

Assignment #2

Futures, Options and other Derivatives

- 2.26. A company enters into a short futures contract to sell 5,000 bushels of wheat for 250 cents per bushel. The initial margin is \$3,000 and the maintenance margin is \$2,000. What price change would lead to a margin call? Under what circumstances could \$1,500 be withdrawn from the margin account?
- 2.28. Suppose that corn can be stored for 20 cents per bushel per year and the risk-free interest rate is 5% per year. How could you make money in the corn market on March 15, 2001, by trading the May 2001 and May 2002 contracts? Use Table 2.2.
- 2.29. The author's Web page www.rotman.utoronto.ca/~hull contains daily closing prices for the December 2001 crude oil futures contract and the December 2001 gold futures contract. (Both contracts are traded on NYMEX.) You are required to download the data and answer the following:
- How high do the maintenance margin levels for oil and gold have to be set so that there is a 1% chance that an investor with a balance slightly above the maintenance margin level on a particular day has a negative balance two days later (i.e., one day after a margin call). How high do they have to be for a 0.1% chance. Assume daily price changes are normally distributed with mean zero.
 - Imagine an investor who starts with a long position in the oil contract at the beginning of the period covered by the data and keeps the contract for the whole of the period of time covered by the data. Margin balances in excess of the initial margin are withdrawn. Use the maintenance margin you calculated in part (a) for a 1% risk level and assume that the maintenance margin is 75% of the initial margin. Calculate the number of margin calls and the number of times the investor has a negative margin balance and therefore an incentive to walk away. Assume that all margin calls are met in your calculations. Repeat the calculations for an investor who starts with a short position in the gold contract.
- 3.24. A stock is expected to pay a dividend of \$1 per share in two months and in five months. The stock price is \$50, and the risk-free rate of interest is 8% per annum with continuous compounding for all maturities. An investor has just taken a short position in a six-month forward contract on the stock.
- What are the forward price and the initial value of the forward contract?
 - Three months later, the price of the stock is \$48 and the risk-free rate of interest is still 8% per annum. What are the forward price and the value of the short position in the forward contract?
- 3.25. A bank offers a corporate client a choice between borrowing cash at 11% per annum and borrowing gold at 2% per annum. (If gold is borrowed, interest must be repaid in gold. Thus, 100 ounces borrowed today would require 102 ounces to be repaid in one year.) The risk-free interest rate is 9.25% per annum, and storage costs are 0.5% per annum. Discuss whether the rate of interest on the gold loan is too high or too low in relation to the rate of interest on the cash loan. The interest rates on the two loans are expressed with annual compounding. The risk-free interest rate and storage costs are expressed with continuous compounding. Assume that no income is earned on gold. Repeat your calculations for the situation where income of 1.5% per annum can be earned on gold.
- 3.26. A company that is uncertain about the exact date when it will pay or receive a foreign currency may try to negotiate with its bank a forward contract that specifies a period during which delivery can be made. The company wants to reserve the right to choose the exact delivery date to fit in with its own cash flows. Put yourself in the position of the bank. How would you price the product that the company wants?

- 3.27. A foreign exchange trader working for a bank enters into a long forward contract to buy one million pounds sterling at an exchange rate of 1.6000 in three months. At the same time, another trader on the next desk takes a long position in 16 three-month futures contracts on sterling. The futures price is 1.6000, and each contract is on 62,500 pounds. Within minutes of the trades being executed the forward and the futures prices both increase to 1.6040. Both traders immediately claim a profit of \$4,000. The bank's systems show that the futures trader has made a \$4,000 profit, but the forward trader has made a profit of only \$3,900. The forward trader immediately picks up the phone to complain to the systems department. Explain what is going on here. Why are the profits different?
- 3.28. A company enters into a forward contract with a bank to sell a foreign currency for K_1 at time T_1 . The exchange rate at time T_1 proves to be $S_1 (> K_1)$. The company asks the bank if it can roll the contract forward until time $T_2 (> T_1)$ rather than settle at time T_1 . The bank agrees to a new delivery price, K_2 . Explain how K_2 should be calculated.