



**MASINDE MULIRO UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**UNIVERSITY EXAMINATIONS**

**2020/2021 ACADEMIC YEAR**

**SECOND YEAR FIRST SEMESTER**

**MAIN EXAMINATION**

**FOR THE DEGREE OF MASTERS SCIENCE IN ECONOMICS**

**COURSE CODE: ECONOMETRICS**

**COURSE TITLE: ECO 810**

**DATE: MONDAY, 25-04-2022**

**TIME: 9:00 -12:00**

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**INSTRUCTIONS TO CANDIDATES**

**ANSWER QUESTION ONE AND ANY OTHER THREE (3) QUESTIONS**

**TIME: 3 HOURS**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

**QUESTION ONE 40 MARKS**

- a) Explain the role of the stochastic error term  $\mu$  in regression analysis? (3 marks)
- b) Highlight four functional forms of regression models that may be non-linear in variables and linear in parameters. (4 marks)
- c) Empirical work based on time series data assumes that the underlying time series is stationary, to exemplify the problem of spurious or nonsense regression. Give any three tests for stationary. (3 marks)
- d) The following table contains the scores for students in econometrics and the GPA (grade point average) for eight college students. Grade point average is based on a four-point scale and has been rounded to one digit after the decimal.

Student	1	2	3	4	5	6	7	8
GPA	2.8	3.4	3.0	3.5	3.6	3.0	2.7	3.7
Econometric scores	21	24	26	27	29	25	25	30

- i. Draw a graph of GPA (grade point average) on y axis against scores for students in econometrics (3 marks)
  - ii. Estimate the relationship between GPA and econometric scores using OLS in an econometric model; obtain the intercept and slope estimates in the equation (6 marks)
  - iii. Comment on the direction of the relationship. Does the intercept have a useful interpretation here?(2 marks)
  - iv. Explain. How much higher is the GPA predicted to be if the econometric scores score is increased by five points? (2 marks)
  - v. What is the predicted value of GPA when econometric score 20? (2 marks)
  - vi. Compute the value of goodness of fit  $R^2$ ? Explain its significance.(5 marks)
- e) The stata output below was obtained from a regression of earnings against cognitive test ASVABC and years of schooling S. the regression equation is represented below
- $$\text{EARNINGS} = \beta_0 + \beta_1 S + \beta_2 \text{ASVABC} + \mu$$

. reg EARNINGS S ASVABC

Source	SS	df	MS	Number of obs =	570
Model	4745.74965	2	2372.87483	F( 2, 567) =	39.98
Residual	33651.2874	567	59.3497133	Prob > F =	0.0000
Total	38397.0371	569	67.4816117	R-squared =	0.1236
				Adj R-squared =	0.1205
				Root MSE =	7.7039

EARNINGS	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
S	.7390366	.1606216	4.601	0.000	.4235506 1.054523
ASVABC	.1545341	.0429486	3.598	0.000	.0701764 .2388918
_cons	-4.624749	2.0132	-2.297	0.022	-8.578989 -.6705095

Give the value and the meaning of the following parameters  $R^2$ , adjusted R,  $\beta_0$ ,  $\beta_1$ ,  $\beta_2$  (10 marks)

**QUESTION TWO (20 MARKS)**

- a) Explain three statistical properties of ordinary least square OLS estimators, the Gauss-Markov theorem. (6 marks)
- b) Why do we employ the normality assumptions in regressions analysis (4marks)
- c) Suppose you are interested in estimating the effect of hours spent in a ECO 810 course (hours) on total ECO 810 score. The population is all college for a particular year.
  - i. Consider the more realistic case where students choose how much time to spend in a preparation course, and you can only randomly sample ECO 810 and hours from the population. The population model is given as  
$$\text{ECO810} = \beta_0 + \beta_1 X_1 + \mu$$
Where,  $X_1$  is time in hours and as usual in a model with an intercept, we can assume  $E(\mu) = 0$ .  
List at least two factors contained in  $\mu$ . Are these likely to have positive or negative correlation with hours? (4 marks)
  - ii. In the equation from part (i), what should be the sign of  $\beta_1$  if the preparation course is effective? (3 marks)
  - iii. In the equation from part (ii), what is the interpretation of  $\beta_0$ ? (3 marks)

**QUESTION THREE (20 MARKS)**

- a) Explain the determinants of choice of functional form of regression model. (10 marks)
- b) The following regression results were based on monthly data over the period January 2010 to December 2020

$$\hat{J}_t = 0.00681 + 0.75815X_t$$

$$\text{se} = (0.02596) (0.27009), t = (0.26229) (2.80700), p \text{ value} = (0.7984) (0.0186), r^2 = 0.4406$$

$$\hat{J}_t = 0.76214X_t$$

$$\text{se} = (0.265799) t = (2.95408), p \text{ value} = (0.0131) r^2 = 0.43684$$

where  $\hat{J}$  = monthly rate of return on NSE, %, and  $X$  = monthly market rate of return, %.

- (i) What is the difference between the two regression models? (4 marks)
- (ii) How would you interpret the slope coefficients in the two models? (2 marks)
- (iii) Explain the meaning of  $r^2$  terms of the two models? (2 marks)
- (iv) The Jarque–Bera normality statistic significance for the first model in this problem is 1.1167 and for the second model it is 1.1170. What conclusions can you draw from these statistics? (2 marks)

**QUESTION FOUR (20 MARKS)**

- a) States that have control over taxation sometimes reduce taxes in an attempt to spur economic growth. Suppose that you are hired by a state to estimate the effect of corporate tax rates on, say, the growth in per capita gross state product (GSP).
  - i. What kind of data would you need to collect to undertake a statistical analysis? (3 marks)
  - ii. Is it feasible to do a controlled experiment? What would be required? (3 marks)
  - iii. Is a correlation analysis between GSP growth and tax rates likely to be convincing? Explain.(4 marks)
- b) The following equation relates housing price (price) to the distance from a recently built garbage incinerator (dist)  
Log price = 9.40 + .312 log (dist)  
n = 135, R<sup>2</sup> = 0.162
  - i. Do you think simple regression provides an unbiased estimator of the ceteris paribus elasticity of price with respect to dist? (5 marks)
  - ii. What other factors about a house affect its price? Might these be correlated with distance from the incinerator? (5 marks)

**QUESTION FIVE (20 MARKS)**

- a) Explain the eight steps of traditional econometric methodology. (10 marks)
- b) Table below gives data on the GDP (gross domestic product) deflator for domestic goods and the GDP deflator for imports for Singapore for the period 2006–2020. The GDP deflator is often used as an indicator of inflation in place of the CPI. Singapore is a small, open economy, heavily dependent on foreign trade for its survival.

Year	1	2	3	4	5	6	7	8	9	10
GDP deflator for domestic goods Y	1000	1020	1040	1080	1140	1280	1480	1520	1540	1560
GDP deflator for imports, X	1000	1040	1090	1100	1110	1250	1750	1770	1890	1970

To study the relationship between domestic and world prices, you are given the following models:

- 1.  $Y_t = \alpha_1 + \alpha_2 X_t + u_t$
- 2.  $Y_t = \beta_2 X_t + u_t$

where Y = GDP deflator for domestic goods and X = GDP deflator for imports

- i. How would you choose between the two models a priori? (2 marks)
- ii. Fit both models to the data and decide which gives a better fit. (6 marks)
- iii. What other model(s) might be appropriate for the data? (2 marks)