



MACHAKOS UNIVERSITY

University Examinations for 2018/2019 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

THIRD YEAR SUPPLEMENTARY EXAMINATION FOR
BACHELOR OF SCIENCE IN AGRI-BUSINESS MANAGEMENT AND TRADE
EAE 414: THEORY OF FINANCE

DATE: 26/7/2019

TIME: 8:30 – 10:30 AM

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 K14 student cannot figure out why market completeness is critical in a one period framework security market. Explain to him what 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;

- i) Form the payoff matrix for this market (1 mark)
- ii) 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)
- iii) Find and interpret the risk-free rate in this market (1 mark)
- iv) 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)
- v) 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

$$Y = 11.15789 - 0.315789X \text{ and the probability distribution of X is;}$$

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 $cov(x, y) = -0.0024$. $E(R_p)$ 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 four financial problems faced by individuals and corporations. (8 marks)
- b) State the agents consumption portfolio choice problem under short sale restrictions (2 marks)
- 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;
- Represent portfolio (h_1, h_2) in terms of wealth (3 marks)
 - What significance does the reformulation in (i) above have? (2 marks)
 - State the payoff of the portfolio in (i) above in terms of w , a , r , and r^*

- 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)

- a) To what extent are the assumptions on characterization of securities and portfolios applicable to security markets in Kenya (10 marks)
- b) In a one-period two-state economy the risk-free interest rate over the period is 25%. An asset that pays out 100 in state 1 and 200 in state 2 trades at a price of 110. What is the no-arbitrage price of a second risky asset that pays out 200 in state 1 and 100 in state 2? (6 marks)
- c) Distinguish between limited and unlimited arbitrage. (4 marks)