



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATION
2020/2021 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER**

**SCHOOL OF BUSINESS AND ECONOMICS
DOCTOR OF PHILOSOPHY IN BUSINESS
ADMINISTRATION**

COURSE CODE: DBA 9104

COURSE TITLE: ECONOMETRICS

DATE: 4TH JUNE, 2021

TIME: 0830 - 1130HRS

INSTRUCTIONS TO CANDIDATES

*Answers question **one** and any other **three** questions .*

QUESTION ONE (40 MARKS)

- (a) Briefly explain the following concepts:
- i) Econometrics
 - ii) Time series data
 - iii) Cross sectional data
 - iv) Pooled data
 - v) Panel data. **(5 marks)**
- (b) How do you perceive the role of econometrics in decision making in business and economics? **(7 marks)**
- (c) Suppose a local government decides to increase the tax rate on residential properties under its jurisdiction. How will you go about determining the effect of this on the prices of residential houses? Follow the eight step procedure of econometrics to answer this question. **(8 marks)**
- (d) Violation of the assumptions of linear regression analysis can be detrimental to securing of Best Linear Unbiased Estimators. Describe two such violation that may occur and their solutions. **(4 marks)**
- (e) You are given the following output using MINITAB statistical package:
- $$\ln Y_t = -1.6524 + 0.3397 \ln X_{2t} + 0.860 \ln X_{3t}$$
- | | | | |
|----------------------|----------|----------|-----------|
| S.E = | (0.6062) | (0.1857) | (0.09343) |
| t = | (-2.73) | (1.83) | (9.06) |
| P _{value} = | (0.014) | (0.085) | (0.000) |
- $R^2 = 0.995, F = 1719.23$
- i) Interpret the coefficient of the labour input, x_2 . Do the same for the coefficient of capital input x_3 . **(2 marks)**
 - ii) Test if the coefficients of the labour input and capital input are individually statistically different from zero ($\alpha = 0.1$) **(4 marks)**
 - iii) What is the interpretation of the intercept value of -1.6524? **(2 marks)**
 - iv) Test the hypothesis that $B_2 = B_3 = 0$ ($\alpha = 0.1$) **(4 marks)**
 - v) Give the sum of the two coefficients of the labour input and that of capital input. Hence comment on the characteristics of the economy. **(2 marks)**
 - vi) Explain the meaning of $R^2 = 0.9995$. **(2 marks)**

QUESTION TWO (20 MARKS)

(a) State the Cobb –Douglas production function defining all the variables involved. **[3marks]**

(b) Suppose for some data the fitted model with all parameters being significant the regression equation is $\ln Y_t = 7.08 + 0.94 \ln(L) + 0.51 \ln(K)$
In addition, $R^2 = 0.9975$. Interpret this model. **[4marks]**

(c) Two researchers are asked to estimate an ARMA model for a daily exchange rate return series, denoted X_t . Researcher A uses Schwarz's criterion for determining the appropriate model order and arrives at ARMA (0,1). Researcher B uses Akaike's information criterion which deems an ARMA (2,0) to be optimal. The estimated models are:

$$A: \hat{X}_t = 0.38 + 0.10\mu_{t-1}$$

$$B: \hat{X}_t = 0.63 + 0.17x_{t-1} - 0.09x_{t-2}$$

Where μ_t is an error term.

You are given the following data:

$$X_t = 0.31 \quad x_{t-1} = 0.02 \quad x_{t-2} = 0.16$$

$$\mu_t = -0.02 \quad \mu_{t-1} = -0.13 \quad \mu_{t-2} = 0.19$$

i. Produce forecasts for the next four days i.e., t+1, t+2, t+3 and t+4. **[4 marks]**

ii. Suppose the actual values of the series on day t+1, t+2, t+3 and t+4 turned out to be 0.62, 0.19, -0.32 and 0.72, respectively. Determine which researcher's model produced the most accurate forecasts. **[5 marks]**

(d) A multiple regression model was fitted to some data with dependent variable y and independent variables x_1, x_2, x_3, x_4 and x_5 . The computer output (Gretl software) is as given below. Use it to answer the question that follows. Model 11: OLS, using observations 1-402 Dependent variable: Y

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	15.0376	0.873388	17.2175	0.00001	***
X1	0.00284463	0.0105637	0.2693	0.78785	
X2	0.0491434	0.0138907	3.5379	0.00045	***
X3	0.224591	0.0293318	7.6569	0.00001	***
X4	0.0323818	0.010223	3.1675	0.00166	***
X5	0.0847841	0.00742937	11.4120	0.00001	***
Mean dependent var	28.77241	S.D. dependent var		5.459457	
Sum squared resid	5803.014	S.E. of regression		3.828064	
R-squared	0.63786	Adjusted R-squared		0.508346	
F(5, 396)	83.92284	P-value(F)		5.82e-60	
Log-likelihood	-1107.019	Akaike criterion		2226.038	
Schwarz criterion	2250.017	Hannan-Quinn		2235.532	

- i. Write down the fitted model and explain if it is valid. **(1 Marks)**
- ii. How good are the predictors in explaining y? **(1marks)**
- iii. Interpret the influence and relevance of each variable including the constant. **(2marks)**

QUESTION THREE (20 MARKS)

(a) Explain the meaning of the following terms:

- i) Dummy variables
- ii) ANOVA Models
- iii) ANCOVA Models
- iv) Differential intercept coefficient
- v) Probit model
- vi) Logit model.

(6 Marks)

(b) Consider the following model:

$$\hat{Y}_i = -0.261 - 2.306D_{2i} - 1.7327D_{3i} + 2.1289D_2D_{3i} + 0.8028X_i$$

$$t = (-0.2357) (-5.4873)^* (-2.1803)^* (9.9094)^*$$

$$R^2 = 0.2032, n = 528, \alpha = 0.05$$

*→ indicate P value is less than 0.05

Where Y_i → hourly wage in dollar

X → education (Years of schooling)

$D_2 = 1$ if female, 0 if male

$D_3 = 1$ if non-white and non-Hispanic
= 0 if otherwise

Interpret these results.

(4 Marks)

(c) Based on a sample of 20 couples, Jane obtained the following regression:

$$\ln \left(\frac{P_i}{1 - P_i} \right) = -9.456 + 0.3638 \text{income}_i - 1.107 \text{babysitter}_i.$$

P = probability of restaurant usage, = 1 if went to restaurant, 0 otherwise, Income = the income in thousands of dollars.

Baby sitter = 1 If needed a baby sitter 0 otherwise. Of the 20 couples, 11 regularly went to a restaurant, 6 regularly used 9 babysitters and the income ranged from a low of \$1700 to a high of \$4400.

Find out the logit value of a couple with an income of \$3300 who needed 9 baby sitter. **(4 Marks)**

(d) Consider the following two regressions based on the US data for 1946 to 1975 (std error are in parenthesis)

$$C_t = 26.19 + 0.6248 \text{GNP}_t - 0.4398 D_t$$
$$\text{S.E} = (2.73) (0.0060) (0.0736), R^2 = 0.999$$

$$\frac{C_t}{\text{GNP}_t} = 25.92 \frac{1}{\text{GNP}_t} + 0.6246 - \frac{0.4315 D_t}{\text{GNP}_t}$$

$$\text{SE} = (2.22) (0.0068) (0.0597), R^2 = 0.875$$

Where C = aggregate private consumption expenditure. GNP = Gross National Product. D = National Defense Expenditure, t = time. The objective of this study was to find out the effect of defense expenditure on other expenditures on the economy.

- i) What might be the reasons for transforming the first equation into the second equation? **(2 Marks)**
- ii) If the objective of the transformation was to remove or reduce heteroscedasticity what assumption has been made about the error variance? **(2 Marks)**
- iii) If there was heteroscedasticity, has the author succeeded in removing it. How can you tell? **(2 Marks)**

QUESTION FOUR (20 MARKS)

(a) What are the various methods of detecting autocorrelation? **(10 Marks)**

(b) Consider the following model:

$$Y_t = B_1 + B_2 X_t + B_3 X_{t-1} + B_4 X_{t-2} + B_5 X_{t-3} + U_t$$

Where Y = the consumption

X = the income

t = time

U = the disturbance term.

This model states that consumption expenditure at time t is a linear function of income not only at time t but also of income in three previous time periods. Such models are called distributed lag models and represent what are called dynamic models (i.e models representing change over time)

i) Would you expect multicollinearity in such models and why? **(5 Marks)**

ii) If multicollinearity is suspected, how would you get rid of it? **(5 Marks)**

QUESTION FIVE (20 MARKS)

(a) Outline the purpose, scope and methodology of econometrics. In so doing, relate why one does not need to be an economist in order to utilize econometric models and methodology of data analysis. **(10 marks)**

(b) State and describe the five assumptions of the classical linear regression model (OLS) and give an intuitive explanation of the meaning and the need for all of them. **(10 marks)**

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