# ECON 133 – Securities Markets – Fall 2010
# Answer Key – Practice Problems – Futures

1. The spot price for is $650. The dividend yield on the S&P 500 is 2.5%. The risk-free interest rate is 5%. Solve for the futures price for gold for a one year contract.

   ANS: $F_0 = S_0(1 + r_f - d)^T = 650(1 + .05 - .025)^1 = 666.25$

2. A one year gold futures contract is selling for $641. Spot gold prices are $600 and the one year risk free rate is 6%. Solve for the arbitrage profit implied by these prices.

   ANS: Parity $F_0 = S_0(1 + r_f - d)^T = 600(1 + .06 - 0)^1 = 636.00$
   The arbitrage profit is $641 - $636 = $5.00

3. The following data on gold futures are from New York Mercantile Exchange. Gold futures are quoted in dollars per troy ounces. Trading unit is 100 troy ounces. Answer the following questions:

| | Last | Open High | Open Low | High | Low | Most Recent Settle | Change |
|---|---|---|---|---|---|---|---|
| | n/a | n/a | n/a | n/a | n/a | 943.30 | 0.00 |
| **Aug. 2009** | 942.50 | n/a | 942.30 | 942.50 | 942.30 | 942.40 | -0.90 |
| **Sept. 2009** | 945.30 | n/a | 944.50 | 945.30 | 944.10 | 943.70 | +1.60 |
| **Oct. 2009** | 946.30 | n/a | 944.20 | 946.40 | 943.20 | 944.80 | +1.40 |
| **Dec. 2009** | 944.70 | n/a | 944.70 | 944.70 | 944.70 | 946.10 | -1.40 |
| **Feb. 2009** | n/a | n/a | n/a | n/a | n/a | 947.30 | 0.00 |
| **April 2010** | | | | | | | |

a) Suppose the contract expiring on Feb. 2010 is exactly 6 months from the quotation date. 6-months interest rate is 3%. If gold is trading at \$900 per troy ounce on the spot market, find out the implied per ounce storage cost of gold. Use the price column "Most Recent Settle"

ANS: $F_0 = S_0(1 + R + W) \Rightarrow 946.10 = 900 \times (1 + 3\% + W) \Rightarrow W = \$0.02.$

b) Suppose the storage cost is zero. If instead the gold futures delivered in Feb. 2010 are selling at \$890, how can you arbitrage? Suppose there is no margin requirement.

ANS: The futures price is lower than the spot price. This is backwardation. To arbitrage, you need to buy low and sell high. Here are the operations and cash flows.

| | Now | Feb 2010 |
|---|---|---|
| Buy futures | 0 | $S_T - 890$ |
| Short sell god | 900 | $-S_T$ |
| Deposit | $-900$ | $900 \times 1.03 = 927$ |

The per-ounce profit is $S_T - 890 - S_T + 927 = \$37$. Note the more people entering the futures, the more likely the futures price will drop and converge to its fair value.