

Sample Final Questions
Fin 3560

1. If the discount yield on a 91-day Treasury bill is 1.8%, what is the effective annual yield?

$$0.018 = \frac{P_F - P_0}{P_F} \times \frac{360}{N} = \frac{100,000 - P_0}{100,000} \times \frac{360}{91}$$

$$0.018(100,000) \times \frac{91}{360} = 100,000 - P_0 \quad P_0 = 100,000 - 0.018(100,000) \times \frac{91}{360} = 99,545$$

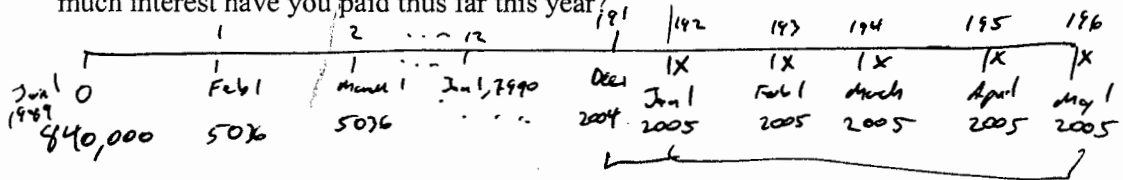
$$99,545 = \frac{100,000}{(1+r)^{91/365}} \rightarrow r = 1.8459961\%$$

2. If a 181-day Treasury bill has an effective annual yield of 2.5%, what is the bond equivalent yield?

$$98,782.98327 = \frac{100,000}{(1.025)^{181/365}}$$

$$bey = \frac{P_F - P_0}{P_0} \times \frac{365}{N} \Rightarrow 2.48444\%$$

3. Assume today is May 1, 2005. Sixteen years and ~~four~~ months ago you bought a house in Wellesley for \$1.2 million on January 1st. You put down 30% and financed the rest with a 30-year fixed rate mortgage at 6% APR, compounded monthly. How much interest have you paid thus far this year?



$PV = 840,000$
 $n = 360$
 $i = 0.5$
 $FV = 0$
 $PMT = 5,036.22441$

Balance
 $n = 169$
 $PMT = 5,036.22441$
 $FV = 0$
 $i = 0.5$
 $PV = 573,663.4930$
 $PV = 562,715.0195$

5 payments in 2005
 $5 \times 5,036.22441 =$

$25,181.12206$ Total payments
 $- 10,998.4735$ principal

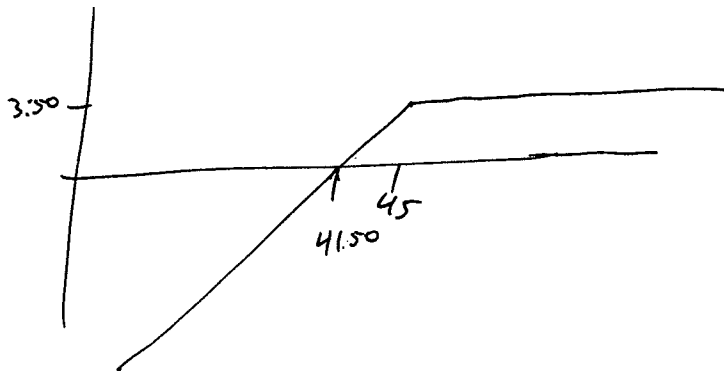
 $14,232.648$ Int.

ANSWER

4. Assume you wrote put options with a strike price of \$45. Draw the net payoff diagram for these options assuming you received \$3.50 for these options. What is your profit or loss if the price at expiration is \$42?

$$45 - 42 = 3 + 3.50$$

= 50 cents



5. If the spot rate is \$1.27/euro, and the three month interest rate in Europe is 2.9% EAY and the U.S. interest rate is as in question 1, what should you reasonably expect the spot rate to be ~~six~~ months from now?

Three

$$(1.018459961)^{1/4} = \frac{1 \text{ €}}{1.27 \text{ \$}} (1.029)^{1/4} \times \frac{\text{€}(\$)}{1 \text{ €}}$$

$$\text{€}(\$) = 1.27 \times \left(\frac{1.018459961}{1.029} \right)^{1/4} = \frac{1.26673528 \text{ \$}}{1 \text{ €}}$$

6. Bank MAG has \$1,000,000 face value of four year bonds with a coupon of 7%. It also has \$200,000 in cash. It finances all of this with \$850,000 of liabilities with a duration of 2.5 years. Assume that the appropriate market interest rate on both the assets and the liabilities is 10% EAY. A six month treasury bond future has a price of \$97,000. The underlying bond is a 10-year 6% annual coupon bond with a face value of \$1000 which has a duration of 7.6 years. How many futures do you need to either buy or sell to hedge the interest rate exposure of the bank? Do you need to buy or sell?

Bond Price = \$904,904

| | |
|-----------------|-----------------------|
| 200,000 cash | \$850,000 liabilities |
| 904,904 bonds | |
| <u>+1104904</u> | <u>1,104,904</u> |

$$D_{\text{bonds}} = \frac{70(1) + 70(2) + 70(3) + 1070(4)}{904.904}$$


$$= \frac{3260.412540}{904.904} = 3.6$$

$$D_A = 3.6 \times \frac{904904}{1104904} + 0 \times \frac{200000}{1104904}$$

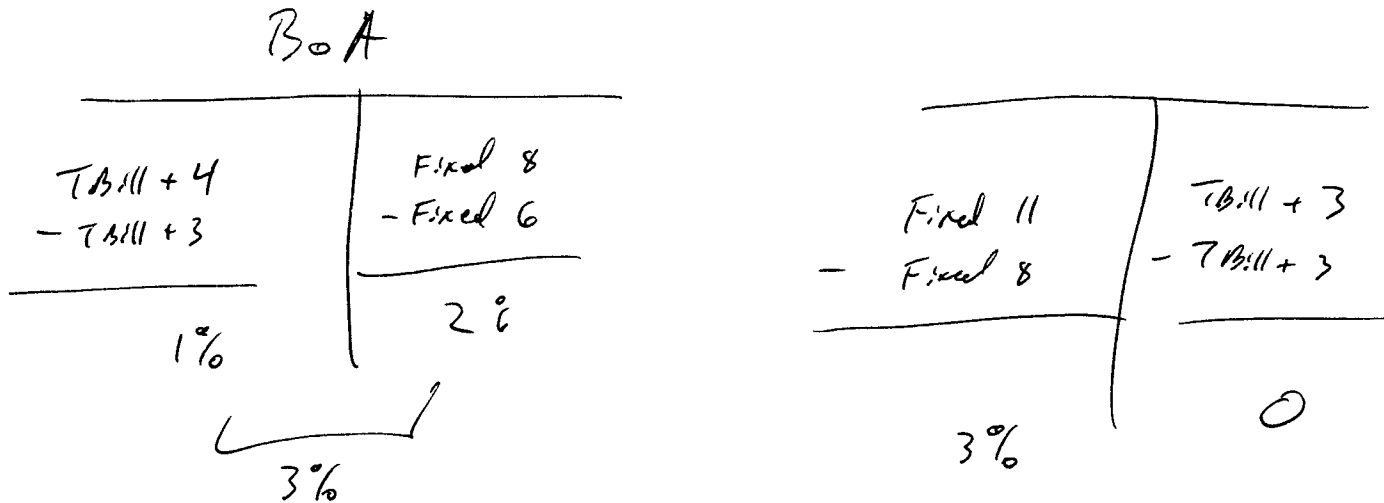
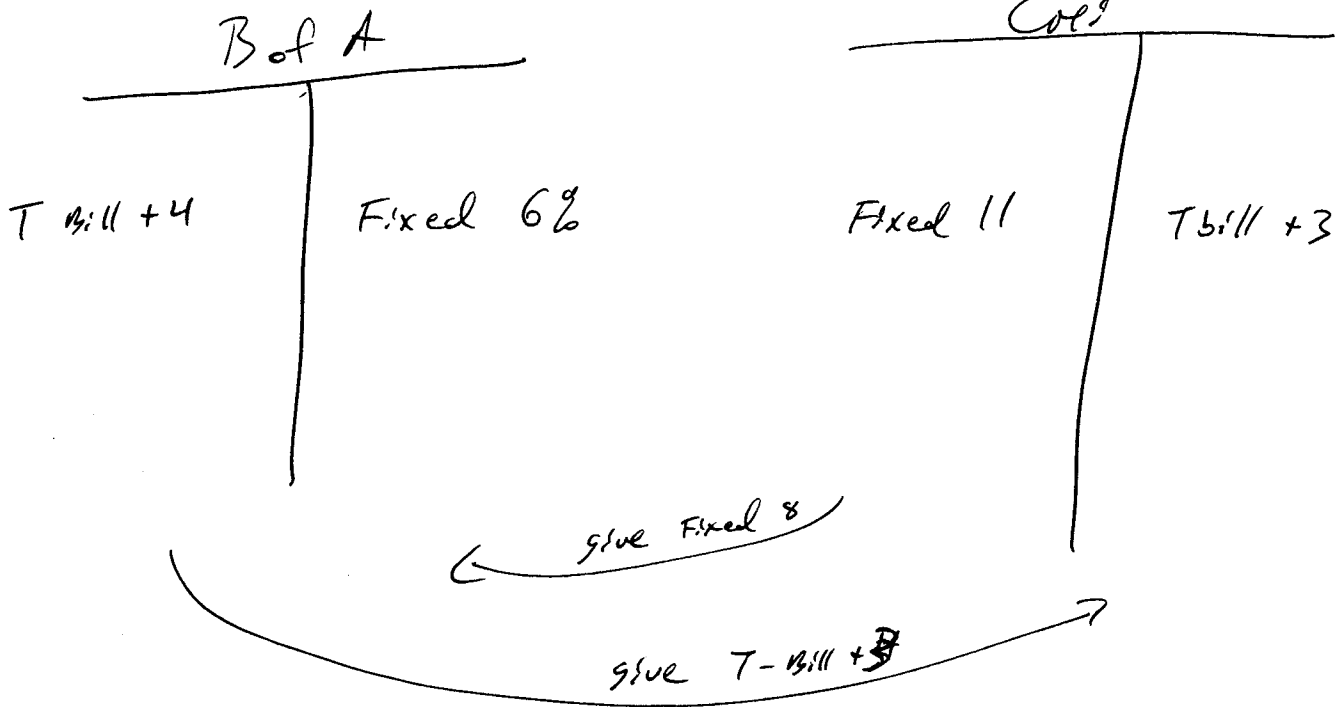
$$= 2.95$$

$$N_F = \frac{-\left(2.95 - \frac{850,000}{1104,904} \times 2.5\right) \times 1104904}{97,000 \times 7.6}$$

so sell 1 Future

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7. Bank of America has \$100 million of floating rate loans yielding the T-bill rate plus 4%. These loans are financed with \$100 million of fixed rate deposits costing 6%. Citigroup has \$100 million of mortgages with a fixed rate of 11%, which are financed with \$100 million of CDs with a variable rate of T-Bill plus 3%. Describe a swap that would be acceptable to both parties. Does this remove all interest rate risk? How much does each bank make?



Both get a spread of 3%
No int. rate risk.