



MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

MASTER OF ECONOMICS

EES 800: ECONOMETRICS I

DATE: 14/12/2021

TIME: 8.30-10.30 AM

INSTRUCTIONS:

- (i) Answer question ONE and any other THREE questions
- (ii) Show your workings clearly

QUESTION ONE (24 MARKS)

- a) Given the following model and data matrix:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

$$X'X = \begin{bmatrix} 100 & 787 & 40 \\ 787 & 64560 & 450 \\ 40 & 450 & 40 \end{bmatrix}$$

$$X'Y = \begin{bmatrix} 540 \\ 26240 \\ 290 \end{bmatrix}$$

Given that TSS is 22 000

- i. Estimate the equation (6 marks)
 - ii. Find the variance covariance matrix (3 marks)
 - iii. Test the significance of each of the slope coefficients estimated (4 marks)
 - iv. Interpret the result (3 marks)
- b) Discuss what is wrong with the following statements pointing out aspects that are wrong
- i. Heteroscedasticity and autocorrelation are similar problems since they are associated with the error terms (2 marks)
 - ii. Heteroscedasticity and autocorrelation are similar since they have the same consequence on OLS estimates (2 marks)

- c) Indicate the difference between the following:
- i. Pearson Product Moment Correlation and Spearman Rank Correlation (2 marks)
 - ii. Covariance and Correlation. (2 marks)

QUESTION TWO (12 MARKS)

- a) Discuss the consequences of the following specification errors: (4 marks)
- i. Exclusion of relevant variables in a model
 - ii. Inclusion of irrelevant variables in a model

- b) A researcher obtained the following regression results

$$Y = 389.6 + 60.8X_1 + 36.5X_2 + 0.061X_3$$

Se (10.3) (13.2) (0.043)

Where Y is diesel consumption in Machakos County in litres, X_1 is urban highways in the county, X_2 is diesel tax rate in the county and X_3 is diesel motor vehicle registrations in the county in thousands.

- i. Is there multicollinearity in the regression? How do you know? (3 marks)
- ii. Explain how in practice the researcher can test for multicollinearity. (5 marks)

QUESTION THREE (12 MARKS)

- a) An agricultural company wishes to downsize its workers due to fall in revenue as a result of the COVID-19 pandemic. To this effect, the management hired 2 external human resource (HR) experts to appraise all the 6 workers. Each of the HR expert awarded marks out of 10, and these were tabulated as follows.

Marks for HR expert I	1	5	7	5	4	2
Marks for HR expert II	5	8	6	4	7	6

Assuming you are a private advisor to the management and you happen to get access to these set of marks before your meeting with the management in which your opinion would be sort. Would you advice the management to proceed and use these marks from the 2 HR experts in making their decision (6 marks)

- b) Explain three types of data used in an econometric analysis. (6 marks)

QUESTION FOUR (12 MARKS)

- a) Derive the OLS estimator and the variance of the OLS estimates. (3 marks)
- b) Consider the estimated demand for tea in England

$$Y = 9.1 + 7.8P_O + 2.4P_C + 0.0035M$$
$$\text{SE} \quad (15.6) \quad (1.2) \quad (0.001)$$
$$R^2 = 0.60 \quad n=25$$

Where Y is quantity of tea consumed, P_O is price of Kenya tea P_C is price of coffee and M is income

- i. Evaluate the statistical significance of the price and income coefficients (3 marks)
- ii. Interpret the coefficients of P_O , P_C and M . Are the signs consistent with economic theory? (3 marks)
- iii. The researcher suspects the model may be misspecified and she includes the price of Indian tea (P_I) in the equation and obtains

$$Y = 10 + 8P_I - 5.6P_O + 2.4P_C + 0.003M$$
$$\text{SE} \quad (4.0) \quad (2.0) \quad (1.3) \quad (0.001)$$
$$R^2 = 0.65 \quad n=25$$

On the basis of the regression in (iii) would you conclude that the initial estimated model was misspecified? What was the nature of the specification error? (3 marks)

QUESTION FIVE (12 MARKS)

- a) A student in EES 800 Class sought to investigate determinants of female wage.

The following empirical model was considered

$$\text{Wage} = \beta_0 + \beta_1 \text{Edu} + \beta_2 \text{EXP} + \beta_3 \text{Age} + \varepsilon u$$

Where Edu is number of years of schooling of the female, EXP is number of experience in years of the female, Age is age of the female in years. On running regression using Stata, the following results were obtained:

Explanatory Variables		Dependent Variable
		Wage
<i>Edu</i>		0.295 (0.036)
<i>EXP</i>		0.821 (-0.014)
Age		0.013
Constant		1.144 (0.127)
Observations		50
R-squared		0.70
F statistic		0.00

Standard errors in parentheses

- i. Interpret slope coefficients stating whether they are significant or not. (6 marks)
 - ii. Interpret the R-squared. (2 marks)
 - iii. Do all the explanatory variables jointly influence wage? How do you know? (2 marks)
- b) Explain the model specification criteria. (2 marks)