

MAP 4170  
Test 4

Name: \_\_\_\_\_  
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All problems are worth 10 points.

1. On 01/01/2005, Bryan sells a stock short for a price of 800. The margin requirement is 50%, and interest on the margin is credited at an annual effective interest rate of 2%. The stock pays a dividend,  $D$ , on 12/31/2005. On 01/01/2006, Bryan buys the stock back at a price of 820 to cover the short. Bryan's yield on the short sell is  $-10\%$ .

Calculate  $D$ .

- (A) 28
  - (B) 36
  - (C) 48
  - (D) 68
  - (E) 76
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2. Yield rates for 6% annual coupon bonds are given to be 3.5% for 1-year bonds and 4% for 2-year bonds.

Find the implied 2-year spot rate from these yield rates.

- (A) 4.01%
- (B) 5.06%
- (C) 6.10%
- (D) 7.15%
- (E) 8.19%

3. On 01/01/2005, Company XYZ's stock is trading at \$80 per share, and Betty sells short \$1000 worth of the stock. (Note: Shares of stock are bought and sold in fractional pieces; you do *not* have to buy or sell a whole number of shares.)

Betty is required to put up a margin of \$500, and it is agreed that she will receive interest on the margin at an annual effective interest rate of  $k\%$ . Company XYZ's stock pays a dividend of 1.45 per share on 12/31/2005. On 01/01/2006, Company XYZ's stock is trading at \$76 per share, and Betty covers the short at this time for a yield of 9.75%.

Calculate  $k$ .

- (A) 3.125
  - (B) 3.250
  - (C) 3.375
  - (D) 3.500
  - (E) 3.625
4. You are given 1-year, 2-year, and 3-year spot rates of 4%, 5%, and 6%, respectively.

Calculate the annual yield rate for 3-year 5% annual coupon bonds implied by these spot rates.

- (A) 5.1%
- (B) 5.3%
- (C) 5.5%
- (D) 5.7%
- (E) 5.9%

5-6. (Problems 5 and 6 both use the following information):

Consider a yield curve defined by the following equation:

$$i_k = 0.09 + 0.002k - 0.001k^2$$

where  $i_k$  is the annual effective rate of return for zero coupon bonds with maturity of  $k$  years.

5. Calculate  $r_2$ , the 2-year spot rate implied by this yield curve.

- (A) 0.04
- (B) 0.06
- (C) 0.07
- (D) 0.08
- (E) 0.09

6. Calculate the 3-year forward rate at time 2,  $f_{[2,5]}$ , implied by this yield curve.

- (A) 0.061
- (B) 0.063
- (C) 0.065
- (D) 0.067
- (E) 0.069

7. A bank offers the following choices for certificates of deposit:

Term (in years)	Nominal annual interest rate convertible quarterly
1	4.00%
3	5.00%
5	5.65%

The certificates mature at the end of the term. The bank does NOT permit early withdrawals. During the next 6 years, the bank will continue to offer certificates of deposit with the same terms and interest rates.

An investor initially deposits 10,000 in the bank and withdraws both principal and interest at the end of 6 years.

Calculate the maximum annual effective rate of interest the investor can earn over the 6-year period.

- (A) 5.09%
- (B) 5.22%
- (C) 5.35%
- (D) 5.48%
- (E) 5.61%
8. Calculate the modified duration of an eight-year 100 par value bond with 10% annual coupons and an effective rate of interest equal to 8%.
- (A) 5.5
- (B) 6.0
- (C) 6.5
- (D) 7.0
- (E) 7.5

9. John purchased three bonds to form a portfolio as follows:

Bond A has semi-annual coupons at 4%, a duration of 21.46 years, and was purchased for 980.

Bond B is a 15-year bond with a duration of 12.35 years and was purchased for 1015.

Bond C has a duration of 16.67 years and was purchased for 1000.

Calculate the duration of the portfolio at the time of purchase.

(A) 16.62 years

(B) 16.67 years

(C) 16.72 years

(D) 16.77 years

(E) 16.82 years

10. Calculate the duration of a common stock that pays dividends at the end of each year into perpetuity. Assume that the dividends increase by 2% each year and that the effective rate of interest is 5%

(A) 27

(B) 35

(C) 44

(D) 52

(E) 58