



"Investing in Africa's Future"

**COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES
NMEC 407: ECONOMETRICS 11
SECOND SEMESTER EXAMINATIONS
APRIL 2026
LECTURER: MR G MANDEWO
TIME: 3 HOURS**

INSTRUCTIONS

ANSWER ANY **FOUR** QUESTIONS FROM THIS PAPER
MARKS ALLOTTED TO EACH QUESTION ARE SHOWN

CLEAR AND NEATLY PRESENTED WORK WILL BE
AWARDED MARKS FOR PRESENTATION

Question 1

- (a) Explain why OLS estimation minimizes the sum of squared residuals. [5 Marks]
- (b) The problem of heteroscedasticity in econometrics may hinder the estimation of regression equations. You are required to fully conceptualise the problem, discuss the causes, effects, demonstrate a detection method, and suggest possible solutions to the problem. In your responses, you are supposed to give concrete examples. [20 Marks]

Question 2

- (a) Define the coefficient of determination (R^2) in a multiple regression context. [5 Marks]
- (b) How do you interpret an R^2 value of 0.85? What are the limitations of using R^2 as a measure of model fit? [5 Marks]
- (c) The estimated earnings are a function of Education, Age, kids and Age squared.

$\ln \text{earnings} = \beta_1 + \beta_2 \text{age} + \beta_3 \text{age}^2 + \beta_4 \text{education} + \beta_5 \text{kids} + \varepsilon$			
Sum of squared residuals:		599.4582	
Standard error of the regression:		1.19044	
R^2 based on 428 observations		0.040995	
Variable	Coefficient	Standard Error	t Ratio
Constant	3.24009	1.7674	1.833
Age	0.20056	0.08386	2.392
Age ²	-0.0023147	0.00098688	-2.345
Education	0.067472	0.025248	2.672
Kids	-0.35119	0.14753	-2.380

Consider the above estimated earnings regression results

- (i) Justify the inclusion of the variables in the regression analysis. [5 Marks]
- (ii) Explain two methods you would use to test the significance of estimated parameters. [5 Marks]
- (iii) The coefficient of determination as given is very small, suggest reasons for this outcome. [5 Marks]

Question 3

- (a) Explain the process of fitting a multiple regression model to a dataset. What diagnostics would you perform to assess the model fit? [7 Marks]
- (b) How would you use the regression equation to forecast the dependent variable for a new observation? [8 Marks]
- (c) Let Y be the income of a person. We want to relate it to its work experience X, Gender (Male/Female) and educational experience (primary/secondary and Higher education)

We consider the model

$$Y = \alpha + \beta_1 X + \beta_2 M + \beta_3 E_1 + \beta_4 E_2 + \epsilon,$$

where

- $M = 1$ if person is male and $M = 0$ if not.
 - $E_1 = 1$ if primary school and $E_1 = 0$ if not.
 - $E_2 = 1$ if secondary school and $E_2 = 0$ if not.
- (i) Explain the causal relationships between the explained variable (Income) and each explanatory variable. **[5 Marks]**
- (ii) Explain why dummy variables are used in regression analysis **[5 Marks]**

Question 4

- a) Briefly explain the difference between linear, exponential, and logarithmic functional forms in regression analysis. **[5 Marks]**
- b) Provide an example of a situation where a linear-log model would apply **[5 Marks]**
- c) Reference is made to the schematic building blocks of an empirical study. Use a practical example of your show how you will implement the steps of an empirical study in econometrics **[15 Marks]**

Question 5

- (a) Describe the importance of choosing the correct functional form in regression analysis. **[5 Marks]**
- (b) Explain one method you could use to test whether a chosen model is correctly specified. **[5 Marks]**
- (c) The following are results are for a linear model and non-linear Model

	Linear		Non-Linear	
	Estimate	Std. Error	Estimate	Std. Error
α	11.1458	9.64	187.899	38.946
β	0.898530	0.00586	0.246004	0.07947
γ	1.00000	-	1.15640	0.03927
$e'e$	12.068		8420	
σ	18.309		15.294	
R^2	0.99856		0.99899	

- (i) The above results in standard notation **[5 Marks]**
- (ii) In terms of the coefficient of determination which model is more powerful and why? **[5 Marks]**
- (iii) Explain the different functional forms that an econometrician may adopt in modelling relationships between variables **[5 Marks]**

END OF EXAMINATION