FIN 5350- Homework 2

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Numerical Problems

Please complete the following numerical problems by hand (or in a Rmd document like this one).

Problem 1

Let $S = \$100$, $K = \$105$, $r = 8\%$, $T = 0.5$, and $\delta = 0.0$. Let $u = 1.3$, $d = 0.8$, and $n = 1$.

a. What are the premium, Δ, and B for a European call?

b. What are the premium, Δ, and B for a European put?

Problem 2

Let $S = \$100$, $K = \$95$, $r = 8\%$, $T = 0.5$, and $\delta = 0.0$. Let $u = 1.3$, $d = 0.8$, and $n = 1$.

a. Verify that the price of a European put is \$7.471.

b. Suppose you observe a call price of \$17. What is the arbitrage?

c. Suppose you observe a call price of \$15.50. What is the arbitrage?

Problem 3

Let $S = \$100$, $K = \$95$, $\sigma = 30\%$, $r = 8\%$, $T = 1$, and $\delta = 0.0$. Let $u = 1.3$, $d = 0.8$, and $n = 2$. Construct the binomial tree for a call option. At each node provide the premium, Δ, and B.

Problem 4

Repeat the option price calculation in the previous question for stock prices of \$80, \$90, \$110, \$120, and \$130, but now let $n = 3$. Keep everyting else fixed. What happens to the initial option Δ as the stock price increases?

Problem 5

Let $S = \$100$, $K = \$95$, $r = 8\%$ (continuously compounded), $\sigma = 30\%$, $\delta = 0$, and $T = 1$ year and $n = 3$.

a. What is the premium for an American call option? Is there any early exercise?

b. What is the premium for a European call option? Use the computational shortcut with the risk-neutral binomial pmf that I showed you in class. Compare the American and European premia.

c. What is the premium for a European put? Does put-call parity hold? (see McDonald Chapter 9). Also use the risk-neutral binomial pmf for this problem.

d. What is the premium of the American put? Compare with the European put. If they differ, explain why.

Problem 6

Let $S = \$40$, $K = \$40$, $r = 8\%$ (continuously compounded), $\sigma = 30\%$, $\delta = 0.0$, $T = 0.5$ year, and $n = 3$.

a. Construct the binomial tree for the stock. What are u and d?

b. Compute the premia of American and European calls and puts.