NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF COMMERCE
DEPARTMENT OF BANKING

DERIVATIVES SECURITIES
CBA 4204

FINAL EXAMINATION   **MAY 2008**

TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

Answer any FOUR (4) questions.

Indicate on your answer booklet whether you are in the conventional or parallel programme.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

Questions may be written in any order, but must be legibly numbered.

The businesses in this question paper are intended to be fictitious.

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This paper consists of 4 printed pages

[Turn over]

QUESTION 1

(a)   The current share price of a stock is $200. The share pays dividends continuously and the current dividend is $5 per share. The risk-free rate of interest is 5% per annum with continuous compounding for all maturities.

  (i)   Calculate the forward price of a five-year contract on the stock.
                                                                                          [5 Marks]
  (ii)   If the forward price agreed at is $240, construct an arbitrage strategy that can make riskless profit for the investor.   **[6 Marks]**
  (iii)   If the forward price agreed at is $220, what strategy can be used to make riskless profit?   **[6 Marks]**

(b)   A 30 months long forward contract on a non-dividend paying stock is entered into when the stock price is $40 and the risk-free rate of interest is 10% per annum with continuous compounding.

  (i)   What is the initial value of the forward contract?   **[2 Marks]**
  (ii)   15 months later, the price of the stock is $45 and the risk-free interest rate is still 10%. What is the value of the forward contract?   **[4 Marks]**

(c)   Distinguish between forward price and delivery price of a forward contract.
                                                                                          [2 Marks]

                           TOTAL   **[25 MARKS]**

QUESTION 2

(a)   Distinguish between the Binomial Option Pricing Model and the Black-Scholes Model.   **[2 Marks]**
(b)   A stock price is currently $50. It is known that at the end of 6 months, it will be either $60 or $42. The risk-free interest rate with continuous compounding is 12% per annum.
  (i)   Calculate the value of a European call option with strike price $48.
                                                                                          [6Marks]
  (ii)   Calculate the value of a European put option with strike price $48.
                                                                                          [4 Marks]

c)   Consider a European call option on a non-dividend paying stock when the stock price is $20, exercise price is $18, time to maturity is one year and the risk-free rate of interest is 10% per annum.
  (i)   Calculate the lower bound for the option price and interpret it. **[3 Marks]**
  (ii)   Suppose the European call option is selling at a price of $3. Construct arbitrage strategies if stock price at the end of the year is $19 and $17.
                                                                                          [10 Marks]

                           TOTAL   **[25 MARKS]**

QUESTION 3

(a)   Why do financial engineers use the "no-arbitrage" principle in derivative securities?
[4 Marks]

(b)   With the aid of clear examples, explain the major uses of derivative securities.
[12 Marks]

(c))   Despite concerted efforts to establish a vibrant derivatives market in Zimbabwe's financial system prior to the 2003/2004 banking crisis, the market remained thin and undeveloped (Chibisa A, 2005). Why did the market remain undeveloped?
[7 Marks]

(d)   In your view, what prompted the ultimate collapse of the derivatives market in Zimbabwe?   **[2 Marks]**

TOTAL   **[25 MARKS]**

QUESTION 4

(a)   Discuss the significance of marking-to-market and margin payments in futures markets.   **[5 Marks]**

(b)   The futures price of one unit of a commodity is $1000, initial margin level is 20% and the   maintenance margin level is $150.

DAY	PRICE
1	$1100
2	$1200
3	$1050
4	$950
5	$900

You are further told that the loser's margin account will be debited up to maintenance level and for any further losses, a variation margin in cash will be called for. Calculate the initial margin, variation margin, margin account balance, and the net gain/loss on a daily basis for both the buyer and the seller. Tabulate your answers.   **[14 Marks]**

c)   The current price of silver is $900 per ounce. Storage costs are $24 per ounce per year payable quarterly in advance. Assuming interest rates are 10% per annum for all maturities, calculate the futures price of silver for delivery in 9 months.
[6 Marks]

TOTAL   **[25 MARKS]**

QUESTION 5

(a)   The stock price is currently $40 and the risk-free interest rate is 9%, volatility is 30%,
strike price is $40 and the term to maturity is one year. Use the Black-Scholes model to find the fair value of a European call option.   **[10 Marks]**

(b)   Explain what would happen to the price of the option in (a) above if:

(i) the risk-free interest rate increases;   **[1 Mark]**

(ii) the current share price falls.   **[1 Mark]**
(i)

(c)   Consider two portfolios **X** and **Y**. Portfolio **X** contains a European call plus cash amount equal to the present value of the strike price. Portfolio **Y** contains a European put plus one non-dividend paying share. Assume an option on the share with current price $41 and the strike price for both put and call is $40. The options expire in six months and the risk-free interest rate is 10% per annum. The put and call premiums are $2.25 and $3 respectively.

(i) Use Put-Call Parity to identify any arbitrage opportunities.   **[3 Marks]**
(ii) How can the investor make riskless profit if share price at the end of six months is $50?   **[5 Marks]**
(iii) Outline the arbitrage strategy if share price at the end of six months is $32.
    [5 Marks]

TOTAL   **[25 MARKS]**

QUESTION 6

With the aid of clearly labeled expiry pay-off diagrams, describe each of the following option trading strategies. Comment briefly on what each of these strategies mean on the market.

(a)   Straddle   **[5 Marks]**
(b)   Strip   **[5 Marks]**
(c)   Strap   **[5 Marks]**
(d)   Strangle   **[5 Marks]**
(e)   Bull Spreads   **[5 Marks]**

TOTAL   **[25 MARKS]**