



MACHAKOS UNIVERSITY

University Examinations for 2017/2018

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN STATISTICS AND PROGRAMMING

SST 406: ECONOMETRIC III

DATE: 18/12/2017

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain any two sources of endogeneity in a multiple regression (2 marks)
- b) Consider the least squares estimator $\hat{\beta} = (X'X)^{-1}X'Y$
Give an account of a desirable property of least squares estimators as stipulated by Gauss – Markov Theorem and Prove the theorem (10 marks)
- c) State and describe the four main steps involved in empirical econometric analysis (8 marks)
- d) Explain the importance of hypothesis testing in an econometric analysis and highlight the circumstances under which a researcher would use a t test other than Z test (5 marks)
- e) Use the matrix method to demonstrate the OLS assumption of error term being Homoskedastic (5 marks)

QUESTION TWO (20 MARKS)

- a) Outline four assumptions of ANOVA (4 marks)
- b) Explain what is meant by identification of an equation (4 marks)
- c) Distinguish between confidence interval and Bootstrapping (2 marks)
- d) Given a least square estimator as $\hat{\beta} = (X'X)^{-1}X'Y = \beta + (X'X)^{-1}X'e$
- i) Clearly explain the effects of non – spherical disturbances on the OLS estimator (5 marks)
- ii) Assuming that $\varepsilon \sim (0, \delta^2 \Omega)$ where Ω is an nxn matrix and p is a matrix such that $\Omega^{-1} = P'P$ derive the GLS estimator for β (5 marks)

QUESTION THREE (20 MARKS)

- a) The regression of post shortage use (Y) on six variables in 2016 is given approximately as

$$\hat{Y} = 242 + 21X_1 + 0.41X_2 - 42X_3 + 189X_4 + 248X_5 + \epsilon$$

SE :	(0.026)	(13.2)	(95)	(28.7)	(80.5)
t :	6.0	18.7	-3.2	2.0	8.6
p –Value:	<0.0005	<0.0005	0.002	0.47	<0.0005

adjusted $R^2 = 0.6734$

Where X_1 = house hold income

X_2 = preshortage water use

X_3 = education of house hold head

X_4 = is dummy representing retirement coded as 1 if household head is retired and 0 otherwise

X_5 = number of people living in the household at the time of water shortage

Required

- (i) Comment on the strength of the model (3 marks)
- (ii) Interpret the coefficients of X_1 and X_2 (2 marks)
- (iii) Construct a 95% confidence interval for the income coefficient (3 marks)
- (iv) What can be said if anything about the terms in the brackets (2 marks)
- (v) Give an economic interpretation of the constant term in the given results (2 marks)
- (vi)
- b) A student specified the following model $Y = B_0 + B_1X + \mu$ and obtained the following data

Y	4	7	3	9	17
X	2	3	1	5	9

Required

- i) Using the given data estimate the specified model using OLS and obtain the variance – covariance matrix (5 marks)
- ii) Distinguish between a stochastic model and a deterministic model (3 marks)

QUESTION FOUR (20 MARKS)

- a) State five sources of multicollinearity (5 marks)
- b) Explain the steps followed in the Breusch Pagan test for heteroskedasticity (5 marks)
- c) Given the following OLS model $Y = B_0 + B_1X + \mu$ proof the unbiasedness property of the OLS estimated parameters and show that $E(\hat{\beta}_1) = \beta_1$ and $E(\hat{\beta}_0) = \beta_0$ (7 marks)
- d) State the limitations of the coefficient of determination (simple r^2) in statistical analysis (3 marks)

QUESTION FIVE (20 MARKS)

The following table gives the bushels of corn per acre (Y), resulting from the use of various amounts of fertilizer X1 and the insecticides X2, and both in pounds per acre from 2001 to 2010.

Year	Corn (Y)	Fertilizer (X ₁)	Insecticide (X ₂)
1	40	6	4
2	44	10	4
3	46	12	5
4	48	14	7
5	52	16	9
6	58	18	12
7	60	22	14
8	68	24	20
9	74	26	21
10	80	32	24

- i. Find the Ordinary Least Square (OLS) regression equation for the data above (6 marks)
- ii. Stating the null and the alternative hypothesis, test at 5% of significance the overall significance of the OLS regression estimated above. (6 marks)
- iii. For the OLS regression equation, find the partial correlation coefficients and interpret your results. (8 marks)