FACULTY OF MANAGEMENT AND ADMINISTRATION

MEC303 INTRODUCTION TO ECONOMETRICS EXAM 2

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER/DECEMBER 2016

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DURATION: 3 HRS

INSTRUCTIONS

Answer **all questions in section A** and **two 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.

SECTION A   (Answer All questions in this Section)

1(a) Two data sets were rejected by an econometrician, Christopher from Malawi. Please investigate the following data sets and establish the problem. [**4 marks**]

Data set A

Consumption	1000	1300	1500	1600	1700	1800	2000
Price	90	85	80	75	70	65	60
Income	180	170	160	150	140	130	120

Data set B

Consumption	1000	1300	1500	1600	1700	1800	2000	
Price	90	85	80	75	70	65	60	
Income	180	170	160	150	140	130	112	

Consumption is the explained variable
Income and Price are explanatory variable

(b) What do you understand by the term Ordinary Least Squares (OLS)? [**4 marks**]
(c) What are the fundamental difference between multiple linear regression model and single linear regression model? [**4 marks**]
(d) What is a dummy variable and give 3 examples where it is appropriate to use it? [**4 marks**]

(e) What is the difference between asymptotic properties of a good estimator and other properties? [**4 marks**]
(f) Katsukunyi was contracted to study the performance of econometrics students in University wide courses. The class consists of 29 students.

$$P = 24.02 + 0.5H - 0.75I + 2.3SLB$$

(8.42)   (0.12)   (4.22)   (1.33)

$R^2 = 0.989$
Given that *P* is for performance
   H denotes the number of study hours
   I is the IQ intelligence Quotient
  SLB is the student language base
   i. Test the significance of individual parameters at 95% LOS.
    [**4marks**]

ii.   Test for the significance of the whole model **[4 marks]**

iii.   Interpret the coefficient of determination and state the decision criteria for models. **[4 marks]**

2. (a) 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) **(4 marks)**

    ii.   Using the first and second normal equations, determine the formular for estimator of β & α **(4 marks)**

    iii.   If you assume that

$$q = Q - \bar{Q}$$
$$p = P - \bar{P}$$

Where P is the price level and Q is the output

Deduce the formula for $\hat{\beta}$ in deviations **(4 marks)**

(b) In the context of a Simple Linear Regression Model prove that the estimated $\hat{\beta}$ is unbiased. **(4 marks)**

(c) Use a specific example to differentiate two methods of hypothesis testing. **(6 marks)**

(d) Make a clear distinction between error and random disturbance term. **(6 marks)**

SECTION B (Answer two questions in this Section)

3. For a sample of 25 students, they have the examination mark, **M**, total hours spent studying, **H**, hours on primary study, **P**, and hours spent on revision, **R**

$$M = 60.6 + 0.25\,P + 0.72\,R - 0.5\,H$$
$$\quad\ (2.8)\quad (0.03)\quad (0.14)\quad (3.486)$$
$$R^2 = 0.999 \qquad\qquad D.W = 2.00$$

(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) **[5 marks]**

(b) How would you use the goodness of fit to support of refute your conclusions in item (a)? **[5 marks]**

(c) If this model suffers from heteroscedasticity, demonstrate various ways you may employ to solve this problem? **[5 marks]**

(d) An economic commentator, suggested that it is possible to test for autocorrelation using the Durbin Watson test. Demonstrate. **[5 marks]**

4 (a) Explain the rationale behind Ordinary Least Squares methodology used in the derivation of estimators.[4 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? [4 marks]

(c)What do you understand by asymptotic properties of estimators? [4 marks]

(d) 'Econometrics is concerned with the empirical determination of economic laws'. Explain what you understand by this statement. [4 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

Deduce the first and second normal equations in the context of price (P) and quantity (Q) [4 marks]

5. Two consultant companies were contracted to estimate the demand for product Z for LILY private Limited. In order to minimize costs both companies restricted the sample size to 25 customers.

Mandewo Consultants

$$Q_Z = 50.1 + 0.53 \text{Income} - 2,1 \text{ Price}$$
$$\quad\quad (22.3) \quad (0.19) \quad\quad (0.21)$$

$R^2 = 0.966$ $\quad\quad\quad\quad\quad$ DW = 2.02

Murairwa Consultants

$$Q_Z = 30.2 - 0.22 \text{Income} - 1.9 \text{ Price}$$
$$\quad\quad (15.9) \quad (0.71) \quad\quad (0.33\quad)$$

$R^2 = 0.972$ $\quad\quad\quad\quad\quad$ DW = 2.03

(a) Determine the best model and provide evidence to justify your choice [4 marks]

(b) What are the conditions that should be fulfilled in order to apply the Durbin Watson test for Auto correlation? [4 marks]

(c) Given a model of the following form:
$$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu$$
$$R^2 = 99.42$$

DW = 2.34

n = 30

Detect an autocorrelation [4 marks]

(d) Explicitly explain how the problem of serial correlation can be resolved. [4 marks]

(e) Explain how the Geary test can be used to test the same problem. [4 marks]

6. (a) The following given steps explains the schematic building blocks of econometrics

Step 1. Statement of theory or hypothesis.

Step 2. Specification of the mathematical model of the theory

Step 3. Specification of the statistical, or econometric, model

Step 4. Obtaining the data

Step 5. Estimation of the parameters of the econometric model

Step 6. Hypothesis testing

Step 7. Forecasting or prediction

Step 8. Using the model for control or policy purposes.

Explain four fundamental problems of authenticity of data obtained through a survey methodology [4 marks]

(b) What is the difference between the random term μ and the error term ℓ?

[4 marks]

(c) What is the underlining distinction between small sample properties and large sample properties of good estimators? [4 marks]

(d) Given a model of the form: $M = \alpha + \beta I + \mu$

Where Income (**M**) is the explained variable and Interest rate (**I**) is the explanatory variable

i. Using the Simple Linear Regression Model (SLRM)obtain the first and second normal equations[4 marks]

ii. use the second normal equation to deduce the formular for $\hat{\beta}$

[4 marks]

7. (a) Make a clear distinction between multicollinearity and heroscedasticity [5]

(b) How do we ensure that models are homoscedastic? [5]

(c) Demonstrate how we can detect autocorrelation using the Durbin Watson Test. [5]

(d) Demonstrate the effects of multicollinearity? [5]

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