

## HW 10.2 (b) Key

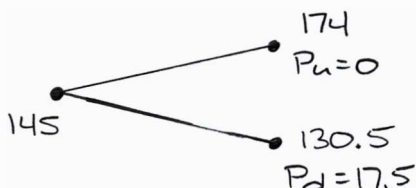
1. Prices for a nondividend-paying stock are modeled with a 1-period binomial tree. You are given the following information:

- (1) The period is one year.
- (2) The stock's current price is 145
- (3)  $u = 1.2$  and  $d = 0.9$ .

- (4) The continuously compounded risk-free rate is 3%.

Find the premium for a one year put option with a strike price of 148. [206-06]

- [A] 9.60 B) 9.22 C) 9.98 D) 10.37 E) 10.75



$$174\Delta + Be^{0.03} = 0$$

$$130.5\Delta + Be^{0.03} = 17.5$$

$$\Delta = -0.4023$$

$$B = 67.93$$

$$P_u = 145\Delta + B = \boxed{9.60}$$

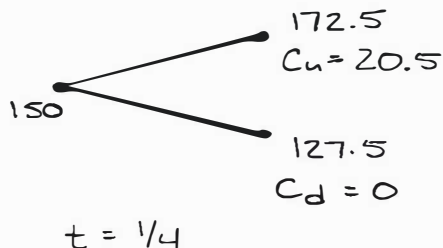
2. Prices for a nondividend-paying stock are modeled with a 1-period binomial tree. You are given the following information:

- (1) The period is 3 months.
- (2) The stock's current price is 150
- (3)  $u = 1.15$  and  $d = 0.85$ .

- (4) The continuously compounded risk-free rate is 3%.

Find the premium for a 3-month call option with a strike price of 152. [206-07]

- [A] 10.68 B) 11.11 C) 11.53 D) 11.96 E) 12.39



$$172.5\Delta + Be^{0.03/4} = 20.5$$

$$127.5\Delta + Be^{0.03/4} = 0$$

$$\Delta = 0.4555$$

$$B = -57.6493$$

$$Call = 150\Delta + B = \boxed{10.68}$$

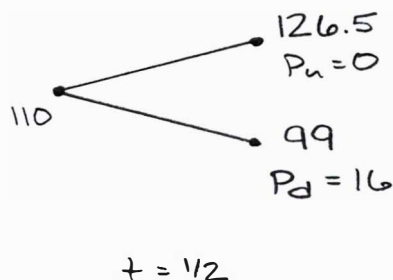
3. Prices for a nondividend-paying stock are modeled with a 1-period binomial tree. You are given the following information:

- (1) The period is 6 months.
- (2) The stock's current price is 110
- (3)  $u = 1.15$  and  $d = 0.9$ .

- (4) The continuously compounded risk-free rate is 3.5%.

Find the premium for a 6-month put option with a strike price of 115. [206-08]

- [A] 8.32 B) 7.99 C) 8.65 D) 8.99 E) 9.32



$$126.5\Delta + Be^{0.035/2} = 0$$

$$99\Delta + Be^{0.035/2} = 16$$

$$\Delta = -0.5818$$

$$B = 72.32$$

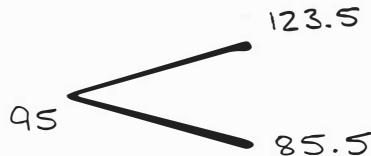
$$P_u = 110\Delta + B = \boxed{8.32}$$

4. Prices for a nondividend-paying stock are modeled with a 1-period binomial tree. You are given the following information:

- (1) The period is one year.
- (2) The stock's current price is 95
- (3)  $u = 1.3$  and  $d = 0.9$ .
- (4) The continuously compounded risk-free rate is 3%.

Find the strike price of a one year call option whose replicating portfolio contains 0.7763 shares of the stock. [206-09]

- [A] 94    B) 92    C) 96    D) 98    E) 100



$$\Delta = \frac{C_u - C_d}{S_u - S_d}$$

Note: If  $C_d \neq 0$ , then  $\Delta = 1$ . So  $C_d = 0$ .

$$0.7763 = \frac{123.5 - K}{123.5 - 85.5}$$

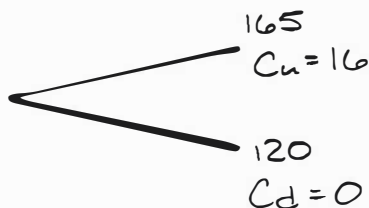
$$K = 94$$

5. Prices for a nondividend-paying stock are modeled with a 1-period binomial tree. You are given the following information:

- (1) The period is one year.
- (2)  $S_u = 165$  and  $S_d = 120$ .
- (3) The continuously compounded risk-free rate is 3.5%.
- (4) The price of a one year call option with a strike price of 149 is 10.36.

Find the current price of the stock. [206-10]

- [A] 145    B) 130    C) 135    D) 140    E) 150



$$K = 149$$

$$r = 0.035$$

$$\begin{aligned} 165\Delta + Be^{0.035} &= 16 \\ 120\Delta + Be^{0.035} &= 0 \end{aligned}$$

$$\Delta = 0.3555$$

$$B = -41.20$$

$$Call = \Delta S + B$$

$$10.36 = 0.3555 S - 41.20$$

$$S = 145$$