FIP Assignment

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Q1. $C = 80$

Sold at par $\quad i^{(p)} = 8\%$

So,

$$(1+i) = \left(1 + \frac{i^{(p)}}{p}\right)^2$$

$$(1+i) = \left(1 + \frac{0.08}{2}\right)^2$$

$$\boxed{\therefore \ i = 8.16\% \text{ p.a}}$$

Q2. (b)

$$(1+S_2)^2 = (1+S_1)(1+1Y1Y)$$

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

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

$$\boxed{\therefore \ 1Y1Y = 4.9295\%}$$

(c)

-111.31	10	10	10 +100
0	1	2	3

$$-111.31 + 10\left(\frac{1-(1+x)^{-3}}{x}\right) + \frac{100}{(1+x)^3} = 0$$

$$\therefore \quad x = 5.7856\%$$

$$S_3 = 5.7856$$

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Q3.

Year 1 = $100(1+0.05)$
Year 2 = $100(1.05)^2$
Year 3 = $100(1.05)^3$
Year 4 = $100(1.05)^4$

YTM = 5%

a)

2	105	110.25	115.2625	121.551
0	1	2	3	4

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

PV = 400
Price = \$400

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

$$= \frac{100\times1 + 100\times2 + 100\times3 + 100\times4}{400}$$

Mac D^n = 2.5 years

Modified Duration $= \frac{-MCD}{1+YTM}$

$$= \frac{-2.5}{1.05}$$

= 2.38095 years.

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Q4. Ranking the investments from most affected to least affected.

B) Zero coupon Treasury strips
C) 5.5% Treasury coupon
D) 9.25% Treasury bond
A) Short term treasury bills

The lower the coupon, the higher the bond is affected by yield changes.
Further, short term securities are less affected.

Q5.
$T = 1$
$C = 6\%$
$FV = \$1000$
$y = 6.5\%$

a.
1060
0 1 2 3

Total rate of return from holding the bond for 1 year $= 6.5\%$ ($\because$ YTM has not changed).

$$PV @ t=1 = 1060\,(1.065)^{-2} + \frac{60}{1.063} + 60$$

$$= 1050.896$$

$$\text{Horizon Yield} = \frac{1050.896}{980.76} - 1$$

$$\cong 7.5\%$$

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b) Purchase price at time 0.

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

$= 986.76$

Selling price @ t = 1 = 1000

($\because$ C = R)

Total inflow @ t = 1 $\rightarrow$ 1000 + 60
= 1060

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

ROR = 7.42227%

Q6.

→ The underwriter assumes the full risk of being unable to resell the bonds at the stipulated offering price. The underwriter bears the risk of interest rate movement between the time of purchase and time of resale. Longer maturity bonds usually have a higher duration and they are exposed to more interest rate risk. Therefore, underwriting fees for longer macaulay maturity bonds are higher as the risk is higher.

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Q7.

I disagree with the statement. The price of a floater will always trade at its par value. First, the coupon rate of a floating rate security (or floater) is equal to a reference rate plus some spread or margin. For example, the coupon rate of a floater can reset at the rate on a three month treasury bill plus the basis points. The price of the floater depends on two factors :- (1) the spread over the reference rate and any restrictions that may be imposed on the resetting of the ~~coy~~ coupon rate. For example, a floater may have a maximum coupon rate called a gap. or a minimum coupon rate called a floor.
The price of a floater will trade close to its par value as long as (1) the spread above the reference rate that the margin requires ~~the~~ is unchanged and neither the cap nor the floor is reached.

Q8. $PV = 100$, $FV = 100$, $C = 6\%$, $i = 6\%$, $T = 10$

(i) $i = 15\%$

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

$$\boxed{PV = 54.83}$$

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(ii) $i = 16\%$

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

$\therefore PV = 51.667.$

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

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

(iii) $i = 5\%$

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

$= 107.7217$

(iv) $i = 6\%$

$PV = 100 \qquad i = c$

$$\% \text{ change} = 1 - \frac{100}{107.7217}$$

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

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

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Q9.

$FV = 100 \quad PV = 100$

$(1.044)^5 = 1$

$\ldots + 1(1.112)^{-1} + 109(1.112)^{-2}$

$= 150.5357$

$\therefore$ Total return

$100(1+i)^5 = 150.5357$

$\boxed{\therefore\ i = 8.52453\%}$

Q10. 8%

Q11. The price responsiveness of a zero-coupon bond is different as yields change. Like other bonds, zero-coupon bonds have greater price responsiveness for changes at higher levels of maturity as interest rates change. Like other bonds, zero-coupon bonds have greater price responsiveness for changes at lower levels of interest rates compared to higher level of interest rates. Except for long-maturity deep-discount bonds, bonds with lower coupon rates will have greater modified and Macaulay durations. Also, for a given yield and maturity, zero-coupon bonds have higher convexity and thus greater price responsiveness to changes in yields.

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Q13. 1. While two portfolios can have the same duration, their convexities may differ so that even for a parallel shift in the yield curve, the % change in price may differ.
2. For non-parallel shift in the yield curve, portfolio of differing convexities may perform very differently even if they have the same duration.

Q14.

	Bond	MV	Duration
(i)	W	13	2
	X	27	7
	Y	60	8
	Z	40	14

Sum of MV = 140

Duration of bond = Σ Weights × duration

$$= \frac{13}{140} \times 2 + \frac{27}{140} \times 7 + \frac{60}{140} \times 8 + \frac{40}{140} \times 14$$

$$= 8.964$$

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

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

$$= 4.482\%$$

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(iii)

$$w - \frac{2 \times 13}{140} = 0.18571$$

$$x - \frac{7 \times 27}{140} = 1.35$$

$$y - \frac{8 \times 60}{140} = 3.4286$$

$$z - \frac{14 \times 40}{140} = 4$$