

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**FACULTY OF COMMERCE**

**DEPARTMENT OF BANKING**

**BACHELOR OF COMMERCE HONOURS DEGREE IN BANKING**

**DERIVATIVE SECURITIES  
[CBA 4204]**

**FINAL EXAMINATION**

**MAY 2012**

**TIME: 3 HOURS**

**INSTRUCTIONS TO CANDIDATES**

- Answer any **FOUR (4)** questions.
- Start the answer to each full question on a fresh page of the answer sheet.
- Indicate on your answer booklet whether you are in the conventional or parallel programme.
- Show all workings.

**INFORMATION FOR CANDIDATES**

- The paper contains **SIX (6)** questions.
- All questions carry equal marks [**25 marks**].
- The businesses in this question paper are intended to be fictitious.

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## QUESTION 1

- a) John is asked to value a one-year European-style call option for Kunakirwa Ltd common stock which last traded at \$43. Call and put option exercise price is \$45; one year put option price is \$4; one year Treasury bill rate is 5.50%, and time to expiration is one year.
- Calculate, using information provided, the value of the European-style call option. [4 marks]
  - Explain the effect, if any, of an increase in short-term interest rate, an increase in stock price volatility, and a decrease in time to option expiration on the value of a call option. [9 marks]
- b) A share is trading at \$20 and the risk-free rate of interest is 10% per annum, with continuous compounding. The exercise price on a European call option is \$18 and time to maturity is one year.
- Estimate the theoretical minimum value of this option. [2 marks]
  - Assume the call option is selling at \$3. Construct an arbitrage strategy to exploit each of the two scenarios where share price at the end of the year is either \$21 or \$16. [10 marks]

## QUESTION 2

- a) A stock is expected to pay a dividend of \$1 per share in two months and in five months. The stock price is \$50, and the risk-free rate of interest is 8% per annum with continuous compounding for all maturities. An investor has just taken a short position in a six-month forward contract on the stock.
- What are the forward price and the initial value of the forward contract? [2 marks]
  - Three months later, the price of the stock is \$48 and the risk-free rate of interest is still 8% per annum. What are the forward price and the value of the short position in the forward contract? [8 marks]
- b) Prove that in a market with restrictions on short sales, the inequality  $F_{0,T} < S_0 e^{RT}$  does not necessarily lead to arbitrage opportunities. [5 marks]

- c) Explain any 5 practical regulations that are enforced to ensure that the obligations involved in futures positions are fulfilled. [10 marks]

### QUESTION 3

- a) “The problem with derivatives is that they are very versatile instruments” (Hull, 2005 p 473). With the aid of examples from global markets, critically examine the logic of this statement. [13 marks]
- b) Identify and explain eight lessons Zimbabwean financial institutions can draw from the mishaps and losses experienced in global derivatives markets. [12 marks]

### QUESTION 4

- a) An investor believes that there will be a big jump in a stock price, but is uncertain as to the direction. Identify 6 different strategies the investor can follow and explain the differences among them. [12 marks]
- b) Suppose that put options on a stock with strike prices \$30 and \$35 cost \$4 and \$7 respectively. How can the options be used to create:
- i) A bull spread [7 marks]
- ii) A bear spread? Construct a table that shows the profit and payoff for both strategies. [6 marks]

### QUESTION 5

- a) A stock price is currently \$50. Over each of the next two three-month periods, it is expected to go up by 6% or down by 5%. The risk-free interest rate is 5% per annum with continuous compounding.
- i) What is the value of a 6 month European call option with a strike price of \$51? [7 marks]
- ii) What is the value of a 6 month European put option with a strike price of \$51? [3 marks]
- b) An option with an exercise price of \$40 has three months to expiry. The risk-free interest rate is 5% per annum and the stock price is currently \$36. If the standard deviation of share price is 50%, calculate the Black-Scholes values of a European call and put options on the share. [10 marks]

- c) Outline the major differences between the Black-Scholes and the Binomial option pricing models. [5 marks]

### QUESTION 6

- a) A wheat farmer argues: "I do not use futures contracts for hedging. My real risk is not the price of wheat. It is that my whole crop gets wiped out by the weather". Discuss this viewpoint. [10 marks]
- b) Suppose that zero interest rates with continuous compounding are as follows:

| <b>Maturity (years)</b> | <b>Rate (% per annum)</b> |
|-------------------------|---------------------------|
| 1                       | 2.0                       |
| 2                       | 3.0                       |
| 3                       | 3.7                       |
| 4                       | 4.2                       |
| 5                       | 4.5                       |

- i) Calculate forward interest rates for the second, third, fourth, and fifth years. [5 marks]
- ii) Value a Forward Rate Agreement (FRA) where you will pay 5% for the third year on \$1 million. [5 marks]
- iii) Advise the Governor of the Reserve Bank of Zimbabwe about the regulatory reforms that are necessary before derivatives are embraced in Zimbabwean financial markets. [5 marks]