

Derivatives – final exam solutions assignment

[Business](#)



Suppose $r = 9\%$, $r_f = 8\%$, and $u = 1\%$ per annum (with continuous compounding). Explain in detail which loan plan the corporate client should choose. 4. (20 points) A non-dividend-paying stock with a volatility of 30% per annum is currently trading at $\$60$. Let $r = 4\%$. A) Using the 1-step binomial tree model, calculate the value of a 6-month European put option with $X = \$75$ b) Using the 2-step binomial tree model, calculate the value of a 6-month American put option with $X = \$75$. 5. (20 points) Suppose S (current stock index) $= 1600$, $r = 10\%$, $u = 20\%$, and $q = 4\%$. An investor has a portfolio which is worth $\$10,000,000$ with $\Delta = 2$.

Suppose the investor wants to protect the value of his/her portfolio at the current level (i. e. 1600). A) Suppose the investor decides to use 3-months S&P 500 futures to achieve the goal. i) How many contracts are needed? ii) What is the value of the " aggregate position" if the index goes down to 1200 3 months later? Suppose the investor decides to use 3- months S&P 500 Put options with $X = 1600$ to achieve the goal? Put premium $= 51.72$ i) it) No need to compute !! How many options are needed? What is the value of the " aggregate position" if the index goes down to 1200 3 months later?)

Suppose the investor decides to sell short 3-months S&P 500 Call options with $X = 1600$ to protect its portfolio. Call premium $= 75.30$ i) Suppose he/she shorts the number of options you get in b) i), what is the value of the " aggregate position" if the 6. (20 points) Today is March 24, 2011. Consider a 4-month futures contract on a deadpanning stock with a spot price of $\$50$. Assume that dividend of $\$3$ per share is expected in 2 months. Let the risk-free interest rate be 7% per annum and the term structure is flat (i. e. The interest rate is constant for any maturity). Calculate the " correct" price of

the futures contract today. B) Suppose you believe the company will increase the dividend to \$5 (instead of \$3), is the "market" forward price too high or too low? C) What position should you take in order to take advantage of this MIS- pricing? (I. E. What will you long and what will you short?)

Suppose you establish the position you described in c). One month later, on April 24, 2011, the company reaffirms that the dividend will be \$3. D) If $S_0 = \$50$, how much will you make or lose? E) If $S_0 = \$40$, how much will you make or lose?

One month later, on April 24, 2011, the company announces that it will cut its dividend to \$1. F) If $S_0 = \$50$, how much will you make or lose? G) If $S_0 = \$40$, how much will you make or lose? 27. (20 points) Today is Feb. 17, 2011. Consider a 3-month forward contract on British Pound with a spot price of \$1.6 / £. Let the risk-free interest rate be 7% and 5% per annum for the US and British Pound respectively for all maturities. A) Calculate the "correct" price of the forward contract today. Consider a 3-month forward contract for 1 million £ (signed today using the correct forward price). B) One month later, on

March 17, 2011, suppose the spot price of the British Pound increases to \$1.81 / £, what will be the value of this forward contract (for 1 million £) on this day? (Assume the interest rates remain the same.) c) Suppose on March 17, 2011, this forward contract (for 1 million £) is quoted at \$20,000. What should you do in order to make money? Suppose you establish the position in c), calculate the profit of your position when the forward contract expires. [Note that you are not provided the spot price on the expiration day.] d) 8.

(20 points) Consider a non-dividend paying stock. Assume $S_0 = \$100$, $r = 10\%$, $\sigma = 30\%$.