

Math 423 Winter 2001 Midterm Exam

Each question worth 10 points

(1) The following table gives the prices of bonds, with prices in dollars and time in years. Coupons are paid twice a year in equal installments.

<u>Principal</u>	<u>Time to Maturity</u>	<u>Annual Coupon</u>	<u>Price</u>
100	.50	0	97
100	1.00	0	94
100	1.50	8	103

- (a) What is the forward rate for an investment of 6 months beginning in 6 months time? Give your answer in percent per annum, simple interest.
- (b) What is the forward rate for an investment of 12 months beginning in 6 months time? Give your answer in percent per annum, simple interest.

(2) A 2 year bond with a face value of \$100 pays an 8% coupon in semi-annual installments. The yield on the bond is 7%.

- (a) Compute the price of the bond, correct to the nearest dollar.
- (b) Find the duration of the bond, correct to the nearest month.

(3) A financial institution has entered into an interest rate swap with a company. According to the terms of the contract the bank pays a fixed interest of 6% per year on a principal of \$10 million, and in return receives floating rate interest. Payments are exchanged every 6 months on February 6th and August 6th. The last payment due in the swap is August 6th 1999. On August 6th 1997 the company defaults and declares bankruptcy. Given that the rate of interest then was 6.2% per annum (continuously compounded), estimate how much the bank has lost from the company default.

(4) A stock is currently \$43 and it is expected to pay a dividend of 90 cents in 4 months. The risk-free rate of interest is 7.5% per annum, continuously compounded. An investor has taken a long position in a 12 month futures contract on the stock.

- (a) Find the current value of the futures price.
- (b) Suppose the investor closes out his position 6 months from now and makes a profit of \$3.54. Find the value of the stock 6 months from now.

(5) An 8 month call option on a stock, with a strike price of \$60 costs \$2.40. An 8 month put option on the same stock, with a strike price of \$50 costs \$3.50. The risk-free rate of interest is 7% per annum, continuously compounded. Find the range of values of the stock price, 8 months from now, for which the strangle portfolio of the two options is in profit.

(6) A non-dividend paying stock has volatility of 28% per annum and its current price is \$54. The risk-free interest rate is 7% per annum, continuously compounded. Find the Black-Scholes price of a European put option on the stock with strike price of \$55 and time to maturity of 4 months.