NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF COMMERCE
DEPARTMENT OF FINANCE
BACHELOR OF COMMERCE HONOURS DEGREE IN
Finance, Banking, Marketing
Insurance and Risk Management
PART I - 2ND SEMESTER FINAL EXAMINATION – MAY 2005
<u>FINANCIAL MATHEMATICS II [CFI 1201]</u>
TIME ALLOTTED: 3 HOURS 30 MINUTES

<u>**INSTRUCTIONS**</u>

❖ **The paper is 3 hours 30 minutes of which is reading time. Candidates may write on the question paper but shall not write in the answer book during reading time.**
❖ **Attempt question 1 and 3 others.**
❖ **Question 1 carries 40 marks.**
❖ **Electronic calculators may be used.**
❖ **Answers to be written only on top pages.**

<u>**Question One**</u>   **[40 marks]**

Loan stock has face value of $1 000, fixed coupon rate of 20%, yield to maturity of 25% and maturity date of June 1 2010. It pays coupons bi-annually on June 1 and December 1.

1.1   Calculate the Dirty and Clean Price if settlement date is April 15 2005 and the sale is ex interest.   ***[10 marks]***

1.2   What is the realized yield if soon after purchasing the bond on April 15 2005, the yield to maturity rises to 27% and remains at this level to investment liquidation date of June 1 2007.   ***[7 marks]***

1.3   What other factors may cause realized return of a Bond investment to differ from the promised yield to maturity?   ***[7 marks]***

1.4   Calculate the Duration of the Bond in years.   ***[10 marks]***

1.5   How can the concept of Duration be used in Bond Portfolio Management?
                                        [6 marks]

<u>**Question Two**</u>   **[20 marks]**

The current earnings per share [EPS], payout ratio and return on Equity of NUST Ltd are $4 000, 40% and 50% respectively.

2.1   Calculate the Implied growth rate of Dividends, stating any critical assumptions made.   ***[5 marks]***

2.2   Another firm UZ Ltd has the same growth rate as NUST Ltd but this can only be sustained for 3 years after which it stabilizes, calculate a possible value of the UZ Ltd stock if the Beta of UZ stock, 91 day Treasury Bill yield and ZSE Industrials Index expected return are 1.2 10% and 20% respectively.
                                        [15 marks]

Question Three   **(20 marks)**

3.1   Show that the covariance of an asset (i) with a portfolio (P) containing the asset

(i) is $\sigma_{ip} = x_i\sigma_i^2 + \sum_{\substack{j=1 \\ i \# j}}^{N} x_j\sigma_{ij}$

Where: σ_{ip} **=**   covariance of ***ith*** asset with portfolio.

             $x_i \ and \ x_j$ **=**   weight placed on ***ith*** asset in the portfolio.

             N **=**   number of asset in the portfolio.

             σ_{ij} **=**   covariance between ***ith*** and ***jth*** assets.

[9 marks]

3.2   A Portfolio comprises 4 securities – A, B, C and D. The portfolio weights of A, B, and C are 30%, 40% and 50% respectively.

       3.2.1   What is the implied weight of security D? Explain.   *[3 marks]*

       3.2.2   What is the covariance of security A with the Portfolio if the variance of A is 20% and the covariances of A with B, A with C and A with D are 25%, 30% and 15% respectively.   *[8 marks]*

Question Four   **[20 marks]**

The current level of the Zimbabwe Stock Exchange [ZSE] Industrial Index is 50 000. Its annual volatility is 40%. The 91 day TB rate is 30%. You have been asked to value a European put option on the Index whose exercise price is equal to the current index level and whose expiry is 3 months. Using Binomial method and assuming 2 equal intervals to expiry.

       4.1.1   Calculate the risk neutral probabilities.   *[7 marks]*

       4.1.2   Calculate the value of the European put   *[7 marks]*

4.2   Very briefly, explain how traded options may enhance the returns of traded stock investments.   *[6 marks]*

Question Five   **(20 marks)**

You are faced with two possible Bond Investment Strategies over your Horizon date of two years.

Strategy A,   is to purchase, initially, a 1 year maturity Bond and roll forward the investment at end of the first year for another year.

Strategy B,   is to purchase a Bond with same credit risk as in **Strategy A** Bond but whose maturity is equal to your Horizon Date of 2 years.

The spot interest rates [yields to maturity] of 1 year and 2 year maturities are 20% and 25% respectively.

5.1   Calculate the guaranteed forward interest rate for 1 year at the beginning of year 2.   *[7 marks]*

5.2   Suppose the expected 1 year spot rate at the beginning of year 2 is 22%, which strategy should you follow. Explain.   *[6 marks]*

5.3   What is the yield curve implication of the strategy you adopted in 5.2.
                                                                                        [7 marks]