F.M Assignment 1

Q1) $d^{(4)} = 8\%$

(1) $\delta = ?$

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

$$\ln\left[\left(1 - \frac{d^{(4)}}{4}\right)^4\right] = -\delta$$

$$\therefore \delta = 0.08081082927$$

(2) $i = ?$

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

$$\therefore i = 8.416578\%$$

(3) $d^{(12)} = ?$

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

$\therefore d^{(12)} = 8.05393392\%$

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

① $1000 = PV \cdot e^{-\int_0^{10} 0.004t + 0.0002t^2 \, dt}$

$= PV \cdot e^{-[0.002t^2 + 0.0002t^3/3]_0^{10}}$

$= PV \, e^{-[0.2 + 0.2/3]}$

$P \cdot V = 765.92833384$

② $(1+i)^{10} = 0.765928338 4$

$\therefore i = 2.70254038\%$

Q3)

① $1 - d = \frac{1}{1+i}$

$\therefore 1 - \frac{1}{1+i} = d$

$\therefore \frac{1+i-1}{1+i} = d$

$\therefore \frac{i}{1+i} = d$

$\therefore \frac{i \times 1}{1+i} = d$

$\therefore iv = d$ //

② $d^{(2)} = ?$

$\frac{d^{(4)}}{4} = 2.25\%$

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

$0.95550625 = 1 - \frac{d^{(2)}}{2}$

$\therefore d^{(2)} = 8.89875\%$

② $d^{(1/2)} = 5\%$

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

$\therefore d^{(2)} = 5.199250715\%$

③ $100(1+i)^{91/365} = A.V$

$A.V = 101.2238407$

$\frac{101.2238407}{100} = \frac{1}{(1-dt)}$

$\therefore d = 4.849461895\%$

Q4)

(1) Same as question (3)

(2) $i = 0.08$

a) $d^{(12)} = ?$

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

$$d^{(12)} = 7.671477761\%$$

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

$$i^{(365)} = 7.696915541\%$$

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

$$\delta = 7.696104114\%$$

d) $i^{(1/2)} = ?$

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

$$i^{(1/2)} = 8.32\%$$

Q5) (i) $d^{(4)} = 6\%$

a) $i^{(2)} = ?$

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

$$i^{(2)} = 6.137751552\%$$

b) $d^{(12)} = ?$

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

$$d^{(12)} = 6.030252528\%$$

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

$$i = 10\%$$

$$200000(1+i)^{93/365} = P.V$$

$$P.V = 2,04,916.3564$$

∴ The sum paid by Amt. on 17 July, 2005 to terminate the contract is ₹2,04,916.3564

Q6)

① Let the product be of ₹100.

Cash payment at to = 70
Credit payment at to. 5 = 75

$$70 = 75(1-d)^{1/2}$$

$$\left(1 - \frac{70}{75}\right)^2 = d$$

$$\therefore d = 12.888889\%$$

Camlin Page
Date / /

②

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

$\therefore d^{(12)} = 13.7195439\%$

b) $i^{(2)} = ?$

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

$\therefore i^{(2)} = 14.28571424\%$

c) $\delta = ?$

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

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

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

$\delta = 13.7985743\%$

Q-7) 20,000 ⇒ 26,000 in 17 months

$\frac{26000}{20000} = (1+i)^{17/2}$

$i = 20.34570672\%$

(1) $i^{(4)} = ?$

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

$$i^{(4)} = 18.95525456\%$$

(2) $d^{(2)} = ?$

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

$$d^{(2)} = 17.68823531\%$$

(3) Simple interest

$$\frac{26000}{20000} = (1 + ni)$$

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

$$\therefore i = 21.17647059\%$$

(4) The interest rate decreases as p increases in nominal rates of interest convertible p^{th} ly. Also simple interest is more than compound of the time period is more than 1 year.

Q8) $i = 8\%$

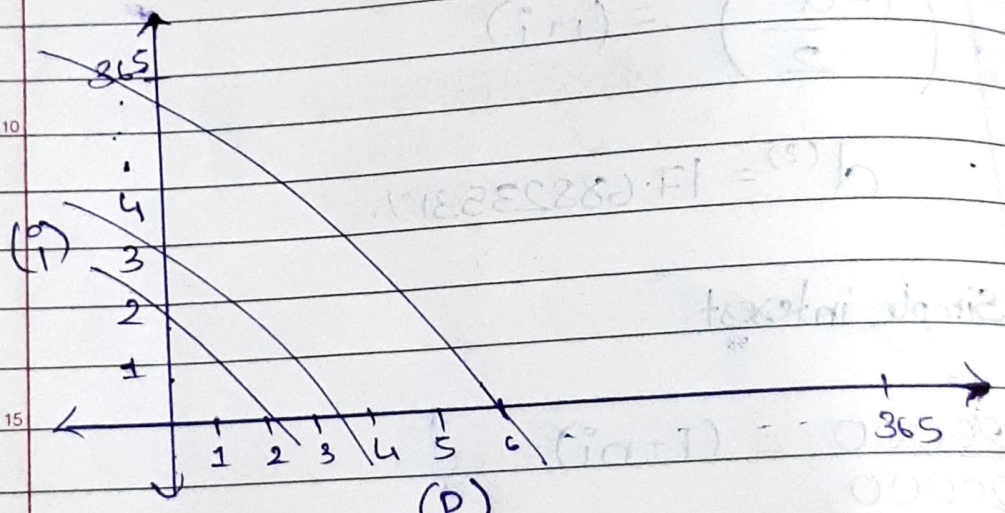
$i^{(2)} = 7.846096908\%$

$i^{(4)} = 7.770618763\%$

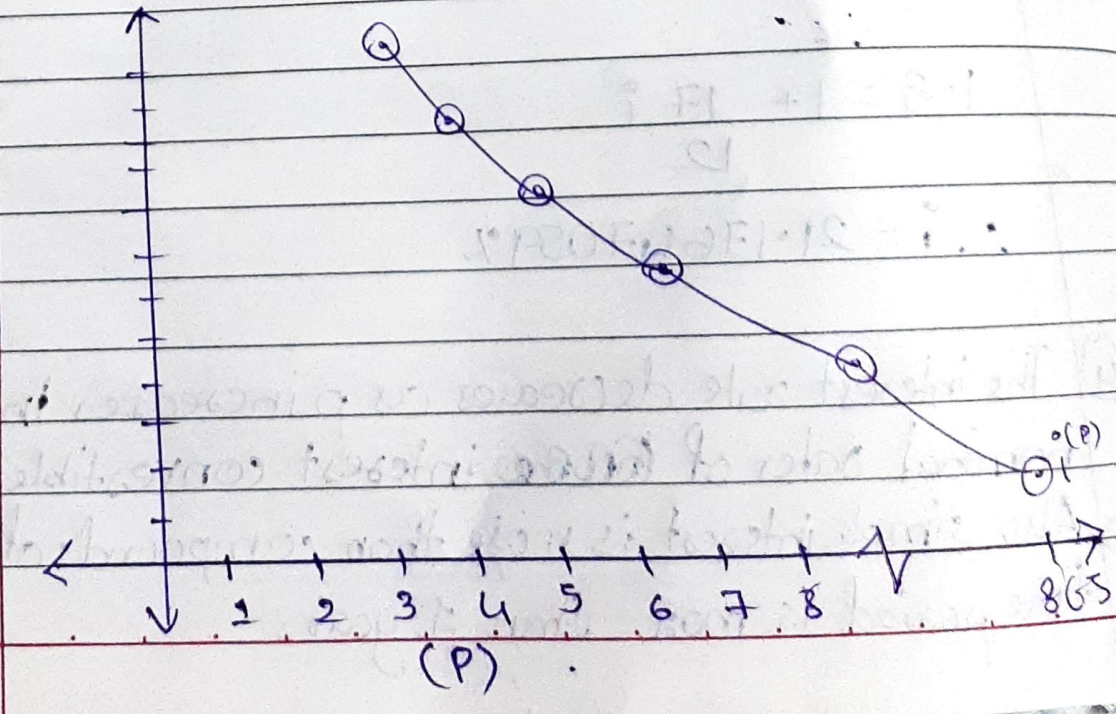
$i^{(6)} = 7.745674178\%$

$i^{(12)} = 7.720836132\%$

$i^{(365)} = 7.696915541\%$



(i)



The nominal rate of interest decreases as they are convertible pthly, where p is increasing.

Q9)

① Force of interest refers to nominal rate of interest compounded infinite number of times on every moment per time period.

② $i^{(2)} = 0.0775$

$i = ?$

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

$i = 0.07900156 25$

$\delta = ?$

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

$\delta = 0.07603613438\%$

$d^{(12)} = ?$

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

$d^{(12)} = 0.07579574 68$

$i^{(1/2)} = ?$

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

$$i^{(1/2)} = 0.082218594\%$$

Q10)

$$\delta(t) = \begin{cases} 0.08 & 0 \le t \le 5 \\ 0.06 & 5 \le t \le 10 \\ 0.04 & t \ge 10 \end{cases}$$

P.V = 1

$\therefore$ A.V = a(t) V(t)

$\therefore$ v(t) for $0 \le t \le 5$ = $0.08t$

for $5 \le t \le 10$ = $0.06t$

for $t \ge 10$ = $0.04t$

a) $50000(1-d)^{\frac{9}{12}} = PV$

$50000(1-0.18)^{\frac{9}{12}} = PV$

$PV = 43085.42623$

∴ The amount initially lent to the borrower was 43085.42623

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

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

$$d^{(12)} = 0.059850246698$$

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

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

$$i^{(12)} = 0.062035201827\%$$

$$i^{(4)} = 0.062356451647\%$$

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

Q12) $P.V = 7049\,(A_{0.12})\,(A_{2,4.5})\,(A_{4.5,i})$

$$= 7049\left(1+\frac{0.06}{12}\right)^{12\times 2}\left(1+2.5\times 0.06\right)\times\left(1-\frac{0.06}{12}\right)^{12\times 1.5}$$

$$P.V = 8348.842852.$$

∴ The accumlates amount after 6 yrs is 8348.842852.

Q13) $2 = (1+i)^x$

$$\ln(2) = x\ln(1+i)$$
$$\ln(2) = x\ln(1.1)$$
$$\frac{\ln(2)}{\ln(1.1)} = x$$

∴ $x = 7.2725$

∴ It would take amount 7.27 yrs to double an investment at 10% rate of interest.