Assignment

16 March 2022 21:06

Q2

c)

0	1	2	3
-111.31	10	10	10 + 100

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

$$\boxed{x = 5.7856\%}$$

$$\boxed{S_3 = 5.7856}$$

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

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

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

$$\boxed{1Y1Y = 4.9795\%}$$

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)

0	1	2	3	4
?	105	110.25	115.7625	121.551

$PV = 100(1.05) + 100(1.05)^2$

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

$$\boxed{PV = 400}$$

$$\boxed{\text{price} = \$400}$$

b) Macaulay Duration

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

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

$$\boxed{MCD = 2.5 \text{ years}}$$

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

$$= \frac{-2.5}{1+0.05}$$

$$= \boxed{2.38095 \text{ years}}$$

Q1 $C = 8\%$ $i^{(p)} = 8\%$

sell at par

So.,

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

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

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

Q5

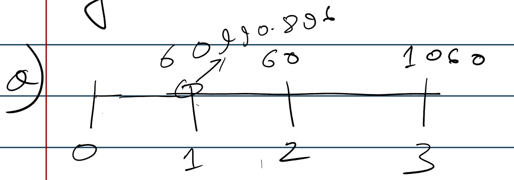
$T = 1$

$C = 6\%$

$FV = \$1000$

$y = 6.5\%$

a)



$\boxed{6.5\%}$

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

Verifying this

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

$= 1050.806$

Horizon yield $= \frac{1050.806}{986.76} - 1$

$\boxed{= 7.499\% \approx 7.5\%}$

b) purchase price @ $T = 0$ =

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

$= 986.76$

Selling price @ $T \Rightarrow 1 = 1000$

($\because C = r$)

Total inflow @ $T = 1 \rightarrow 1000 + 60$

$= 1060$

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

$\boxed{RoR = 7.42227\%}$

Q4 Ranking the investmentts 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

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

Q7

→ I disagree with the statement

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

(i) $i = 15\%$

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

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

$\boxed{PV = 54.83}$

b) $i = 16\%$

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

$\boxed{PV = 51.667}$

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

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

c) $i = 5\%$

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

$= 107.7217$

d) $i = 6\%$

$\boxed{PV = 100}$ $\because i = C$

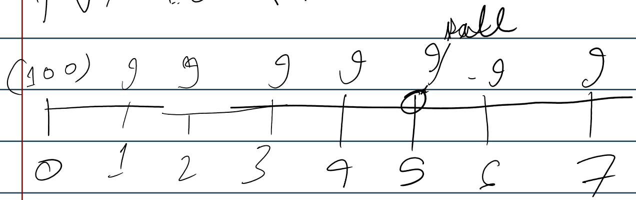
$\% \text{ change} = 1 - \frac{100}{107.7217}$

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

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

g) $FV = 100$, $PV = 100$
sale

q9 FV = 100, PV = 100



$$9\left(\frac{(1.094)^{5}-1}{0.094}\right)+9(1.112)^{-1}+109(1.112)^{-2}$$

$$= \underline{150.5357}$$

∴ Total return :–

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

$$\boxed{i=8.524527\%}$$

q10 8%

q11→ I disagree with the statement since since ZCBs also have a convex price-yield curve.

q12 Mod. duration = $-\dfrac{\text{Macaulay Duration}}{(1+YTM)}$

From the eqn. we can see that as YTM will tend towards 0 the Modified duration will move towards the macaulay duration. I agree with the statement.

q13 I disagree with the statement.

While 2 portfolios may have the same duration, their convexities might be different which will lead to unequal changes with changes in interest rates.

Q15

a) The graphical depiction of the relationship between bonds of the same credit quality but different maturitises is the yield curve.

b) Since treasury securities are free from default risk, it is the most active bond offering with no liquidity issues. Therfore it is the most watched.

Q14

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

$\Sigma MV = 140$

a) duration of portfolio $= \Sigma w \times$ duration

$= \frac{13}{\cancel{140}\,70} \times 2 + \frac{27}{\cancel{140}\,20} \times \cancel{7} + \frac{\cancel{60}\,3}{\cancel{140}\,7} \times 8 + \frac{40}{140} \times 14$

$= \frac{13}{70} + 1.35 + 4 + \frac{24}{7}$

$= \boxed{8.96428}$

b) $8.964 \times (0.0005)$

$= \boxed{4.48214\%}$

c) $W - \frac{2 \times 13}{} = 0.18571$

$$\overline{}$$
$$140$$

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

$$x - \frac{8 \times 60}{140} = 3.42857$$

$$2 - \frac{14 \times 40}{140} = 4$$

$$\overline{8.96428}$$