BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

JUN 2024

DEPARTMENT OF ECONOMICS

PROGRAMMES: BSc HONOURS DEGREE IN ECONOMICS

EC 206: INTRODUCTION TO ECONOMETRICS

DURATION: 3 HOURS

INSTRUCTIONS:

1. Answer all questions
2. NO CELLPHONES ALLOWED IN THE EXAMINATION ROOM.

Question 1

To find out if there is any relationship between fertilizer applied and soya bean yield for farmers in Bindura district the following model was suggested:

$$Y = \beta_0 + \beta_1 F + \varepsilon$$

where Y is soya bean yield, F if fertilizer application in kilograms per hectare, the βs are parameters.

Plot	1	2	3	4	5	6	7	8	9	10	11	12
Yield	219	97	176	280	211	204	241	207	163	202	144	164
Fert	55	41	48	88	43	67	41	24	45	77	37	60

a. Draw a scatter plot and superimpose a regression line for the data. **(4 marks)**

b. Regress the above model and obtain estimates for the parameters. **(8 marks)**

c. Find estimates of the standard errors for the parameters. **(8 marks)**

d. How would you test the assumption of the normality of the error term? Show the test. **(5 marks)**

Question 2

Consider the standard simple regression model; $Y = \alpha + \beta X + \mu$ under the Classical Linear Regression Model Assumptions. Let $\hat{\alpha}$ be the estimator of α.

a. Show that $\hat{\alpha}$ is an unbiased estimator of α **(6 marks)**

b. Derive the variance of $\hat{\alpha}$ **(8 marks)**

c. Calculate the variance of the error term σ_{μ}^2 **(11 marks)**

Question 3

a. A joint log-linear model is given as:

$$\log L = -n\log\delta_{\mu}^2 - \frac{n}{2}\log 2\Pi - \frac{1}{2\delta_{\mu}^2}\sum(Y-\alpha-\beta X)^2$$

i. Derive the variance of the residuals under MLE and show that it is biased for small samples. **(10 marks)**

ii. Briefly explain any three situations where the use of MLE is recommended. **(6 marks)**

b. Briefly explain each of the following terms as they relate to econometrics:

i) Coefficient of determination
ii) Autocorrelation
iii) Dummy variable trap. **(9 marks)**

Question 4

a. In a simple econometric model of the form $Y = \alpha + \beta X + \mu$, prove that $\hat{\beta} = \frac{\sum xY}{\sum X^2 - n\bar{X}^2}$ **(5 marks)**

b. The table below shows the exam marks for econometrics mock exam for 10 students and their average study time per semester for the module.

Student	1	2	3	4	5	6	7	8	9	10
Exam mark	81	34	61	57	63	75	66	90	72	61
Study time(hrs)	60	82	71	66	51	62	48	67	53	69

i. Suppose you want estimate simple econometric model of the form $M = \alpha + \beta T + \mu$, where M and T are exam mark and study time respectively, find estimates for parameters $\hat{\alpha}$ and $\hat{\beta}$ **(6 marks)**

ii. Calculate the standard errors and the corresponding t values for the coefficients. **(6 marks)**

iii. Calculate the variance of the error term. **(8 marks)**

END OF PAPER