

UNIVERSITY OF TEXAS AT AUSTIN

HW Assignment 6Binomial option pricing.

6.1. **One-period binomial option pricing.** Please, provide your complete solutions to problems 6.1 and 6.6. For the remaining (multiple-choice) questions, you can simply provide just your final answer.

Problem 6.1. (15 points) Let $S(0) = \$100$, $K = \$105$, $r = 8\%$, $T = 0.5$ and $\delta = 0$. Suppose that $u = 1.3$ and $d = 0.8$. Using the one-period binomial model, calculate the following:

- (5 pts) The fair premium for a European put with the above characteristics.
- (5 pts) The Δ in the corresponding replicating portfolio.
- (5 pts) The amount B invested in the riskless asset in the replicating portfolio.

Problem 6.2. (5 points) Consider a continuous-dividend-paying stock with the current price of \$50 and dividend yield 0.02.

The continuously-compounded, risk-free interest rate is 0.05.

You are using a one-period binomial tree to model the stock price at the end of the next quarter. You assume that the stock price can either increase by 0.04 or decrease by 0.02. What is the risk-neutral probability associated with this tree?

- 0.3675
- 0.4588
- 0.5430
- 0.8409
- None of the above.

Problem 6.3. (10 points) Consider a non-dividend paying stock whose current price is \$52 per share. You model the evolution of this stock price over the following year using a one-period binomial tree under the assumption that the stock price can be either \$72 or \$42 in one year.

The continuously-compounded, risk-free interest rate is 0.05.

Consider a \$50-strike, one-year European call option on the above stock. What is the call price consistent with the above stock-price model?

- About 5.21
- About 8.84
- About 9.29
- About 20.08
- None of the above.

Problem 6.4. (5 points) 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.

- \$3.97
- \$4.52
- \$4.70
- \$4.97
- None of the above.

Problem 6.5. (5 points) Consider the one-period binomial option pricing model. Let $V_C(0) > 0$ denote the price of a European call on a stock which pays continuous dividends. What is the impact on the value of European call option prices if the company decides to increase the dividend yield paid to the shareholders?

- (a) The call option price will drop.
- (b) The call option price will increase.
- (c) The call option price will always remain constant.
- (d) The impact on the price of the call cannot be determined using the binomial option pricing model.
- (e) There is not enough information provided.

Problem 6.6. (15 points) Consider a continuous-dividend-paying stock whose current price is \$40 and whose dividend yield is 0.02. The price of stock in three months is modeled using a one-period binomial tree.

The continuously-compounded, risk-free interest rate is 0.06.

According to the above stock-price model, the replicating portfolio of an at-the-money, three-month European call option consists of:

- 0.6 shares of stock, and
- borrowing \$20 at the risk-free interest rate.

What is the risk-free portion of the replicating portfolio for the otherwise identical put option?