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1. Carefully define the differences between the following
   a. Long futures position and short futures position

      *A **long** position in the futures market is an agreement to **buy** at a certain price on a certain date. A **short** position is an agreement to **sell**.*

   b. hedger, speculator, and arbitrageur

      A hedger participates in the market to minimize risk in other activities, a speculator looks to gamble on future outcomes and make a profit, an arbitrageur takes risk-free moves to increase profits.

   c. futures contract and forward contract

      The main difference is that a futures contract is settled at the end of each day while a forward contract is often over-the-counter and is settled at the end of the contract.

   d. futures contract and options contract

      In an options contract there is the option of taking action (buying or selling), while in a futures contract the action must be taken.

2. An investor writes one May put option on corn with a strike price of $6.00. The price of the option is $0.30 per bushel.
   a. Under what circumstances would the investor make a gain?

      If the price rises above $5.70 at the time of exercise.

   b. Given that one contract includes 5,000 bushels of corn, what is the total gain/loss if the price of corn
      i. falls to $5.00?

         $$= \{\min(\$5.00 - \$6.00, 0) + \$0.30\} * 5{,}000$$
         $$= \{-\$1.00 + 0.30\} * 5{,}000$$
         $$= -\$3{,}500$$

    ii. increases to $7.00?

$$= \{\min(\$7.00 - \$6.00, 0) + \$0.30\} * 5{,}000$$
$$= \{\$0.00 + 0.30\} * 5{,}000$$
$$= +\$1{,}500$$

3. The same investor in question 1, now looks to use the futures market. Assume the futures price for a May corn contact is selling for $6.50.
   a. Compute the gains/losses for the investor when the investor takes a long position on that contract and closes the account when prices are at
      i. $5.00

      $$= (\$5.00 - \$6.50) * 5{,}000 = -\$7{,}500$$

      ii. $7.00

      $$= (\$7.00 - \$6.50) * 5{,}000 = +\$2{,}500$$

4. ~~Given the answers in 1 and 2, what are the major differences between using futures and options contracts with regard to upside and downside risk.~~

5. Are futures and options "zero-sum games?"

   Yes. The gains from one party are losses to the other. For example, if one gains from a long position, another loses that exact amount in a short position. The net gain for all parties is zero.

6. A trader enters into a short cotton futures contract when the futures price is 50 cents per pound. The contract is for the delivery of 50,000 pounds. How much does the trader gain/lose if the price of cotton at the end of the contract is
   a. 48.20 cents per pound?

   $$= (50.00C - 48.20C) * 50{,}000$$
   $$= (1.80C) * 50{,}000 = 90{,}000C$$
   $$= +\$900$$

   51.30 cents per pound?

   $$= (50.00C - 51.30C) * 50{,}000$$
   $$= (-1.30C) * 50{,}000 = 65{,}000C$$
   $$= -\$650$$

7. A trader buys two July futures contracts on frozen orange juice. Each contract is for the delivery of 15,000 pounds. The current futures price is 160 cents per pound, the initial margin is $6,000 per contract, and the maintenance margin is $4,500 per contract. What price change would lead to a margin call? Under what circumstances could $2,000 be withdrawn from the margin account?

In order to lead to a margin call, the futures contract would need to lose $3,000 in value. We know the following relationship for a long futures position

$$Profits = (P_t - \$1.60) * 30,000$$
$$-\$3,000 = (P_t - \$1.60) * 30,000$$
$$P_t = -\frac{\$3,000}{30,000} + \$1.60 = \$1.50$$

So, the price would need to fall to 150 cents per pound in order for a margin call to occur.

In order to withdraw $2,000 from the margin account we can use the same setup as before.

$$+\$2,000 = (P_t - \$1.60) * 30,000$$
$$P_t = \frac{\$2,000}{30,000} + \$1.60 = \$1.6\overline{6}$$

So, the price would need to increase above $166.6\overline{6}$ cents per pound to withdraw from the margin account.

8. If the futures price is greater than the spot price, explain how an arbitrage opportunity might exist. (*In your answer, be sure to define an arbitrage opportunity.*)