

Practice problems for Lecture 3.

1. A Simple Option Pricing Problem in One Period

Riskless bond (interest rate is 50%):

100 \longrightarrow 150

Stock:

50 $\begin{array}{l} \nearrow 125 \\ \searrow 50 \end{array}$

European put option with a strike of 150:

? $\begin{array}{l} \nearrow ? \\ \searrow ? \end{array}$

a. What are the final up and down payoffs of the option?

b. What is the portfolio of the stock and the bond that replicates the option?

c. What is the price of the replicating portfolio?

d. Verify the option price using risk-neutral probabilities.

e. Would an American put have the same price?

2. Thought questions (answer each in a sentence or two of ordinary length)

a. For call options on a stock that pays no dividends, early exercise is never optimal. However, this is not true in general for put options. Why not?

b. The price of a call option with positive strike price is always less than the stock price. Why?

c. The price of a European put option is never greater than the strike price. Why not?

3. Put-call Parity

Sad Corp (SC) is a distressed firm that is not expected to pay dividends over the next year. SC stock is currently at \$10, and it costs \$7 to buy an at-the-money call option on SC maturing one year from now. The price of a riskfree zero-coupon bond with a face of \$100 maturing one year from now is \$95. Assume there is no arbitrage.

a. If the call option described above is a European option, what is the price today of an at-the-money European put option on SC maturing one year from now?

b. If the call option described above is an American option, what do we know about the price today of the same European put option?

c. If the call option described above is an American option, what do we know about the price today of an at-the-money American put option on SC maturing one year from now?