LAIKIPIA UNIVERSITY

# UNIVERSITY EXAMINATIONS

## FIRST SEMESTER 2025/2026 ACADEMIC YEAR

## FOURTH YEAR EXAMINATION FOR THE DEGREE OF SCIENCE IN ECONOMICS & STATISTICS

## ECON 415: ECONOMETRICS III

***STREAM:*** ***BSC (ECON STAT)*** ***TIME: 2 HRS***

***DAY: FRIDAY [8.30 A.M-10.30 A.M]*** ***DATE: 06/02/2026***

**THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES**

**PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.**

**INSTRUCTIONS: Attempt Question ONE and Any other TWO questions**

**QUESTION ONE (30 MARKS)**

a) What do we mean by stationary series? State any **four** essential conditions required for Stationary series. **(6 Marks).**

b) State any **four** stationarity tests you would use to establish whether a variable is stationary or not. **(4 Marks)**

c) If a variable is non-stationary after conducting an appropriate test (s) above (b). Explain two methods you would use to convert a non-stationary series to become stationary **(4 Marks)**

d) Consider the following random walk (RW) time series process

$$y_t = y_{t-1} + \varepsilon_t \quad .$$

Where $\varepsilon_t \sim (0, \sigma^2)$, is a

white noise process.

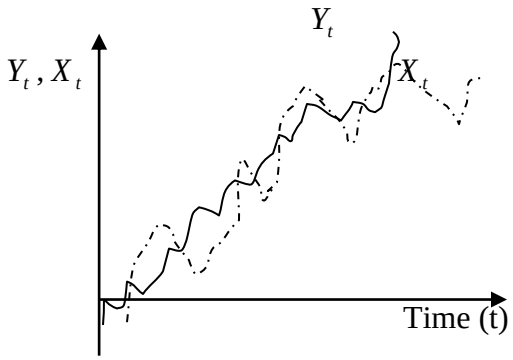
Demonstrate that the RW process is a non-stationary or an integrated process. **(6 Marks)**

e) Distinguish between Fixed effects model and a random effects model in Panel data? **(4 Marks)**

f) Explain the advantages and disadvantages of using panel data? **(6 marks)**

**QUESTION TWO (20 MARKS)**

a) The Figure below shows two time series variables; use it to answer the question (s) that follows:




i) What is the meaning of cointegration? **(3 Marks)**

ii) Explain if there is any indications that the two variables $Y_t$ and $X_t$ above are cointegrated. **(4 Marks)**

b) Explain what do we mean by 'spurious regressions' **(3 Marks)**

c) Explain the course of action that, if you were given the data, you would take to examine the relationship between the two variables? **(6 Marks)**

d) State and explain four characteristics of integrated series **(4 marks)**

**QUESTION THREE (20 MARKS)**

a) Consider the following panel model

$$y_{it} = x_{it}'\beta + V_{it}$$

Where the index i refers to the country and t to time, with: $V_{it} = \varepsilon_{it} + \mu_i$, where $\mu_i$ is a country specific error term, $\varepsilon_{it}$ is the overall error and COV$(\varepsilon,x)$=0 for all $i,t$. Identify the model and explain whether it is ideal or not to estimate its parameters using OLS? **(10 Marks)**

b) Describe the steps of Hausman specification test for testing whether to estimate fixed effects or random effect model. **(4 marks)**

**c)** What are the main steps of the Box-Jenkins approach to ARMA modeling? **(6 Marks)**

**QUESTION FOUR (20 MARKS)**

Given the AR (1) stochastic process

$(1-\beta L)y_t = c + \varepsilon_t$ Where $\varepsilon_t$ is a white noise process, $\varepsilon_t \rightarrow N(0,\sigma^2)$

a) Under which conditions is the process stationary? **(4 marks)**

b) Determine the following characteristics if $\beta = -0.4, c = 20$ and $\sigma^2 = 1.2$:

i) Mathematical expectation (the Mean) **(4 Marks)**

ii) The Variance **(4 Marks)**

iii) First, and second auto-covariances ($\gamma_1 and \gamma_2$) of the process **(8 Marks)**

**QUESTION FIVE (20 MARKS)**

a) You are given the MA(3) process as follows

$$y_t = \mu + \varepsilon_t - \alpha_1\varepsilon_{t-1} - \alpha_2\varepsilon_{t-2} - \alpha_3\varepsilon_{t-3}$$

Where $\varepsilon$ is a white noise error term

b) Derive the first three moments of the model and comment on their stationarity condition :

i) The Mean **(4 Marks)**
ii) The Variance **(4 Marks)**
iii) The first covariance and autocorrelation function of the model **(6 Marks)**

c) Derive a 2-step ahead forecast and the forecast variance for the model in (a**). (6 marks)**