AFRICA UNIVERSITY®
A United Methodist-Related Institution

"Investing in Africa's Future"

College of Business, Peace, Leadership and Governance

COURSE TITLE: MEC 303 – ECONOMETRICS

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 2019

LECTURER: G. MANDEWO

DURATION: (3 HRS)

INSTRUCTIONS

Answer **all questions in section A** and **THREE questions in Section B**.
Total possible mark is **100.**

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

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

Show all your workings.

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

1. **SECTION A (Answer All questions in this Section)**

(a) What are the schematic building blocks of Econometrics course? **[4 marks]**

(b) What kind of a relationship do we envisage between population and sample parameters? **[4 marks]**

(c) It is known that expected value of the error term is zero. What is the rationale of including it in the Population Regression Function (PRF)? **[4 marks]**

(d) Demonstrate the method of Ordinary Least Squares (OLS) to estimate parameters for Simple Linear Regression Model (SLRM). **[4 marks]**

(e) What are normal equations? Derive first and second normal equations for a Simple Linear Regression Model **[4 marks]**

2. Given the following data on Consumption (C) and Income (M)

Consumption	5	5.5	5.5	6	7.5	8	8.5	9	9	10
Income	12	13	150	15	18	18	20	21	25	26

(a) Plot a scatter diagram and ascertain apriori expectations. **[2 marks]**

(b) Estimate the regression function and interpret the findings. **[4 marks]**

(c) Fit the estimated regression function in the scatter diagram. **[2 marks]**

(d) Compute the coefficient of determination and interpret it. **[4 marks]**

(e) Panashe argued that Income does not affect Consumption. Demonstrate how you could prove him right or wrong. **[4 marks]**

(f) Test the significance of the whole model **[4 marks]**

SECTION B (ANSWER THREE QUESTIONS IN THIS SECTION)

3. (a) What is the difference between the coefficient of determination and the adjusted coefficient of determination? **[4]**

(b) What is the difference between a null hypothesis and an alternative hypothesis.**[4]**

(c) Two consultant companies were contracted to estimate the demand for product **Z** for IM private Limited. In order to minimize costs both companies restricted the sample size to 27 customers.

Coblar Consutants

$$Q_Z = 100.325 + 1.5\text{Income} - 3.6\ \text{Price}$$

(22.3) (0.19) (0.21)

$R^2 = 0.966$

Panashe Consultants

$Q_Z =$ 30,2 – 0.22Income – 1.9 Price

(15.9) (0.71) (0.33)

$R^2 = 0.972$ DW

Compare these two models and determine the best one **[12]**

4. For a sample of 27 students, they have the examination mark, ***M***, total hours spent studying, ***H***, hours on primary study, ***P***, and hours spent on revision, ***R***

$$\hat{M} = 45.6 + 0.15\,P + 0.21\,R - 0.5\,H$$
$$(2.8) \quad (0.03) \quad (0.14) \quad (3.486)$$
$$R^2 = 0.99 \qquad D.W = 2.00$$

(a) What conclusions can you draw from this model about the relationship between final mark (M), and the explanatory variables **(H)** Hours spent studying hours, (P) Hours of primary study, (R) hours spent on revision? (justify your response quantitatively) **[6 marks]**

(b) How would you use the goodness of fit to support of refute your conclusions in item (a)? **[3 marks]**

(c) If this model suffers from heteroscedasticity, demonstrate various ways you may employ to solve this problem? **[3 marks]**

(d) An economic commentator, suggested that it is possible to test for autocorrelation using the Durbin Watson test. Demonstrate. **[3 marks]**

5 (a) Explain the rationale behind Ordinary Least Squares methodology used in the derivation of estimators.**[3 marks]**

(b) Consider a Population Regression Function of the form

$$Y = \alpha + \beta X + \mu$$

If Y is the explained variable, and X is the explanatory variable and β & α are parameters to be estimated, what is the justification of including the random disturbance term μ? **[3 marks]**

(c)What do you understand by asymptotic properties of estimators? **[3 marks]**

(d) *'Econometrics is concerned with the empirical determination of economic laws'.* Explain what you understand by this statement. **[3 marks]**

(e)Consider a population regression function of the form

$$Q = \alpha + \beta P + \mu$$

Where Q is he quantity demanded which is a dependent variable and P is the price level which is an independent variable

i. Deduce the first and second normal equations in the context of price (P) and quantity (Q) **[3 marks]**

6. Agricultural production in Zimbabwe has been studied by experts from 2010 (1) to 2013 (2). The method of analysis which the Canadian firm employed is regression analysis. The following results where then presented for analysis:

$$AGOUT_t = 1201 + 0.712\,AGOUT_{t-1} - 0.25\,R_t + 3.3\,INPUT_t$$
$$\textbf{(1000)} \quad \textbf{(211)} \qquad\qquad \textbf{(1.3)} \qquad \textbf{(0.5)}$$

$$\mathbf{R^2 = 0.999}$$
$$\mathbf{DW = 2}$$

Where
$AGOUT_t$ is agricultural output this season
$AGOUT_{t-1}$ is the agricultural produce the previous season
R_t Represent the borrowing rate in this period
$INPUT_t$ show inputs in the current period.

(a) If it is common knowledge that $AGOUT_{t-1} = 0.75\ INPUT_t$. What is the apparent econometric problem that exists? **[3]**

(b) Demonstrate the effects of such a problem. **[3]**

(c) Suppose the problem has been solved, interpret the model, giving economic intuition. **[3]**

(d) Calculate the adjusted R^2. **[3]**

(e) Evaluate the significance of the whole model. **[3]**

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