

PROBLEM SET 1

Due Thursday, February 3

1. A trader enters into a short forward contract on 100 million yen. The forward exchange rate is \$0.0080 per yen. How much does the trader gain or lose if the exchange rate at the end of the contract is (a) \$0.0074 per yen; (b) \$0.0091 per yen?
2. A trader buys a European put on a share for \$3. The stock price is \$42 and the strike price is \$40. Under what circumstances does the trader make a profit? Under what circumstance will the option be exercised? Draw the diagram showing the variation of the trader's profit with the stock price at the maturity of the option.
3. A trader buys a call option with strike price of \$45 and a put option with a strike price of \$40. Both options have the same underlying and maturity. The call costs \$3 and the put costs \$4. Draw a diagram showing the variation of the trader's profit with the asset price.
4. The price of gold is currently \$500 per ounce. The forward price for delivery in one year is \$700. An arbitrageur can borrow at 10% per annum. What should the arbitrageur do? Assume that the cost of storing gold is zero.
5. Describe the profit from the following portfolio: a long forward contract on an asset and a long European put option on the asset with the same maturity as the forward contract and a strike price that is equal to the forward price of the asset at the time the portfolio is set up.
6. What rate of interest with continuous compounding is equivalent to 15% per annum with monthly compounding.
7. Suppose that you enter into a six-month forward contract on a non-dividend-paying stock when the stock price is \$30 and the risk-free interest rate (with continuous compounding) is 12% per annum. What is the forward price?
8. A company's cash position, measured in millions of dollars, follows a Wiener process

$$dC = \mu dt + \sigma dz$$

with a drift  $\mu = 0.5$  per quarter and a variance rate of 4.0 per quarter. How high does the company's initial cash position have to be for the company to have a less than 5% chance of a negative cash position by the end of one year?

9. Calculate the price of a three-month European put option on a non-dividend-paying stock with a strike price of \$50 when the current stock price is \$50, the risk-free interest rate is 10% per annum, and the volatility is 30% per annum.
10. Show that  $S^{-2r/\sigma^2}$  could be the price of a traded security.

**Problems from the book:** 1, 2 page 31; 3 page 56.