

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

B.COMM (ACTUARIAL SCIENCE) HONOURS DEGREE

FINANCIAL ECONOMICS – CIN 4115

NOVEMBER/DECEMBER 2005 FIRST SEMESTER EXAMINATION

DURATION: 3 HOURS

Instructions To Candidates

1. Attempt **ALL** questions, beginning each question on a new sheet.
 2. For this question paper you are permitted to have an electronic calculator (non – programmable)
 3. You must not start writing your answers until instructed to do so by the invigilator
 4. Mark allocations are shown in brackets
 5. Write clearly and show all workings
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1. (a) Investment projects A and B have both a rate of return that is normally distributed with expected return μ . The variance of the rate of return of project A is σ_A^2 , the variance of the rate of return of project B is σ_B^2 , with $\sigma_A^2 < \sigma_B^2$.

Show that:
 - (i) A does not dominate B with respect to first order stochastic dominance

[4 marks]
 - (ii) A does not dominate B with respect to third order stochastic dominance.

[5 marks]
- (b) A homeowner is considering buying buildings insurance. His current total wealth is \$100 000. Over one year there is a 1% chance of his house suffering \$50 000 of damage, and a 10% chance of suffering \$5 000 of damage.
 - (i) A large insurer sells many thousands of identical policies to homeowners like the one above. What premium should they charge each year if they expect zero profit?

[4 marks]

(ii) The homeowner has a log utility function. What is the maximum price he is willing to pay for this insurance? **[6 marks]**

(iii) Comment on your answers in (i) and (ii). **[3 marks]**

2. (a) An investor uses semi-variance as a measure of dispersion. This is consistent with his choice of utility function:

$$U(x) = \begin{cases} a + bx + cx^2 & \text{for } x \leq \mu \\ a - c\mu^2 + (b + 2c\mu)x & \text{for } x > \mu \end{cases}$$

Under what conditions does this investor have the properties of risk-averseness and non – satiation. **[6 marks]**

(b) You are given that a portfolio consists of two assets B and C which are independent. The two assets have the following returns

Probability	Asset B	Asset C
$\frac{1}{3}$	45	30
$\frac{1}{3}$	60	60
$\frac{1}{3}$	75	90

An investor wants to create a minimum variance portfolio P consisting of these two assets.

(ii) If short-sales are allowed find the portfolio P . Compute its mean and variance. **[7 marks]**

(iii) Sketch the opportunity set formed by these two assets. Mark on your sketch the efficient frontier (short-sales are disallowed). **[8 marks]**

3. (a) Consider four assets with expected return $\mu_1 = 6\%$, $\mu_2 = 7\%$, $\mu_3 = 8\%$ and $\mu_4 = 10\%$ with the following variance – covariance matrix (Units are %%).

10	8	0	15
8	15	0	16
0	0	40	0
15	16	0	35

An investor wants to calculate the minimum variance portfolio for a given expected return E_p . He or she expresses this problem in matrix notation as $Ay = b$. Write down the matrices A , y and b . **[6 marks]**

- (b) An investor chooses to invest in equities from two counters : Lowland and Highland. Lowland equities have an expected return of 5%, with standard deviation of 15%. Highland equities are more risky, their expected return is 10%, with standard deviation 25%. The correlation coefficient of the two equity markets is 0.3.

Given that the investor has x invested in low bond shares and $1 - x$ invested in Highland shares, state equations for the expected return and standard deviation for the investor's portfolio. **[6 marks]**

4. (a) Give the definitions for the Capital Line and the Security Market Line. Define all terms you use. **[6 marks]**
- (b) Given the expected return on the market is 10% and the risk-free rate of return is 5%. An investor buys stocks of company A and Company B. Stock A has a beta of 0.4 and stock B has a beta of 1.2.
- (i) What is the interpretation of a shares beta value? **[3 marks]**
 - (ii) Calculate the weights the investor should hold in stock A and stock B to obtain a portfolio with beta 0.8. **[5 marks]**
 - (iii) Calculate the expected return on this portfolio. **[3 marks]**

5. You consider buying shares of company A and of Company B. Your investment decision is based on a two-index model. The return on the stock of A is given by:

$$R_A = 1.0 + 0.0I'_L + 0.5I'_S + C'_A \quad \text{and for B by } R_B = 2.0 + 0.8I'_L + 0.0I'_S + C'_B$$

where

I'_L denotes the return on an index of large stocks

I'_S denotes the return on an index of small stocks

Assume that:

C'_A and C'_B are uncorrelated and have zero mean.

C'_i and I'_L are uncorrelated, $i \in \{A, B\}$

C'_i and I'_S are uncorrelated, $i \in \{A, B\}$

- (a) Regression analysis shows that I'_S is related to I'_L via

$$I'_S = 1.0 + 1.5I'_L + d_t$$

Where d_t and I'_L are uncorrelated.

Express the returns on the stocks of A and on the stocks of B in a transformed two-index model with orthogonal indices. **[8 marks]**

- (b) Calculate the mean and variance for each stock given the following data:

$$E[I'_L] = 8\%$$

$$E[I'_S] = 10\%$$

$$\sigma_L^2 = 5\% \%$$

$$\sigma_s^2 = 8\% \%$$

$$\sigma_c^2 A = 12\% \%$$

$$\sigma_c^2 B = 10\% \%$$

Where I'_L, I'_S denotes the orthogonal indices with variance

σ_L^2 and σ_s^2 respectively. σ_{ci}^2 denotes the variance of C'_i , for $i \in \{A, B\}$

[5 marks]

6. (a) Explain the weak, semi-strong and strong form of the efficient market hypothesis in terms of gambling on horse races. **[8 marks]**
- (b) Explain your understanding of the following under efficient market hypothesis.
- (i) Momentum investors and contrarians. **[4 marks]**
- (ii) Fundamental analysis **[3 marks]**

END OF EXAMINATION