

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:**

**TIME: 2 HRS**

**DAY:**

**DATE:**

**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)**

- What do we mean by stationary series? State any **four** essential conditions required for Stationary series. **(6 Marks)**.
- State any **four** stationarity tests you would use to establish whether a variable is stationary or not. **(4 Marks)**
- 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)**
- Consider the following random walk (RW) time series process

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

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

white noise process.

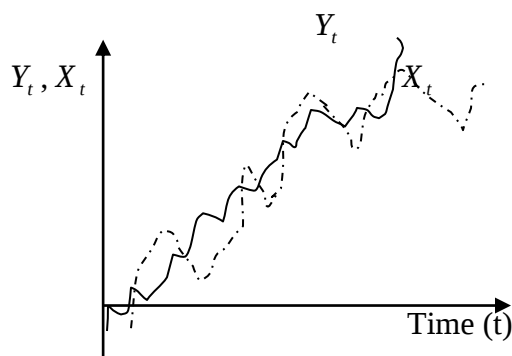
Demonstrate that the RW process is a non-stationary or an integrated process.

**(6 Marks)**

- Distinguish between Fixed effects model and a random effects model in Panel data? **(4 Marks)**
- Explain the advantages and disadvantages of using panel data? **(6 marks)**

**QUESTION TWO (20 MARKS)**

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



- What is the meaning of cointegration? **(3 Marks)**
- 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  $\text{COV}(\varepsilon, x) = 0$  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

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

- 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)