NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF COMMERCE

DEPARTMENT OF FINANCE

CFE 5301: PRODUCT DESIGN AND ENGINEERING

NOVEMBER/DECEMBER 2015: EXAMINATION

Time : 3 hours

Candidates should attempt **FOUR** questions.

A1. A firm processes canned beans in Zimbabwe for sale in South Africa. Assume that the local currency for Zimbabwe is the dollar, and that for South Africa is the rand. The investment to start production is 7 million dollars. Additional funds can be raised by borrowing dollars at 15% to finance a hedging strategy. The rate of return demanded by investors, bearing in mind the risk involved, is 18%. The sales are predicted to generate 11 million dollars at the end of the year. The manufacturing costs are 4 million dollars per year. The interest rate is 11% for rands and 12% for dollars. The current rate of exchange is 11.2 rands to one dollar. The company pays 16% tax on earnings.

(a) Find the position of the company at the end of the year if

(i) the company is not hedged and the exchange rate remains at 11.2 rands to a dollar at the end of the year.

(ii) the company is not hedged and the exchange rate becomes 15 rands to a dollar at the end of the year.

(b) Suppose that a European call option to buy \$1 with strike price 11.2 rands to a dollar is available. The call option expires after one year and it costs \$0.08. The company borrows funds to buy the options and the interest rate is 17%.

(i) If the company fully hedges its position by buying options, find the net position of the company at the end of the year given that by that time the open market exchange rate is 14 rands to the dollar.

(ii) To reduce the cost of buying options the company decides to hedge 50% of its position, by buying the call option. Find the net position of the company if the exchange rate is at 12.3 rands to the dollar at the end of the year.

(c) Would you advise the company not to hedge, to fully hedge or to effect a partial hedge? Justify your answer.

[5,5,5,5,5]

A2. Consider a bear spread. An investor takes a short position in a futures contract denoted by x_t. but he or she thinks that x_t will not fall below a certain level $x_{\min}$.

(a) How would you create a position that trades off gains beyond a certain level against large losses if x_t increases above what is expected?

(b) With the aid of a diagram, show how much you would pay for this position.

(c) Determine the maximum gain and the maximum loss.

(d) (Use **Table 1** below.) Ronald buys a \$70-strike call and sells a \$85-strike call for 100 shares of XYZ stock. Both have expiration date one year from now. The current price of one share of XYZ stock is \$75. The risk free annual effective rate of interest is 5%. The premium per share of \$70-strike and \$85-strike calls are \$10.76 and \$3.680736, respectively.

Table 1: Prices of some calls and puts with strike price K and expiration Date T

K	65	70	75	80	85	90
Call(K,T)	14.32	10.76	7.79	5.44	3.68	3.12
Put(K,T)	1.22	2.42	4.23	6.64	9.63	10.1

(i) Find the profit at expiration as a function of the strike price.

(ii) Make a table with Ronald's profit when the spot price at expiration is \$65, \$70, \$75, \$80 \$85 \$90.

(iii) Draw the graph of Ronald's profit.

A3. It is March 1. You are a Zimbabwean tobbaco farmer and have just sold 900 000 kilogrammes of tobbaco to a South Africa firm for delivery on August 1. The local currency of Zimbabwe is the dollar (USD) and that for South Africa is the rand (ZAR). The price of tobbaco is USD4.00 /kilogramme and you will be paid upon delivery. The USD-ZAR exchange rate on March 1 is still 11.1 (South African rands per one dollar), making the value of your contract at signing $ZAR39$ 960 000. Therefore, between March 1 and August 1, you will be long ($USD3,600,000$D) and exposed to fluctuations in the South African rand vs. USD dollar.

(a) Summarise, in table form, the sale details of a futures contract that may be used to hedge against the exchange risk.

(b) Determine the optimal hedge ratio for the futures contract.

(c) Showing all essential details, examine your net position if

(i) the ZAR has rallied 5 cents vs USD.

(ii) the ZAR has fallen 5 cents vs USD.

Give an appropriate comment in each case.

[7,9,9]

A4. (a) A portfolio is currently worth \$10million and has a beta of 1.0. The S&P 100 is currently standing at 500.

(i) Explain how a put option on the S&P 100 with a strike of 480 can be used to provide portfolio insurance.

(ii) How would you adjust your hedging strategy if the beta of the portfolio changes to -0.7.

(b) Consider a stock index currently standing at 250. The dividend yield on the index is 4% per annum and the risk-free rate is 6% per annum. A three-month European call option on the index with a strike price of 245 is currently worth \$10.

Find the value of a three-month European put option on the index with a strike price of 245.

(c) Discus the merits and demerits of each of the following hedging strategies:

(i) call option on yen.

(ii) a call option on yen futures.

[9,8,8]

A5. (a) Suppose that each day during July the minimum temperature is 68 degrees Fahrenheit and the maximum temperature is 82 degrees Fahrenheit.

Find the payoff from a call option on the cumulative Cooling Degree Day(CDD) during July with a strike of 250 and a payment rate of $\$5,000$ per degree day?

(b) "The CDD for a particular day is the payoff from a call option on the day's average temperature." Explain.

(c) Suppose that you have 50 years of temperature data at your disposal. Explain carefully the analyses you would carry out to value a forward contract on the cumulative CDD for a particular month.

[8, 7, 10]

END OF QUESTION PAPER