THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

P.O. Box 62157
00200 Nairobi - KENYA
Telephone: 891601-6
Ext 1022/23/25

MAIN EXAMINATION

MAY – AUGUST 2021

FACULTY OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

REGULAR PROGRAMME

EQT 806: ECONOMETRICS II

Date: AUGUST 2021	**Duration: 3 Hours**
INSTRUCTIONS: Answer any FOUR Questions	

Q1.

a) Consider the general linear regression model, Y ¿ $X\beta+\mathcal{E}$, demonstrate the property of asymptotic consistency of the least squares estimator. $\hat{\beta}=$¿. **(5 Marks)**

b) Given the general linear regression mode $Y=X\beta+\mathcal{E}$ and the orthogonality conditions $E(\varepsilon)=0$ and $E(X'\varepsilon)=0$.Obtain the K^{th} Moment condition and show that $\hat{\beta}_{MM}=\hat{\beta}_{OLS}=$¿ **(4 Marks)**

c) State and define one of the following asymptotic theories **(3 Marks)**
   i) Khinchines theorem
   ii) Slutsky's theorem

d) Critique the assumptions of the Classical Linear Regression Model (CLRM) **(3 Marks)**

Q2.

Consider the supply and demand model for truffles

Demand: $Q_i = \alpha_1 + \alpha_2 P_i + \alpha_3 PS_i + \alpha_4 DI_i + \varepsilon_{di}$

Supply: $Q_i = \beta_1 + \beta_2 P_i + \beta_3 PF_i + \varepsilon_{si}$

Where In the demand equation Q_i is the quantity of truffles traded in a particular marketplace, P_i is the market price of truffles, PS_i is the market price of a substitute for real truffles (another fungus much less highly prized), and DI_i is per capita monthly disposable income of local residents. The supply equation contains the market price P_i and quantity suppliedQ_i. Also it includesPF_i, the price of a factor of production, which in this case is the hourly rental price of truffle-pigs used in the search process. In this model it is assumed that P_i and Q_i are endogenous variables. The exogenous variables are PS_i, DI_i, PF_i, and the intercepts.

i) Explain why some variables are present in one equation and omitted from the other equation. (**2 Marks**)

ii) Define the term endogeneity and explain why OLS cannot be used to estimate a system of equations (**3 Marks**)

iii) Determine and explain the identification status of each equation (**2 Marks**)

iv) Obtain the reduced form equations (**5 Marks**)

v) The estimated demand equation if given in the following output

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. ivregress 2sls q ps di  (p = pf)

Instrumental variables (2SLS) regression          Number of obs =
                                                  Wald chi2(3)  =   20.
                                                  Prob > chi2   =  0.00
                                                  R-squared     =
                                                  Root MSE      =  4.58

------------------------------------------------------------------------------
           q |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interva
-------------+----------------------------------------------------------------
           p |  -.3744591   .1533755    -2.44   0.015    -.6750695   -.07384
          ps |   1.296033   .3306669     3.92   0.000     .6479381    1.9441
          di |   5.013977   2.125875     2.36   0.018      .847339    9.1806
       _cons |  -4.279471   5.161076    -0.83   0.407    -14.39499    5.8360
------------------------------------------------------------------------------
Instrumented:  p
Instruments:   ps di pf
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Suppose PS_i and DI_i are each increased by one unit what happens to the demand curve. Does the demand for truffles shift right or left or not at all? Is the estimate demand for truffles consisted with expectations? (3 Marks)

Q3.

a) Discuss the basic steps in the Box-Jenkings approach to analyze and estimate Autoregressive-Moving Average (ARMA) models (**6 Marks**)
b) Derive the Augmented Dickey-Fuller test equation and hypothesis for testing unit root (**4 Marks**)
c) define the following terms
   i) VAR model (**2 Marks**)
   ii) Granger Causality (**3 Marks**)

Q4.

a) Consider the following panel data models where the dependent variable, y_{it} may be considered as a linear function of explanatory variables, x_{it} based on some fundamental economic theory. If the relationship is static, the econometric expression may be written as;

$$y_{it}=\alpha_i+x_{it}^{'}\beta+\varepsilon_{it} \qquad i=1,2,\ldots,N;t=1,2,\ldots,T \qquad (4.1)$$

Where

ε_{it} $IID(0,\delta_{\varepsilon}^2)$ and $x_{it}^{'}$ is uncorrelated with ε_{it}

Explain the following variations of the panel data model I (4.1)

i) Pooled panel model **(2 Marks**)
ii) Fixed effect model (**2 Marks**)
iii) Random effect model (**2 Marks**)

b) Model (4.1) was applied to a Cobb-Douglas production function on a dataset containing observations on 35 African countries, assuming different structure of the individual effects α_i. Based on the results given on Table 4.1, the Panel data estimates of the growth equation

Dependent Variable ; log of production	Pooled Coefficients (t-values)	FE coefficients (t-values)	RE Coefficients (t-values)
Constant	-0.5330* (-1.77)	2.123*** (9.66)	1.820*** (5.73)
Elasticity of output with respect to capital	0.9144*** (16.08)	0.371*** (8.25)	0.447*** (10.67)
Elasticity of output with respect to labor	0.0856 (1.50)	0.629*** (13.98)	0.553*** (6.29)
Adjusted R-squared	0.72	0.99	0.73
No. of cross-sections	35	35	35
Total no. of observations	140	140	140
$H_0 : all\ \alpha_i = \alpha : F_{calc} = 796.0 * ¿ * ¿$			
$Hausman\ test : \chi^2(2) = 18.70 * ¿ * ¿$			

*Notes; Figures in parentheses are t-values using robust variance estimate. *** Significance at 1%, ** significance e at 5% and * significance at 10%*

Which of the 3 models are consistent with the African Dataset? Justify your answer and interpret the results from the model of your choice. (**4 Marks**)

a) Given $y_{it} = \alpha_i + x_{it}^{'}\beta + \varepsilon_{it}$ model in 4.1 show that pooled ordinary least squares estimator yield biased and inconsistent results (**5 Marks**)

Q5.

a) The following Probit output results were obtained from data on automobile and public transportation travel times and the alternative chosen for N=21 individuals. the dependent variable $y_i = 1$ if automobile transportation is chosen

Dependent variable : Y
Method : ML - Binary Probit
Convergence achieved after 4 iterations
Covariance Matrix computed using second derivatives

Variable	Coefficient	Std.Error	z-statistic	Prob.
C	-0.064434	0.399239	-0.161391	0.8718
X	0.029999	1.010286	2.91635	0.0035

i) If an individual is faced with the situation that it takes 30 minutes longer to take public transportation than to drive to work, what is the probability that auto transportation will be selected? interpret your answer (**5 Marks**)

ii) Differentiate between the coefficients in the table and the value calculated in (i) above (**1 Mark**)

b) Are the following statements correct? If they are only partly correct, identify that part. Describe in details and justify your answers carefully.

i) Even if the model includes binary dependent variable, the OLS estimator is still valid because it is BLUE (**3 Marks**)

ii) In the logit model, the marginal effect of x on y can be interpreted directly from the estimated parameters like linear regression models **(3 Marks**)

c) "The residual for Linear Probability Model (LPM) is heteroscedastic by definition" is this true? Prove your answer (**3 Marks**)

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