

Assignment - I801 (i)(1)

$$d^4 = 8\%$$

$$S = P$$

$$\left(1 - \frac{d^4}{4}\right)^4 = e^{-S}$$

$$(1 - 0.02)^4 = e^{-S}$$

$$\ln(0.922368160) = -S$$

$$S = 0.08081$$

$$S \Rightarrow 8.081083\%$$

(2)

$$1 + i = e^S$$

$$i = e^S - 1$$

$$i = 8.41657\%$$

(3)

$$\left(1 - \frac{d^4}{4}\right)^4 = \left(1 - \frac{d^{12}}{12}\right)^{12}$$

$$\left[0.9223682\right]^{\frac{1}{12}} = \left(1 - \frac{d^{12}}{12}\right)$$

$$d^{12} = 8.053929$$

Ques (2)

$$(i) \delta(t) = 0.004t + 0.0002t^2$$

$$- \int_0^{10} \delta(t) dt$$

$$PV_0 = 1000 \times e$$

$$- \int_0^{10} (0.004t + 0.0002t^2) dt$$

$$= 1000 \times e$$

$$- \left[\frac{0.004t^2}{2} + \frac{0.0002t^3}{3} \right]_0^{10}$$

$$= 1000 \times e$$

$$- \left[0.002(100) + \frac{0.0002(1000)}{3} \right]$$

$$= 1000 \times e$$

$$PV_0 = 765.9283384$$

(ii)

$$1000 \cdot AV_{10} = 765.9283384 \times (1+i)^{10}$$

$$\left[\frac{1000}{765.928} \right]^{1/10} = 1+i$$

$$i = 2.7025404\%$$

Ques (3)

$$(i) \text{ Since we know, } d = \frac{i}{1+i}$$

and $\frac{1}{1+i}$ can be written as v i.e. discount factor.

$$d = iv$$

(ii)

a)

$$(1+d)^4 = \left(\frac{1-d^2}{2} \right)^2$$

$$(1-0.0225)^2 = \left(\frac{1-d^2}{2} \right)$$

$$d^2 = 8.89875\%$$



$$d^4 = 6\%$$

(i)

$$a) \left(1 + \frac{i^2}{2}\right)^2 = \left(1 - \frac{d^4}{4}\right)^{-4}$$

$$\left(1 + \frac{i^2}{2}\right)^2 = \left(1 - \frac{0.06}{4}\right)^{-4}$$

$$i^2 = 0.0$$

$$i^2 = 6.13775\%$$

$$b) \left(1 - \frac{d^{12}}{12}\right)^{12} = \left(1 - \frac{d^4}{4}\right)^4$$

$$\left(1 - \frac{d^{12}}{12}\right)^{12} = \left(1 - \frac{0.06}{4}\right)^4$$

$$d^{12} = 6.03025\%$$

(ii)



$$2,20,000 = 200,000 (1+i)$$

$$i = 0.1$$

Time Period from 15th April 2005 to 17th July 2005 $\approx$ 3 months.

$$\text{Sum Paid on 17th July 2005} \Rightarrow (1+i)^{\frac{3}{12}} \times 2,00,000$$

$$\Rightarrow 204822.7373$$

DOUBT!

Ques (6)

Page No.

Date: / / 20

$$0.7 = 0$$

$$0.7 = 1(1-d)$$

$$x = 1$$

Retail Price = R

$$70 = 75$$

$$X = R \times (1 - 0.03) \quad (\text{Cash Repayment})$$

$$Y = R \times (1 - 0.25)^2 \quad (\text{Credit})$$

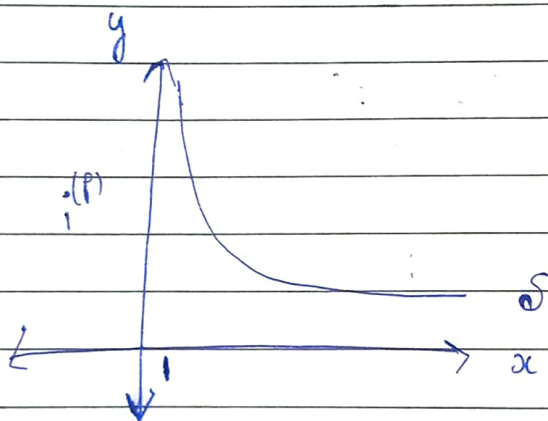
$$\frac{X}{Y} = \frac{R(1-0.03)}{R(1-0.25)^2} = 1-d$$

 $\Rightarrow$

Ques (6) (i) $\frac{0.70}{0.75} = 1-d$

$$d = 6.6667\%$$

Ques (8)



On increasing the value of 'p', the nominal rate of interest $[i^{(p)}]$ tends to get closer to the value of force of interest (δ).

(6)

(ii)

$$d^{(2)} = [1 - (1-d)^{1/2}] \times 12$$

$$i^{(2)} = [(1-d)^{1/2} - 1] \times 2$$

$$\delta = -\ln(1-d)$$

$$d^{(2)} = [1 - (1-0.06667)^{1/2}] \times 12$$

$$i^{(2)} = [(1-0.06667)^{1/2} - 1] \times 2$$

$$\delta = -\ln(1-0.06667)$$

$$d^{(2)} = 6.8798\%$$

$$i^{(2)} = 7.02003\%$$

$$\delta = 6.8996\%$$

i) $i^4 = ?$

$$26000 = 20,000 \times \left(1 + \frac{i^4}{4}\right)^{\frac{4 \times 17}{12 \times 3}}$$

$$(1.3)^{\frac{3}{17}} = \left(1 + \frac{i^4}{4}\right)$$

$$i^4 = 18.95525\%$$

(ii)

$$\frac{26000}{20000} = \left(1 - \frac{d^2}{2}\right)^{\frac{-2 \times 17}{12 \times 6}}$$

$$(1.3)^{\frac{-6}{17}} = \left(1 - \frac{d^2}{2}\right)$$

$$d^2 = 17.68823\%$$

(iii)

$$\frac{26000}{20000} = \left(1 + \frac{17 i}{12}\right)$$

$$1.3 - 1 = \frac{17 i}{12}$$

$$i = 21.17647\%$$

Ques

Q

(1)

force of interest $\Rightarrow$ It refers to nominal interest rate or a discount rate compounded infinite number of times per time period.

(11)

$$1) \quad i^2 = 0.0775$$

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

$$\left[1 + \frac{0.0775}{2}\right]^2 = 1 + i$$

$$\boxed{i = 7.9001563\%}$$

$$2) \quad \ln(1+i) = d$$

$$\boxed{7.6036134\%}$$

3)

$$(1+i) = \left(1 - \frac{d^{12}}{12}\right)^{-12}$$

$$(1+i)^{\frac{-1}{12}} = 1 - \frac{d^{12}}{12}$$

$$\boxed{d^{12} = 7.57957\%}$$

4) $i^{(1/2)}$

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

$$\Rightarrow 1 + 2i^{1/2} = (1+i)^2$$

$$\boxed{i^{(1/2)} = 8.2122186\%}$$

Ques (10)

Wenn $t \geq 5$ Wenn $0 \leq t < 5$

$$- \int_0^t (0.08) ds$$

$$v(t) = e$$

$$- [0.08t]_0^t$$

$$\Rightarrow e$$

$$\Rightarrow e^{-0.08t} = v(t)$$

Wenn $5 \leq t \leq 10$

$$- \int_0^5 0.08 ds$$

$$- \int_5^t (0.06) ds$$

$$v(t) = e^{-0.08(5)} \times e^{-[0.06t]_5^t}$$

$$\Rightarrow e^{-0.4} \times e^{-[0.06t - 0.3]}$$

$$\Rightarrow e^{-0.4} \times e^{-[0.06t - 0.3]}$$

$$v(t) \Rightarrow e^{-0.4 + 0.3 - 0.06t} \Rightarrow e^{-0.1 - 0.06t} = v(t)$$

Wenn $t \geq 10$

$$- 0.08(5)$$

$$v(t) = e^{-0.1 - 0.06(10)} \times e^{- \int_{10}^t (0.04) ds}$$

$$v(t) = e^{-0.1 - 0.6} \times e^{-[0.04s]_{10}^t}$$

$$\Rightarrow e^{-0.1 - 0.6} \times e^{-[0.04s]_{10}^t}$$

$$\Rightarrow e^{-0.1 - 0.6} \times e^{-0.04t + 0.4}$$

$$v(t) \Rightarrow e^{-0.3 - 0.04t}$$

(11)

Ques ①

a)

$$d = 18\%$$

$$t = \frac{9}{12}$$

$$9/12$$

$$PV = \text{Amt. due} \times (1-d)$$

$$50,000 \times (1-0.18)^{9/12}$$

$$PV = 43085.42623$$

b)

(i) $d = 6\%$, d^{12}

$$e^{-\frac{0.06}{12}} = \left(1 - \frac{d^{12}}{12}\right)$$

$$d^{12} \Rightarrow 5.9850250\%$$

(ii) $d^4 = 6\%$, $i^{12} = ?$

$$\left(1 - \frac{d^4}{4}\right)^{-4} = \left(1 + \frac{i^{12}}{12}\right)^{12}$$

$$1 - d \cdot \left(1 - \frac{0.06}{4}\right)^{-4} = 1 + \frac{i^{12}}{12}$$

$$i^{12} = 6.0607089\%$$

c)

$$d < \delta < i^{(4)}$$

$$d < \delta < i^{(4)}$$

d)

Already done :-)

Ques (12)

$$AV_6 = 7049 \times \left(1 + \frac{i^{12}}{12}\right)^{24} \times [1 + 10 \times 0.015] \times \left[1 - \frac{d^{12}}{12}\right]^{-18}$$

$$\Rightarrow 7049 \times \left(1 + \frac{0.06}{12}\right)^{24} \times [1 + 10 \times 0.015] \times \left[1 - \frac{0.06}{12}\right]^{-18}$$

$$\Rightarrow 7049 \times 1.12715978 \times [1.15] \times 1.09442123$$

$$\boxed{AV_6 = 9999.883762}$$

(13) (i) $2x = x \times (1+i)^t$
 $2 = [1 + 0.1]^t$

$$\log 2 = t \log [1.1]$$

$$t = \frac{\log 2}{\log 1.1}$$

7.272541 years

~~3.043766~~

~~2.00833~~

(ii)

$$2 = \left(1 - \frac{d^{12}}{12}\right)^{-12t}$$

$$2 = \left(1 - \frac{0.1}{12}\right)^{-12t}$$

$$\ln 2 = -12t \ln \left(1 - \frac{0.1}{12}\right)$$

$$\boxed{t = 6.90255}$$