MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF ECONOMICS AND STATISTICS

BACHELOR OF ECONOMICS AND FINANCE

BACHELOR OF ECONOMICS

EES 400: FUNDAMENTALS OF ECONOMETRICS I

DATE: 9/8/2021   **TIME: 2.00-4.00 PM**

INSTRUCTIONS:

Answer Question ONE and any other TWO Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a)   An Econometric modeler from EES 400 class of Machakos University sought to investigate the effect of disposable income on consumption. The specified model was:

$$Y_i = \beta_0 + \beta_1 X_i + \mu_i$$

Where Y is household consumption and X is household income.

The following data was obtained.

Household	A	B	C	D	E
Income (in Kshs.'000s)	2	5	8	10	15
Consumption (in Kshs.'000s)	1	2	3	4	5

Using the above data

i.   Fit the sample consumption function for the 5 households and interpret your results. From the marginal propensity to consume, what can you say about the nature of households in the sample?   (5 marks)

ii.   Compute the ESS and RSS for this data   (4 marks)

iii.   Compute the coefficient of determination for this data and interpret your results.

(3 marks)

b)   The real estate is facing a decline in demand for houses. Economists link this drop in demand to COVID-19 that has negatively affected individuals' incomes. Explain the methodology in Econometrics to be followed to execute such a study.   (12 marks)

c)   Explain why a researcher may prefer correlation coefficient over covariance in determining association between variables.   (3 marks)

d)   What are the consequences of heteroscedasticity in a regression model?   (3 marks)

QUESTION TWO (20 MARKS)

a)   In a regression of wages ($WAGE$) on years of experience (EXP) for random sample of 100 companies, the following results were obtained:

$$WAGE = 2.3 + 0.25EXP\ldots\ldots\ldots.1$$

t   (2.72)   (5.10) R^2=0.71

$$\frac{W}{EXP} = 0.267 + 2.58\frac{1}{EXP}\ldots\ldots\ldots..2$$

t   (7.43)   (16.59) R^2=0.81

i.   Interpret the two regression equations.   (4 marks)

ii.   What is the author assuming in going from equation 1 to 2? Was he worried about heteroscedasticity? How do you know?   (3 marks)

iii.   Can you relate the slopes and intercepts of the two models?   (3 marks)

iv.   Can you compare the R^2 values of the two models? Why or why not?   (2 marks)

b)   Derive the Fundamental $\hat{\beta}$ of OLS estimator.   (8 marks)

QUESTION THREE (20 MARKS)

a)   An Econometrics student came across the following information

$$\hat{Y} = 10 + 4X$$
$$n = 204$$
$$\sum_{i=1}^{n}(Y_i - \bar{Y})^2 = 20$$
$$\sum_{i=1}^{n}(\hat{Y} - \bar{Y})^2 = 5$$
$$t_{calculated} = 10$$

i.   Find R^2?   (3 marks)

ii.   What is the standard error of the slope coefficient?   (3 marks)

iii.   What is the F statistic ($F_{calculated}$)   (4 marks)

b) Distinguish clearly between Multicollinearity, Heteroscedasticity and Autocorrelation

(6 marks)

c) Indicate the type of data and write the model used by the following students.

   i. The effect of inflation on Kenya's GDP between 1990 and 2020. (2 marks)

   ii. The effect of firm size on profitability of commercial banks in Kenya between 1990 and 2020. (2 marks)

QUESTION FOUR (20 MARKS)

a) A researcher obtained the following regression results

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

$$t \qquad (3.5) \quad (8.3) \quad (5.2)$$

Where Y is quantity demanded of Lenovo computers in Machakos, Kitui and Makueni towns, X_1 is price of the computers, X_2 is average income of University students

   (i) Is there multicollinearity in the regression? How do you know? (3 marks)

   (ii) Explain how in practice the researcher can test for multicollinearity (4 marks)

b) Show that the Fundamental $\hat{\beta}$ of OLS is unbiased estimate of the population parameter, β.

(5 marks)

c) A student sought to investigate labour productivity among manufacturing firms in Kenya. Data on labour productivity (output worker), capital per labour (K L) and proportion of skilled labour (S) was collected. The researcher used Stata software to analyze the data and the following results were obtained.

Source	SS	df	MS
Model	6199579.27	2	3099789.64
Residual	15827246	72	219822.861
Total	22026825.3	74	297659.801

Number of obs	=	75
F(2, 72)	=	14.10
Prob > F	=	0.00
R-squared	=	0.28
Adj R-squared	=	0.26
Root MSE	=	468.85

outputworker	Coefficient.	Standard Error	t	P>t
KL	0.86	0.195	4.39	0.000
S	4.93	1.62	3.04	0.003
constant	94.31	58.27	1.62	0.110

   i. Interpret the slope coefficients (4 marks)

   ii. Interpret the coefficient of determination (2 marks)

   iii. Test the hypothesis that all the slope coefficients jointly significant? How do you know? (2 marks)

QUESTION FIVE (20 MARKS)

a) Machakos University seeks to hire 5 employees. To arrive at the 5 employees, 10 individuals were shortlisted and two interviews were carried out by two independent HR experts during two separate days.

Marks Awarded by HR 1	6	5	8	8	7	6	10	4	9	7
Marks Awarded by HR II	8	7	7	10	5	8	10	6	8	6

Compute the Pearson Product Moment coefficient correlation between the two HR experts. Can Machakos University use these results to hire the job seekers? Explain   (10 marks)

b) Indicate whether each of the following statements is true or false and then give a brief explanation.

  i. A high R^2 implies no omitted variables bias   (3 marks)

  ii. A high p-value indicates that we cannot reject the null hypothesis   (3 marks)

  iii. In a regression model with no explanatory variables the R^2 is equal to 0   (4 marks)