"*Investing in Africa's Future*"

COLLEGE OF BUSINESS, PEACE, LEADERSHIP, AND GOVERNANCE

NMEC 303: INTRODUCTION TO ECONOMETRICS

END OF SECOND SEMESTER EXAMINATIONS

APRIL 2023

LECTURER: MR MANDEWO

INSTRUCTIONS

Answer ***All* questions in Section A and *One* question 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 question.

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

SECTION A

Question 1

(a) Two data sets were rejected by an econometrician, Christopher from Malawi. Please investigate the following data sets and establish the problem. **[10 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) Demonstrate the effects of such a problem **[10 marks]**

Question 2

(a) What are the conditions that should be fulfilled in order to apply the Durbin Watson test for Auto correlation? **[8 marks]**

(b) Given a model of the following form:

$$\mathbf{Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu}$$

$$\mathbf{R^2 = 99.42}$$

$$\mathbf{DW = 2.34}$$

$$\mathbf{n = 30}$$

Detect an autocorrelation **[8 marks]**

(c) Explicitly explain how the problem of serial correlation can be resolved. **[8 marks]**

(d) Explain how the Geary test can be used to test the same problem. **[8 marks]**

Question 3

Assumption number 2 of classical Linear Regression Model:

$$E(\mu_i \, \mu_j) =$$

(a) Illustrate the problem caused when we violate this assumption. **[8 marks]**

(b) How can one use the Bruesch Pagan Godfrey test to detect this problem? **[10marks]**

(c) Demonstrate all methods of resolving this problem **[10 marks]**

SECTION B

Question 4

A research student has been investigating the relationship between office rents and vacancy rates in various US cities. She was able to obtain data from 30 cities on average monthly office rents in $ per square foot (Y) and vacancy rates in per cent (X). Running a simple linear regression using Excel she obtained the following results.

SUMMARY OUTPUT

Regression Statistics

Multiple R 0.53957932

R Square 0.29114585

	coeficients	*Std Error*	*t Stat*
Intercept	20.639	1.142	18.060
X Variable	-0.303	0.089	-0.48730158

a) Interpret the values obtained for the regression coefficients and explain whether they are in line with what you would have anticipated *a priori*. **[4 marks]**

b) Can you conclude at the 5% significance level that higher vacancy rates result in lower rents? Explain, giving a full interpretation of the calculated values for the t Stat and P-value for the X Variable. **[4 marks]**

c) The Excel results include information that can be used to provide a 95% confidence interval for the slope parameter. Discuss the values for the Lower and Upper limits shown in the table above, explaining how they relate to the estimated Standard Error. **[4 marks]**

d) Fully explain the meaning and interpretation of the R square value shown in the table. **[4 marks]**

e) The student's supervisor comments that the regression results are based on a rather small sample, which means that they are associated with a low number of degrees of freedom. Explain what this means and note its implications for hypothesis testing of the regression parameters. **[4 marks]**

Question 5

(a). The term BLUE describes a good estimator. How can we demonstrate the estimator is best? **[5 marks]**

(b) Explain the importance of R^2 and $\overline{R}^2$ (R^2 adjusted for degrees of freedom). What advantages of $\overline{R}^2$ over R^2? **[5 marks]**

(c) Explain what you understand by Heteroscedasticity in a regression model? What are the causes of Heteroscedasticity? **[5 marks]**

(d) Deduce the first and the second normal equations for Simple Linear Regression Model **[5 marks]**

END OF EXAMINATION