

CHAPTER – 11

SECURITY VALUATION

(I) BOND PRICING OR BOND VALUATION**Question – 01**

M/s Agfa Industries is planning to issue a debenture series on the following terms:

Face Value	₹ 100
Term of maturity	10 years

Yearly coupon rate

Years	
1 – 4	9%
5 – 8	10%
9 – 10	14%

The current market rate on similar debentures is 15 per cent per annum. The Company proposes to price the issue in such a manner that it can yield 16 per cent compounded rate of return to the investors. The Company also proposes to redeem the debentures at 5 per cent premium on maturity. Determine the issue price of the debentures.

Solution:**Issue Price of Bond**

Years	CF	PVF (16%)	PV
1 – 4	₹ 9	2.798	25.18
5 – 8	₹ 10	1.545	15.45
9 – 10	₹ 14	0.490	6.86
10	105	0.227	23.84
		Issue Price	71.33

Question – 02

Nominal value of 10% bonds issued by a company is ₹ 100. The bonds are redeemable at ₹ 110 at the end of year 5. Determine the value of the bond if required yield is (i) 5%, (ii) 5.1%, (iii) 10% and (iv) 10.1%.

(SM TYK – 19)

Solution:

Case 1: Required yield rate = 5%

Year	Cash flow ₹	DF (5%)	Present Value (₹)
1 – 5	10	4.3295	43.295
5	110	0.7835	86.185
Value of bond			129.48

Case 2: Required yield rate = 5.1%

Year	Cash flow ₹	DF (5.1%)	Present Value(₹)
1-5	10	4.3175	43.175
5	110	0.7798	85.778
Value of bond			128.95

Case 3: Required yield rate = 10%

Year	Cash flow ₹	DF (10%)	Present Value (₹)
1-5	10	3.7908	37.908
5	110	0.6209	68.299
Value of bond			106.207

Case 4: Required yield rate = 10.1%

Year	Cash flow ₹	DF (10.1%)	Present Value (₹)
1-5	10	3.7811	37.811
5	110	0.6181	67.991
Value of bond			105.802

Question – 03

John inherited the following securities on his uncle's death:

Types of Security	Nos.	Annual Coupon %	Maturity Years	Yield %
Bond A (₹ 1,000)	10	9	3	12

Bond B (₹ 1,000)	10	10	5	12
Preference shares C (₹ 100)	100	11	*	13*
Preference shares D (₹ 100)	100	12	*	13*

*Likelihood of being called at a premium over par.

Compute the current value of his uncle's portfolio.

Solution:

Value of Portfolio

Bond A	= (900 × 2.402) + (10,000 × 0.712)	= ₹ 9,282
Bond B	= (1,000 × 3.605) + (10,000 × 0.567)	= ₹ 9,275
Preference shares C	= 10,000 × 11% = $\frac{₹ 1,100}{13\%}$	= ₹ 8,462
Preference shares D	= 10,000 × 12% = $\frac{₹ 1,200}{13\%}$	= ₹ 9,231
Value of portfolio		= ₹ 36,250

(II) BOND YIELD

QUESTION – 04

Based on the credit rating of bonds, Mr. Z has decided to apply the following discount rates for valuing bonds:

Credit Rating	Discount Rate
AAA	364 day T bill rate + 3% spread
AA	AAA + 2% spread
A	AAA + 3% spread

He is considering to invest in AA rated, ₹ 1,000 face value bond currently selling at ₹ 1,025.86. The bond has five years to maturity and the coupon rate on the bond is 15% p.a. payable annually. The next interest payment is due one year from today and the bond is redeemable at par. (Assume the 364 day T-bill rate to be 9%). You are required to calculate the intrinsic value of the bond for Mr. Z. Should he invest in the bond? Also calculate the current yield and the Yield to Maturity (YTM) of the bond.

Solution:

AA Rated:

Discounting Rate = $9 + 3 + 2 = 14\%$

(1) Calculation of IV_0

$$\begin{aligned} &= (150 \times PVAF, 14\%, 5) + (1,000 \times PVF, 14\%, 5) \\ &= (150 \times 3.433) + (1,000 \times 0.5194) \\ &= ₹ 1,034.35 \end{aligned}$$

Sine bond is under priced, hence it should be purchased.

(2) Current Yield

$$\begin{aligned} &= \frac{\text{Coupon}}{\text{CMP}} \times 100 \\ &= \frac{₹ 150}{₹ 1,025.86} \times 100 \\ &= 14.62\% \end{aligned}$$

(3) YTM

$$\begin{aligned} &= \frac{I + \left(\frac{F-P}{n}\right)}{\frac{F+P}{2}} \times 100 \\ &= \frac{150 + \left(\frac{1,000 - 1,025.86}{5}\right)}{\frac{1,000 + 1,025.86}{2}} \times 100 \\ &= 14.30\% \text{ p.a.} \end{aligned}$$

Note: Alternative IRR method can be used.

Question – 05

Calculate Market Price of:

- (i) 10% Government of India security currently quoted at ₹ 110, but yield is expected to go up by 1%.

- (ii) A bond with 7.5% coupon interest, Face Value ₹ 10,000 & term to maturity of 2 years, presently yielding 6% Interest payable half yearly.

(SM TYK – 21)

Solution:

(i) Yield:

Assumed FV of bond is ₹ 100

Interest Amount = ₹ 10

Assumed Yield = Current Yield

$$\text{Existing Current Yield} = \frac{\text{₹ 10}}{\text{₹ 110}} \times 100 = 9.09\%$$

$$\text{Revised Yield} = 9.09\% + 1\% = 10.09\%$$

$$\text{Bond price} = \frac{\text{₹ 10}}{\text{₹ 10.09\%}} = \text{₹ 99.11}$$

Note: Discounting rate के बढ़ने से Bond Price कम हो जाता है।

(ii) Calculation of Value of Bond:

Note: YTM Formula के Method से CMP Answer approx. में आता है & therefore don't do from this formula for calculating CMP.

$$\begin{aligned} \text{CMP} &= (\text{₹ 375} \times \text{PVAF, 4, 3\%}) + (1,000 \times \text{PVF, 4, 3\%}) \\ &= (375 \times 3.717) + (1,000 \times 0.888) \\ &= \text{₹ 10,274} \end{aligned}$$

Question – 06

An investor is considering the purchase of the following bond:

Face value ₹ 100

Coupon rate 11%

Maturity 3 years

- (i) If he wants a yield of 13% what is the maximum price he should be ready to pay for?
- (ii) If the Bond is selling for ₹ 97.60, what would be his yield?

(SM TYK – 20)**Solution:****(i) Calculation of Maximum Price**

$$\begin{aligned}
 IV_0 &= ₹ 11 \times PVIFA (13\%,3) + ₹ 100 \times PVIF (13\%,3) \\
 &= (₹ 11 \times 2.361) + (₹ 100 \times 0.693) \\
 &= ₹ 25.97 + ₹ 69.30 \\
 &= ₹ 95.27
 \end{aligned}$$

(ii) Calculation of Yield

$$\begin{aligned}
 \text{At 12\% the value} &= ₹ 11 \times PVIFA (12\%,3) + 100 \times PVIF (12\%,3) \\
 &= (₹ 11 \times 2.402) + (₹ 100 \times 0.712) \\
 &= ₹ 26.42 + ₹ 71.20 \\
 &= ₹ 97.62
 \end{aligned}$$

It the bond is selling at ₹ 97.60 which is more than the fair value, the YTM of the bond would be less than 13%. This value is almost equal to the amount price of ₹ 97.60.

Therefore, the YTM of the bond would be 12%.

Alternatively

$$\begin{aligned}
 YTM &= \frac{₹ 11 + \frac{(₹ 100 - ₹ 97.60)}{3}}{\frac{(₹ 100 + ₹ 97.60)}{2}} \\
 &= 0.1194 \text{ or } 11.94\% \text{ say } 12\%
 \end{aligned}$$

Note: अगर Question में Factors दिया है तो YTM निकालने के लिए IRR Method ही Use होगा, अगर Factor नहीं दिया है तो किसी भी Method से YTM निकाला जा सकता है।

Question – 07

There is a 9% 5-year bond issue in the market. The issue price is ₹ 90 and the redemption price ₹ 105. For an investor with marginal income tax rate of 30% and capital gains tax rate of 10% (assuming no indexation), what is the post-tax yield to maturity?

Solution:

$$\begin{aligned} \text{YTM} &= \frac{I(1-t) + \left(\frac{RV^* - P}{n}\right)}{\frac{RV^* + P}{2}} \times 100 \\ &= \frac{9(1-0.30) + \left(\frac{103.50 - 90}{5}\right)}{\frac{103.50 + 90}{2}} \times 100 \\ &= 9.30\% \text{ p.a.} \end{aligned}$$

RV = 105

Capital gain tax $[105 - 90] \times 10\% = 1.50$

RV* = 105 - 1.5 = 103.50

Question – 08

On 31st March, 2013, the following information about Bonds is available:

Name of Security	Face Value ₹	Maturity Date	Coupon Rate	Coupon Date (s)
Zero coupon T-Bill	10,000	31 st March, 2023	N.A.	N.A.
10.71% GOI 2023	1,00,000	20 th June, 2013	N.A.	N.A.
10% GOI 2018	100	31 st March, 2023	10.71	31 st March
	100	31 st March, 2018	10.00	31 st March & 30 th September

Calculate:

- (i) If 10 years yield is 7.5% p.a. what price the Zero Coupon Bond would fetch on 31st March, 2013?
- (ii) What will be the annualized yield if the T-Bill is traded @ 98500?
- (iii) If 10.71% GOI 2023 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March)

- (iv) If 10% GOI 2018 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March)?

Solution:**(i) Price of ZCB**

$$\begin{aligned}\text{Price} &= ₹ 10,000 \times \text{PVF}, 7.5\%, 10 \\ &= 10,000 \times 0.485 \\ &= ₹ 4,850\end{aligned}$$

(ii) Annualized yield

$$\begin{aligned}\text{Annualized yield} &= \frac{1,00,000 - 98,500}{98,500} \times 100 \times \frac{365}{81} \\ &= 6.86\% \text{ p.a.}\end{aligned}$$

(iii) Price of Bond

$$\begin{aligned}\text{Price} &= (₹ 10.71 \times \text{PVAF}, 8\%, 10) + (₹ 100 \times \text{PVF}, 8\%, 10) \\ &= (₹ 10.71 \times 6.710) + (₹ 100 \times 0.463) \\ &= ₹ 118.16\end{aligned}$$

(iv) Price of Bond

$$\begin{aligned}\text{Price} &= (₹ 5 \times \text{PVAF}, 4\%, 10) + (₹ 100 \times \text{PVF}, 4\%, 10) \\ &= (₹ 5 \times 8.111) + (₹ 100 \times 0.676) \\ &= ₹ 108.16\end{aligned}$$

Question – 09

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.

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

(RTP November – 2020)

Solution:

Calculation of YTM

$$(6\%) \text{ Price} = (\text{₹ } 95 \times 6.801) + (1,000 \times 0.592) = \text{₹ } 1,238.10$$

$$(8\%) \text{ Price} = (\text{₹ } 95 \times 6.246) + (1,000 \times 0.500) = \text{₹ } 1,093.37$$

Interpolation

6%	-----	₹ 1,238.10
8%	-----	₹ 1,093.37
2%		₹ 144.73

$$\begin{aligned} \text{YTM} &= 6 + \left(\frac{2}{144.73} \times (1,238.10 - 1,125.75) \right) \\ &= 7.55\% \text{ p.a.} \end{aligned}$$

Prevailing invest rate of similar debenture should be 7.55% p.a.

Question – 10

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.

(Exam Nov – 2022)

Solution:

(1) Value of Bond

(i) Discount Rate = 9%

$$\begin{aligned} IV_0 &= (\text{₹ } 8 \times 3.890) + (100 \times 0.650) \\ &= \text{₹ } 96.12 \end{aligned}$$

(ii) Discount Rate = 7%

$$\begin{aligned} IV_0 &= (\text{₹ } 8 \times 4.100) + (100 \times 0.713) \\ &= \text{₹ } 104.10 \end{aligned}$$

(iii) Discount Rate = 8.25%

$$\begin{aligned} IV_0 &= (\text{₹ } 8 \times 3.967) + (100 \times 0.673) \\ &= \text{₹ } 99.04 \end{aligned}$$

(iv) Discount Rate = 7.75%

$$\begin{aligned} IV_0 &= (\text{₹ } 8 \times 4.019) + (100 \times 0.689) \\ &= \text{₹ } 101.05 \end{aligned}$$

(2) Effective Yield

$$\begin{aligned} \text{Price of Bond} &= \text{₹ } 100 + 1\% \\ &= \text{₹ } 101 \end{aligned}$$

YTM is a rate at which price of bond is ₹ 101 hence YTM = 7.75%

(3) Transaction Cost

$$= \text{₹ } 1,00,000 \times 2\% = \text{₹ } 2,000$$