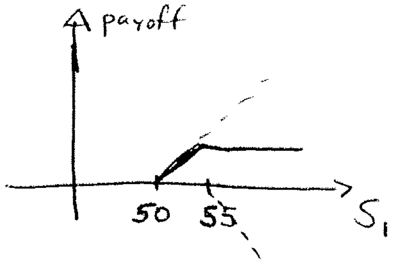
Exam FM/2 Mock Exam (3/23/2010)

Key:

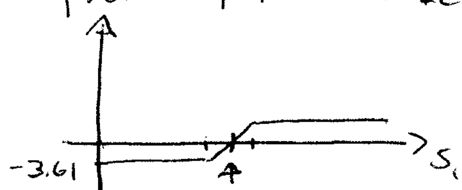
1) long call (50) + short call (55)



$IC = 7 - 3.50 = 3.50$

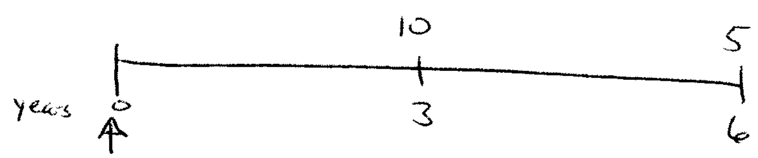
$AV_{IC} = 3.5\,e^{.03} \doteq 3.61$

profit = payoff − AV_{IC}



break-even = 53.61

2)

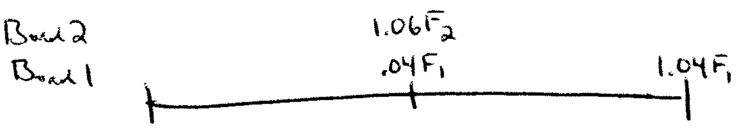


d = simple discount rate

$12 = 10(1-3d) + 5(1-6d)$

$12 = 15 - 60d \Rightarrow d = \frac{3}{60} = .05$

3) F_1 = face amount of bond 1 ; F_2 = face amount of bond 2



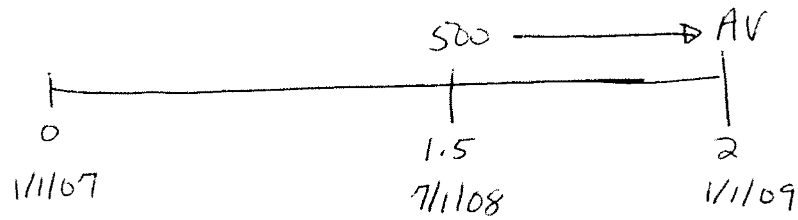
$$\left.\begin{array}{r} 1.06F_2 + .04F_1 = 11400 \\ 1.04F_1 = 20800 \end{array}\right\} \Rightarrow F_1 = 20000 \;\; \& \;\; F_2 = 10000$$

P_1 = Price of Bond 1 $= 800\, a_{\overline{2}|.05} + 20000\, v^2_{.05} = 19628$

$P_2 = 1.06(10000)\, v_{.04} = 10192$

$\therefore \Sigma = 19628 + 10192 = 29820$

4)



$$AV = 500\, e^{\int_{1.5}^{2} \frac{3+t}{30}\,dt} = 500\, e^{\frac{1}{30}\left(3t+\frac{t^2}{2}\right)\Big|_{1.5}^{2}} = 500 e^{.0791\overline{6}}$$

$$AV \doteq 540$$

5) $X: \quad a(t) = \left(\frac{15-t}{15}\right)^{-1} = \frac{15}{15-t}$

$$\left.\begin{aligned} AV_4^X &= 1000 \cdot a(4) = 1000 \cdot \tfrac{15}{11} \\ AV_4^Y &= 1000(1.04)^6(1+i) \end{aligned}\right\} = \quad \therefore\ 1+i = \frac{15}{11(1.04)^6}$$

$$\Longrightarrow i \doteq .0775$$

6) 1-year spot rate $S_1 = .03$

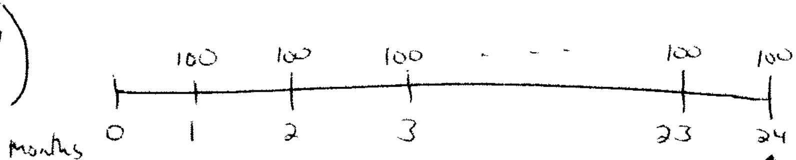
$S_2 = .05$

$S_3 = .06$

$$\frac{100}{1.03} + \frac{200}{(1.05)^2} + \frac{300}{(1.06)^3} = R\left(\frac{1}{1.03} + \frac{1}{(1.05)^2} + \frac{1}{(1.06)^3}\right)$$

$$\Longrightarrow R \doteq 195$$

7)

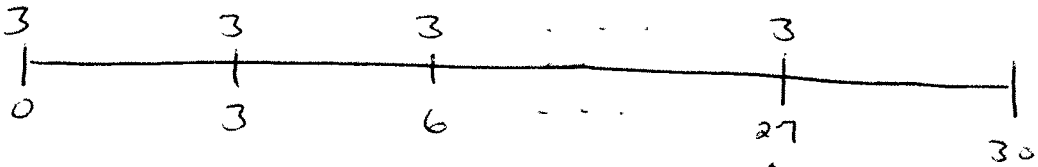


$$AV = 100 + 100\left(1+\tfrac{i}{12}\right) + 100\left(1+2\tfrac{i}{12}\right) + \cdots + 100\left(1+23\tfrac{i}{12}\right)$$

$$AV = 100(24) + 100\tfrac{i}{12}(1+2+3+\cdots+23) = 2400 + 100\left(\tfrac{.10}{12}\right)\left(\tfrac{23\cdot 24}{2}\right)$$

$$AV = 2630$$

8)



$AV = 3\, s_{\overline{10}|j}$

j = 3-year eir

$1+j = (1.03)^6 \Rightarrow j \doteq .194$

$AV = 3\, s_{\overline{10}|.194} \doteq 75$

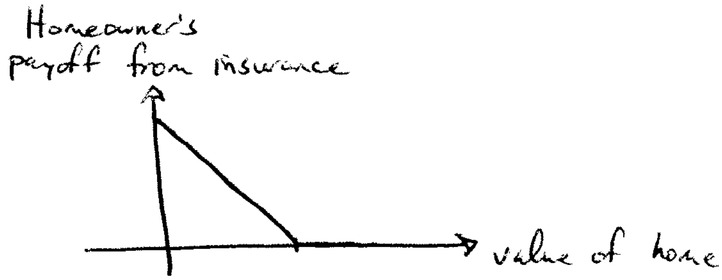
9) Put - Call Parity : $(K = S_0)$ $\quad C_0 - P_0 = S_0(1 - v^T)$

If $r > 0$, then $v^T < 1$ and so $C_0 > P_0$

If $r = 0$, then $v^T = 1$ and so $C_0 = P_0$

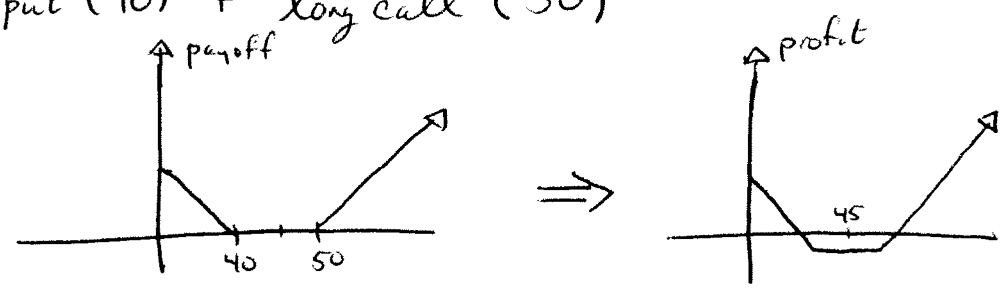
I & III are true

10)



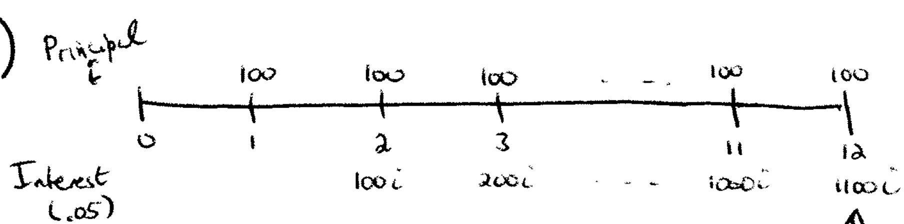
long put

11) long put (40) + long call (50)



Joe profits from a significant increase or decrease in stock price,
I & II are true

12)

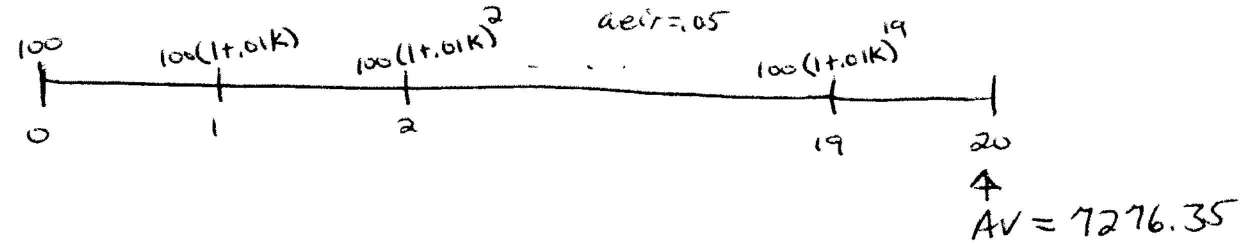


$AV = 100(12) + 100i \cdot (Is)_{\overline{11}|.05}$

$$AV = 1200 + 100i \cdot \frac{\ddot{s}_{\overline{11}|.05} - 11}{.05} = 1748.40$$

$$\Rightarrow i \doteq .07$$

13)



$$7276.35 \overset{VEP}{=} 100(1.05)^{20} + 100(1+.01k)(1.05)^{19} + \cdots + 100(1+.01k)^{19}(1.05)$$

$$= 100(1.05)^{20}\left[1 + \frac{1+.01K}{1.05} + \cdots + \left(\frac{1+.01K}{1.05}\right)^{19}\right]$$

geometric $r = \frac{1+.01K}{1.05} > 1$ since $k > 5$

$$= 100(1.05)^{20} \cdot s_{\overline{20}|j} \qquad j = r-1$$

$$7276.35 = 100(1.05)^{20} \cdot s_{\overline{20}|j} \implies j \doteq .032 \quad \text{(Use calculator TVM)}$$

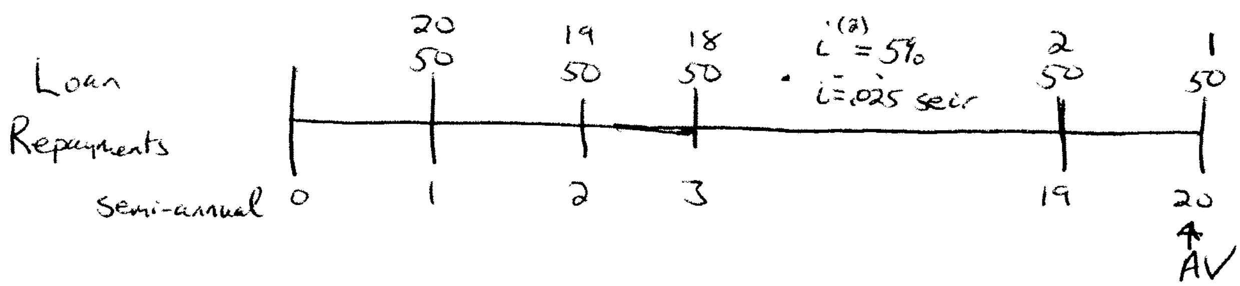
$$\therefore \quad r = \frac{1+.01K}{1.05} = 1.032 \implies k \doteq \cancel{.0836}\ 8.36$$

14) $R_{SF} = \dfrac{300000}{s_{\overline{20}|.0675}} \implies R_{SF} = 7520$

$$R_{Total} = 22520 \implies R_I = 15000 = 300000 \cdot i$$

$$\implies i = .05$$

15)

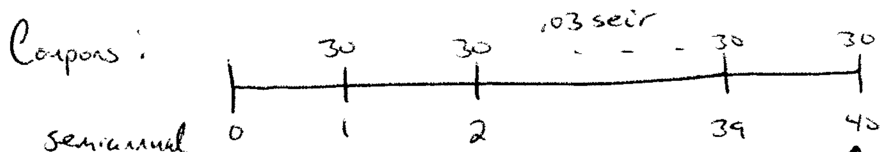


$$AV = 50\, s_{\overline{20}|.025} + (Ds)_{\overline{20}|.025}$$

$$= 50\, s_{\overline{20}|.025} + \frac{20(1.025)^{20} - s_{\overline{20}|.025}}{.025} \doteq 1566.34$$

$$\therefore \quad 1000(1+j)^{10} = 1566.34 \implies j \doteq 4.6\%$$

16) Price $= P = 30\, a_{\overline{40}|.025} + 700\, v^{40}_{.025} \doteq 1013.78$



$AV = 30\, s_{\overline{40}|.03} = 2262.04$

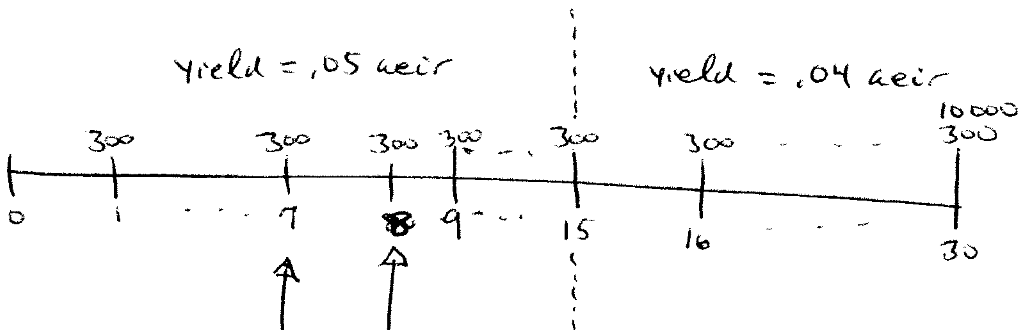
$+\ 700$ (Redemption)

2962.04

$\therefore\ 1013.78(1+i)^{20} = 2962.04$

$\Rightarrow i \doteq 5.59\%$

17)



$BV_{15} = 300\, a_{\overline{15}|.04} + 10000\, v^{15}_{.04}$

$= 8888.16$

$BV_8 = 300\, a_{\overline{7}|.05} + 8888.16\, v^{7}_{.05} \doteq 8052.56$

$BV_7 = 300\, a_{\overline{8}|.05} + 8888.16\, v^{8}_{.05} \doteq 7954.82$

Accumulation of discount for year 8 is

$BV_8 - BV_7 \doteq 98$

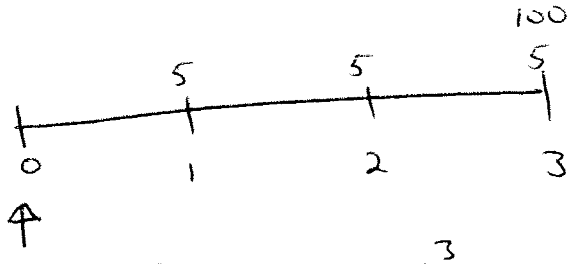
18) Mod D (Bond A) $= 17\, v_{.06} = 16.0377$

Mod D (Bond B) $= 10\, v_{.06} = 9.4340$

$\therefore$ Mod D (Portfolio) $= \frac{885}{885+1115}(16.0377) + \frac{1115}{885+1115}(9.4340)$

$\doteq 12.4$

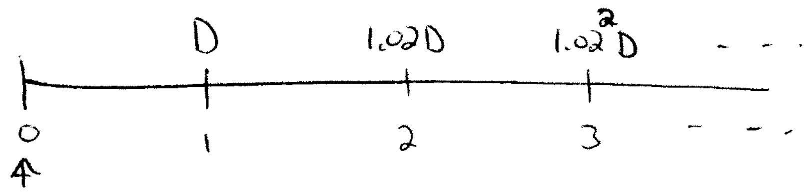
19) Per 100 of face value, we have



$$P = 5\,a_{\overline{3}|i} + 100\,v_i^3 = \frac{5}{1.04} + \frac{5}{(1.05)^2} + \frac{105}{(1.06)^3}$$

$$\Longrightarrow i \doteq 5.9\%$$ (Use calculator TVM)

20)



$$\text{Mac}D = \frac{Dv + 2\cdot 1.02D\cdot v^2 + 3\cdot 1.02^2 D\cdot v^3 + \cdots}{Dv + 1.02Dv^2 + 1.02^2 Dv^3 + \cdots}$$

$$= \frac{\cancel{Dv}\left(1 + 2(1.02v) + 3(1.02v^2) + \cdots\right)}{\cancel{Dv}\left(1 + 1.02v + (1.02v)^2 + \cdots\right)}$$

Let $X = 1.02v = \frac{1.02}{1.05}$ (like a new v)

Then $$\text{Mac}D = \frac{1 + 2X + 3X^2 + \cdots}{1 + X + X^2 + \cdots} = \frac{(I\ddot{a})_{\overline{\infty}|}}{\ddot{a}_{\overline{\infty}|}}$$

Note: $$(I\ddot{a})_{\overline{\infty}|} = \frac{\ddot{a}_{\overline{\infty}|} - \cancel{\infty v^{\infty}}^{\to 0}}{d} = \frac{\ddot{a}_{\overline{\infty}|}}{d}$$

$$\therefore \text{Mac}D = \frac{\left(\frac{\ddot{a}_{\overline{\infty}|}}{d}\right)}{\ddot{a}_{\overline{\infty}|}} = \frac{1}{d} = \frac{1}{1 - v_{new}} = \frac{1}{1 - X} = 35$$