Quiz B: 4/16/12 Name & Time Key

Quiz: Assume you are planning to buy a put option on Johnson & Johnson because you believe its stock price will fall through the end of this year. Specifically, you believe that J&J's stock price will fall from its current price of $64 per share to $45 per share by the time July options expire on 7/20/2012 (95 days from today) and to $40 per share by the time October options expire on 10/19/2012 (186 days from today). While you plan to buy an October put with a $55 strike price, you expect to hold it only through the expiration of the July option on 7/20. You have determined that over the past year, the standard deviation of returns related to J&J's assets was 40% and on J&J's stock was 52%. Through 7/20, you estimate that the standard deviation of returns related to J&J will be as follows: J&J's assets = 34%, J&J's stock = 41%, the July put on J&J with a $55 strike price = 57%,and the July call on J&J with a $55 strike price = 58%. And you estimate that through 10/19, the standard deviation of returns related to J&J will be as follows: J&J's assets = 38%, J&J's stock = 46%, the October put on J&J with a $55 strike price = 68%, and the October call with a $55 strike price = 67%. The return on short-term U.S. Treasuries is less than 1% but varies across maturity as follows: 4/19/2012 = 0.066%; 7/19/2012 = 0.068%; 10/18/2012= 0.117%, 12/31/2012 = 0.160%. Set up the calculations to determine the value of this put according to the Black-Scholes option pricing model.

Note: Bonus WSJ Questions on back of page

+3 $d_1 = \dfrac{\ln\left(\frac{64^{+4}}{PV(K)}\right)}{.46^{+2}\sqrt{\frac{186+2}{365}}} + \dfrac{.46^{+2}\sqrt{\frac{186}{365}+2}}{2}$ (15)

+2 $d_2 = d_1 - .46^{+2}\sqrt{\frac{186}{365}+2}$ (6)

+3 $PV(K) = \dfrac{55^{+8}}{(1.00117)^{186/365}}$ +2 (21)

+3 $P = PV(K)(1-N(d_2)) - 64^{+4}(1-N(d_1))$ (7)

+1 $N(d_1)$ + $N(d_2)$ ⇒ look up on table or in Excel

$S = 64^{+8}$ $r_f = .00117^{+8}$

$K = 55^{+8}$

$\sigma = .46^{+6}$

$T = 186/365^{+8}$