FIP Assignment

1) 100, 4, 4 ... (100)

x, 100 — 1 yr bond. (100) — Same return.

$$\frac{[104 + 4\times(1.04)]}{\cancel{100}} = \frac{100+x}{\cancel{100}} \Rightarrow 100 + x = 108.16.$$

$$x = 8.16$$

yearly coupon = 8.16%

2)(a) (106.8) 10, 100.

$$\frac{110}{1+x} = 106.8 \qquad x = S_1 = 2.99625\%$$

(101.93) 5, 5, 100.

$$\frac{5}{1.0299625} + \frac{105}{(1+S_2)^2} = 101.93.$$

$$S_2 = 4.00157\%$$

(111.31) 10, 10, 10, 100.

$$\frac{10}{1.0299625} + \frac{10}{1.0400157^2} + \frac{110}{(1+S_3)^3} = 111.31$$

$$S_3 = 6.00095\%.$$

(b) $(1+S_2)^2 = (1+S_1) \times (1 + 1y1y).$

$$1y1y = \left[\frac{(1+S_2)^2}{(1+S_1)}\right] - 1.$$

$$1y1y = 0.0501670267\,1$$

$$\approx 5.01670\%$$

3)(a)
$$\frac{100(1+0.05)}{1.05} + \frac{100(1+0.05)^2}{1.05^2} + \frac{100(1+0.05)^3}{1.05^3} + \frac{100(1+0.05)^4}{1.05^4}$$

$= \$400$

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

Macauly duration $= 2.5$ yrs.

Modified duration $= \frac{2.5}{1.05} = 2.38095$ yrs

4) order :- b, c, d, a

A lower coupon rate ~~with~~ bond will have higher price volatility than higher coupon rat bond because these bonds will have longer duration as it pays proportionately less payment before final maturity.

A higher maturity bond will have higher price volatility as it will have higher duration than a bond with lower maturity keeping all other values the same.

Considering the above 2 factors, we conclude the order to be b, c, d, a.

5) a)

0	1 sell	2	3
	60	60	60, 1000

$\frac{60}{1.065} + \frac{1060}{1.065^2} = 990.89 + 60$

$= 1050.896868$

price at time 0 $= \frac{60}{1.065} + \frac{60}{1.065^2} + \frac{1060}{1.065^3} = 986.7576224$

return $= \frac{1050.896868}{986.7576224} - 1 = 0.06500\ldots$

b) price sold @ 6% $= \frac{60}{1.06} + \frac{1060}{1.06^2} = 1000$

total amount recieved $= 1000 + 60 = 1060$

return $= \frac{1060}{986.7576224} - 1 = 0.074225$

~~7.4225%~~

6) When underwriter purchases bonds from corporate client, ~~it~~ they also carry the risk of being unable to resell the bond at its offering price, i.e. they carry the risk of interest rate movements from time of purchase to time of resale. The ~~too~~ longer the maturity, ~~long~~ higher the risk as longer duration. For this reason, underwriter charges larger fee for bonds with longer maturity

7) the price of floater ~~is~~ equal to benchmark rate + spread. The coupon rate of floater can reset at the rate on three month treasury bill + basis points. If market requires larger spread, the price of the floater will trade below par and vice versa. Similarly, if coupon rate is restricted from changing to the reference rate plus the spread because of the cap, then the price of a floater will trade below par. For the above reasons, we disagree with the given statement.

8) a) $\frac{6}{15\%}\left[1-1.15^{-10}\right]+100\times1.15^{-10}=\$54.83108$

b) $\frac{6}{16\%}\left[1-1.16^{-10}\right]+100\times1.16^{-10}=\$51.6677$

$$\frac{51.6677-54.83108}{54.83108}\approx 0.05769227$$

$\approx (5.769\%)$

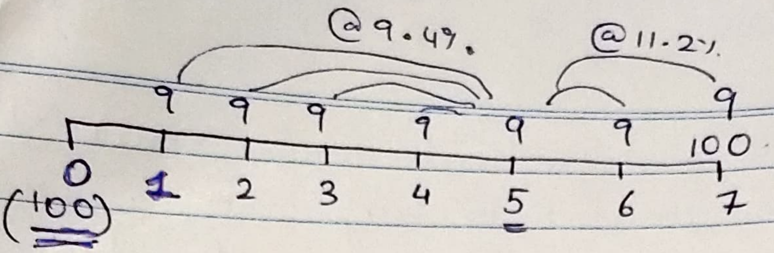
c) $\frac{6}{5\%}\left[1-1.05^{-10}\right]+100\times1.05^{-10}=\$107.72173$

d) $\frac{6}{6\%}\left[1-1.06^{-10}\right]+100\times1.06^{-10}=\$100$

$\approx (7.168\%)$

e) The ~~vol~~ price volatility is higher in lower interest rate environment than in higher interest rate environment due to convex relationship between the yeild & price of the bond.

9)



selling price of bond at $t=5 \Rightarrow \frac{9}{1.112} + \frac{109}{1.112^2} = \$96.2424$

reinv am at $t=5 \Rightarrow$ ~~9/+/ 9~~ $9(1.094)^4 + 9(1.094)^3 + 9(1.094)^2 + 9(1.094) + 9 = \$54.2933$

total amount recieved $\Rightarrow \$54.2933 + \$96.2424$

$\Rightarrow \$150.5357495$

let rate of return be i.

$100 \times (1+i)^5 = 150.5357495$.

$\boxed{i = 8.524534\%}$ p.a.

10) for ZCB, there is 0 reinvestment risk if held to maturity because its return is not dependent on interest-on-interest component. Yeild of ZCB is equal to YTM.

11) price-responsiveness of a ZCB is different as yeild changes. like other bonds, ZCB have greater price responsiveness for changes at lower levels of interest rate compared to higher level of interest rates. For ZCB, for a ~~given~~ lower yeild & will have higher convexity & thus greater price responsiveness to changes in yeilds. ZCB holds convexity property.

12) We agree to the statement as logically, to find modified duration, we estimate the duration of tangent line of the convex curve. In case of small changes in interest rates, the convexity will be less & as a result, the difference between macauly & modified duration will be less.

13) 2 portfolio having same duration can have different convexities & so the statement is not true & for non-parallel shift, both bonds can act differently having the same duration

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

$= 8.96428$ yrs.

(b) change = Ann. modified duration × ΔYTM

$= 8.96428 \times 0.005$

$= 0.0448214$

% change $= \frac{0.448214}{140} \times 100 = 0.032\%$

(c) contribution of bond W ⇒ $\frac{13}{140} \times 2 = 0.1857$

contribution of bond X ⇒ $\frac{27}{140} \times 7 = 1.3500$

contribution of bond Y ⇒ $\frac{60}{140} \times 8 = 3.4285$

contribution of bond Z ⇒ $\frac{40}{140} \times 14 = 4.0000$

15) a.) graphical deception of relationship between yeild of bonds of same credit quality but different maturities.

b.) Treasury securities are free from default risk. The treasury market is the largest & most active bond market offering fewest problems in terms of illiquidity & infrequent trading.