



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

**FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
ECONOMICS AND STATISTICS, BACHELOR OF ECONOMICS AND BACHELOR OF
ECONOMICS AND FINANCE**

EES 400: FUNDAMENTALS OF ECONOMETRICS

DATE: Thursday, 8th February, 2018

TIME: 11.00 a.m. - 1.00 p.m.

INSTRUCTIONS:

Answer question **ONE** and any other **TWO** questions

QUESTION ONE (30 MARKS)

- (a) State the Gauss Markov Theorem (2 marks)
- (b) Highlight any two problems that are likely to arise from the violation of one or more of the basic ordinary least squares assumptions (2 marks)
- (c) Explain the role of the disturbance term in an econometric model (3 marks)
- (d) Outline any three uses of econometric research methodology (3 marks)
- (e) Explain the steps that constitute an econometric research methodology (4 marks)
- (f) A researcher is attempting to estimate the mean μ of some population. He is able to observe a single observation drawn randomly from each of two random variables X_1 and X_2 . It is known that both variables have an expected value equal to μ . It is also known that the variance of X_2 is five times the variance of X_1 . In order to estimate μ the researcher decides to use a statistic which is a weighted average of the observed values of X_1 and X_2 , i.e. he uses an estimator of the form: $\hat{O} = WX_1 + (1 - W)X_2$
Where W lies between zero and one inclusive.

- (i) Show whether is $\hat{O}$ an unbiased estimator for μ (4 marks)

- (ii) Let δ^2 represent the variance of X_1 . Find, in terms of w and δ^2 , an expression for the variance of $\hat{O}$. (6 marks)
- (iii) Using your answer to part (ii), find the value for W the researcher should choose in order for $\hat{O}$ to have the smallest variance possible (4 marks)
- (iv) What does it mean to say that an estimator is consistent? (2 marks)

QUESTION TWO

Discuss the problems associated with the use of R^2 in judging the performance of a single equation, or as a basis of comparison of different equations (4 marks)

The following table gives data on the assessed value of houses (Y), size of dwelling (X_1) and the age of the house (X_2)

House	Assessed value (Tens of Thousands)	Size of Dwelling (Thousands of square Feet)	Age (Years)
1	84.4	2.00	3.42
2	77.4	1.71	11.50
3	75.7	1.45	8.33
4	85.9	1.76	0.00
5	79.1	1.93	7.42
6	70.4	1.20	32.00
7	75.8	1.55	16.00
8	85.9	1.93	2.00
9	78.5	1.59	1.75
10	79.2	1.50	2.75
11	86.7	1.90	0.00
12	79.3	1.39	0.00
13	74.5	1.54	12.58
14	83.8	1.89	2.75
15	76.8	1.59	7.17

Required:

- (i) Compute Ordinary Least Squares (OLS) estimates for the regression (6 marks)
- (ii) Interpret the results in part (i) (2 marks)
- (iii) Predict the assessed value for a house that has a size of 1750 square feet and is 10 years old (2 marks)
- (iv) Stating the null and alternative hypothesis, test at 5% level of significance the overall significance of the OLS regression model estimated above (6 marks)

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QUESTION THREE (20 MARKS)

- (a) Define multicollinearity (1 mark)
- (b) Explain the consequences of multicollinearity on the following:
- (i) Goodness of fit (2 marks)
 - (ii) Hypothesis testing (2 marks)
 - (iii) Confidence intervals (2 marks)
- (c) An ANOVA table for a certain three variable regression Y, X1, X2 and 30 observations is given as shown below

Source of variation	SS	df	MSS	F-ratio
Regression	20029.84	b	e	g
Residuals	12691.54	c	f	
Total	a	d		

Required:

- (i) Find the values of a, b, c, d, e, f, and g (7 marks)
- (ii) Calculate the adjusted R-squared and interpret the result (3 marks)
- (iii) Use the ANOVA table to test for the overall significance of the model (3 marks)

QUESTION FOUR (20 MARKS)

- (a) Define Heteroscedasticity (1 mark)
- (b) State two sources of Heteroscedasticity (2 marks)
- (c) What are the consequences of Heteroscedasticity? (2 marks)
- (d) State three tests for Heteroscedasticity (3 marks)
- (e) Consider a simple classical linear regression model given as:

$$y = a + \beta X + \mu$$

Required:

- (i) Derive the Ordinary Least Square estimators for the above specified model (4 marks)
- (ii) Show that $\hat{\beta}$ is an unbiased estimator of β (4 marks)
- (iii) Prove that:

$$E(\hat{a}) = a \quad (4 \text{ marks})$$

QUESTION FIVE (20 MARKS)

- (a) State the general relationship between consumption (Y) and disposable income (X) in:
- (i) Exact linear form (½ mark)
 - (ii) Stochastic form (½ mark)
 - (iii) Why would you expect most observed values of y not to fall exactly on a straight line? (1 mark)
- (b) Explain in detail any four assumptions underlying the simple classical linear regression model (4 marks)
- (c) Examine the causes of autocorrelation in regression estimation (4 marks)
- (d) Clearly explain the steps used to test for autocorrelation using the Breusch-Pagan-Godfrey (BPG) test (5 marks)
- (e) The following data relates to income levels and expenses of food in thousands of shillings

Income	35	49	21	39	15	28	25
Food expenditure	9	15	7	11	5	8	9

Calculate the Pearson correlation for the relationship between income and food expenditure and interpret your results. (5 marks)