$$\begin{cases}
P_1 + P_2 = 240 \\
P_1 - P_2 = 24
\end{cases} = \begin{cases}
P_1 = 132 \\
P_2 = 108
\end{cases}$$

(1) 
$$P_i = F(2r) \alpha m_j + F v^n = 200 r \alpha m_i o s + 100 v_i o s$$

$$24 = 100 r \, a_{11.015} = \frac{100 r}{.015} (1-v^{n})$$

$$y^n = 1 - \frac{24(.015)}{100r} = 1 - \frac{.0036}{r}$$

Thus, (2)=)

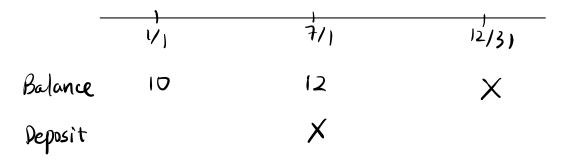
$$108 = 100 \text{ r} \cdot \frac{-036/r}{.015} + 100 \left(1 - \frac{.0036}{r}\right)$$

$$= 24 + 100 - \frac{.36}{r}$$

$$-16 = -\frac{.36}{r} = ) r = .025$$

$$r_2 = .0275$$
 } coupon vate for 6 months.  
 $r_1 = .045$ 

2.



Time-weight return:

$$\dot{x} = \frac{12}{10} \cdot \frac{x}{12+x} - 1 = 0$$

$$\frac{x}{12+x} = \frac{10}{12}$$

$$x = 10 + \frac{3}{6}x$$

$$\frac{1}{6}x = 10 = 0$$

Dollar-weight return:

$$A_{0} = 10$$

$$C_{1} = 60 \quad (in \quad 1/2 \quad yvs)$$

$$A_{1} = 60$$

$$\hat{v}_{0} = \frac{A_{1} - C_{1} - A_{0}}{A_{0} + C_{1}(1 - 1/2)} = \frac{60 - 60 - 10}{10 + 60(1/2)} = -\frac{10}{40}$$

$$= -.75$$

3,

Account: 100000 103000

A 103992

Deposit:

-8000

2005: 
$$\chi = \frac{A - (100000 - 8000)}{100000 - 8000 (1 - \frac{9}{12})}$$
 (dollar-weight MTD)

$$2006: \quad \chi = \frac{103992}{A} - 1 \quad \text{(time-weight NATD)}$$

Thus, 
$$\chi = \frac{A - 92000}{94000} = \frac{103992}{A} - 1$$

$$\begin{cases} A = 92000 + 94000 \times \\ (1+x)A = 103992 \end{cases}$$

$$(1+x)(92000+94000x)=103992$$

$$=)$$
  $\chi = 6.25\%$ 

4.

1/1 3/15 6/1 6/30 10/1 12/31

Account: 50 40 80 157.5 175 X

Deposit: 20 80 75

$$\frac{40}{50} \cdot \frac{80}{40+10} \cdot \frac{157.5}{80+80} - 1 = .05$$

$$\frac{175}{157.5} \cdot \frac{\times}{175+75} = 1.05$$

Bond 1: 
$$85.12 = \frac{20}{5} \frac{100(.02)}{(H50(42))^{4/2}} + \frac{100}{(1+50(10))^{10}}$$
 (1)

Bond 2: 133,34 = 
$$\sum_{t=1}^{20} \frac{1001.05}{(1+s_0(t/L))^{5/2}} + \frac{100}{(1+s_0(10))^{10}}$$
 (2)

(b) see section notes.

$$= \prod_{j=1}^{K} (1+i\omega(j-l,j))$$

(c) Use formula:  

$$i_0(k-1, k) = \frac{(1+S_0(k))^k}{(1+S_0(k-1))^{k-1}} - 1$$

7. 
$$F_1 + F_2 = 100$$
  
 $F_1D_1 + F_2D_2$   
 $F_1 + F_2 = 13.5 (*)$ 

$$=)$$
 12.7 $F_1$  + 14.6 $F_2$   $=$  1350

Value:  $P_1 = 88.35$ ,  $P_2 = 130.49$  (per 100 of face)  $V = \frac{F_1 P_1 + F_2 P_2}{100} = 106.095$  (\*\*)

(\*): For portfolio A and B, with values

PVA and PVB, and Puration PA and DB.

Then,  $\begin{cases} PV_A \cdot P_A = \sum_{k=1}^n k \, v^k \, CF_k^{(A)} \\ PV_B \cdot P_B = \sum_{k=1}^n k \, v^k \, CF_k^{(B)} \end{cases}$ 

where  $CF_k^{(A)}$ : cashflows for asset A at time k,

CF(B): cashflows for asset B at the K.

Then Duration for portfolio 15

$$D_{p} = \frac{\sum_{k=1}^{n} k v^{k} CF_{k}^{(A)} + \sum_{k=1}^{n} k v^{k} CF_{k}^{(B)}}{\sum_{k=1}^{n} v^{k} CF_{k}^{(A)} + \sum_{k=1}^{n} v^{k} CF_{k}^{(B)}}$$

(xx): Fact: If F=C (face = redemption), then

$$\frac{F}{PV}$$
 is fixed.

For Bond 1: 
$$\frac{100}{P_1} = \frac{F_1}{V_1} = \frac{F_1 P_1}{100}$$

For Bond 2: 
$$\frac{100}{P_2} = \frac{F_2}{V_2} \Rightarrow V_2 = \frac{F_2P_2}{100}$$

Value Por Portfolio:

8. See Section Notes.