

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF COMMERCE
DEPARTMENT OF FINANCE
BACHELOR OF COMMERCE HONOURS DEGREE IN FINANCE
PART I- 2ND SEMESTER FINAL EXAMINATION – JUNE 2007
FINANCIAL MATHEMATICS II CFI 1201
TIME ALLOTTED: 3 HOURS 10 MINUTES

INSTRUCTIONS

1. The paper is 3 hours 10 minutes, of which 10 minutes is reading time.
2. Attempt question 1 and 3 others.
3. Question 1 carries 40 marks.
4. Electronic calculators may be used
5. Write legibly.

Question One [40 marks]

NUST Pension Fund has a One-off obligation of \$14 000 000, due at the end of 3 years. It has decided to discharge the obligation by purchasing ,today, a portfolio of government bonds. The yield curve is flat at 42%.

- 1.1 Calculate the present value of the obligation. [3 marks]
- 1.2 What is the duration and convexity of the future obligation? [3 marks]
- 1.3 Suggest a strategy for immunizing bond portfolio, purchased to discharge the obligation, against interest rate risk in times of high interest rate volatility. Explain fully [7 marks]
- 1.4 Determine the reaction of Portfolio value to 50 basis point a parallel rise, immediately after purchase, in the yield curve. [8 marks]
- 1.5 Suppose a bond pays an annual coupon of 35% on a par value of \$1 000. Calculate the realized yield following the 50 basis points, and only, rise in yield to maturity , if maturity of the bond is 4 years and horizon date of the investor is 3 years. [19 marks]

Question Two [20 marks]

Consider two assets, A and B, with performance measures tabled below:

ASSET	A	B
\bar{R}	30%	20%
σ	25%	18%

- 2.1 What are the weights and expected return of a fully hedged portfolio of assets **A** and **B**, if the correlation coefficient between their returns is **-1**? [10 marks]
- 2.2 What are the weights and expected return of the minimum variance portfolio if the correlation coefficient between their returns is zero. [10 marks]

Question Three**[20 marks]**

You are considering two investment strategies over your horizon date of 3 years. The first is to purchase a two year maturity, government bond, whose spot yield is 28%, and roll forward the investment at the end of the second year.

The second strategy is to purchase a government bond with a maturity of 3 years (your horizon date). The spot yield to maturity on this bond is 30%.

- 3.1 What is the observed one year forward rate at the beginning of year 3?
[7 marks]
- 3.2 Suppose the expected one year spot rate at the beginning of year 3, is 36%, which strategy is more profitable? Explain
[6 marks]
- 3.3 What is the yield curve implication of the decision taken in 3.2 above?
[7 marks]

Question Four**[20 marks]**

Delta, whose stock is currently trading at \$20 000, has proposed an interim dividend of \$1 500 per share payable in 91 days. The yield on 91 day Treasury Bills is 100% per annum. You have been offered to buy or sell, the stock, 91 days forward at a forward price of \$23 000.

- 4.1 What position should you take, today and at delivery date to profit?
[8 marks]
- 4.2 Determine, and explain the nature of the profit if the spot price at delivery date is \$18 000.
[8 marks]
- 4.3 State the critical assumptions you have made.
[4 marks]

Question Five**[20 marks]**

You have been offered the option to purchase a piece of land for \$40 000 000 which is its current price, 6 months from now, when you come back from a working visit to the diaspora.

- 5.1 What is the fair price, using two step binomial process, of the option, if the yield on 182 day Treasury bill is 60% per annum. and land price volatility is 80% per annum.
[5 marks]
- 5.2 Suppose you have the option to exercise early and the land does not have rentable income before the expiry date, is it ever profitable to do so? Explain
[15 marks]