



"Investing in Africa's Future"
COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES
NMEC 303: ECONOMETRICS 1
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 report on energy use in the transport sector in the Zimbabwe includes regression results based on the following two models

Model 1

$$\text{Euset} = \beta_1 + \beta_2 \text{GDPt} + \beta_3 \text{Epricet} + \beta_4 \text{Trendt} + u_t$$

Model 2

$$\text{Euset} = \beta_1 + \beta_2 \text{GDPt} + \beta_3 \text{Epricet} + \beta_4 \text{Trendt} + \beta_5 \text{Euse}_{t-1} + u_t$$

where Euse = energy consumption in the transport sector in thousands of tonnes of oil equivalent at time t

GDP = real Gross Domestic Product in \$ million at 2000 prices at time t

Eprice = an index of real energy prices (2000 = 100)

Trend = a time trend taking values 1, 2, 3 ... etc. at time t

Euse_{t-1} = Energy use in the previous year

u is an unobservable disturbance term and the β_s are constant parameters.

(a) Briefly discuss the differences between the two models and the likely problems it presents. **[10 marks]**

(b) Give a detailed explanation of the procedures you will take to address each of the following statements contained in the report:

(i) 'It is possible to test the significance of the whole model' **[8 marks]**

(ii) "There is a small but significant trend increase in energy use over time, over and above that reflecting GDP growth". **[7 marks]**

Question 2

- Outline the steps involved in conducting a hypothesis test. **[5 marks]**
- Explain how to construct a confidence interval for a population mean and interpret its meaning. **[5 marks]**
- What is the significance of the slope and intercept coefficient in a simple linear regression model? **[5 marks]**
- How can outliers affect the results of a simple linear regression model? **[5 marks]**

Marks]

- What are the properties of a good estimator for a small sample? **[5 Marks]**

Question 3

- (a) Briefly describe the Chi-square distribution and its role in hypothesis testing.
[4 Marks]
- (b) Explain the t-distribution and when it is used instead of the normal distribution.
[4 Marks]
- (c) What is the F-distribution used for in econometric analysis? **[4 Marks]**
- (b) A research student has been investigating the relationship between office rents and vacancy rates in various Angolan cities. She was able to obtain data from 25 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			
<i>Regression Statistics</i>			
Multiple R 0.53957932			
R Square 0.29114585			
	<i>coefficients</i>	<i>Std Error</i>	<i>t Stat</i>
Intercept	20.639	1.142	18.060
X Variable	-0.303	0.089	-0.48730158

- (i) 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]

- (ii) Can you conclude at the 5% significance level that higher vacancy rates result in lower rents?
[4 marks]

- (ii) 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.

[5 marks]

Question 4

- (a) Define the following properties of an estimator: unbiasedness, consistency, efficiency, and sufficiency.
[10 marks]
- (b) Explain why these properties are desirable in econometric estimation.
[5 Marks]

(c) Given the volume of sales and the advertising expenditures follows

Advertising	8	12	15	18	18	20	20	23	24	24
Sales	10	20	30	40	50	60	70	80	90	100

- (a) Give apriori expectations of the signs of the parameters and justify your prediction. **[3 marks]**
- (b) Draw a scatter diagram and fit in the regression equation. **[4 marks]**
- (c) Calculate and interpret the goodness of fit. **[4 marks]**

Question 5

- (a) Define consistency and asymptotic normality of an estimator. **[7 Marks]**
- (b) Explain the importance of large sample properties for inference in econometrics. **[8 Marks]**

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. **[5 marks]**
- (c) Fit the estimated regression function in the scatter diagram. **[3 marks]**

End of Examination