"Investing in Africa's Future"

AFRICA UNIVERSITY
(A United Methodist-Related Institution)

COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

BUSINESS CYCLES AND FORECASTING (MEC406)

FINAL EXAMINATION

MAY 2019

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3 HOURS

INSTRUCTIONS

*Answer **all** questions in Section A and **any three (3)** in Section B.*

*Start **each** question on a new page in your answer booklet.*

*The marks allocated to **each** question are shown at the end of the question.*

Show all your workings.

Credit will be given for logical, systematic and neat presentations.

SECTION A: ANSWER ALL QUESTIONS

1. Explain the following Business Cycles and Forecasting terms:
   a) Business Cycles   **[2 marks]**
   b) Investment Multiplier   **[4 marks]**
   c) Stochastic Process   **[2 marks]**
   d) Co-integration   **[4 marks]**

2. The following model:

$$Y_t = C_t + I_t$$
$$C_t = a + bY_{t-1}$$
$$I_t = v\left(Y_{t-1} + Y_{t-2}\right)$$

    Find the reduced form equation and show that the nature of oscillations depends on the accelerator.   **[12 marks]**

3. Given the model: $Y_t = \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \ldots\ldots\ldots\ldots + \alpha_p Y_{t-q} + \delta + u_t$,
   a) Derive the Yule Walker equations.   **[12 marks]**
   b) Show that u_t is a well behaved mean.   **[4 marks]**

SECTION B: ANSWER ANY THREE (3) QUESTIONS

4. The business cycle is the downward and upward movement of gross domestic product around its long-term growth trend.
   a) What are the defining characteristics of the Business Cycle?   **[12 marks]**
   b) Business cycles have gone through a number of evolution stages such as six, four and three stages. With a diagram, explain the three stages of business cycle.   **[8 marks]**

5. A time series is a sequence of numerical data points in successive order.
   (a) Discuss the four components of times series.   **[12 marks]**
   (b) What are the strengths and weaknesses of the time series model?   **[8 marks]**

6. The following is a business cycles model:

$$Y_t = C_t + I_t$$
$$Y_t = W_t + M_t + \pi_t$$
$$\pi_t = Y_t - \left(W_t + M_t\right)$$
$$C_t = a + b\pi_t + W_{t-1}$$
$$I_t = v\left(\pi_t - \pi_{t-1}\right)$$
$$\left(\frac{W}{Y}\right)_t = w - z\frac{Y}{Z_t} - uU_{t-1}$$
$$U_t = j - kY_t$$
$$M_t = m + nY_t$$

$$\frac{Y}{Z_t} = q + rY_t$$

    a) Identify the model and discuss its origin.   **[8 Marks]**

    b) Explain how the model works.   **[12 Marks]**

7. Given the MA (q) model
   a) Show that
      i) $E(Y_t) = \mu$.   **[2 marks]**
      ii) $\gamma_0 = \sigma_u^2 \left(1 + \beta_1^2 + \beta_2^2 + \ldots\ldots + \beta_q^2\right)$.   **[3 marks]**
      iii) $\gamma_i = \sigma_u^2 \left(\beta_i + \beta_1 \beta_{i+1} + \ldots\ldots + \beta_{q-i} \beta_q\right)$.   **[4 marks]**
   b) Plot the Correlogram of the model: $Y_t = 5 + U_t + 0.6 U_{t-1} + 0.2 U_{t-2} + 0.1 U_{t-3}$.

                                                   [11 marks]

<p align="center">End of paper</p>

ADDITIONAL INFORMATION

1. *MA(q) model:*
$$Y_t = \mu + u_t + \beta_1 U_{t-1} + \beta_2 U_{t-2} + \ldots\ldots\ldots + \beta_q U_{t-q}$$

2. AR(p) model:
$$Y_t = \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \ldots\ldots\ldots + \alpha_p Y_{t-q} + \delta + u_t$$

3. Model:
$$Y_t = \alpha + \beta T + \rho Y_{t-1} + \sum_{i=1}^{k} \lambda_i \Delta Y_{t-i} + \varepsilon_i$$

4. Unrestricted model:
$$\Delta Y_t = \alpha + \beta T + (\rho - 1) Y_{t-1} + \lambda_1 \Delta Y_{t-1} + w_t$$

5. Restricted model:
$$\Delta Y_t = \alpha + \lambda_1 \Delta Y_{t-1} + v_t$$

6. Model:
$$Y_t = \alpha + \beta T + \rho Y_{t-1} + \varepsilon_t$$

7. Unit root test statistic:
$$F = (n-k) \dot{\iota} \dot{\iota}$$

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