

Math 423 Winter 2002 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	97.56
100	1.00	0	95.14
100	1.50	6	101.35

(a) What is the forward rate for an investment of 6 months beginning in 6 months time? Give your answer in percent per annum with continuous compounding correct to two decimal places.

(b) What is the forward rate for an investment of 6 months beginning in 12 months time? Give your answer in percent per annum with continuous compounding correct to two decimal places.

(2) A financial institution has entered into a 5-year currency swap with company X. Under the terms of the swap it receives interest at 5.8% per annum in sterling and pays interest at 4.6% per annum in U.S. dollars. Interest payments are exchanged twice a year on June 27th and December 27th. The principal amounts are \$8.6 million and 6.2 million pounds sterling. Suppose company X declares a default on June 26th of the third year of the swap. Find the cost in dollars to the financial institution. The exchange rate on June 26th is 1 pound sterling = \$1.48. Assume the continuous rate of interest in the U.S. is 4.12% per annum and in England 5.28%.

(3) Suppose the exchange rate today between the German mark and the U.S. dollar is 1 mark = \$0.562. The continuous rate of interest in the U.S. is 4.32% per annum. The 6 month forward price for a contract made today on the mark-dollar exchange rate is 1 mark = \$0.565. Calculate the implied annual continuous rate of interest on the German mark.

(4) A nondividend paying stock is currently \$35. The risk-free rate of interest is 7.5% per annum, continuously compounded. The price of a European call option on the stock with strike price \$36 and expiration date in 6 months is \$3.65.

(a) Find the price of the European put option on the stock with the same strike price and expiration date as the European call option.

(b) Find the maximum price of an American put option on the stock with the same strike price and expiration date as the European call option.

(5) Three call options on a stock have the same expiration date, and strike prices of \$50, \$57, and \$60. The market price of the call option with strike price \$50 is \$7.00 and the market price of the call option with strike price \$60 is \$2.50. Find the optimal no arbitrage upper and lower bounds for the price of the option with strike price \$57. Assume the rate of interest is zero.

(6) A dividend paying stock has volatility of 23% per annum and its current price is \$45. One dividend payment is expected in the next 6 month period. The dividend is expected to be \$0.70, paid 2 months from now. The risk-free interest rate is 6% per annum, continuously compounded. Find the Black-Scholes price of a European call option on the stock with strike price of \$46 and time to maturity of 5 months.