Practice problems for Lecture 5.

1. Forward and Futures Prices

A forward contact and a futures contract on silver are both one day to maturity. Suppose the futures price is $7.00/ounce but the forward price is $6.90/ounce. Assume the spot price tomorrow will be either $6.85 or $7.05. Assume futures have cash settlement. Construct an arbitrage.

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<th>buy/sell AG forward</th>
<th>cash today</th>
<th>cash tomorrow up state</th>
<th>cash tomorrow down state</th>
<th>ounces AG tomorrow</th>
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<tr>
<td>buy/sell AG futures</td>
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<tr>
<td>buy/sell AG spot</td>
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2. Concepts (short answer) Which of the following situations can be expected to be an arbitrage. Explain briefly why or why not.

a. July wheat futures are 30% more expensive than September wheat futures.

b. July wheat futures are 30% cheaper than September wheat futures.
c. July gold is 30% more expensive than September gold.

d. July electricity is 30% cheaper than September electricity (at the same location).

3. Futures option pricing (single period)

Riskless bond (interest rate is 20%):

\[
100 \rightarrow 120
\]

Futures price:

\[
50 \leftarrow 80 \leftarrow 30
\]

Derivative security (call futures option with strike = 50)
a. What is the portfolio of the futures contract and the bond that replicates the option? (Reminder: you do not put up any money to enter a futures position.)

b. What is the price of the replicating portfolio?

c. What are the risk-neutral probabilities of the two states? (Warning: the formula using stock up and down probabilities does not work for futures.)