MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FOURTH YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF ECONOMICS AND STATISTICS

BACHELOR OF ECONOMICS

EAE 414: THEORY OF FINANCE

DATE: 21/1/2021 **TIME: 2.00-4.00 PM**

INSTRUCTIONS:

- **(i) Answer question one (Compulsory) and any other two questions**
- **(ii) Do not write on the question paper**
- **(iii) Show your workings clearly**

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Define the following as used in finance

- i. Law of one price (2 marks)
- ii. Bid-Ask spread (2 marks)
- iii. Arbitrage and strong arbitrage (2 marks)
- iv. Risk free asset (2 marks)
- v. Redundant Security (2 marks)

b) Mercy, a K24 student at Machakos University cannot figure out why market completeness is critical in a one period framework security market. Explain to her market completeness is as well as its implications. (7 marks)

c) Consider a financial market with a money account, a stock, and a European call option on the stock with strike price of KES196. Suppose there are two future states. If state 1 realizes, the stock price declines to KES 168 from the current price of KES200. If state 2 happens, the stock price rises to KES224. Suppose the interest rate on the money account is 5% no matter the state and assuming that the payoffs on the stock and the money account are the stock prices and compounded money value respectively in the different date 1 states

i. Complete the table below for the payoffs and clearly state the rationale for your answers (2 marks)

	Date 0	Date 1 (Payoffs)	
	Price	State 1	State 2
Money Account	1		
Stock	200		
Call Option	C_0		

ii. At what price should we price the call option to avoid arbitrage (3 marks)

iii. Would there be an arbitrage if the price were 15 or 25 (8 marks)

QUESTION TWO (20 MARKS)

A security market has three securities. Security one has a payoff of 10 in state one, -5 in state two and a payoff of 3 in state 3. Security two has a payoff of -7 in state one, 14 in state two and a payoff of -5 in state 3. Security three has payoff of -1 in state one, -5 in state two and a payoff of 7 in state 3. If the security prices are 55, 27 and 18 for security one, two and three respectively;

a) Form the payoff matrix for this market (1 mark)

b) Find and interpret the state prices given that $p_j = \sum_s x_{js} \frac{u_1'(c_0, c_1)}{u_0'(c_0, c_1)}$ (*value of a security= sum [payoffs in future states X state prices]*). (10 marks)

c) Find and interpret the risk-free rate in this market (1 mark)

d) Find the price of a put option placed on the 3rd security if its strike price KES 5 given that the payoffs in the payoff matrix represent the future prices of the securities in the various states in date 1 (3 marks)

e) what is the replicating portfolio for this put option? Does the replicating portfolio have the same price as the put option given the date zero prices of security 1, 2 and 3 (5 marks)

QUESTION THREE (20 MARKS)

a) Given that $y = mx + c$ where m and c are constants, use the properties of mean and variance to prove that;

i. $E(y) = c + mE(x)$ Where E is the expectations operator (1 mark)

ii. $Var(y) = m^2 Var(x)$ (2 marks)

b) Given that securities X and Y are perfectly correlated such that $Y = 11.15789 - 0.315789X$ and the probability distribution of X is;

probability	$x_i\%$
0.2	11
0.2	9
0.2	25
0.2	7
0.2	-2

Find; $E(X)$ and $Var(X)$ (3 marks)

$E(Y)$ and $Var(Y)$ (3 marks)

c) Write down the equations for expected portfolio return and variance for a portfolio consisting of security X and Y if a % is invested in security X and b % is invested in Y (2 marks)

d) Use the equations in (c) above to complete the following table given that $\text{cov}(x, y) = -0.0024$. . $E(R_p)$ and $\sigma(R)$ are expected portfolio returns and standard deviation of portfolio returns respectively.

(6 marks)

Percentage in X	percentage in Y	$E(R_p)\%$	$\sigma(R) = \sqrt{(\text{var}(R_p))}$	$\sigma\%$
100	0			
75	25			
50	50			
25	75			
0	100			

e) Use the table in (d) above to demonstrate the significance of portfolio diversification (3 marks)

QUESTION FOUR (20 MARKS)

a) Explain in detail any three interlinkages between financial markets and the macroeconomy (9 marks)

b) State the agents consumption portfolio choice problem under short sale restrictions (1 mark)

c) Let there be two securities: a risky security with return denoted by r and a risk free security with return r^*. For a portfolio (h_1, h_2) such that $p_1h_1 + p_2h_2 = w$, let $a = p_2h_2$ denote the amount invested in the risky security. Required;

i. Represent portfolio (h_1, h_2) in terms of wealth (3 marks)

ii. What significance does the reformulation in (i) above have? (2 marks)

iii. State the payoff of the portfolio in (i) above in terms of w, a, r, and r^* (2 marks)

iv. State the agents portfolio choice problem given that the representative agents utility function is $u = V(z)$, where z is a portfolio payoff. (3 marks)

QUESTION FIVE (20 MARKS)

Consider the following three securities which give the stated payoffs at the stated probabilities

Security 1		security 2		Security 3	
Payoff	Prob.	Payoff	Prob.	Pay off	Prob.
4	0.25	1	0.33	6	0.20
5	0.50	6	0.33	10	0.70
12	0.25	8	0.33	13	0.10

a) Draw the pairwise cumulative distribution curves for the payoffs in separate panels (12 marks)

b) which pairs of these securities exhibit first order stochastic dominance and second order stochastic dominance (4 marks)

c) Is it true to say that: (2 marks)

$$payoffs\ of\ security\ 3 = payoffs\ of\ security\ 1 + 'something\ good'$$

d) If true/not true why? (2 marks)