



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. $Var(y) = m^2Var(x)$ (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 $cov(x, y) = -0.0024$. $E(R_p)$ and $\sigma(R)$ are expected portfolio returns and standard deviation of portfolio returns respectively. (6 marks)

Percentage in X	percentage in Y	$E(R_p)$ %	$\sigma(R) = \sqrt{\text{var}(R_p)}$	σ %
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;
- 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^* (2 marks)
 - 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

- Draw the pairwise cumulative distribution curves for the payoffs in separate panels (12 marks)
- which pairs of these securities exhibit first order stochastic dominance and second order stochastic dominance (4 marks)
- Is it true to say that:
payoffs of security 3 = payoffs of security 1+'something good' (2 marks)
- If true/not true why? (2 marks)