

FIP-Assignment 2

(Roll-no. - 404)

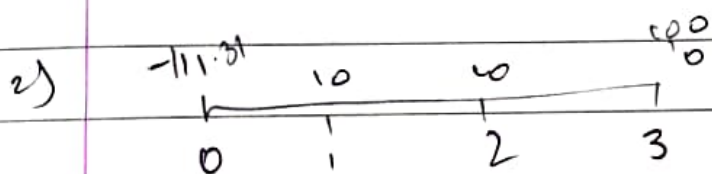
1) Coupon rate = 8%, par = 1000

$$\text{Current yield} = \text{Bond value} \times (1 + \text{Semi-Annual rate})^n$$

$$\Rightarrow 1000 \times (1 + \frac{8\%}{2})^2$$

$$\Rightarrow \text{TR } 1081.6$$

$$\frac{1081.6 - 1000}{1000} = \cancel{8.16\%} \quad 8.16\%$$



$$-111.31 + 10 \left[\frac{1 - (1 + 2\%)^{-3}}{2\%} \right] - \frac{1100}{(1 + 2\%)^3} = 0$$

$$n = 5.7856 \text{ y.}$$

$$S_3 = 5.7856 \text{ y.}$$

$$b) (1+S_2)^2 = (1+S_3)(1+1Y1Y)$$

$$(1.0398)^2 = (1.0299)(1+1Y1Y)$$

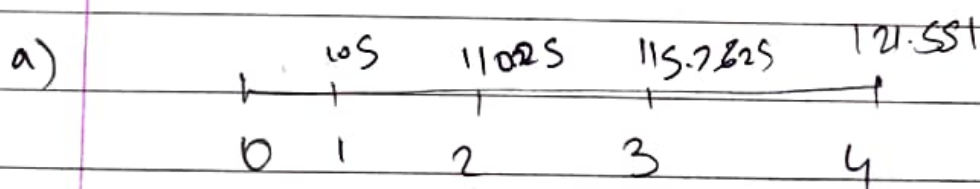
$$1Y1Y = \frac{1.0398^2}{1.0299} - 1$$

$$1Y1Y = 4.7795\%$$

Q3)

$$\begin{aligned} \text{year 1} &= 100(1+0.05) \\ \text{year 2} &= 100(1.05)^2 \\ \text{year 3} &= 100(1.05)^3 \\ \text{year 4} &= 100(1.05)^4 \end{aligned}$$

$$YTM = 5\%$$



$$\begin{aligned} PV = & \frac{100(1.05)}{(1.05)} + \frac{100(1.05)^2}{(1.05)^2} + \frac{100(1.05)^3}{(1.05)^3} \\ & + \frac{100(1.05)^4}{(1.05)^4} \end{aligned}$$

$$PV = 400$$

$$b) \text{ Macaulay Duration} = \frac{\sum (PV \times t)}{\sum PV}$$

$$= \frac{100 \times 1 + 100 \times 2 + 100 \times 3 + 100 \times 4}{400}$$

$$= 2.5 \text{ years}$$

$$\text{Modified duration} = \frac{-MCD}{1 + YTM} = \frac{-2.5}{1 + 0.05}$$

$$= 2.38095 \text{ years}$$

$$Q9) T=1, C=6\%, FV=1000, y=6.5\%$$

$$PV \Rightarrow 1060 (1.065)^{-2} + \frac{60}{1.065} + 60$$

$$= 1050.896$$

$$\text{Horizon yield} = \frac{1050.896 - 1}{956.76}$$

$$= 7.999\% \approx 7.5\%$$

b) Purchase Price $\rightarrow$

$$60 \left(\frac{1 - (1.065)^{-3}}{0.065} \right) + 1000(1.065)^{-3}$$

$$= 986.76$$

$$\text{Total Inflow @ } T=1 \rightarrow 1000 + 60 \\ = 1060$$

$$\text{Rate of Return} = \left(\frac{1060}{986.76} \right) - 1$$

$$= 7.4227\%$$

4) Ranking the investments from most affected to least affected :-

B) ~~Zero~~ Zero coupon Treasury strips

C) 5.5% Treasury coupon

D) 9.25% Treasury bill

A) 860P term Treasury bill

6b) The underwriter assumes the full risk of being unable to sell the bonds at negotiated offering price.

- The underwriter bears the risk of interest movement b/w the time of purchase and resale
- Longer maturity bonds usually have a higher duration and they are exposed to more interest rate risk
- Therefore underwriting fees for longer maturity bonds are higher as the risk is higher

6c) i) $PV = 100$, $FV = 100$, $C = 6\%$, $i = 6\%$, $T = 10$

i) $i = 15\%$,

$$PV = 6 \left(\frac{1 - (1.15)^{-10}}{0.15} \right) + 100(1.15)^{-10}$$

$$= \cancel{54.46} \quad 54.83$$

b) $i = 16\%$,

$$PV = 6 \left(\frac{1 - (1.16)^{-10}}{0.16} \right) + 100(1.16)^{-10}$$

$$PV = 51.667$$

$$\% \text{ change} = \frac{1 - 51.6677}{54.83}$$

$$= \boxed{5.7674\%}$$

c) $i = 5\%$

$$PV = 6 \left(\frac{1 - (1.05)^{-10}}{0.05} \right) + 100 (1.05)^{-10}$$

$$= 107.7217$$

d) $i = 6\%$, $PV = 100$, $i = c$

$$\text{change} \Rightarrow \frac{1 - 100}{107.7217}$$

$$= \boxed{7.1682\%}$$

e) Price volatility is higher at lower interest rates due to convex nature of price yield curve

Q9) ~~PV = 400~~

Total return $\Rightarrow 100(1+i)^5 = 150.5357$

$$i = 8.525\%$$

Q10)

Q14)

Bond	No	Duration
W	13	2
X	27	7
Y	60	8
Z	40	14
	<u>140</u>	

i)

Duration of bond = $\sum w_i \times \text{duration}$

$$\begin{aligned} &= \frac{13}{140} \times 2 + \frac{27}{140} \times 7 + \frac{60}{140} \times 8 \\ &\quad + \frac{40}{140} \times 14 \\ &= 8.964 \end{aligned}$$

ii)

$$8.964 \times (0.005) \times 140$$

$$= \frac{6.2748}{140} \times 100$$

$$= 4.482\%$$

$$\text{iii) } W = \frac{0.13 \times 13}{140} = 0.12371$$

$$Y = \frac{7 \times 27}{140} = 1.35$$

$$V = \frac{8 \times \frac{60}{7}}{140} = 3.4286$$

$$Z = \frac{14 \times 40}{140} = 4$$

Q.3) 2 Portfolios can have same duration & their convexities may differ so that even for a parallel shift in yield curve the % change in price may differ.

For non parallel shift in the yield curve, portfolios of differing convexity may perform very differently even if they have the same duration.

Q11) The price responsiveness of a zero coupon bond is diff. as yields change. ZCB have > price responsiveness for change at higher lvl of maturity as interest rates change.
ZCB > price responsiveness for change at lower lvl of interest rates compared to higher lvl of interest rates.

Expect for long maturity deep discount bonds
Bond with lower coupon rate will have greater modified and Macaulay durations.
For given yield at maturity, zero coupon bond have higher convexity and thus greater price responsiveness to change in yield.

Q15) Yield curve is graphical depiction of relationship b/w the yield on bonds of same credit quality but different maturities.

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Treasury yield curve is yield curve closely watched by market participants for :-

- Treasury securities are free from default risk
- They are most active in largest bond market offering fewest problems in terms of ~~liquidity~~ illiquidity at infrequent trading