 360 days in a year)

Answer:

(i) Dirty Price

= Clean Price + Interest Accrued

$$= 99.42 + 100 \times \frac{10}{100} \times \frac{262}{360} = 106.70$$

(ii) First Leg (Start Proceed)

$$= \text{Nominal Value} \times \frac{\text{Dirty Price}}{100} \times \frac{100 - \text{Initial Margin}}{100}$$

$$= 8,00,00,000 \times \frac{106.70}{100} \times \frac{100 - 2}{100} = 8,36,52,800$$

$$\text{Second Leg (Repayment at Maturity)} = \text{Start Proceed} \times \left(1 + \text{Repo rate} \times \frac{\text{No. of days}}{360} \right)$$

$$= 8,36,52,800 \times \left(1 + 0.0565 \times \frac{14}{360} \right) = 8,38,36,6040$$