



UNIVERSITY OF GHANA

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MASTER IN BUSINESS ADMINISTRATION SECOND SEMESTER EXAMINATIONS: 2019/2020 DEPARTMENT OF FINANCE (UGBS) FINC 612: FINANCIAL DERIVATIVES (3 Credits)

READ THE INSTRUCTIONS CAREFULLY, BELOW:

1. This is an open book examination, so no formulas or tables are provided
2. Attempt all the questions
3. The examination has a duration of eight (8) hours and will be conducted as follows:
 - a. Start date and time: June 14, 2020 at 7:30AM
 - b. Submission date and time: June 14, 2020, at 3:30 PM
4. Late submission will **not** be tolerated.
5. All answers **must** be submitted via **Sakai**
6. Your final document (answer) must have the completed student's submission cover page as the first or front page with the following information:
 - a. The course code and course name
 - b. Student's index number with the student's signature by it
 - c. The date and time of submission
7. It is the student responsibility to independently write the exams.
8. If it is detected that a student engaged in academic dishonesty the appropriate University policy will be activated
9. All submissions will be subjected to similarity (copying) test
10. Use only UG email address for the submission of the exams.
11. You can submit a scanned hand-written document in PDF format
12. However, if you choose to submit an MS document; it must be typed and formatted as follows:
 - a. Times New Roman
 - b. Font size: 12
 - c. Full paragraphing
 - d. Use Microsoft Word (when excel is used the final document must be copied into word)
 - e. Convert your final document into PDF as one document
 - f. The name of your PDF file should be the course code (leave a space) and your index number.
13. Round off all final answers to two decimal places, where necessary.

Question 1

- A. What would happen in the options market if the price of an American call were less than the value $\text{Max}(0, S_0 - X)$? Would your answer differ if the option were European? Explain. **(5 Marks)**
- B. Critique the following statement made by an options investor: “My call option is very deep in-the-money. I don’t see how it can go any higher. I think I should exercise it.” **(5 Marks)**
- C. Why do higher interest rates lead to higher call option prices but lower put option prices? **(5 Marks)**
- D. Suppose a European put price exceeds the value predicted by put–call parity. How could an investor profit? Demonstrate that your strategy is correct by constructing a payoff table showing the outcomes at expiration **(5 Marks)**
- E. Consider a two-period, two-state world. Let the current stock price be 45 and the risk-free rate be 5 percent. Each period the stock price can go either up by 10 percent or down by 10 percent. A call option expiring at the end of the second period has an exercise price of 40.
1. Find the stock price sequence.
 2. Determine the possible prices of the call at expiration.
 3. Find the possible prices of the call at the end of the first period.
 4. What is the current price of the call? **(5 Marks)**

Question 2

- A. A portfolio manager desires to generate \$10 million 100 days from now from a portfolio that is quite similar in composition to the S&P 100 index. She requests a quote on a short position in a 100-day forward contract based on the index with a notional amount of \$10 million and gets a quote of \$25.2. If the index level at the settlement date is \$35.7, calculate the amount the manager will pay or receive to settle the contract. **(5 Marks)**
- B. A forward contract covering a \$10 million face value of T-bills that will have 100 days to maturity at contract settlement is priced at 1.96 on a discount yield basis. Compute the dollar amount the long must pay at settlement for the T-bills. **(5 Marks)**

C. Consider an FRA that:

- Expires/settles in 30 days.
- Is based on a notional principal amount of \$1 million.
- Is based on 90-day LIBOR.
- Specifies a forward rate of 5%.

Assume that the annual 90-day LIBOR 30-days from now (at expiration) is 6%. Compute the cash settlement payment at expiration and identify which party makes the payment. **(5 Marks)**

D. Consider a long position of five July wheat futures contract, each of which covers 5,000 bushels. Assume that the contract price is \$2.00 per bushel and that each contract requires an initial margin deposit of \$150 and a maintenance margin of \$100. Compute the margin balance for this position after a 2-cent decrease in price on Day 1, a 1-cent increase in price on Day 2, and a 1-cent decrease in price on Day 3. **(5 Marks)**

E. BB can borrow in the United States for 9%, while AA has to pay 10% to borrow in the United States. AA can borrow in Australia for 7%, while BB has to pay 8% to borrow in Australia. BB will be doing business in Australia and needs AUD, while AA will be doing business in the United States and needs USD. The exchange rate is 2AUD/USD. AA needs USD1.0 million and BB needs AUD2.0 million. They decide to borrow the funds locally and swap the borrowed funds. The swap period is for five years. Calculate the cash flows for this swap. **(5 Marks)**

Question 3

A. Explain why an option's time value is greatest when the stock price is near the exercise price and why it nearly disappears when the option is deep-in- or out-of-the-money. **(5 Marks)**

B. Call prices are directly related to the stock's volatility, yet higher volatility means that the stock price can go lower. How would you resolve this apparent paradox? **(5 Marks)**

C. The value $\text{Max} [0, X (1+r)^{-T} - S_0]$ was shown to be the lowest possible value of a European put. Why is this value irrelevant for an American put? **(5 Marks)**

D. Buying an at-the-money put has a greater return potential than buying an out-of-the-money put because it is more likely to be in-the-money. Appraise this statement. **(5 Marks)**

E. Explain the advantages and disadvantages to a covered call writer of closing out the position prior to expiration. **(5 Marks)**

Question 4

- A.** A stock price is currently \$40. Over each of the next two 3-month periods it is expected to go up by 10% or down by 10%. The risk-free interest rate is 12% per annum with continuous compounding. What is the value of a 6-month European put option with a strike price of \$42? **(5 Marks)**
- B.** From Question 4A, what is the value of a 6-month American put option with a strike price of \$42? **(5 Marks)**
- C.** A stock price is currently \$30. During each 2-month period for the next 4 months it will increase by 8% or reduce by 10%. The risk-free interest rate is 5%. Use a two-step tree to calculate the value of a derivative that pays off $[\max(30 - S_T, 0)]^2$, where S_T is the stock price in 4 months. If the derivative is American-style, should it be exercised early? **(5 Marks)**
- D.** Consider a European call option on a non-dividend-paying stock where the stock price is \$40, the strike price is \$40, the risk-free rate is 4% per annum, the volatility is 30% per annum, and the time to maturity is 6 months. **(5 Marks)**
- i. Calculate u , d , and p for a two-step tree.
 - ii. Value the option using a two-step tree.
- E.** Repeat Question 4D for an American put option on a futures contract. The strike price and the futures price are \$50, the risk-free rate is 10%, the time to maturity is 6 months, and the volatility is 40% per annum. **(5 Marks)**