RM

CA - FINAL

CHAPTER: BOND VALUATIONS AND ANALYSIS

SFM - COMPILR

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Bond Analysis and Valuation

Years	May		Nov	
	RTP	Paper	RTP	Paper
2008	NA	NA	Yes	Yes
2009	Yes	Yes	Yes	Yes
2010	Yes	Yes	Yes	Yes
2011	Yes	NO	Yes	Yes
2012	Yes	NO	Yes	Yes
2013	Yes	Yes	No	Yes
2014	Yes	Yes	No	No
2015	Yes	Yes	Yes	Yes
2016	Yes	Yes	Yes	Yes
2017	Yes	Yes	Yes	No
2018 (Old)	Yes	Yes	Yes	Yes
2018 (New)	Yes	Yes	No	Yes

2008

Question 1 - Nov RTP 2008

The following data are available for a bond

Face value	Rs. 1,000
Coupon Rate	15%
Years to Maturity	6
Redemption value	Rs.1,000
Yield to maturity	17%

What is the current market price, duration and volatility of this bond? Calculate the expected market price, if increase in required yield is by 75 basis points.

Solution

(1) Current Market Price = PV of Coupons + PV of Redemption

= 150 (PVIFA 17,6) + 1,000 (PVIFA 17,6)

= 150 (3.589) + 1,000 (0.390)

= 538.35 +390 = 928.35

(2) Duration

Year	Cash flow	P.V. @ 17%		Proportion of bond	Proportion of bond

				value	value x time (years)
1	150	.855	128.25	0.138	0.138
2	150	.731	109.65	0.118	0.236
3	150	.624	93.60	0.101	0.302
4	150	.534	80.10	0.086	0.345
5	150	.456	68.40	0.074	0.368
6	1150	.390	448.50	0.483	2.898
			928.50	1.000	4.288

Duration of the Bond is 4.288 years

3. Volatility $= \frac{\text{Duration}}{\text{YTM Factor}} = \frac{4.288}{1.17} = 3.67$

4. The expected market price if increase in required yield is by 75 basis points.

   = Rs.928.35 Rs.75 (3.67/100) = Rs.25.553

   then the market price will be = Rs.928.35 – 25.553 = Rs.902.797

   Hence, the market price will decrease

Question 2 **Nov 2008 – RTP**

The Investment portfolio of a REG EPF Trust is as follows:

Government Bond	Coupon Rate	Purchase rate (F.V. Rs. 100 per Bond)	Duration (Years)
G.O.I. 2008	11.68	106.50	3.50
G.O.I. 2012	7.55	105.00	6.50
G.O.I. 2017	7.38	105.00	7.50
G.O.I. 2024	8.35	110.00	8.75
G.O.I. 2034	7.95	101.00	13.00

Face value of total Investment is Rs.5 crores in each Government Bond.

Calculate actual Investment in portfolio.

What is a suitable action to churn out investment portfolio in the following scenario?

1. Interest rates are expected to lower by 25 basis points.
2. Interest rates are expected to raise by 75 basis points.

Also calculate the revised duration of investment portfolio in each scenario.

Solution

Calculation of Actual investment of Portfolio

Security	Purchase price	Investment (Rs. in lakhs)
G.O.I. 2008	106.50	532.50*
G.O.I. 2012	105.00	525.00
G.O.I. 2017	105.00	525.00
G.O.I. 2024	110.00	550.00
G.O.I. 2034	101.00	505.00
Total		**2,637.50**

$\frac{\text{Rs.5 crores}}{\text{Rs.100 x 100000}}$ = Rs.106.50

Average Duration = $\frac{3.5 + 6.5 + 7.5 + 8.75 + 13.00}{5}$ = 7.85

Suitable action to churn out investment portfolio in following scenario.

To reduce risk and to maximize profit or minimize losses.

(1) Interest rates are expected to be lower by 25 basis points in such case increase the average duration by purchasing GOI 2034 and Disposing of GOI 2008.

Revised Average Duration shall be = $\frac{39.25 - 3.5 + 13.00}{5}$ = 9.75 years

(2) Interest rates are expected to rise by 75 basis points in such case reduce the average duration by (*) Purchasing GOI 2012 and disposing of GOI 2034.

Revised Average Duration shall be = $\frac{39.25 - 13.00 + 3.50}{5}$ = 6.55 years

(*) Purchasing of GOI 2008 is not beneficial as maturity period is very short and 75 basis points is comparatively higher change.

Question 3 - Nov 2008 Paper – 4 Marks

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 Rs.1,000.

Solution

(i) Implicit rate of Interest for Year 2 and Year 3

For Year 2 $= \frac{(1 + r^2)^2}{(1 + r^1)} - 1$

$= \frac{(1.1125)^2}{(1.1050)} - 1 = 12\%$

For Year 3 $= \frac{(1 + r^3)^3}{(1 + r^1)(1 + f^2)} - 1$

$= \frac{(1.12)^3}{(1.1125)^2} - 1 = 13.52\%$

(ii) If fairly priced at Rs.1000 and rate of interest increases to 12.5% the percentage charge will be as follows:

Price $= \frac{1000(1\ 12)^5}{(1.125)^5} = \text{Rs. } 978$

% Change $= \frac{1000 - 978}{1000} \times 100 = 2.2\%$

Question 4 - Nov 2008 Paper – 6 Marks

XL Ispat Ltd. Has made an issue of 14 % non – convertible debentures on Jan 1, 2007. These debentures have a face value of Rs.100 and is currently traded in the market at a price of Rs.90.

Interest on these NCDs will be paid through post-dated cheques dated June 30 and December 31. Interest payments for the first 3 years will be paid in advance through post-dated cheques while for the last 2 years post-dated cheques will be issued at the third year. The bond is redeemable at par on December 31, 2011 at the end of 5 years.

Required

i. Estimate the current yield at the YTM of the Bond.

ii. Calculate the duration of the NCD

iii. Assuming that intermediate coupon payments are, not available for reinvestment calculate the realized yield on the NCD.

Solution

IV = P.V. of coupons + P.V. of Redemption

= 160 × PVIFA (17%, 6) + 1000 × PVIF (17%, 6)

= 160 × 3.6847 + 1000 × 0.319

= 589.56 + 410

= Rs.999.56/-

Year	CF	DF	DCF	Wx
1	160	0.855	136.8	136.8

2	160	0.731	116.96	233.92
3	160	0.624	99.24	297.72
4	160	0.534	85.44	341.76
5	160	0.456	72.96	364.8
6	1160	0.39	452.4	2714.4
			963.8	4089.4

$$D = \frac{\sum Wx}{\sum W} = \frac{4089.4}{963.8} = 4.24 \text{ years}$$

$$MD = \frac{D}{\text{YTM Factgor}} = \frac{4.24}{1.17} = 3.63\%$$

Except market price if required yield increases by 75 basis pts.

IV = 967.85 – (0.75 × 3.63)%

= 967.87 – 2.7225%

= Rs.937.56/-

Duration

Short cut formula = YR × AF × YTM Factor + (1 – yr) × n

YR = Yield Ratio = $\frac{CY}{YTM}$

AF = Annuity factor

n = period

Question 5 **Nov 2008 Paper – 8 Marks**

The data given below relates to a convertible bond :

Face value	Rs.250
Coupon rate	12%
No. of shares per bond	20
Market price of share	Rs.12
Straight value of bond	Rs.235
Market price of convertible bond	Rs.265

Calculate :

(i) Stock value of bond. (ii) The percentage of downside risk.

(iii) The conversion premium (iv) The conversion parity price of the stock.

Solution

(i) Stock value or conversion value of bond 12 × 20

= Rs.240

(ii) percentage of the downside risk

$= \frac{265 - 235}{235} \times 100 = 12.77\%$

This ratio gives the percentage price decline experienced by the bond if the stock becomes worthless.

(iii) Conversion Premium

$$= \frac{\text{Market Price} - \text{Converion Value}}{\text{Conversion Value}} \times 100$$

$$= \frac{265 - 240}{240} \times 100 = 10.42\%$$

(iv) Conversion Parity Price

$$= \frac{\text{Bond Price}}{\text{No of shares on Conversion}}$$

= 265 / 20 = Rs.13.25

This indicates that if the price of shares rises to Rs.13.25 from Rs.12 the investor will neither gain nor lose on buying the bond and exercising it. Observe that Rs.1.25 (13.25– 12.00) is 10.42% of Rs.12, the Conversion Premium.

2009

Question 6 **May 2009 RTP**

A 9% 5 years bond is issued in the market at Rs.90 and redemption price Rs.105. For an investor with marginal income tax rate of 30% and capital gain tax 10% (assuming no indexation), what is the post-tax yield to maturity ?

Solution

I = 100 × 9% × 0.7 = 6.3

CGT = (105 – 90) × 10% = 1.5

F = 105 – 1.5 = 103.5

$$\text{YTM} = \frac{I + \frac{F - P}{n}}{\frac{F + P}{2}} = \frac{6.3 + \frac{103.5 - 90}{5}}{\frac{103.5 + 90}{2}} = 9.30\%$$

Question 7 **May 2009 Paper – 6 Marks**

ABC Ltd. has Rs.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 Rs.300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be Rs.6 million and the call premium is 4 per cent. Rs.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.

Solution

Initial Cash Movements

A)	Net proceeds of fresh issue (300 – 6)	294
B)	Redemption of old bonds	(312)
C)	Tax shield on bond premium (12 × 30%)	3.6
D)	Tax shield on unamortised portion of issue cost (9 × 0.3)	2.7

(11.7)

Recurring cash flows

	Old	New
A) Post tax coupon	25.2	21
B) Tax shield on unamortized discount, floating cost	0.45	0.3
	$(9 \times \frac{1}{6} \times 0.3)$	$(6 \times \frac{1}{6} \times 0.3)$
	24.75	20.7
	4.05	

= 4.05 × PVIFA (7%, 6)
= 4.05 × 4.767
= 19.30

Net Savings = 19.3
– 11.7
7.6

Since the decision is Positive we should go ahead with bond refunding decision

Question 8 **May 2009 Paper – 20 Marks**

(a) Consider two bonds, one with 5 years to maturity and the other with 20 years to maturity. Both the bonds have a face value of Rs.1,000 and coupon rate of 8% (with annual interest payments) and both are selling at par. Assume that the yields of both the bonds fall to 6%, whether the price of bond will increase or decrease? What percentage of this increase/decrease comes from a change in the present value of bond's principal amount and what percentage of this increase/decrease comes from a change in the present value of bond's interest payments?

(b) Consider a bond selling at its par value of As. 1.000, with 6 years to maturity and a 7% coupon rate (with annual interest payment), what is bond's duration?

(c) If the YTM of the bond in (b) above increases to 10%, how it affects the bond's duration?

And why?

(d) Why should the duration of a coupon carrying bond always be less than the time to its maturity?

Solution

A) Since bond is trading at par, redeemable at pat

CY = YTM = Coupon = 8%

5 Yr. Bond

Yield	P.V. of coupon	+	P.V. of redemption	=	Bond
8%	319.42	+	680.88	=	1000
	(80 × 3.99)		(1000 × 0.681)		

6%	336.99 (80 × 4.212)	+	747 (1000 × 0.747)	=	1089.99
Change	17.57		66.42		83.99
% Δ	20.92%		79.08%		100%

20 Yr Bond

Yield	P.V. of coupon	+	P.V. of redemption	=	Bond
8%	786 (80 × 9.818)	+	214 (1000 × 0.214)	=	1000
6%	917.6 (80 × 11.47)	+	312 (1000 × 0.312)	=	1229.6
Change	131.6		98		229.6
% Δ	57.32%		42.68%		100%

B) D = YR × AF × YTM Factor + (1 – YR)n $\because \frac{CY}{YTM} = 1$

= 4.767 × 1.07

= 5.1 yrs.

C) D = 4.8 yrs.

= 4.356 × 1.1

Question 9 - Nov 2009 RTP – Similar to - Question 3 - Nov 2008 Paper – 4 Marks

Question 10 – Nov 2009 RTP – Similar to - Question 4 - Nov 2008 Paper – 6 Marks

Question 11 - Nov 2009 Paper - 4 Marks

An investors is considering the purchase of the following Bond:

Face value Rs.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 Rs.97.60, what would be his yield?

Solution

Value of bond = P.V. of coupons + P.V. of redemption

= 11 × PVIFA (13%, 3) + 100 × PVIF (13%, 3)

= 11 × 2.3611 100 × 0.693

= Rs.95.27/-

$$\text{YTM} = \frac{I + \frac{F-P}{n}}{\frac{F+P}{2}} = \frac{11 + \frac{100-97.6}{3}}{\frac{100+97.6}{2}} = 11.94\%$$

2010

Question 12 **May 2010 RTP**

Phototech plc has in issue 9% bonds which are redeemable at their par value of £100 in five years' time. Alternatively, each bond may be converted on that date into 20 ordinary shares of the company. The current ordinary share price of Phototech plc is £4·45 and this is expected to grow at a rate of 6·5% per year for the foreseeable future. Phototech plc has a cost of debt of 7% per year.

Required:

Calculate the following current values for each £ 100 convertible bond:

(i) market value; (ii) floor value; (iii) conversion premium.

Solution

(a) Calculation of market value of each convertible bond

Expected share price in five years' time = £4·45 x(1·065)5 =£6·10

Conversion value = £6·10 x 20 =£122

Compared with redemption at par value of £100, conversion will be preferred

The current market value will be the present value of future interest payments, plus the present value of the conversion value, discounted at the cost of debt of 7% per year.

Market value of each convertible bond = (£ 9 x 4·100) + (£ 122 x 0·713)

= £123·89

Calculation of floor value of each convertible bond

The current floor value will be the present value of future interest payments, plus the present value of the redemption value, discounted at the cost of debt of 7% per year.

Floor value of each convertible bond = (£ 9 x 4·100) + (£ 100 x 0·713)

= £108·20

Calculation of conversion premium of each convertible bond

Current conversion value = £ 4·45 x 20 =£89·00

Conversion premium = £123·89–£89·00 =£34·89

This is often expressed on a per share basis,

i.e.£34·89/20 =£1·75 per share

Question 13 **May 2010 RTP**

On 1 June 2003 the financial manager of Gadgets Corporation's Pension Fund Trust is reviewing strategy regarding the fund. Over 60% of the fund is invested in fixed rate long-term bonds. Interest rates are expected to be quite volatile for the next few years.

Among the pension fund's current investments are two AAA rated bonds:

1) Zero coupon June 2018

2) 12% Gilt June 2018 (interest is payable semi-annually)

The current annual redemption yield (yield to maturity) on both bonds is 6%. The semi-annual yield may be assumed to be 3%. Both bonds have a par value and redemption value of $100.

Required:

Estimate the market price of each of the bonds if interest rates (yields):

(i) increase by 1%; (ii) decrease by 1%.

[Given PVF (2.5%, 30) = 0.4767, PVF (3%, 30) = 0.412, PVF (3.5%,30) = 0.3563]

Solution

The current market prices of the two bonds may be estimated to be:

Zero coupon $= \frac{\$100}{(1.06)^{15}} = \$\ 41.73$

12% gilt with a semi-annual coupon

Present value of an annuity for 30 periods at 3% is $\frac{1-(1.03)^{-30}}{0.03} = 9.6004$

	$
Present value of interest payments $6×19·6004	= 117·60
Present value of redemption using PVF (3%, 30) [$100×0·4120]	= 41·20
	158·80

(i) If interest rates increase by 1%

Zero coupon $= \frac{\$100}{(1.07)^{15}} = \$\ 36.25$ a decrease of $5·48 or 13·1%

12% gilt

Present value of an annuity for 30 periods at 3.5% is $\frac{1-(1.025)^{-30}}{0.035} = 18.3920$

	$
Present value of interest payments $6×18·3920	= 110·35
Present value of redemption using PVF (3.5%, 30) [$100×0·3563]	= 35·63
	145·98

This is a decrease of $12·82 or 8·1%

(ii) If interest rates decrease by 1%

Zero coupon $= \frac{\$100}{(1.05)^{15}} = \$\ 48.10$ an increase of $6·37 or 15·3%

12% gilt

Present value of an annuity for 30 periods at 2.5% is $\frac{1-(1.025)^{-30}}{0.025}$ = 20.9303

	$
Present value of interest payments $6 × 20·9303	= 125·58
Present value of redemption using PVF (2.5%, 30) [$100 × 0·4767]	= 47·67
	173·25

This is a decrease of $12·82 or 8·1%

Question 14 **May 2010 Paper – 8 Marks**

Consider the following data for government securities

Face value	Interest (Rate %)	Maturity (Years)	Current Price (Rs.)
1,00,000	0	1	90,000
1,00,000	10.5	2	98,000
1,00,000	11.0	3	98,500
1,00,000	11.5	4	98,900

Calculate the forward interest rates.

Solution

Bond A $90000 = \frac{100000}{(1+r_{01})}$

$r01 = \frac{100000}{90000} - 1 = 11.11\%$

Bond B $98000 = \frac{10500}{(1+r_{01})} + \frac{110500}{(1+r_{02})^2} +$

$98000 - 9450.1 = \frac{110500}{(1+r_{02})^2}$

$r02 = \left(\frac{110500}{88549.9}\right)^{\frac{1}{2}} - 1 = 11.71\%$

Bond C $98500 = \frac{11000}{(1+r_{01})} + \frac{11000}{(1+r_{02})^2} + \frac{11000}{(1+r_{03})^3}$

$98500 - 9900.1 - 8814.72 = \frac{11000}{(1+r_{03})^3}$

$r03 = \left(\frac{111000}{79785.18}\right)^{\frac{1}{3}} 1 = 11.64\%$

Bond D $98900 = \frac{11500}{(1+r_{01})} + \frac{11500}{(1+r_{02})^2} + \frac{11500}{(1+r_{03})^3} + \frac{111500}{(1+r_{04})^4}$

$98900 - 10350.1 - 9215.39 - 8264.91 = \frac{111500}{(1+r_{04})^4}$

$$r_{04} = \left(\frac{111500}{71069.6}\right)^{\frac{1}{4}} - 1$$

$$= 11.92\%$$

Term Structure

Bond	Maturity	Rate
A	1	11.11
B	2	11.71
C	3	11.64
D	4	11.92

$$f_{12} = \frac{(1.1171)^2}{1.1111}) - 1 = 12.31\%$$

$$f_{13} = \sqrt{\left[\frac{(1.1164)^3}{1.1171}\right]} - 1 = 11.90\%$$

$$f_{14} = \left[\frac{(1.1192)^4}{1.1111}\right]^{\frac{1}{3}} - 1 = 12.19\% \ [1]$$

$$f_{23} = \frac{(111.64)^3}{(111.71)^2} - 1 = 11.5\%$$

$$f_{24} = \left[\frac{(1.1192)^4}{(1.1171)^2}\right]^{\frac{1}{2}} - 1 = 12.13\%$$

$$f_{34} = \frac{(1.1192)^4}{(1.1164)^3} - 1 = 12.76\%$$

Question 15 - Nov 2010 RTP

NewChem Corporation has issued a fully convertible 10% debenture of Rs.10,000 face value, convertible into 20 equity shares. The current market price of the debenture is Rs.10,800, whereas the current market price of equity share price is Rs.480.

You are required to calculate (i) the conversion premium and (ii) the conversion value.

Solution

As per the conversion terms 1 Debenture = 20 equity share (known as the conversion ratio.)

The conversion terms can also be expressed as: 1 Debenture of Rs.500 = 1 equity share.

(i) The conversion premium measures how much more expensive it is to buy the convertible debenture than the underlying equity share.

(ii) The cost of buying Rs.500 debenture (one equity share) is:

$$Rs.500 \times \frac{108}{100} = Rs.540$$

Comparing this with the cost of buying one equity share from market at Rs.480.

Thus, conversion premium is therefore:

$$\frac{540 - 480}{480} \times 100 = 12.5\%$$

Therefore, it is more expensive to buy the debenture and get it converted, than to purchase one equity share directly.

(iii) The conversion value is calculated as the market value of equity shares that is equivalent to one unit of the convertible debenture.

Conversion value = conversion ratio X MPS (equity shares)

= 20 x Rs.480

= Rs.9,600

From this calculation of conversion value, the conversion premium may also be calculated as below:

$$\frac{10800 - 9600}{9600} \times 100 = 12.5\%$$

Question 16 - Nov 2010 Paper – 5 Marks

Calculate Market Price of:

(i) 10% Government of India security currently quoted at 110 but interest rate 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.

Solution

Assuming Bond to be perpetual

i) Yield $= \frac{\text{Coupen}}{\text{MP}}$

$\therefore \quad = \frac{10}{110}$

$= 0.09\%$

New Yield = 9.09 + 1 = 10.09%

New Price $= \frac{10}{10.09\%}$

= Rs.99.11/-

ii) Value = P.V. of coupons + P.V. of redemption

= 375 × PVIFA (3%, 4) + 10000 × PVIF(3%, 4)

= 375 × 3.7171 + 10000 × 0.889

= Rs.10273.91/-

2011

Question 17 **May 2011 RTP**

ABC Ltd. has the following outstanding Bonds.

Bond	Coupon	Maturity
Series X	8%	10 Years
Series Y	Variable changes annually comparable To prevailing rate	10 Years

Initially these bonds were issued at face value of Rs.10,000 with yield to maturity of 8%.

Assuming that:

(i) After 2 years from the date of issue, interest on comparable bonds is 10%, then what should be the price of each bond?

(ii) If after two additional years, the interest rate on comparable bond is 7%, then what should be the price of each bond?

(iii) What conclusions you can draw from the prices of Bonds, computed above.

Solution

Here we shall compare two bonds, one with fixed copoun rate and another as per with prevailing interest rate.

(i) After 2 Years passed (8 years remaining) Value of Bond Series – X

= Rs. 800 PVIAF (10% ,8) + Rs.10,000 PVIF (10%, 8)

= Rs. 800 x 5.335 + Rs. 10,000 x 0.467

= Rs. 4,268 + Rs. 4,670 = Rs. 8,938

Since Bond-Series Y has a variable interest rates, so the interest amount will increase and decrease with the movement of interest rates. As given presently rate of interest is 10%, the value of Bond will be:

= Rs. 1,000 PVIAF (10%, 8) + Rs. 10,000 PVIF (10%, 8)

= Rs. 1,000 x 5.335 + Rs. 10,000 x 0.467

= Rs. 5,335 + Rs. 4,670 = Rs. 10,005

(ii) After 2 additional years at the yield rate of 7%, the value of Bond shall be as follows:

Bond-Series X

= Rs. 800 PVIAF (7%, 6) + Rs. 10,000 PVIF (7%, 6)

= Rs. 800 x 4.767 + Rs. 10,000 x 0.666

= Rs. 3,814 + Rs. 6,660

= Rs. 10,474

Bond-Series Y

= Rs.700 PVIF (7%, 6) + Rs.10,000 PVIF (7%, 6)

= Rs.700 x 4.767 + Rs.10,000 x 0.666

= Rs.3,337 + Rs.6,660 = Rs.9,997

(iii) From above prices it can be concluded that price of Bond-Series X moves inversely with change in interest rate. Whereas, the price of Bond Series Y does not fluctuate, reason being its interest (coupon) adjusted according to change in interest rates.

Question 18 **May 2011 RTP**

Pet feed plc has outstanding, a high yield Bond with following features:

Face Value	£ 10,000
Coupon	10%
Maturity Period	6 Years
Special Feature	Company can extend the life of Bond to 12 years.

Presently the interest rate on equivalent Bond is 8%.

(a) If an investor expects that interest will be 8%, six years from now then how much he should pay for this bond now.

(b) Now suppose, on the basis of that expectation, he invests in the Bond, but interest rate turns out to be 12%, six years from now, then what will be his potential loss/gain.

Solution

(i) If the current interest rate is 8%, the company will not extent the duration of Bond and the maximum amount the investor would ready to pay will be:

= £ 1,000 PVIAF (8%, 6) + £ 10,000 PVIF (8%, 6)

= £ 1,000 x 4.623 + £ 10,000 x 0.630

= £ 4,623 + £ 6,300

= £ 10,923

(ii) If the current interest rate is 12%, the company will extent the duration of Bond. After six years the value of Bond will be

= £ 1,000 PVIAF (12%, 6) + £ 10,000 PVIF (12%, 6)

= £ 1,000 x 4.111 + £ 10,000 x 0.507

= £ 4,111 + £ 5,070

= £ 9,181

Thus, potential loss will be £ 9,181 - £ 10,923 = £1,742

Question 19 Nov 2011 RTP – Similar to - Question 1 - Nov RTP 2008

Question 20 Nov 2011 RTP

M Ltd. has to make a payment on 30th January, 2011 of Rs.80 lakhs. It has surplus cash today, i.e. 31st October, 2010; and has decided to invest sufficient cash in a bank's Certificate of Deposit scheme offering an yield of 8% p.a. on simple interest basis. What is the amount to be invested now?

Solution

Calculation of Investment Amount

Amount required for making payment on 30th January, 2011=Rs.80,00,000

Investment in Certificates of Deposit (CDs) on 31st October, 2010

Rate of interest = 8% p.a.

No. of days to maturity = 91 days

Interest on Rs.1 of 91 days

(Rs.1 × 0.08 × 91/365) = 0.0199452

Amount to be received for Re. 1

(Rs.1.00 + Rs.0.0199452) = 1.0199452

Calculation of amount to be invested now to get Rs.80 lakhs after 91 days:

$$= \frac{Rs.80,00,000}{Rs.1.0199452}$$

= Rs.78,43,558.65

Question 21 – Nov 2011 RTP – Similar to Question 6 - May 2009 Paper 6 Marks

Question 22 - Nov 2011 Paper – 5 Marks

The six months forward price of a security is Rs.208.18. The rate of borrowing is 8 percent per annum payable at monthly rates. What will be the spot price?

Solution

Calculation of spot price

The formula for calculating forward price is: $A = P\left(1 + \frac{r}{n}\right)^{mn}$

Where A = Forward price

P = Spot Price

r = rate of interest

n = no. of compounding

n = time

Using the above formula,

208.18 = P (1 + 0.08/12) 6

Or 208.18 = P x 1.0409

P = 208.18/1.0409 = 200

Hence, the spot price should be Rs.200.

Question 23 **Nov 2011 Paper – 6 Marks**

Pineapple Ltd has issued fully convertible 12 percent debentures of Rs. 5,000 face value, convertible into 10 equity shares. The current market price of the debentures is Rs.5,400. The present market price of equity shares is Rs. 430.

Calculate:

(i) the conversion percentage premium, and

(ii) the conversion value

Solution

(i) As per the conversion terms 1 Debenture = 10 equity share and since face value of one debenture is Rs.5000 the value of equity share becomes Rs. 500 (5000/10).

The conversion terms can also be expressed as: 1 Debenture of Rs.500 = 1 equity share.

The cost of buying Rs. 500 debenture (one equity share) is:

$$= \text{Rs.}500 \times \frac{5400}{5000} = \text{Rs.}540$$

Market Price of share is Rs.430.

Hence conversion premium in percentage is:

$$= \frac{540 - 430}{430} \times 100 = 25.58\%$$

(ii) The conversion value can be calculated as follows:

Conversion value = Conversion ratio X Market Price of Equity Shares

= 10 × Rs.430 = Rs.4300

Question 24 - **Nov 2011 Paper – 8 Marks**

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 T Bill rate + 3% Spread
AA	AAA + 2% Spread
A	AAA + 3% Spread

He is considering to invest in AA rated, Rs.1,000 face value bond currently selling at Rs.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 384 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

Value of bond = P.V. of coupons + P.V. of redemption

= 150 × PVIFA (14%, 5) + 1000 × PVIF(14%, 5)

$= 150 \times 3.433 + 1000 \times 0.519$

$= Rs.1034.36/-$

Current MP $= Rs.1025.86/-$

The bond is trading cheap, therefore the investor should go long.

$$CY = \frac{Coupen}{MP} \times 100$$

$$= \frac{150}{1025.86} \times 100$$

$$= 14.62\%$$

$$YTM = \frac{I + \frac{F - P}{n}}{\frac{F + P}{2}}$$

$$= \frac{150 + \frac{1000 - 1025.86}{5}}{\frac{1000 + 1025.86}{2}} = \frac{144.828}{1012.93}$$

$$= 14.3\%$$

2012

Question 25 - May 2012 RTP – Similar to - Question 4 - Nov 2008 Paper – 6 Marks

Question 26 - Nov 2012 RTP

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

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

You are required to calculate:

(a) Conversion Value of Debenture

(b) Market Conversion Price

(c) Conversion Premium per share

(d) Ratio of Conversion Premium

(e) Premium over Straight Value of Debenture

(f) Favourable income differential per share

(g) Premium pay back period

Solution

(a) Conversion Value of Debenture

= Market Price of one Equity Share X Conversion Ratio

= Rs.25 X 30 = Rs.750

(b) Market Conversion Price

$$= \frac{\text{Market Price of Convertible Debenture}}{\text{Convertion Ratio}} = \frac{900}{30} = \text{Rs.30}$$

(c) Conversion Premium per share

= Market Conversion Price – Market Price of Equity Share

= Rs.30 – Rs.25 = Rs.5

(d) 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

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

(f) Favourable income differential per share

$$= \frac{\text{Coupon Interest from Debenture} - \text{Convertion Ratio} - \text{Dividend Per Share}}{\text{Convertion Ratio}}$$

$$= \frac{85 - 30 - 1}{30} = \text{Rs. } 1.833$$

(g) Premium pay back period

$$= \frac{\text{Conversion Premium Per Share}}{\text{Favaourable Income Differential Per Share}} = \frac{5}{1.833} = 2.73 \text{ years}$$

Question 27 - Nov 2012 RTP – Similar to - Question 1 - Nov RTP 2008

Question 28 - Nov 2012 Paper – 5 Marks

Calculate the Current price and the Bond equivalent yield (using simple compounding) of a money market instrument with face value of Rs.100 and discount yield of 8% in 90 days. Take 1 year 360 days.

Solution

Let Current Price of Bond is V then

Rs.100 = V (1+r)t

Rs.100 = V (1+0.08)

Rs.100 = V (1.08)

V= Rs.92.59

Bond Equivalent Yield

$$\text{BEY} = \frac{100 - V}{V} \times \frac{300}{\text{Days of Maturity}}$$

$$\text{BEY} = \frac{100 - 92.59}{92.59} \times \frac{360}{90} = 32\%$$

2013

Question 29 - May 2013 RTP –Similar to-Question 26 - Nov 2012 RTP

Question 30 - May 2013 Paper – 6 Marks

M/s. Earth Limited has 11% bond worth of Rs.2 crores outstanding with 10 years remaining to maturity.

The company is contemplating the issue of a Rs.2 crores 10 year bond carring the coupon rate of 9% and use the proceeds to liquidate the old bonds.

The unamortized portion of issue cost on the old bonds is Rs.3 lakhs which can be written off no sooner the old bonds are called. The company is paying 30% tax and it's after tax cost of debt is 7%. Should Earth Limited liquidate the old bonds?

You may assume that the issue cost of the new bonds will be Rs.2.5 lakhs and the call premium is 5%.

Solution

1. Calculation of initial outlay:-

		Rs. (lakhs)
a.	Face value	200.00
	Add:-Call premium	10.00
	Cost of calling old bonds	210.00
b.	Gross proceed of new issue	200.00
	Less: Issue costs	2.50
	Net proceeds of new issue	197.50
c.	Tax savings on call premium and unamortized cost 0.30 (10 + 3)	Rs. 3.90 lakhs

∴ Initial outlay = Rs. 210 lakhs – Rs. 197.50 lakhs – Rs. 3.90 lakhs = Rs. 8.60 lakhs

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

Saving in annual interest expenses	**Rs. (lakhs)**
[Rs.200 x (0.11 – 0.09)]	4.000
Less:-Tax saving on interest and amortization 0.30 x [4+(3-2.5)/10]	1.215
Annual net cash saving	2.785
PVIFA (7%, 10 years)	7.024
∴Present value of net annual cash saving	Rs. 19.56 lakhs
Less:- Initial outlay	Rs. 8.60 lakhs

Net present value of refunding the bond Rs. 10.96 lakhs

Decision: The bonds should be refunded

Question 31 - Nov 2013 Paper – 5 Marks

ABC Ltd. issued 9%, 5 year bonds of Rs.1,000/- each having a maturity of 3 years. The present rate of interest is 12% for one year tenure. It is expected that Forward rate of interest for one year tenure is going to fall by 75 basis points and further by 50 basis points for every next year in further for the same tenure. This bond has a beta value of 1.02 and is more popular in the market due to less credit risk.

Calculate

(i) Intrinsic value of bond

(ii) Expected price of bond in the market

Solution

(i) Intrinsic Value of Bond = Pv of Coupon + Pv of Redemption

Forward rate of interests

1st Year	12%
2nd Year	11.25%
3rd Year	10.75%

$$\text{PV of Interest} = \frac{90}{1+0.12} + \frac{90}{(1+0.12)(1+0.1125)} + \frac{90}{(1+0.12)(1+0.1125)(1+0.1075)}$$

= Rs.217.81

$$\text{PV of Redemption} = \frac{1000}{(1+0.12)(1+0.1125)(1+0.1075)} = \text{Rs. } 724.67$$

IV = 217.81 + 724.67 = Rs. 942.48

(ii) Expected Price = Intrinsic Value x Beta Value

= Rs.948.48 x 1.02 = Rs.961.33

2014

Question 32 - May 2014 RTP

Mr. A is planning for making investment in bonds of one of the two companies X Ltd. and Y Ltd. The detail of these bonds is as follows:

Company	Face Value	Coupon Rate	Maturity Period
X Ltd.	Rs. 10,000	6%	5 Years
Y Ltd.	Rs. 10,000	4%	5 Years

The current market price of X Ltd.'s bond is Rs.10,796.80 and both bonds have same Yield To Maturity (YTM). Since Mr. A considers duration of bonds as the basis of decision making, you are required to calculate the duration of each bond and you decision.

Solution

To calculate duration of bond we need YTM, which shall be calculated as follows:

Let us try NPV @ 5%

$$= \frac{600}{(1.05)^1} + \frac{600}{(1.05)^2} + \frac{600}{(1.05)^3} + \frac{600}{(1.05)^4} + \frac{600}{(1.05)^5} - 10,796.80$$

= Rs. 571.43 + Rs. 544.22 + Rs. 518.30 + Rs. 493.62 + Rs. 8,305.38 – Rs. 10,796.80

= – Rs. 363.85

Let us now try NPV @ 4%

$$= \frac{600}{(1.04)^1} + \frac{600}{(1.04)^2} + \frac{600}{(1.04)^3} + \frac{600}{(1.04)^4} + \frac{600}{(1.04)^5} - 10,796.80$$

= Rs. 576.92 + Rs. 554.73 + Rs. 533.40 + Rs. 512.88 + Rs. 8,712.43 – Rs. 10,796.80

= Rs. 93.56

Let us now interpolation formula

$$\text{IRR} = \text{Lower Rate} + \frac{+NPV}{\sum NPV} \text{ x Difference of Rate}$$

$$4\% + \frac{93.56}{93.56 + 363.85} \text{ x } 1 = 4.20\%$$

Duration of X Ltd.' s Bond

Year	Cash Flows	P.V @ 4.2%		Proportion of Bond Value	Proportion of Bond Value x time (Years)
1	600	0.9597	575.82	0.0533	0.0533
2	600	0.9210	552.60	0.0512	0.1024
3	600	0.8839	530.34	0.0491	0.1473
4	600	0.8483	508.98	0.0472	0.1888
5	10600	0.8141	8,629.46	0.7992	3.9960
Total			**10,797.20**	**1.0000**	**4.4878**

Duration of the Bond is 4.4878 years say 4.9 years.

Duration of Y Ltd.'s Bond

Year	Cash Flows	P.V @ 4.2%		Proportion of Bond Value	Proportion of Bond Value x time (Years)
1	400	0.9597	383.88	0.0387	0.0387
2	400	0.9210	368.40	0.0372	0.0744
3	400	0.8839	353.56	0.0357	0.1071
4	400	0.8483	339.32	0.0342	0.1368
5	10400	0.8141	8,466.64	0.8542	4.2710
Total			**9,911.80**	**1.0000**	**4.6280**

Duration of the Bond is 4.6280 years say 4.63 years.

Decision: Since the duration of Bond of Y Ltd. is lower hence it should be preferred. However difference between the duration of bond is not much higher and with higher coupon rate of X Ltd.'s bond, Mr. A should go for X Ltd.'s bond.

Question 33 - May 2014 Paper – 8 Marks

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

Face Value of Bond	: Rs.1000
Coupon Rate	: 8.5%
Time of Maturity	: 3 years.
Interest Payment	: Annual, at the end of year
Principle Repayment	: At the end of bond Maturity
Conversion Ratio	: Number of shares per bond : 25
Current Market Price Per Share	: Rs.45
Market Price of Convertible Bond	: Rs.1175

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

Calculate as of today

1. Straight value of Bond
2. Conversion value of Bond
3. Conversion Premium
4. Percentage of Downside Risk
5. Conversion Parity Price.

Solution

(i) Straight Value of Bond

= Rs. 85 x 0.9132 + Rs. 85 x 0.8340 + Rs. 1085 x 0.7617 = Rs. 974.96

(ii) Conversion Value

= Conversion Ratio x Market Price of Equity Share

= Rs. 45 x 25 = Rs. 1,125

(iii) Conversion Premium

Conversion Premium = Market Conversion Price - Market Price of Equity Share

$= \frac{1175}{25} - \text{Rs. } 45 = \text{Rs. } 2$

(iv) Percentage of Downside Risk

$$= \frac{1,175 - 974.96}{974.96} \times 100 = 20.52\%$$

(v) Conversion Parity Price

$$= \frac{\text{Bond Price}}{\text{No of shares on Conversion}}$$

$$= \frac{1175}{25} = \text{Rs. } 47$$

2015

Question 34 - May 2015 RTP – Similar to - Question 26 - Nov 2012 RTP

Question 35 **May 2015 Paper – 8 Marks**

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

Name of Security	Face Value	Maturity Date	Coupon Rate	Coupon Date
Zero Coupon	10,000	31st March, 2023	N.A	N.A
T – Bill	1,00,000	20th June, 2013	N.A	N.A
10.71% GOI 2023	100	31st March, 2023	10.71	31st March
10% GOI 2018	100	31st March, 2018	10.00	31st March & 31st October

Calculate

1. If 10 years yield is 7.5% p.a. What price the Zero coupon Bond would fetch on 31st March, 2013?
2. What will be the annualized yield if the T – bill is traded @98,500?
3. 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?
4. 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

1. Value of Zero Coupon Bond for 10 years yield @ 7.5%

$$\frac{10,000}{(1.075)^{10}} = \text{Rs. } 4,852$$

2. Annualized yield

$$\text{BEY} = \frac{(FV - P)}{P} \times \frac{360}{\text{Days of Maturity}}$$

$$\text{BEY} = \frac{10000 - 98500}{98500} \times \frac{361}{81} = 6.86\%$$

3. Value of GOI 2023 Bond

= PV of Coupons + PV of Redemption

= 10.71 PVAF (8%, 10) + 100 PVF (8%, 10)

= 10.71 x 6.71 + 100 x 0.4632

= Rs. 118.18

4. Value of GOI 2018 Bond

= PV of Coupons + PV of Redemption

= 5 PVAF (4%, 10) + 100 PVF (4%, 10)

= 5 x 8.11 + 100 x 0.6756

= Rs. 108.11

Question 36 – Nov 2015 – RTP – Similar to - Question 5 - Nov 2008 Paper – 8 Marks

Question 37 - Nov 2015 Paper – 5 Marks

The following data is available for a Bond

Face Value	Rs.1000
Coupon Rate	11%
Years to Maturity	6
Redemption Value	Rs.1,000
Yield to Maturity	15%

(Round of your answers to 3 decimals)

Calculate the following with respect to the Bond

1. Current Market Price
2. Duration of Bond
3. Volatility of Bond
4. Expected market price if increase in required yield is by 100 basis points.
5. Expected market price if decrease in required yield is by 75 basis points.

Solution

1. Current Price of the Bond

= PV of Coupon + PV of Redemption

= 110 x PVAF (15%, 6) + 1,000 x PVF (15%, 6)

= 110 x 3.7845 + 1,000 x 0.4323

= 416.29 + 432.3

= 848.59

2. Duration of the Bond

Year	Cash Flows	P.V @ 15%		Proportion of Bond Value	Proportion of Bond Value x time (Years)
1	110	0.870	95.70	0.113	0.113
2	110	0.756	83.16	0.098	0.196
3	110	0.658	72.38	0.085	0.255
4	110	0.572	62.92	0.074	0.296
5	110	0.497	54.67	0.064	0.320
6	1110	0.432	479.52	0.565	3.39
Total			848.35	1.0000	4.570

Duration of the Bond is 4.570 years

3. Volatility of the Bond

$= \frac{\text{Duration}}{\text{YTM Factor}} = \frac{4.570}{1.15} = 3.974$

4 Expected market price if increase in required yield is by 100 basis points.

= 848.35 x 3.974% = 33.162

Market Price will decrease as Market price and yield are inversely related.

Hence the expected market price = 848.35 – 33.162 = Rs.801.318

5. Expected market price if decrease in required yield is by 75 basis points.

= 848.35 x 75% of (3.974) = 24.87

Market Price will increase as Market price and yield are inversely related.

Hence the expected market price = 848.35 + 24.87 = Rs.859.35

Question 38 – Nov 2015 Paper – 6 Marks

Mr A will need Rs.1,00,000 after 2 years for which he wants to make one time necessary investment now. He has choice of 2 types of bonds. The details of which are as follows.

	Bond X	Bond Y
Face Value	Rs.1000	Rs.1000
Coupon	7% Payable annually	8% Payable annually
Years to maturity	1	4
Current Price	Rs.972.73	Rs.936.52
Current Yield	10%	10%

Advice Mr. A whether he should all his money in one type of bond or he should buy both the bonds and if so, in which quantity?

Assume that there will be no call risk or default risk?

Solution

Duration of Bond X

Year	Cash Flows	P.V @ 10%		Proportion of Bond Value	Proportion of Bond Value x time (Years)
1	1070	.909	972.63	1.00	1.00

Total	972.63	1.00	1.00

Duration of Bond X = 1 year

Duration of Bond Y

Year	Cash Flows	P.V @ 10%		Proportion of Bond Value	Proportion of Bond Value x time (Years)
1	80	0.909	72.72	0.077	0.077
2	80	0.826	66.08	0.071	0.142
3	80	0.751	60.08	0.064	0.192
4	1080	0.683	737.64	0.788	3.152
Total			**936.52**	**1.000**	**3.563**

Duration of Bond Y = 3.563 years

Let a be the investment in bond X and therefore investment in Bond Y will be (1-a)

Since the required duration is 2 years, the proportion of investment in each security shall be calculated as follows

2 = a x 1 + (1-a) 3.563

A = 0.61

B = 1 – 0.61 = 0.39

Therefore, the proportion of investment shall be 61% in X and 39% in Y

Amount of Investments

Bond X

PV of Rs.1,00,000 for 2 years @ 10% x 61%

= (Rs. 1,00,000 x 0.826) x 61%

= Rs.50,386

No of Bonds to be purchased = $\frac{50.386}{972.73}$ = 51.79 i.e 52 Bonds (Approx)

Bond y

PV of Rs.1,00,000 for 2 years @ 10% x 39%

= (Rs.1,00,000 x 0.826) x 39%

= Rs.32,214

No of Bonds to be purchased = $\frac{32.214}{936.52}$ = 34.40 i.e 34 Bonds (Approx)

Question 39 - Extra Question

Note : This Question is Included because author thinks that it is important for students to solve this

M/s. Transindia Ltd. is contemplating calling As. 3 crores of 30 years, 1,000 bond issued 5 years ago with a coupon interest rate of 14 percent. 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 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.

What is the feasibility of refunding bonds?

Solution

Initial Cash Movements

a)	Net proceeds of new issue (3cr – 0.04)	2.96	Inflow
b)	Redemption of old bonds (3 × 1.4)	(3.42)	Outflow
c)	Interest (Post tax period) for overlapping $(3 \times 14\% \times \frac{2}{12} \times 60\%)$	(0.042)	Outflow
d)	Tax shield of unamortized floating cost & discount $(0.09 + 0.036 \times \frac{25}{30} \times 40\%)$	0.042	Inflow
e)	Tax shield on premium on redemption $(3 \times 0.14 \times 40\%)$	0.168	Inflow
		(0.292)	

Recurring Cash Flows

		Old	**New**
1)	Post tax coupon	2520000 $(3 \times 14\% \times 60\%)$	2160000 $(3 \times 12\% \times 60\%)$
2)	Tax shield on amortization, Discount, Cost	(16800) $\left[\frac{30000 \times 30 + + 360000 \times \frac{25}{30}}{25} \times 40\%\right]$	(6400) $\left[\frac{400000}{25} \times 40\%\right]$
		25,03,200	21,53,600
		349600 × PVIFA (8%, 25)	
		= 349600 × 10.675	
		= 3731901	

Net savings = 3731901 − 2920000 = 811901

Question 40 - **May 2016 RTP**

The following data are available for a Bond

Face Value	Rs.1,000
Coupon Rate	16%
Years to Maturity	6
Redemption value	Rs.1,000
Yield to maturity	17%

Calculate the duration and volatility of this bond?

Solution

To calculate the duration first we shall calculate Market price of bond as follows:

160 (PVIFA 17%,6) + 1,000 (PVIF 17%,6)

= 160 (3.589) + 1,000 (0.390)

= 574.24 + 390

= 964.24

1. Duration

Year	Cash Flow	PV @ 17%		Proportion of bond value	Proportion of bond value x time (years)
1	160	0.855	136.80	0.142	0.142
2	160	0.731	116.96	0.121	0.242
3	160	0.624	99.84	0.103	0.309
4	160	0.534	85.44	0.089	0.356
5	160	0.456	72.96	0.076	0.38
6	1160	0.390	452.40	0.469	2.814
			964.40	**1.000**	**4.243**

Duration of the Bond is 4.243 years

2. Volatility

Volatility of the bonds = $\frac{\text{Duration}}{(1+\text{YTM})}$ = $\frac{4.243}{1.17}$ = 3.63%

Question 41 - **May 2016 Paper**

Bright Computers Limited is planning to issue a debenture series with a face value of Rs.1,000 each for a term of 10 years with the following coupon rates:

Years	Rates
1 – 4	8%
5 – 8	9%
9 – 10	13%

The current market rate on similar debenture is 15% p.a. The company proposes to price the issue in such a way that a yield of 16% compounded rate of return is received by the investors. The redeemable price of the debenture will be at 10% premium on maturity. What should be the issue price of debenture?

PV @ 16% for 1 to 10 years are: .862, .743, .641, .552, .476, .410, .354, .305, .263, .227 respectively.

Solution

Present Value of Debenture

Year	Cash Outflow (Rs.)	PVF @ 16%	Present Value (Rs.)
1 – 4	80	2.798	223.84
5 – 8	90	1.545	139.05
9 – 10	130	0.490	63.70
10	1100	0.227	249.70
			676.29

Question 42 - **Nov 2016 RTP**

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

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

You are required to calculate:

(a) Conversion Value of Debenture
(b) Market Conversion Price
(c) Conversion Premium per share

(d) Ratio of Conversion Premium
(e) Premium over Straight Value of Debenture
(f) Favourable income differential per share
(g) Premium pay back period

Solution

(a) Conversion Value of Debenture
= Market Price of one Equity Share X Conversion Ratio
= Rs.25 x 30 = Rs.750

(b) Market Conversion Price

$$= \frac{\text{Market Price of Convertible Debentures}}{\text{Conversion Ratio}} \quad = \frac{\text{Rs.900}}{30} \quad = \text{Rs.30}$$

(c) Conversion Premium per share
Market Conversion Price – Market Price of Equity Share
= Rs.30 – Rs.25 = Rs.5

(d) Ratio of Conversion Premium

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

(e) Premium over Straight Value of Debenture

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

(f) Favourable income differential per share

$$= \frac{\text{Coupon Interest from Debenture} - \text{Conversion Ratio x Dividend per share}}{\text{Conversion Ratio}}$$

$$= \frac{85 - 30 \text{ x } 1}{30} \quad = \text{Rs.1.833}$$

(g) Premium pay back period

$$= \frac{\text{Conversion premium per share}}{\text{Favourable income deifferential pre share}} \quad = \frac{\text{Rs.5}}{\text{Rs.1.833}} \quad = 2.73 \text{ years}$$

Question 43 - Nov 2016 RTP

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 Rs.1,000.

Solution

(i) Implicit rates for year 2 and year 3

For year 2 f_2 $= \frac{(1+ r_2)^2}{1+ r_1} - 1$

$= \frac{(1.1125)^2}{(1.1050)} - 1$

$= 12\%$

For year 3 f_3 $= \frac{(1+ r_3)^3}{(1+ r_1)(1+ f_1)} - 1$

$= \frac{(1.12)^3}{(1.1050)(1.12)} - 1$

$= \frac{1.404928}{1.2376} - 1$

$= 13.52\%$

(ii) If fairly priced at Rs.1000 and rate of interest increases to 12.5% the percentage charge will be as follows:

Price $= \frac{1000(1.12)^5}{(1.125)^5}$

$= \frac{1762.34168}{1.8020}$

= Rs.977.99 or Rs.987

% Change $= \frac{1000-978}{1000} \times 100$

$= \frac{22}{1000} \times 100$

$= 2.2\%$

Question 44 - Nov 2016 RTP – Similar to Question 39

Question 45 - Nov 2016 Paper

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 Rs.100.

The relevant present value table is as follows.

Present Value	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)

(i) Current market price of the bond, assuming it being equal to its fundamental value,

(ii) Minimum market price of equity share at which bond holder should exercise conversion option; and

(iii) Duration of the bond.

Solution

(i) Current Market Price of Bond

Time	CF	PVIF *% PV (CF)	PV (CF)
1	14	0.926	12.964
2	14	0.857	11.998
3	14	0.794	11.116
4	14	0.735	10.290
5	114	0.681	77.634
		ΣPV (CF) i.e. P_0 =	124.002

Say Rs.124.00

(ii) Minimum Market Price of Equity shares at which Bondholder should exercise conversion option:

$\frac{124.00}{20.00}$ = Rs.6.20

(iii)Duration of the Bond

Year	Cash Flow	PV @ 8%	Proportion of bond value	Proportion of bond value x time (years)

1	14	0.926	12.964	0.105	0.105
2	14	0.857	11.998	0.097	0.194
3	14	0.794	11.116	0.089	0.267
4	14	0.735	10.290	0.083	0.332
5	114	0.681	77.634	0.626	3.130
			124.002	1.000	4.028

Question 46 - **May 2017 RTP**

G holds securities as detailed herein below:

Security	Face Value (Rs.)	Numbers	Coupon Rate (%)	Maturity Years	Annual Yield (%)
Bonds A	1,000	100	9	3	12
Bond B	1,000	100	10	5	12
Preference shares C	100	1,000	11	*	13*
Preference shares C	100	1,000	12	*	13*

* Likelihood of being called (redeemed) at a premium over par.

Compute the current value of G's portfolio.

Solution

Computation of current value of G's portfolio

(i) 100 Nos. Bond A, Rs.1,000 par value, 9% Bonds maturity 3 years:

	Rs.
Current value of interest on bond A 1-3 years: Rs.9000 × Cumulative P.V. @ 12% (1-3 years) = Rs.9000 × 2.402	21,618
Add: Current value of amount received on maturity of Bond A End of 3rd year: Rs.1,000 × 100 × P.V. @ 12% (3rd year) = Rs.1,00,000 × 0.712	71,200
	92,818

(ii) 100 Nos. Bond B, Rs.1,000 par value, 10% Bonds maturity 5 years:

Current value of interest on bond B 1-5 years: Rs.10,000 × Cumulative P.V. @ 12% (1-5 years) = Rs.10,000 × 3.605	36,050
Add: Current value of amount received on maturity of Bond B End of 5th year: Rs.1,000 × 100 × P.V. @ 12% (5th year) = Rs.1,00,000 × 0.567	56,700 92,750

(iii) 100 Preference shares C, Rs.1,000 par value, 11% coupon

$$\frac{11\% \times 1000 Nos. \times Rs.100}{13\%} = \frac{11,000}{0.13}$$ Rs.84,615

(iv) 100 Preference shares D, Rs.1,000 par value, 12% coupon

$$\frac{12\% \times 1000 Nos. \times Rs.100}{13\%} = \frac{12,000}{0.13}$$ Rs.92,308

Total current value of his portfolio [(i) + (ii) + (iii) + (iv)]	3,62,491

Question 47 - **May 2017 RTP**

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

Face value of bond	Rs.1,000
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	Rs.45
Market price of convertible bond	Rs.1175

AAA rated company can issue plain vanilla bonds without conversion option at an interest rate of 9.5%.
Required: Calculate as of today:
(i) Straight Value of bond.
(ii) Conversion Value of the bond.
(iii) Conversion Premium.
(iv) Percentage of downside risk.
(v) Conversion Parity Price.

t	1	2	3
$PVIF_{0.095,t}$	0.9132	0.8340	0.7617

Solution

(i) Straight Value of Bond
= Rs.85 x 0.9132 + Rs.85 x 0.8340 + Rs.1085 x 0.7617
= Rs.974.96

(ii) Conversion Value
= Conversion Ration x Market Price of Equity Share
= Rs.45 x 25 = Rs.1,125

(iii) Conversion Premium
= Market Conversion Price - Market Price of Equity Share
= Rs.2

(iv) Percentage of Downside Risk
$= \frac{Rs.1,175 - Rs.974.96}{Rs.974.96} \times 100 = 20.52\%$

(v) Conversion Parity Price
$= \frac{\text{Base Price}}{\text{No. of share on conversion}} = \frac{Rs.1,175}{25} = Rs.47$

Question 48 - May 2017 Paper

Bank A enter into a Repo for 14 days with Bank B in 10% Government of India Bonds 2018 @ 5.65% for Rs.8 crore. Assuming that clean price be Rs.99.42 and initial Margin be 2% and days of accrued interest be 262 days. You are required to determine

(i) Dirty Price

(ii) Repayment at maturity (consider 360 days in a year)

Solution

(a) Dirty Price

Clean price + Interest accrued

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

$= 106.70$

(b) First leg (Start Proceed)

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

$= \text{Rs.}8,00,00,000 \times \frac{106.70}{100} \times \frac{100-2}{100}$

= Rs.8,36,52,800 or, rounded off to Rs.8,36,53,000

(c) Second leg (Repayment at Maturity)

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

$= \text{Rs.}8,36,53,800 \times \left(1 + 0.0565 \times \frac{14}{360}\right)$

= Rs.8,38,36,804

Question 49 - May 2017 Paper

RC Ltd. is able to issue commercial paper of Rs.50,00,000 every 4 months at a rate of 15% p.a. The cost of placement of commercial paper issue is Rs.2,000 per issue. RC Ltd. is required to maintain line of credit Rs.2,00,000 in bank balance. The applicable income tax rate for RC Ltd. is 30%. What is the cost of funds (after taxes) to RC Ltd. for commercial paper issue? The maturity of commercial paper is four months.

Solution

	Rs.
Issue Price	50,00,000
Less: Interest @ 15% for 4 months	2,50,000
Issue Expenses	2,000
Minimum Balance	2,00,000
	45,48,000

$\text{Cost of Funds} = \frac{2,52,000(1-0.30)}{45,48,000} \times \frac{12}{4} \times 100$

$= \frac{5,29,200}{45,48,000} \times 100$

$= 11.636\%$

Question 50 - May 2017 Paper

P Ltd. has current earnings of Rs.6 per share with 10,00,000 shares outstanding. The company plans to issue 80,000, 8% convertible preference shares of Rs.100 each at par. The preference shares are convertible into 2 equity shares for each preference share held. The equity share has a current market price of Rs.42 per share.

Calculate:

(i) What is preference share's conversion value?

(ii) What is conversion premium?

(iii) Assuming that total earnings remain the same, calculate the effect of the issue on the basic earnings per share (A) before conversion (B) after conversion.

(iv) If profits after tax increases by Rs.20 Lakhs what will be the basic EPS, (A) before conversion and (B) on a fully diluted basis?

Solution

(i) Conversion value of preference share

Conversion Ratio x Market Price
2 × Rs.42
= Rs.84
(Or Rs.67,20,000)

(ii) Conversion Premium

(Rs.100/Rs84)–1 = 19.05%
(Or Rs.12,80,000 or Rs.16 per share)

(iii) Effect of the issue on basic EPS

	Rs.
Before Conversion	
Total (after tax) earnings Rs.6 x 10,00,000	60,00,000
Dividend on Preference Shares	6,40,000
Earnings available to equity holders	53,60,000
No. of shares	10,00,000
EPS	5:36
On diluted Basis	
Earnings	60,00,000
No. of shares (10,00,000 + 1,60,000)	11,60,000
EPS	5:17

(iv) EPS with increase in Profit

	Rs.
Before Conversion	
Earnings	80,00,000
Dividend on Preference Shares	6,40,000
Earnings for equity shareholders	73,60,000
No. of shares	10,00,000
EPS	7:36
On diluted Basis	
Earnings	80,00,000
No. of shares	11,60,000
EPS	6:90

Question 51 - **May 2017 Paper**

The following information are available with respect of Krishna Ltd.

Year	Krishna Ltd. Average Share Price	Dividend per share	Average Market Index	Dividend Yield	Return on Govt. bonds
2012	245	20	2013	4%	7%
2013	253	22	2130	5%	6%
2014	310	25	2350	6%	6%
2015	330	30	2580	7%	6%

Compute Beta Value of the Krishna Ltd. at the end of 2015 and state your observation.

Solution

Computation of Beta Value

Calculation of Return

$$\text{Returns} = \frac{D_1+(P_1-P_0)}{P_0} \times 100$$

Year	**Returns**	
2012 – 13	$\frac{22+(253-245)}{245} \times 100$	= 12.24%
2013 – 14	$\frac{25+(310-253)}{253} \times 100$	= 32.41%
2014 - 15	$\frac{30+(330-310)}{310} \times 100$	= 16.13%

Calculation of Returns from market Index

Year	**% of Index Appreciation**	**Dividend Yield %**	**Total Return %**
2012 – 13	$\frac{(2130-2013)}{2013} \times 100 = 5.81\%$	5%	= 10.81%
2013 – 14	$\frac{(2350-2130)}{2130} \times 100 = 10.33\%$	6%	= 16.33%
2014 - 15	$\frac{(2580-2350)}{2350} \times 100 = 9.79\%$	7%	= 16.79%

Computation of Beta

Year	Krishna Ltd. (X)	Market Index (Y)	XY	Y^2
2012 - 13	12.24%	10.81%	132.31	116.86
2013 - 14	32.41%	16.33%	529.25	266.67
2014 – 15	16.13%	16.79%	270.82	281.90
Total	60.78%	43.93%	932.38	665.43

Average Return of Krishna Ltd. = $\frac{60.78}{3}$ = 20.26%

Average Market Return $= \frac{43.93}{3}$ = 14.64%

Beta (β) $\frac{\Sigma XY - n\bar{X}\bar{Y}}{\Sigma Y^2 - n(\bar{Y})^2}$ $= \frac{932.38 - 3 \times 20.26 \times 14.64}{665.45 - 3(14.64)^2}$ = 14.64%

Observation

	Expected Return (%)	Actual Return (%)	Action
2012 - 13	6% + 1.897(10.81% - 6%) = 15.12%	12.24%	Sell
2013 - 14	6% + 1.897(16.33% - 6%) = 25.60%	32.41%	Buy
2014 – 15	6% + 1.897(10.79% - 6%) = 26.47%	16.13%	Sell

Question 52 - Nov 2017 RTP

The data given below relates to a convertible bond:

Face Value	Rs.250
Coupon Rate	12%
No. of shares per bond	20
Market price of share	Rs.12
Straight value of bond	Rs.235
Market price of convertible bond	Rs.265

Calculate:
(i) Stock value of bond.
(ii) The percentage of downside risk.
(iii) The conversion premium
(iv) The conversion parity price of the stock

Solution

(i) Stock value or conversion value of bond

= 12 × 20
= Rs.240

(ii) Percentage of the downside risk

$\frac{Rs.265 - Rs.235}{Rs.235}$ = 0.1277 or 12.77% or $\frac{Rs.265 - Rs.235}{Rs.235}$ = 0.1132 or 11.32%

This ratio gives the percentage price decline experienced by the bond if the stock becomes worthless.

(iii) Conversion Premium

$= \frac{\text{Market price} - \text{Conversion value}}{\text{Conversion value}} \times 100$

$= \frac{Rs.265 - Rs.240}{Rs.240} \times 100$

= 10.42%

(iv) Conversion Parity Price

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

$= \frac{Rs.265}{20}$

= 13.25%

This indicates that if the price of shares rises to Rs.13.25 from Rs.12 the investor will neither gain nor lose on buying the bond and exercising it. Observe that Rs.1.25 (Rs.13.25 – Rs.12.00) is 10.42% of Rs.12, the Conversion Premium.

Question 53 – May 2018 – RTP – Similar to - Question 37 - Nov 2015 Paper – 5 Marks

Question 54 - May 2018 Paper

Constant Engineering Ltd. has developed a high tech product which has reduced the Carbon emission from the burning of the fossil fuel. The product is in high demand. The product has been patented and has a market value of Rs.100 Crore, which is not recorded in the books. The Net Worth (NW) of Constant Engineering Ltd. is Rs.200 Crore. Long term debt is Rs.400 Crore. The product generates a revenue of Rs.84 Crore. The rate on 365 days Government bond is 10 percent per annum. Bond portfolio generates a return of 12 percent per annum. The stock of the company moves in tandem with the market. Calculate Economic Value added of the company.

Solution

Note: Lot of things are missing in the question, so I have made necessary assumptions to complete the question

1. Tax rate is not given
2. Re and Kd are not specified

EVA = NOPAT – Kc.

1. NOPAT = EBIT – Tax
   = 84 (Note - Tax rate is not given, so 84 is assumed as NOPAT)

2. Total Funds
   Net Worth = 200 + 100 = 300 Re = 12% (Assumed)
   Debt = 400 Kd = 10% (Assumed)

Kc = 300 × 12%	=	36
Kd = 400 × 10%	=	40
		76

EVA = 84-76 = 8 EVA

Question 55 - **May 2018 Paper**

The following is the data related to 9% fully convertible (into Equity Shares) debentures issued by Delta Ltd. at Rs.1000.

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

Calculate:

(a) Conversion value of Debenture;

(b) Market Conversion Price;
(c) Conversion Premium per share;
(d) Ratio of Conversion Premium;
(e) Premium over straight Value of Debenture;
(f) Favourable Income Differential per share; and
(g) Premium pay back period

Solution

1. Conversion Ratio = 25 shares

2. Conversion value of Debenture / Stock Value of Bond
   = 25 × 30 = Rs.750

3. Market Conversion Price / Conversion Parity Price
   = Market Value of Debenture/Conversion Ratio
   = 1000/25 = Rs.40

4. Ratio of Conversion Premium
   Conversion Premium
   = Conversion Parity Price – Market Price of Share
   = 40-30
   = 10

   Conversion Premium Ratio
   $= \frac{40-30}{30} \times 100 = 33.33\%$

5. Premium over Straight value of Debenture
   = Market Price of Debenture – Straight value of Debenture
   = 1000 – 800 = Rs.200

6. Favourable Income differential per share
   Interest = 1000 × 9% = 90.
   Dividend/share per debenture = 25 × 1 = 25
   i.e. $\frac{90-25}{25}$ = Rs.2.6/share

7. Premium pay back period
   Conversion Premium = MP of Debenture – Stock value of Bond
   = 1000-750 = 250

   Income differential = 90-25 = 65
   Pay back period = 250/65 = 3.846 years

Question 56 - May 2018 Paper

A bond is held for a period of 45 days. The current discount yield is 6 per cent per annum. It is expected that current yield will increase by 200 basis points and current market price will come down by Rs.2.50.
Calculate:
(i) Face value of the Bond and
(ii) Bond Equivalent Yield

Solution

1. Bond with discount yield of 6% matures in 45 days
   Therefore, yield of 45 days = 6 x $\frac{45}{365}$ = 0.7397%

   So the Present value of the bond today
   PV = $x/1.007397$ = 0.9927x

2. If yield increases by 2% price falls by Rs.2.5
   A. So at 8% yield price will be 0.9927x – 2.5
   B. Also with discount yield of 8% maturing in 45 days
      The yield for 45 days shall be = 8 x $\frac{45}{365}$ = 0.9863%

      So the Present value of the bond today
      PV = $x/1.009863$ = 0.9902x

3. So 0.9927x – 2.5 = 0.9902x
   Therefore x = 1000 ------- Face Value = 1000

Question 57 - May 2018 (New) – RTP

XL Ispat Ltd. has made an issue of 14 per cent non-convertible debentures on January 1, 2007. These debentures have a face value of Rs.100 and is currently traded in the market at a price of Rs.90.
Interest on these NCDs will be paid through post-dated cheques dated June 30 and December 31. Interest payments for the first 3 years will be paid in advance through post-dated cheques while for the last 2 years post-dated cheques will be issued at the third year. The bond is redeemable at par on December 31, 2011 at the end of 5 years.
Required:
(i) CALCULATE the current yield and YTM of the bond.
(ii) CALCULATE the duration of the NCD.
(iii) CALCULATE the realized yield on the NCD assuming that intermediate coupon payments are, not available for reinvestment calculate.

Solution

(i) Current Yield = $\frac{7}{12}$ x $\frac{12}{6}$ = 0.1555 or 15.55%

YTM can be determined from the following equation

7 × PVIFA (YTM, 10) + 100 × PVIF (YTM, 10) = 90

Let us discount the cash flows using two discount rates 7.50% and 9% as follows:

Year	Cash Flows	PVF @ 7.50%	PV@ 7.50%	PVF@9%	PV@9%
0	-90	1	-90	1	-90
1	7	0.930	6.51	0.917	6.419
2	7	0.865	6.055	0.842	5.894
3	7	0.805	5.635	0.772	5.404
4	7	0.749	5.243	0.708	4.956
5	7	0.697	4.879	0.650	4.550
6	7	0.648	4.536	0.596	4.172
7	7	0.603	4.221	0.547	3.829
8	7	0.561	3.927	0.502	3.514
9	7	0.522	3.654	0.460	3.220
10	107	0.485	51.90	0.422	45.154
			6.560		-2.888

Now we use interpolation formula

$7.50\% + \frac{6.560}{6.560-(-2.888)} \times 1.50\%$

$7.50\% + \frac{6.560}{9.448} \times 1.50\% = 7.50\% + 1.041\%$

YTM = 8.541% say 8.54%

Note: Students can also compute the YTM using rates other than 15% and 18%.

(ii) The duration can be calculated as follows:

Year	Cash Flows	PVF @ 8.54%	PV@ 8.54%	Proportion of NCD value	Proportion of NCD value x time
1	7	0.929	6.447	0.0717	0.0717
2	7	0.849	5.943	0.0661	0.1322
3	7	0.782	5.474	0.0608	0.1824
4	7	0.721	5.047	0.0561	0.2244
5	7	0.664	4.648	0.0517	0.2585
6	7	0.612	4.284	0.0476	0.2856

7	7	0.563	3.941	0.0438	0.3066
8	7	0.519	3.633	0.0404	0.3232
9	7	0.478	3.346	0.0372	0.3348
10	107	0.441	47.187	0.05246	5.2460
			89.95		7.3654

Duration = 7.3654 half years i.e. 3.683 years.

(iii)Realized Yield can be calculated as follows:

$\frac{(7 \times 10)+100}{(1+R)^{10}} = 90$

$(1+R)^{10} = \frac{170}{90}$

$R = \left(\frac{170}{90}\right)^{\frac{1}{100}} - 1 = 0.06380$ or 6.380% for half yearly and 12.76% annually.

Question 58 - May 2018 (New) – Paper

Sabanam Ltd. has issued convertible debentures with coupon rate 11%. Each debenture has an option to convert to 16 equity shares at any time until the date of maturity. Debentures will be redeemed at Rs.100 on maturity of 5 years. An investor generally requires a rate of return of 8% p.a. on a 5-year security. As an advisor, when will you advise the investor to exercise conversion for given market prices of the equity share of

(i) Rs.5,
(ii) Rs.6
(iii)Rs.7.10.

Cumulative PV factor for 8% for 5 years : 3.993

PV factor for 8% for year 5 : 0.681

Solution

Investor wants a return of 8%
On Investment
IV of Bond
= PV of coupon + PV of Redemption
= 11 × PVIFA (8%, 5) + 100 × PVIFA (8%, 5)
= 112.023

For investor to break even and convert share the price would be
= 112.02316 = 7.00

The Investor should convert at price of Rs.7.10/share

Question 59 Nov 2018 – RTP

Pet feed plc has outstanding, a high yield Bond with following features:

Face Value	£ 10,000
Coupon	10%
Maturity Period	6 Years

Special Feature	Company can extend the life of Bond to 12 years

Presently the interest rate on equivalent Bond is 8%.

(a) If an investor expects that interest will be 8%, six years from now then how much he should pay for this bond now.

(b) Now suppose, on the basis of that expectation, he invests in the Bond, but interest rate turns out to be 12%, six years from now, then what will be his potential loss/ gain if company extends the life of bond by another 6 years.

Solution

(a) If the current interest rate is 8%, the company will not extent the duration of Bond and the maximum amount the investor would ready to pay will be:
= £1,000 PVIAF (8%, 6) + £10,000 PVIF (8%, 6)
= £1,000 x 4.623 + £10,000 x 0.630
= £4,623 + £ 6,300
= £ 10,923

(b) If the current interest rate is 12%, the company will extent the duration of Bond. After six years the value of Bond will be
= £1,000 PVIAF (12%, 6) + £10,000 PVIF (12%, 6)
= £1,000 x 4.111 + £10,000 x 0.507
= £4,111 + £5,070
= £9,181
Thus, potential loss will be £9,181 - £10,923 = £1,742

Question 60 **Nov 2018 – Paper**

Sonic Ltd. issued 8% 5 year bonds of Rs.1,000 each having a maturity of 3 years. The present rate of interest is 12% for one year tenure. It is expected that forward rate of interest for one year tenure is going to fall by 75 basis points and further by 50 basis points for next year. This bond has a beta value of 1.02 and is more popular in the market due to less credit risk.

Calculate:

(i) Intrinsic Value of bond

(ii) Expected price of bond in the market

Solution

Discounting rates

Year	Forward Rate
1	12%
2	11.25%
3	10.75%

A. IV of Bond = PV of future cash flow

Year	CF	PV	
1	80	71.43	-@12%
2	80	64.21	-@12%, 11.25%
3	1080	782.64	-@12%, 11.25%, 10.75%
		918.28	

B. Expected value of Bond = 918.20 x 1.02 = Rs.936.6456

Question 61 **Nov 2018 (New) - Paper**

Tangent Ltd. is considering calling Rs 3 crores of 30 years, Rs 1,000 bond issued 5 years ago with a coupon interest rate of 14 per cent. The bonds have a call price of Rs 1,150 and had initially collected proceeds of Rs 2.91 crores since a discount of Rs 30 per bond was offered. The initial floating cost was Rs 3,90,000. The Company intends to sell Rs 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 Rs 1,000. The estimated floatation cost is Rs 4,25,000. 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 then their proceeds to be used to retire the old bonds, the company expects a two months period of overlapping interest during which interest must be paid on both the old and the new bonds. You are required to evaluate the bond retiring decision. [PVIFA 8%,25= 10.675]

Solution

Part 1 : Initital Cash Flows

1	Redemption of Old Bonds (30000000 / 1000 x 1150)	3,45,00,000	Outflow
2	Tax Sheild on POR of OLD Bonds (45,00,000 x 40%)	18,00,000	Inflow
3	Issue of New Bonds (3,00,00,000 - 4,25,000)	2,95,75,000	Inflow
4	Tax sheild on unamortised floatation cost on old bonds (9,00,000 + 3,90,000) x 25/30 x 40%)	4,30,000	Inflow
5	Post tax overlapping interest (3,00,00,000 x 14% x 2/12 x 60%)	4,20,000	Outflow

	NET	-31,15,000	

Part 2 : Recurring Cash Flows

		OLD	NEW
1	Post Tax Coupon OLD = 30000000 x 14% x 60% New = 30000000 x 12% x 60%	25,20,000	21,60,000
2	Tax Sheild on Amortization of floatation cost/Discount OLD = (900000 + 390000)/30)x40% New = 425000 / 25 x 40%	17,200	6800
	NET	25,02,800	21,53,200

Difference of old and new	3,49,600	
PVIFA for 25 years	37,31,980	
NET Cash flows of Part 1 and Part 2		6,16,980

Since the cash flows are positive we should go ahead with the project.

Question 62 **Nov 2018 (New) - Paper**

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

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

(i) Calculate the duration of each bond.

(ii) The bond portfolio manager has been asked to keep 45% of the portfolio money in Bond A. Calculate the percentage amount to be invested in bonds B and C that need to be purchased to immunize the portfolio.

(iii) After the portfolio has been formulated, an interest rate change occurs, increasing the yield to 11%. The new duration of these bonds are : Bond A = 7.15 Years, Bond B = 6.03 Years and Bond C = 4.27 years.

Is the portfolio still immunized ? Why or why not ?

(iv) Determine 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 :

PV	T1	T2	T3	T4	T5
PVIF0.09	0.917	0.842	0.772	0.708	0.650

PV	T6	T7	T8	T9	T10
PVIF0.09	0.596	0.547	0.502	0.460	0.4224

Solution

1. Duration A = 6.94 / B = 5.94 / C = 4.24

2. DA = DL

Wa x Da x Wb x Db x Wc x Dc = 6

(0.45 x 6.94) + (Wb x 4.94) + (0.55 - Wb) x 4.24

3.123 + 5.94Wb + 2.33 – 4.24Wb = 6%

1.7Wb + 5.453 = 6

Wb = 0.32

Wc = 0.55 – 0.32 = 0.23

Wa = 0.45

3. If Yield = 11%

Duration =

7.15 for A / 6.03 for B / 4.27 for C

= (7.15 x 0.45) + (6.03 x 0.32) + (4.27 x 0.23)

= 6.13 years

Note : if the yield changes, the duration changes and therefore the portfolio is not immunized.