University of Texas at Austin

Problem Set #10

Binomial option pricing: Forward trees. Two periods.

Problem 10.1. (5 points) Assume that the a stock price is modeled using a one-period forward binomial tree with the length of a single period equal to three months. According to this model, the stock price can take either the value of \$50, or the value of \$40 in exactly three months. Calculate the volatility of the stock price.

(a) About 0.22
(b) About 0.28
(c) About 0.30
(d) About 0.32
(e) None of the above.

Problem 10.2. The current price of a continuous-dividend-paying stock is \$100 per share. Its volatility is given to be 0.30 and its dividend yield is 0.03.

The continuously compounded risk-free interest rate equals 0.06.

Consider a \$95-strike European put option on the above stock with three months to expiration. Using a one-period forward binomial tree, find the price of this put option.

(a) \$3.97
(b) \$4.52
(c) \$4.70
(d) \$4.97
(e) None of the above.

Problem 10.3. The current price of a stock is \$100 per share. Its dividend yield is 0.01 and volatility is 0.3. In order to model the stock price at the end of a year, Bertie constructed a forward binomial tree. He then calculated the price of a one-year, 90-strike European put option on this stock and obtained \$8.50. What is the **positive** continuously compounded, risk-free interest rate Bertie used?

Problem 10.4. For a two-period binomial model, you are given that:

(1) each period is one year;
(2) the current price of a non-dividend-paying stock S is $S(0) = \$20$;
(3) $u = 1.2$, with u as in the standard notation for the binomial model;
(4) $d = 0.8$, with d as in the standard notation for the binomial model;
(5) the continuously compounded risk-free interest rate is $r = 0.04$.

Consider a **special** call option which pays the excess above the strike price $K = 23$ (if any!) at the end of **every** binomial period.

Find the price of this option.