MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF ECONOMICS & STATISTICS

BACHELOR OF ECONOMICS

EES 401: FUNDAMENTALS OF ECONOMETRICS II

DATE: 9/12/2021   **TIME: 8.30-10.30 AM**

INSTRUCTIONS:

> **Answer Question ONE and any other TWO Questions**

QUESTION ONE (COMPULSORY) (30 MARKS)

a)   Answer the following multiple choice questions.

      i.   Applying OLS on simultaneous equations results in the parameter being:

          A.   Biased

          B.   Inefficient

          C.   Inconsistent

          D.   Biased and inconsistent

      ii.   Regressing a time series variable on another time series variable, which have no meaningful relationship may often show a significant relationship. Such regression is known as

          A.   Random walk phenomenon

          B.   White noise

          C.   Spurious Regression

          D.   Stationary series

iii.   In logit model, as the odds ratio decreases from 1 to 0, the logit becomes

    A.   Negative

    B.   Positive

    C.   Equal to 0

    D.   Fraction

iv.   In which of the following models both intercept and slope coefficient is fixed across individual subjects and over time?

    A. Fixed Effects least square dummy variable

    B. Pooled OLS mode

    C. Fixed Effects within group model

    D. Random Effects model

v.   Given regression model, $Y_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \cdots.. + \beta_k X_{t-k} + u_t$, the short run multiplier is given by:

    A. β_0

    B. $\beta_0 + \beta_1$

    C. $\beta_0 + \beta_1 + \beta_2$

    D. $\beta_0 + \beta_1 + \beta_2 + \cdots + \beta_k$

vi.   From the estimated equation, $Y_t = 3 + 0.2 ln X_t$ we interpret as

    A.   An increase X by one unit leads to an increase in Y by 0.2 units, ceteris paribus.

    B.   An increase in X by one percent leads to an increase in Y by 0.02 units, ceteris paribus.

    C.   An increase in X by one unit leads to an increase in Y by 20 percent, ceteris paribus.

    D.   An increase in Y by one percent leads to an increase in X by 0.02 units, ceteris paribus.

vii.   In Hausman test, rejecting the null hypothesis means

    A.   Fixed Effects model is preferred over Random Effects Model

    B.   Random Effects Model is preferred over Fixed Effects model

    C.   Both Fixed Effects model and Random Effects Model are equally preferred

    D.   Neither Fixed Effects model nor Random Effects Model are equally preferred

viii.   In estimating Structural Equation Model by indirect Least Square Method

    A.   GLS is applied to the reduced equation

B.   GLS is applied to the structural equation

C.   OLS is applied to reduced equation

D.   OLS is applied to structural equation

ix.   The slope coefficient in Linear Probability Model (LPM) measures

A.   The change in the average value of the explanatory variable for a unit change of the response variable

B.   The change in the probability of an event is occurring as a result of a unit change in the value of the explanatory variable.

C.   Elasticity of change

D.   None of the above

x.   Logit and probit models are preferred over Linear Probability Model(LPM) because of the following shortcomings of LPM.

A.   Low very low R2

B.   Nonsense regression

C.   Linearity of the relationship

D.   All of the above

b)   Consider the demand function for chicken.

$$lny = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \mu$$

Where lny is per capita consumption of chicken, X_1 real disposable per capita income, X_2 is real retail price of chicken per Kg, X_3 is real price per pork per Kg, X_4 is real retail price of beef.

Using time series data for 1960-1982 the following are the OLS estimates

Variable	Coefficient	Standard error
X1	0.3425	0.0833
X2	-0.5046	0.1109
X3	0.1485	0.0997
X4	0.0911	0.1007
Constant	2.1898	0.1557

i.   Using t-test, which of the coefficients are individually statistically significant at 5 % level?   (5 marks)

ii.   Interpret the magnitude of each coefficient   (5 marks)

iii.   The R^2 of the estimated equation is 0.9823. Interpret it   (2 marks)

c)   What are the advantages of using panel data in estimating regression models   (5 marks)

d)   Describe the rationale behind instrumental variable methodology   (3 marks)

e)   Consider the linear regression model

$$wage = \beta_1 + \beta_2 EDUC + \beta_3 FEMALE + \mu$$

Where wage is hourly wage in US dollars, EDUC is years of education of the worker, FEMALE is a dummy variable that assumes the value 1 for observations on females and 0 for observations on non-females and μ is a random error term.

The model is estimated based on a random sample of 160 observations and the following results obtained:

$$\widehat{wage} = -2.841 + 2.456 EDUC - 5.021 FEMALE$$

Interpret the estimated coefficients on EDUC and FEMALE   (5 marks)

QUESTION TWO (20 MARKS)

a)   Given the following Keynesian Income determination model:

$$C_t = \beta_0 + \widehat{\beta_1} Y_t + \mu_t$$
$$Y_t = C_t + I_t$$

    i.   Show that Y_t and μ_t are related thus showing presence of endogeneity   (5 marks)

    ii.   Show that $\widehat{\beta_1}$ is biased/inconsistent   (5 marks)

b)   EES 401 students modelled determinants of female labour force participation. The following results were obtained

Dependent Variable: Dummy variable taking 1 if a female is employed 0 otherwise

VARIABLES	Marginal Effects
Marital Status	0.843***
	(0.070)
Education	0.254***
	(0.069)
Household head	0.710***
disability	-0.344*
	(0.201)
Age	0.019***
	(0.002)
Constant	-3.731***
	(0.155)
Observations	10,146

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Where marital status is 1 if the female is married, 0 otherwise; education is years of female schooling, household head is 1 if the female is household head 0 otherwise, disability is 1 if female is disabled, 0 otherwise, age is years when the female is productive (15-60 years)

i. Does the sign of coefficient of each explanatory variable conform to economic theory? Explain (5 marks)

ii. Interpret the marginal effects results (5 marks)

QUESTION THREE (20 MARKS)

a) Distinguish clearly between order and rank conditions of identification, making explicit the steps for tracing identifiability of equations (10 marks)

b) A given firm in Nairobi County has estimated the following sales relationship for its main product for the last five years using monthly data.

$$Y_t = 4.932 - 1.328P_t + 2.56M_{t-1} - 3.56Y_{t-1}$$

$$se \qquad (0.5517)\ (0.8533) \qquad (0.712)$$

$$R^2 = 0.8738$$

Where Y is sales in units, P is price in Kshs., M is income in Kshs.

Required:

Conduct hypothesis test on the slope regression coefficients of the model at 5 % level of significance (5 marks)

c) Using data from three firms in Machakos County, a researcher estimated the total cost function shown below.

$$TC_{it} = \beta_{1i} + \beta_2 Q_{1t} + \beta_3 PF_{it} + u_{it}$$

Where TC is total cost, Q is output, PF is fuel price and u is the error term.

The researcher obtained the results shown below.

Variable	Fixed Effects	Random Effects
Constant	- -	0.8499
		(0.0433)
Q	0.0557	0.0393
	(0.0042)	(0.0033)
PF	0.0351	0.0092
	(0.0051)	(0.0036)
p value for Hausman test	0.0000	

i.   Is there a vast difference in the results produced by the two models? If so, what might account for these differences? (3 marks)

ii.   Which results should the researcher report? Explain. (2 marks)

QUESTION FOUR (20 MARKS)

a)   Using a sample of 545 full-time workers in the Kenya, a researcher is interested in the question of whether women are systematically underpaid compared to men. The researcher runs a simple regression of an individual's wage on a male dummy, equal to 1 for males and 0 for females. This gives the results reported in Table below.

Variable	Estimates	Standard Error	t ratio
Constant	5.09	0.58	8.78
Male	0.82	0.15	5.47
N= 545			$R^2 = 0.26$

i.   How can you interpret the coefficient estimate of 0.82? How do you interpret the estimated intercept of 5.09? (4 marks)

ii.   How do you interpret the R^2 of 0.26? (2 marks)

iii. What is the average wage rates of males and females? (2 marks)

iv.   A student is unhappy with this model as a female dummy is omitted from the model. Comment upon this criticism. (2 marks)

b)   Consider the estimated equation below

$$Y = 5.24 + 0.25D + 2.4X + 0.34DX$$

Where Y is bank's financial performance measured by annual profit, D is dummy variable for gender of the bank's manager. The dummy variable takes the value 1 if the bank manager is male, 0 otherwise. X is bank size measured by number of employees.

i.   What is the implication of not including DX. Show the computations (4 marks)

ii.   What is the mean profit for a bank whose manager is female (3 marks)

iii. What is the mean profit for a bank whose manager is male (3 marks)

QUESTION FIVE (20 MARKS)

a)   Explain three reasons why we may have a spike or sharp decrease in a variable   (6 marks)

b)   What is identification problem?   (4 marks)

c)   Koyck assumes that coefficents of a distributed-lag model decline geometrically with the number of lags. A distributed-lag models results are found to be:

$$Y_t = 8.27 + 0.111X_t + 0.064X_{t-1} - 0.055X_{t-2}$$

i.   Illustrate that Koyck's assumption is true for $\lambda = 0.2$ and $0 \angle K \angle 5$ (3 marks)

ii.   Evaluate the mean and median lags for $\lambda = 0.2, 0.4, 0.6, 0.8$ (7 marks)