

SUNY-Stony Brook. Economics Department
Economics 323: Fall 2011
Professor Hugo Benítez-Silva

Problem Set 2: Due Tuesday October 4, 2011 in class.

Please in your answers always show your work. Otherwise your grade will suffer considerably. There are 3 sections.

1. It is not a lie if you believe it! But do you? (Again, justify your answers). (30%)
 - a) In the framework of valuing an option to delay an investment, if the average expected price remains the same, but the probability of facing a low price next period becomes smaller, then the NPV of waiting to invest next period will be higher. **True or False**
 - b) Any rational investor always prefers a project that gives him, or her, the option to wait to invest next year instead of a project that offers a now or never choice. **True or False**
 - c) If the uncertainty over prices next period increases, that is, the gap between the possible high price and the possible low price next period increases, keeping the average expected price constant, waiting to invest next period becomes more valuable. **True or False**
 - d) If the stock price at expiration is greater than the exercise price, the value of the call option at expiration will be zero. **True or False**
 - e) The higher the stock price is at expiration, the lower the value of the put option will be at expiration. **True or False**

2. (40%) A firm is considering investing in a digital camera factory. The factory can be built instantly at a cost I , and can produce one camera forever, with no operating costs. The investment is assumed to be irreversible. Currently the price of the camera is \$400 but it will change. With a given probability q the price will rise to \$500, and with probability $(1-q)$ will fall to \$300. After that the price will remain at that level, higher or lower, forever. We assume that the risk over the future price of camera is unrelated to the rest of the economy, so cash flows can be discounted using the risk-free rate of interest. Take the interest rate to be 10%. Set $I = \$4000$, and $q = 0.5$.
- Given those above values, should the firm invest now, or would it be better to wait a year and see how the price of cameras changes? How much is it worth to have the flexibility to make the investment decision next year, rather than having to invest either now or never?
 - If we think of this in another way, how high an investment cost I would the firm be willing to accept to have a flexible investment opportunity rather than an inflexible “now or never” one?
 - If the probability of change in price changes to $q = 0.80$, and the high price is now \$425, and the low price is still \$300, should the firm invest now, or would it be a better option to wait a year? Interpret your results.
 - Now suppose that the uncertainty over price increases. Assume that next period there is a probability $q = 0.5$ of the price of cameras going up to \$600, and the same probability of going down to \$200, then would it be better to invest now or to wait? Interpret your results.
 - Based on the original conditions given in the question except that the investment I decreases to \$2000, should the firm invest now or is it better to wait a year?

3. (30%) Suppose you buy a call option of a firm's stock. The current price of the stock is \$60, but the price will change next period, with a probability 70% of increasing to \$120, and with a probability 30% of decreasing to \$30. The exercise price for this call option is \$70 at expiration (next period). Assume the interest rate is 5%.

a) What is the present value of your expected profit? (Remember that is the price of the call option in today's dollars)

b) Now consider a three-period case:

Suppose the stock price in the first period is still \$60. In the second period, the stock price will increase to \$120 with a probability 70%, and this price will continue to change in the third period, with a probability 40% of increasing to \$150 and a probability 60% of decreasing to \$100; in the second period, the stock price will go down to \$30 with a probability 30%, and this price will also continue to change in the third period, with a probability 40% of going up to \$65 and a probability 60% of going down to \$20. The call option you buy will expire in the third period and the exercise price is still \$70. The interest rate is still assumed to be 5%. Calculate the present value of your expected profit.