

Quiz A: 8/8/16

Name Key

Assume that the risk-free interest rate equals 4%, that Ajax stock currently trades for \$41 per share, and that for each of the next two years Ajax's stock price will either rise \$7 per share or fall \$4 per share. Assume that you would like to create a portfolio that generates the same payoffs as a call on Ajax with a \$40 strike price. *Note: Use a "+" for inflows of cash and a "-" for outflows of cash.*

- What transactions would be required today to create the portfolio? What would be the total cost to set up the portfolio?
- Assume the price of Ajax stock falls a year from today. What transactions would be required to balance your portfolio? What cash flows will each transaction create? What is your total net cash flow a year from today?
- Assume the price of Ajax rises a year from today and then falls two years from today. What transactions will be required to liquidate your portfolio? What cash flows will each transaction create? What is your total net cash flow two years from today?

$$S_0 = 41 = 41 + 7; S_d = 37 = 41 - 4; S_{uu} = 55 = 41 + 7 + 7; S_{ud} = S_{du} = 44 = 41 + 7 - 4 = 41 - 4 + 7; S_{dd} = 37 - 4 = 33$$

$$C_{00} = 15, C_{0d} = C_{d0} = 4, C_{dd} = 0$$

$$D_0 = \frac{15 - 4}{55 - 44} = +1; B_0 = \frac{4 - 44(1)}{1.04} = -38.4615; C_u = 48(1) - 38.4615 = 9.5385$$

$$D_d = \frac{4 - 0}{44 - 33} = 0.36364; B_d = \frac{0 - 33(0.36364)}{1.04} = -11.5385; C_d = 37(0.36364) - 11.5385 = 1.9161$$

$$D_u = \frac{9.5385 - 1.9161}{48 - 37} = 0.6929; B_u = \frac{1.9161 - (37)(0.6929)}{1.04} = -22.8104; C = 41(0.6929) - 22.8104 = 5.6003$$

a. Buy 0.6929 shares, short sell 22.8104 of bonds; Cost = \$5.6003

b. Sell 0.3293 shares (0.6929 - 0.3636); CF = +12.1844 = 0.3293 × 37
Buy to cover 12.1844 of bonds; CF = -12.1844

$$\text{Net} = 0$$

c. Sell 1 share; CF = +44

Buy to cover \$40 (-38.4615 × 1.04) of bonds; CF = -40

$$\text{Net} = +4$$