National University of Science and Technology

Think in Other Terms

FACULTY OF COMMERCE

DEPARTMENT OF FINANCE

BACHELOR OF COMMERCE HONOURS DEGREE IN FINANCE

PART IV - 1ST SEMESTER FINAL EXAMINATION - JANUARY 2011

FINANCIAL ENGINEERING CFI 4106

TIME: 3 HOURS

INSTRUCTIONS TO CANDITATES

1. **Answer ALL Questions in Section A, and ANY THREE in Section B**
2. **Start the answer to each full question on a fresh page of the answer sheet.**
3. **Questions may be written in any order, but must be legibly numbered.**
4. **Write legibly.**

INFORMATION FOR CANDIDATES

The businesses in this question paper are intended to be fictitious

The paper contains FIVE (5) questions.

All questions carry equal marks [25 marks]

<u>Section A</u> (Multiple choice) 25 marks

1. A Trader takes a long position in a Eurodollar futures contract with face value of $1million at 98.14 and closes it out at 98.27. The trader has:
 A. Lost $325
 B. Gained $325
 C. Lost $1300
 D. Gained $1300 (3)

2. Stock selling at $40, 3 month put at $50 selling for $11 and 3 month call at $50 selling for $1, risk free rate at 6%. How much , if anything can be made from through arbitrage?
A. No arbitrage
B.$0.28
C.$0.72
D.$2.83 (4)

3. A decrease in the market rate of interest will;
A. Increase put and call prices
B. decrease put and call prices.
C. Decrease put prices and increase call prices
D. Increase put prices and decrease call prices (2)

4. A forward rate agreement is equivalent to the following interest rate options;
A. Long a call and a put
B. Short a put and a call
C. Short a call and long a put
D. Long a call and short a put (2)

5. Consider a $2m Forward Rate Agreement with a contract rate of 5% on a 60 day LIBOR. If 60 day LIBOR is 6% at maturity, the long will
A. pay $3,300
B. pay $3,333
C. receive $3,300
D. pay $3,333 (3)

6. Party A has entered into a forward contract to purchase P10 million at an exchange rate of $0.98 per pula. At settlement , the exchange rate is $0.97 per pula. If the contract is settled in cash, Party A will;
A. make a payment of $100,000
B. receive $100,000
C. make a payment of $103,000
D. receive $103,000 (3)

7. A company treasurer needs to borrow $10m for 180 days ,60 days from now. The type of FRA and position the treasurer should take to hedge interest rate risk are;
A. 2 against 6 long
B.2 against 6 short
C.2 against 8 long
D. 2 against 8 short (2)

8. The short in a deliverable forward contract;
A. has no default risk
B. receives a payment at contract initiation
C. is obligated to deliver a specified asset
D. makes a cash payment to the long. (2)

9. In a covered call , the investor ;
A. is long on a call and asset
B. long on call and short in an asset
C. short in a call and long in an asset
D. short asset and short in a call (2)

10. In a Bear Call spread;
A. sell a call with lower strike and buy a call with higher strike price
B.sell a call with higher strike price and buy a call with lower strike price
C. sell a call with lower strike and buy a put with higher strike price
D. sell a call with higher strike and buy a put with lower strike price (2)

Section B
Question 1

a) Given a market without arbitrage opportunities between Put options and Call options, using relevant arguments, show that, for European options;

$$C + Ke^{-rt} = P + S_o$$

Where ;

C =Call price
P=Put price
K=Exercise price
S_o= Spot price
r= risk free rate of return
t= time to maturity for both put and call options (10)

b) Given that European Call option and Put option premiums are at \$4 and \$3 respectively. The spot price of an underlying asset is \$50 while the exercise price on both put options and call options contracts of 0.25 years to maturity is \$60.Risk free rate is at 6%.
   i. Evaluate the relationship between two possible portfolios that can be derived from the information given above. (6)
   ii. What strategy will a rational investor undertake to maximize returns in (b)(i) above. (4)

(c) Explain (in not more than 7 sentences) basis risk as it applies to Futures contracts. (5)

Question 2

a) The current spot price of an AICO Limited share is $2694, a call option at a strike price of $2600 will attract a premium of $154 while a call option with a strike price of $2800 will attract a premium of $49.Show that a Bear Call spread strategy based on information given above will result in a maximum profit of $105 and a maximum loss of $95. Your answer should be accompanied by a pay off diagram. (11)

b) Mr Nicholson is considering to expand his timber production line. The upgrading of the production house will take 3 months to complete. Raw timber prices are likely to increase between now and 3 months time. There is no storage space and Mr Nicholson cannot therefore buy the raw material now for future use. A forward contract is used by Mr Nicholson to hedge the price risk. The current spot price per tonne of timber is $108 and the risk free rate is 5%.

i. What forward price is Mr Nicholson expected to contract at if he has to buy the timber as soon as upgrading of production house is complete. (3)

ii. Evaluate arbitrage opportunities which will arise if the actual forward price is $130. (4)

c) Air Zimbabwe expects a boom in the number of flights in two months and its projections are that it will need to buy two million gallons of Jet A1 fuel in 1 months time. To hedge this exposure , it decides to use ‘ Heating oil’ futures. The following data pertains to Jet A fuel prices and the prices of futures on Jet A1 fuel observed over the past 15 months. Correlation coefficient between cash prices and futures contracts prices is 0.928, Standard Deviation of spot prices is 0.0263 and Standard deviation of futures prices is 0.0313.

i. Calculate the minimum variance hedge ratio . (4)

ii. If the size of each futures contract is 42000, find the optimal number of contracts to be used to hedge the exposure. (3)

Question 3

a) Eston Supplies ltd, a Zimbabwean based company is considering borrowing ZAR 50 million from South Africa at a fixed rate of interest for five years. It will have to pay a fixed rate of 14% in that market if any borrowing is approved. When borrowing from Zimbabwean markets, Eston Supplies is likely to pay a rate of 12% p.a. Genetics Unlimited, a South African based company is considering borrowing an equivalent of ZAR50 million dollars from the Zimbabwean market for five years also at a fixed rate. It is expected to borrow at a rate of 12% in South Africa and 11% in Zimbabwe. The exchange rate between the South African rand and Zimbabwean dollar is $7/rand and is expected to remain unchanged over the 5 year period.
Suggest an appropriate currency swap which the two companies may consider . Assume that there is an intermediary involved and charges 0.01%. Savings and charges are shared equally between the two companies. (11)

b) ABC limited buys, from ZDB Bank, a 3 -against-9 month Forward Rate Agreement (FRA) at a contract rate of 6.25% . The benchmark rate / settlement reference rate is the treasury bill rate. At settlement date, the benchmark rate is 9%. Assuming a notional amount of $100, 000 , show and explain the cash flows at maturity. (6)

c) Explain the basic mechanics in a Credit Default Swap. How do these instruments differ from Collateralized Debt Obligations? (8)

Question 4

a) Engine Wire Limited and Iminent Faces Corporation are United States based companies both considering to borrow funds for capital expenditure. Engine Wire is AAA rated company which can borrow from fixed rate markets at 10% and from floating rate markets at MLR + 0.3%. Iminent faces Corporation, a BBB rated company can borrow at 12.5% and MLR+0.75% from fixed rate markets and floating rate markets respectively. The possible swap will be for three years.

i. As a Financial Director in Iminent Faces corporation, convince your counterpart in Engine Wire Pvt Ltd that there is an opportunity that the two (4)

ii. Show, diagrammatically, the possible swap transaction between the two companies, assuming that an intermediary will be involved and will charge a commission of 0.4% which the two companies involved will share in a 35% and 65% proportion for Engine Wire and Iminent Faces respectively. Savings are shared equally. (10)

iii. Calculate the value of the swap to Engine Wire Ltd assuming a notional amount of USD$1 million, LIBOR rate of 5% and forecasted floating rate of 11% at the end of year 1 .(5)

b) What risks are associated with currency swap transactions? (6)

Question 5

a) Explain how the following aspects are achieved through securitization.

i. Reduction in risk based regulatory capital requirements. Include relevant calculations in your answer (6)

ii. Diversification of loan book portfolios. (4)

b) Shangri –La Limited , a listed entity on the Zimbabwe Stock Exchange is likely to take –over Luxon Investments, an unlisted firm which however has been operating for a long time. There is confidence amongst most market participants that the transaction will have a significant impact on the Shangri-La share price. The current share price is $60. Options are available in the market at premiums of 3% and 4% of market price for Call options and Put options respectively (for 'at the money' and in the money' options). 'Out of the money' options are available at premiums which are 0.7% less than 'at the money options' on both call options and put options.
As a financial engineering student from NUST, design an investment strategy which will result in minimal upfront costs and unlimited profits. (5)

c) '…. Financial product innovation may result in moral hazard and ultimately a crisis….'. In not more than 15 sentences, elaborate on this statement with particular reference to the 2008 Global financial crisis. (10)