University of Texas at Austin

# Problem Set #8

Forward contracts. European call options. European put options.

## 8.1. Forwards.

**Problem 8.1.** (5 points) A soy-bean farmer shorts forward contracts on soy in an amount matching his crop volume and with delivery at harvest time. Then, he is considered:

(a) an arbitrageur.
(b) a broker.
(c) a speculator.
(d) a hedger.
(e) None of the above.

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## 8.2. Calls.

**Problem 8.2.** The initial price of a non-dividend-paying asset is \$100. A six-month, \$95-strike European call option is available at a \$8 premium.

The continuously compounded risk-free interest rate equals 0.04.

What is the break-even point for this call option?

(a) 86.84
(b) 87
(c) 103
(d) 103.16
(e) None of the above.

**Problem 8.3.** (5 points) A stock's price today is \$1000 and the annual effective interest rate is given to be 5%. You write a one-year, \$1,050-strike call option for a premium of \$10 while you simulataneously buy the stock. What is your **profit** if the stock's spot price in one year equals \$1,200?

(a) \$150.00
(b) \$139.90
(c) \$10.50
(d) - \$39.00
(e) None of the above.

**Problem 8.4.** (20 points)

The primary ingredient for a certain jeweler is gold which she intends to buy in exactly one year. She considers all of her other production-related expenses to be negligible.

The jeweler uses exactly one ounce of gold to produce every one of her pieces, and will able to sell every piece for \$1,000.

The jeweler models the market price of gold in one year as follows:

| Gold price in one year | Probability |
|---|---|
| 750 per ounce | 0.2 |
| 850 per ounce | 0.5 |
| 950 per ounce | 0.3 |

The jeweler hedges the price of gold by buying a $1-$year call option with an exercise price of \$900 per ounce. The option costs \$100 per ounce now.

The continuously compounded risk-free interest rate is 5%.

Calculate the expected profit of the **hedged** portfolio per piece of jewelery produced.

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### 8.3. **Puts.**

**Problem 8.5.** The initial price of the market index is \$900. After 3 months the market index is priced at \$915. The nominal rate of interest convertible monthly is 4.8%. The premium on the put, with a strike price of \$930, is \$8.00. What is the profit at expiration for a **long** put?

(a) \$15.00 loss
(b) \$6.90 loss
(c) \$6.90 gain
(d) \$15.00 gain
(e) None of the above.

**Problem 8.6.** **Sample FM(DM) #12**
Consider a European put option on a stock index without dividends, with 6 months to expiration, and a strike price of 1,000. Suppose that the nominal annual risk-free rate is 4% **convertible semiannually**, and that the put costs 74.20 now. What price must the index be in 6 months so that being long the put would produce the same profit as being short the put?

A. 922.83
B. 924.32
C. 1,000.00
D. 1,075.68
E. 1,077.17

**Problem 8.7.** Farmer Shaun is producing sweet potatoes. He intends to harvest $10,000-$cartons' worth in six months. His total costs are \$12.00 per carton.

He wishes to hedge using European put options. There are two puts on sweet potatoes with the exercise date in six months available: one with the strike price of \$13 per carton and another with the strike price of \$15 per carton. Their premiums are \$0.15 and \$0.18, respectvely.

Assume that the prevailing risk-free interest rate is 4% effective for the half-year period.

At harvest time, in six months, it turns out that the sweet-potato spot price equals \$14. What would Farmer Shaun's profit be if he had decided to hedge using the \$13-strike put versus his profit if he had decided to use the \$15-strike put to hedge?