W1-2-60-1-6

JOMO KENYATTA UNIVERSITY

OF

AGRICULTURE AND TECHNOLOGY

UNIVERSITY EXAMINATIONS 2017/2018

SECOND YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREES OF

BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE

STA 2294: FINANCIAL ECONOMICS I

DATE: AUGUST 2018 TIME: 2 HOURS

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*INSTRUCTIONS TO CANDIDATES:*

1. *Answer questions ONE (section A) and any two questions in section B*
2. *Be neat and show all your workings*
3. *All questions except question one carry equal marks*

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This paper consists of 5 printed pages

STACS Examination board 2017/2018

## QUESTION ONE (30 MARKS)

a) Explain the following terms as applied in Utility Theory

i) Decreasing Marginal Utility. (1 Mark)

ii) Iso-elasticity. (1 Mark)

iii) Certainty Equivalent. (2 Mark)

iv) Relative Risk aversion. (1 Mark)

b) Describe the three forms of the Efficient Markets Hypothesis (EMH). (3 Marks)

c) State the Assumptions of Mean Variance Portfolio Theory. (2 Marks)

d) An investor has the choice of the following assets that earn rates of return as follows in each of the four possible states of the world:

| *State* | *Probability* | *Asset 1* | *Asset 2* | *Asset 3* |
|---|---|---|---|---|
| *1* | *0.2* | *5%* | *5%* | *6%* |
| *2* | *0.3* | *5%* | *12%* | *5%* |
| *3* | *0.1* | *5%* | *3%* | *4%* |
| *4* | *0.4* | *5%* | *1%* | *7%* |
| *Market Capitalization* | | *10000* | *17546* | *82454* |

i) Determine the market price of risk assuming CAPM holds. (8 Marks)

e) Investor A has an initial wealth of \$100 and a utility function of the form:

$$U(w) = log(w)$$

Where $w$ is her wealth at any time.

Investment Z offers her a return of -18% or +20% with equal probability.

i) What is her expected utility if she invests nothing in Investment Z? (1 Mark)

ii) What is her expected utility if she invests entirely in Investment Z? (2 Marks)

iii) What proportion $a$ of her wealth should she invest in Investment Z to maximize her expected utility? What is her expected utility if she invests this proportion in Investment Z? (5 Marks)

f) Suppose Investor A has a *power* utility function with $\gamma = 1$, whilst Investor B has a power utility function with $\gamma = 0.5$.

i) Which investor is more risk-averse (assuming that $w > 0$)? (2 Marks)

ii) Suppose that Investor B has an initial wealth of 100 and is offered the opportunity to buy Investment X for 100, which offers an equal chance of a payout of 110 or 92. Will she choose to buy Investment X? (2 Marks)

## QUESTION TWO (20 MARKS)

a) An investor can invest in two assets, A and B:

| | A | B |
|---|---|---|
| Expected return | 6% | 8% |
| Variance | 4%% | 25%% |

The correlation coefficient of the rate of return of the two assets is denoted by $\rho$ and is assumed to take the value 0.5.

The investor is assumed to have an expected utility function of the form:

$$E_\alpha(U) = E(r_p) - \alpha Var(r_p)$$

Where $\alpha$ is a positive constant and $r_p$ is the rate of return on the assets held by The investor.

i) Determine, as a function of $\alpha$, the portfolio that maximizes the investor's expected utility. (8 Marks)

ii) Show that, as $\alpha$ increases, the investor selects an increasing proportion of Asset A. (1 Mark)

b) State and prove the First order Stochastic dominance Theorem. (11 Marks)

## QUESTION THREE (20 MARKS)

a) What are the limitations of utility theory? (3 Marks)

b) Define the following measures of investment risk:

i) Variance of return (1 Mark)

ii) Downside semi-variance of return (2 Marks)

iii) Shortfall probability. (1 Mark)

iv) Value at risk. (2 marks)

c) An investor is contemplating an investment with a return of £ $R$, where:

$$R = 15{,}000 - 25{,}000U$$

Where $U$ is a uniform $[0, 1]$ random variable.

Calculate each of the following four measures of risk:

i) Variance of return (2 marks)

ii) Downside semi-variance of return (3 marks)

iii) Shortfall probability, where the shortfall level is £10,000 (2 marks)

iv) Value at Risk at the 5% level. (3 marks)

## QUESTION FOUR (20 MARKS).

a) Discuss the assumptions underlying the theory of consumer choice. (5 marks)

b) Consider Assets U and V which offer returns according to the table below:

| | *Sum of cumulative probabilities* | |
|---|---|---|
| *Return* | U | V |
| 6% | 0.25 | 0 |
| 7% | 0.75 | 0.75 |
| 8% | 1.5 | 1.5 |
| 9% | 2.5 | 2.5 |

Based on First order stochastic dominance alone, discuss whether an investor can choose between assets U and V.

(3 Marks)

c) Two assets, A and B with independent returns $R_A$ and $R_B$, are available to investors. The return on Asset A is assumed to be normally distributed:

$R_A \sim N$ (8%, 36%%)

The return on Asset B can be described by the following probability distribution:

$$R_B = \begin{bmatrix} 15\% \text{ with probability } 0.04 \\ 1\% \text{ with probability } 0.2 \\ 10\% \text{ with probability } 0.6 \\ 20\% \text{ with probability } 0.16 \end{bmatrix}$$

i) Calculate the expected return, $E$ and the standard deviation, $\sigma$, of the return on Asset B. (3 Marks)

ii) For both assets, find the value at risk (VaR) at the 5% confidence level on a £1m portfolio invested entirely in that asset. (3 marks)

iii) Compare assets A and B in the light of your answers to parts (i) and (ii) and comment on the use of VaR as a measure of investment risk. (3 marks)

d) Consider the following utility function:

$$U(w) = -e^{aw}, a > 0$$

i) Derive expressions for the absolute risk aversion and relative risk aversion measures.

ii) What does the latter indicate about the investor's desire to hold risky assets?

(3 marks)

U = E(r) = variance / mean.

Dow

Only takes into account.

returns below mean return

Sh

measures probability of return

a certain chosen