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The following data are available for a Bond

FV Rs 10,000 to be redeemed at par
On maturity coupon rate 8.5%

Years to Maturity → 5 years
YTM = 10%

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.
(b) Using the Present value Method.

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

Ans

YR	C.	PV@10%.	PV	tx PV
1	050	0.909	772.65	772.65
2	050	0.826	702.1	1404.2
3	050	0.751	688.5	1915.5
4	850	0.683	580.55	2322.2
5	10050	0.621	6737.85	33,689.25
			9431.5	40,103.8

(ii) Duration = $\frac{40,103.8}{9431.5}$ = 4.25 years

(iii) Volality = Maculay Duration

$\frac{4.25}{1+0.10}$ = 3.86

(vi) Expected price =

(a) Duration $\Rightarrow \frac{\Delta i}{(1\%)} = \frac{\Delta P}{3.86\%}$

$\rightarrow$ 2% ?

∴ for a 2% change in YTM

Change in price.

= $3.86\% * \frac{(-2\%)}{(-1\%)}$ =

= 7.72%

(a) Revised price = 9431.5 + 7.72% X 9481.5

9431.5 + = 10,159.61

(b) Rate changed from 10% to 8% a drop of 2%

Ans = 10204.05

Convexity

	YTM	Duration	IV	difference
V_0	10%	9487.5	9431.5	
V_+	8%	10,159.61	10,204.05	45
V_-	12%	8703.39	8734.29	31

$$\text{convexity} = \frac{V_+ + V_- - 2V_0}{2V_0 \times (\Delta YTM)^2}$$

$$\text{Convexity} = \frac{10,204.05 + 8734.35}{9431.5 \times 2 \times (0.02)^2}$$ 2% change

$$= \frac{75.4}{9431.5 \times 2 \times (0.0004)}$$

$$\text{Convexity} = \frac{75.4}{7.65} = 9.98$$

$$\text{Convexity Effect on price} = C \times (\Delta YTM)^2 \times 100$$
$$= 9.98 \times (0.02)^2 \times 100$$
$$= 0.3992\% \text{ or } 0.40\%$$

or

$$\left[\frac{V_+ + V_- - 2V_0}{2V_0 \times (\Delta YTM)^2}\right] (\Delta YTM)^2$$

$V_0 \times$ Convexity Effect

$9431.5 \times 0.40\% = 37.38$ Rs

Price change is due to Convexity.