Q2 i $\delta(t) = 0.004t + 0.0002t^2$

$PV_0 = 1000 \times e^{\int_0^{10} \delta(t)\,dt}$

$= 1000 \times e^{\int_0^{10} (0.004t + 0.0002t^2)}$

$= 1000 \times e^{-[0.002t^2 + 0.0002t^3/3]}$

$= 1000 \times e^{-[0.002t^2(100) + \frac{0.0002(100)}{3}]}$

~~100~~

$PV_0 = 765.9283384$

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

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

$= i = 2.7025404$

Q3 Since we know $= d = \frac{1}{1+i}$

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

$d = iv$

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

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

$d^2 = \cancel{0.8}\ 8.89875$

$$\frac{(x+1)^2}{(x+2)^3(x+3)^4}\left[\frac{2}{x+1}-\frac{3}{x+2}+\frac{4}{x+3}\right]$$

FM Assignment 1

(1) $d^{(4)} = 8\%$

$\delta = ?$

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

$\left(1-\frac{(0.02)}{4}\right)^4 = e^{-(\delta)}$

$\delta = 0.08081$

$\delta = 8.081834\%$

(2) $1+i = e^{\delta}$

$i = e^{\delta}-1$

$i = 8.41657$

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

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

$d^{(12)} = 8.053929$

Date
Page

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

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

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

Q10. $v(t) = e^{-\int_0^t (0.08)\,ds}$

$= e^{-[0.08t]_0^t}$

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

when $5 < t < 10$

$v(t) = e^{-\int_0^5 0.08\,ds} \times e^{-\int_5^t (0.06)\,ds}$

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

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

$= e^{-0.4 + 0.3 - 0.06t}$

$\Rightarrow e^{-0.1 - 0.06t}$

when $t \geq 10$

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

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

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

(4)

Date ____
Page ____

$$(1.08)^{1/0.5} = 1 + \frac{i^{0.5}}{0.5}$$

$$i^{0.5} = 8.32\%$$

Question 5

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

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

$$i^{2} = 6.13775$$

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

$$d^{12} = 6.030025\%$$

2

2,00,000 ———— 2,20,000

$$2,20,000 = 2,00,000(1+i)$$
$$i = 0.1$$

Time period b/w 15th April to 17th July = 3 mon

Sum paid on 17th July 2005 = $(1+i)^{3/12} \times 2,00,000$

$$\Rightarrow 2,04,822.7373$$

9

Q12 $AV_6 = 7049 \times \left(1 + \frac{i^{(12)}}{12}\right)^{24} \times (1 + 10 \times 0.015) \times \left(1 - \frac{d^{(12)}}{12}\right)^{-18}$

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

$\Rightarrow 7049 \times 1.12715978 \times (1.15) \times 1.094428$

$AV_6 = 9999.887362$

Q13. $2x = x \times (1+i)^t$

$2 = [1 + 0.1]^t$

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

$t = \frac{\log 2}{\log 1.1} \Rightarrow 7.278254$ years

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

$2 = \left[1 - \frac{0.1}{12}\right]^{-12t}$

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

$t = 6.90255$

Date
Page

Q11. $d = 18\%$

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

$PV = \text{Amt due} \times (1-d)^{9/12}$

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

$PV = 43{,}085.4263$

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

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

$d^{12} = 5.985025\%$

2. $d^{4} = 6\%$ $i^{(12)} = ?$

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

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

$i^{12} = 6.0607089\%$

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

6

Date ___
Page ___

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

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

$= 6.8798\%$

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

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

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

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

$\delta = 6.8996\%$

Q4. Force of Interest → It refers to the nominal rate of interest rate compounded infinite times per time period

2. $i^{2} = 0.0775$

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

$i = 7.90001563\%$

$\ln(1+i) = \delta$

$= 7.6036134\%$

3) $(1+i) = \left(1 - \frac{d^{12}}{12}\right)^{-12}$

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

$d^{(12)} = 7.57957\%$

Date ____
Page ____

Q6. (1) $\frac{0.7}{0.75} = 1 - d$

$d = 6.6667\%$

Q.7. $i^{(4)} = ?$

$26,000 = 20,000 \times \left(1 + \frac{i^{(4)}}{4}\right)^{4 \times \frac{17}{12}}$

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

$i^{(4)} = 18.95525$

$\frac{26,000}{20,000} = \left(1 - \frac{d^{2}}{2}\right)^{-2 \times \frac{17}{12}}$

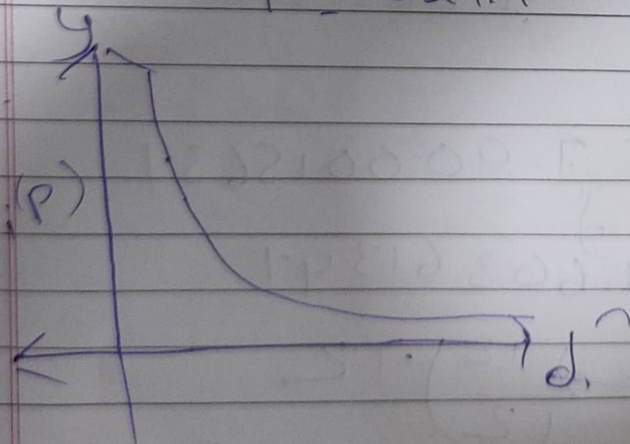
$(1.3)^{-6/17} = \left(1 - \frac{d^{2}}{2}\right)$

$d^{2} = 17.68823\%$

3. $\frac{26,000}{20,000} = 1 + \frac{17}{12} i$

$i = 21.17647$

Q8.




On increasing the value of $i^{(P)}$ the nominal rate of interest $i^{(P)}$ tends to get closer to the value of force of interest

Date
Page

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

$\left[1-2(0.05)\right]^{1/4} = \left[1-\frac{d^{2}}{2}\right]$

$d^{2} = 5.19925$

3) $i = 0.05$

$(1+i)^{91/365} = \left(1-\frac{91}{365}d\right)^{-1}$

$(1.05)^{-91/365} = 1 - \frac{91}{365} \times d$

Q4 Similar done 3 i)

2) $i = 0.08$

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

$(1.08)^{-1/12} = 1 - \frac{d^{(12)}}{12}$

~~1.08~~

$d^{(12)} = 7.67147\%$.

b) $i^{(365)}$ & $1+i = \left(1+\frac{i^{(365)}}{365}\right)^{365}$

$(1.08)^{1/365} = 1+\frac{i^{(365)}}{365}$

$i^{(365)} = 7.6969\%$.

d) $i^{(0.5)}$

$1+i = \left(1+\frac{i^{(0.5)}}{0.5}\right)$