



**National University of
Science and Technology**
Think in Other Terms



FACULTY OF COMMERCE
DEPARTMENT OF FINANCE
BACHELOR OF COMMERCE HONOURS DEGREE IN FINANCE
RISK MANAGEMENT [CFI 4204]
FINAL EXAMINATIONS APRIL 2014
TIME ALLOWED: 3 HOURS

Instructions to Candidates

1. Answer any **FOUR (4)** questions
2. Show **ALL** calculations

Information to candidates

1. The paper consists of **SIX (6)** printed pages
2. All six questions carry **25 marks** each

QUESTION ONE

- (a) During the normal course of doing business, banks often have excess funds that they must invest. Maturing investments also have to be managed in a way that minimises risks at roll-over dates. Explain how a bank with excess liquidity should structure the timing and maturity of its investments to minimise reinvestment risk, highlighting all pertinent considerations to be taken into account in the process. **(10 marks)**
- (b) Suppose BNM Bank's balance sheet shows that assets are more than liabilities and the bank's Asset Liability Management unit intends to cash-match its assets and liabilities to eliminate risk. Assuming the bank operates in a fixed interest rate environment, advise the bank on what it should do to achieve its objective. **(8 marks)**
- (c) Examine the asset and liability mismatches that arise on banks' balance sheets in the conduct of their normal banking business and highlight the risks that these mismatches expose banks to. **(7 marks)**

Total = 25 marks

QUESTION TWO

- (a) SolTech plans to borrow \$10 million in 30 days at 90 day LIBOR plus 100 basis points. To lock in a borrowing rate of 7%, it buys an FRA at a rate of 6%. Thirty days later, LIBOR is 7.5%. Demonstrate that SolTech's effective borrowing rate is 7% under these circumstances. **(4 marks)**
- (b) An investment management firm has a client who would like to temporarily reduce his exposure to equities by converting a \$25 million equity position to cash for a period of four months. The client would like this reduction to take place without liquidating his equity position. The investment management firm plans to create a synthetic cash position using an equity futures contract. This futures contract is priced at 1170.10, has a multiplier of \$250, and expires in four months. The dividend yield on the underlying index is 1.25%, and the risk free rate is 2.75%.

Required

- i. Calculate the number of futures contracts required to create synthetic cash. **(3 marks)**
- ii. Determine the effective amount of money committed to this risk free transaction and the effective number of units of the stock index that are converted to cash. **(4 marks)**

- iii. Assume that the stock index is at 1031 when the futures contract expires. Show how this strategy is equivalent to investing the risk free asset, cash. **(4 marks)**

- (c) A pension fund manager expects to receive cash inflow of \$50 million in three months and wants to use futures contracts to take a \$17.5 million synthetic position in stocks and \$32.5 million in bonds today. The stock would have a beta of 1.15 and the bonds a modified duration of 7.65. A stock index futures contract with a beta of 0.93 is priced at \$175 210. A bond futures contract with a modified duration of 5.65 is priced at \$95 750.

Required

- i. What action should the manager take? **(1 mark)**
- ii. Calculate the number of stock and bond futures contracts the fund manager would have to trade in order to meet his objective. **(4 marks)**
- iii. When the futures contracts expire in three months, stocks have declined by 5.4% and bonds have declined by 3.06%. Stock index futures are priced at \$167 559 and bond futures are priced at \$93 586. Show that profits on the futures positions are essentially the same as the change in the value of stocks and bonds during the three month period. **(5 marks)**

Total = 25 marks

QUESTION THREE

- (a) Operational risk encompasses the risk posed by people to institutions, yet these very same people are responsible for the good of the companies they work for. Analyse five sources of such operational risk, examining the techniques that can be used to manage each identified risk. **(20 marks)**
- (b) Briefly discuss how a firm that is intending to close down a business line can use RAROC and the hurdle rate to make its decision. **(5 marks)**

Total = 25 marks

QUESTION FOUR

- (a) InnTrade is an options trading company that makes markets in a variety of derivative instruments. It has just sold 500 call options on a stock currently priced at \$125.75. Suppose the trade date is 18 November. The call has an exercise price of \$125.00, 60 days until expiration, a price of \$10.89, and a delta of 0.5649. InnTrade will delta-hedge this transaction by buying an appropriate number of shares. Any additional transactions required to adjust

the delta hedge will be executed by borrowing or lending at the continuously compounded risk free rate of 4%. Two days later, on 20 November, the following information applies:

Stock price	\$122.75	Option price	\$9.09
Delta	0.5176	Number of options	500
Shares	328	Bond balance	-\$6 072
Market value	\$29 645		

Required

- i. At the end of 19 November, the delta was 0.6564. Based on this, show how 328 shares of stock are used to delta hedge 500 call options. **(3 marks)**
- ii. Show the allocation of the \$29 645 market value of InnTrade's total position among stock, options and bonds on 20 November. **(3 marks)**
- iii. Show all the transactions that must be done to adjust the portfolio to be delta hedged for the following day (21 November) **(4 marks)**
- iv. On 21 November the stock is worth \$120.50 and the call is worth \$7.88. Calculate the market value of the delta hedged portfolio and compare it with the benchmark, based on the market value on 20 November. **(4 marks)**

- (b) Safex is a typical floating rate borrower, taking out loans at LIBOR plus a spread. On 15 January it takes out a loan of \$25 million for one year with quarterly payments on 12 April, 14 July, 16 October, and the following 14 January. The underlying rate is 90 day LIBOR, and Safex will pay a spread of 250 basis points. Interest is based on the exact number of days in the period. Current 90 day LIBOR is 6.5%. Safex buys an interest rate cap for \$20 000 that has an exercise rate of 7% and has caplets expiring on the rate reset dates.

Determine the caplet payoffs and effective interest payments if LIBOR on the following dates is given as:

12 April	7.250%	
14 July	6.875%	
16 October	7.125%	(6 marks)

- (c) Explain how lenders can use interest rate floors to manage interest rate risk arising from floating rate loans. **(5 marks)**

Total = 25 marks

QUESTION FIVE

- (a) Mr. Ndlovu has a \$100 000 equity portfolio which he wants to protect from falling below this value, but he does not want to forego the chance of

benefiting if the portfolio rises above this level. Suppose it is known that the portfolio value can rise to \$112 000 or fall to \$91 000 after six months. Furthermore, if it rises to \$112 000, then after another six months the portfolio value will be either \$125 000 or \$100 000. If the portfolio value had fallen to \$91 000, then after a year it could have risen to \$100 000 or fallen to \$78 000.

Assume the following:

- Transaction costs are zero,
- There are no futures markets,
- Security price movements are continuous, and
- The semi-annual risk free interest rate is 5%.

Required

- (i) Illustrate how you would use dynamic asset allocation to insure this portfolio to meet Mr. Ndlovu's goal. Show **all** steps. **(12 marks)**
- (ii) Briefly explain another strategy that replicates the outcome of the strategy in (i) above. **(4 marks)**
- (iii) In the real world, what factors are likely to complicate the hedging strategy in (i) above? **(4 marks)**
- (b) Mr. Smith wants to use perturbation analysis to hedge a Treasury 13.5% 2004-08 bond which has a price factor of 1.3914412 and was trading at £126.25 on 1 June. Suppose that when interest rates rise by half a percentage point the price of the CTD bond falls by £2 and the price of the bond to be hedged falls by £2.50. Calculate the perturbation hedge ratio and comment on what it means in relation to the bond's volatility. **(3;2 marks)**

Total = 25 marks

QUESTION SIX

- (a) Mrs Ncube is the newly appointed Chief Risk Officer for a leading commercial bank in Zimbabwe. Besides normal commercial banking services, the bank also owns an asset management company and a building society. She has noticed that the bank and all its subsidiaries have not been adjusting active position takers' performance for the level of risk taken. Consequently she has directed this to be implemented forthwith. Justify her action. **(9 marks)**
- (b) Evaluate the role of risk appetite in the risk management process. **(6 marks)**

- (c) Having an internal audit unit implies that a bank does not need to have an autonomous risk management unit as well. Critically analyse this statement.
(10 marks)

Total = 25 marks

END OF EXAMINATION PAPER