AERC
CREA

# AFRICAN ECONOMIC RESEARCH CONSORTIUM

## Collaborative MA Programme in Economics for Anglophone Africa (Except Nigeria)

## JOINT FACILITY FOR ELECTIVES (JFE) 2010

## JUNE – OCTOBER

# ECONOMETRICS THEORY AND PRACTICE I

## First Semester: Final Examination

**Duration: 3 Hours** **Date: Monday, August 9, 2010**

---

**INSTRUCTIONS:**

1. There are Five Questions in this Examination.
2. Attempt **ANY FOUR** Questions.
3. All Questions Carry Equal Marks.
4. You May Use Calculators. Show All Your Work to Solutions.

---

## Question 1

(a) Write short notes on any two of the following. (Your answers should not exceed a page for each of the concepts)

(i) Bayesian Estimation and inference.

(ii) Threshold autoregressive models.

(iii) Simultaneous Equation bias.

(iv) Engle and Yoo ARDL test for cointegration (bounds test).

**[10marks]**

(b) Distinguish between **any three** of the following (Your distinction on any pair of these concepts should not exceed two pages of your answer booklet)

(i) Weakly stationary and spurious regression.

(ii) Trend stationary process and difference stationary process.

(iii) Vector Autoregression (VAR) and the Vector Error Correction Mechanism (VECM).

(iv) Random Walk process and white noise stochastic process.

(v) Eigenvalue and Trace statistic in cointegration

(vi) Cointegrating equation and log likelihood

**[15 marks]**

## Question 2

Economic theory postulates an exact relationship between economic variables. Consider the following economic relationship:

Demand function: $LD = b_o + b_1LP + b_2LY$: where D is the quantity demanded; P is the price; Y is income; and L is the logarithmic expression.

Supply function: $LS_x = a_o + a_1LP + a_2P_s$: where Sx is the quantity supplied; P is the price, Ps is the price of factor input; and L is the Logarithmic expression.

Liquidity preference or demand for money function:

$LPm = Wo + W_1LR + W_2LY$:

where $P_m$ is real demand for money; R is the interest rate and Y is income. L is as defined above.

Cost function: $C = G_o + G_1X$: where C is total cost and X is total output.

(i) What is the meaning of an exact relationship? **[2 mark]**

(ii) What is the economic meaning of the coefficients $b_1$, $b_2$, $a_1$, $a_2$, $W_1$, $W_2$, $G_o$ and $G_1$? **[4 marks]**

(iii) What would you expect the signs of the coefficients of the parameters in (ii) above to be, and why? **[10 marks]**

(iv) Assuming the aggregate consumption function as $C = K_o + K_1Y + U$, interpret the coefficients of $K_o$ and $K_1$ and write the aggregate saving functions and define the relationship between the coefficients of the saving and consumption function. **[4 marks]**

(v) To what extent is the model $C = K_o + K_1Y + U$, realistic in econometric analysis? **[5 marks]**

## Question 3

(a) An econometrician has specified the demand for money from the monetary approach to the balance of payments as $Md = AY^{\alpha 1}R^{\alpha 2}P^{\alpha 3}e^{U}$ ............................................... *1*

Where *Md*= money demanded, which at equilibrium is equal to money supply. Y = the income level, *R* = interest rate and *P*=inflation rate obtained by logging the first difference of the consumer price. You are required to linearise equation (1) **[5 marks]**

(b) If the econometrician decided to use two techniques, that is the Ordinary Least Squares technique (OLS) and the Vector Autoregressive technique (VAR) to estimate the coefficient of A, $\alpha_1$, $\alpha_2$, and $\alpha_3$ what conclusion would be obtained from both results and why? **[5 marks]**

(c) Let $Y_t$ be an (Px1) vector of variables observed in time t. Assuming that all variables are integrated of order one.

State the general vector autoregressive (VAR) model for $Y_t$ and rewrite this in a vector error correction (VEC) form. **[5 marks]**

(d) Advance reasons to justify the no-stationarity of macroeconomic time series data especially those of the developing countries? **[5 marks]**

(e) What are the implications of differencing macroeconomic time series? **[5 marks]**

## Question 4

(a) What is meant by identification in a system estimation modeling? **[4 marks]**

(b) Using the order and the rank conditions to determine the nature of identification in equation $Y_{1t}$ and $Y_{2t}$ below.

$$Y_{1t} = \propto_0 + \propto_1 Y_{2t} + \propto_2 Y_{t-1} + U_{1t} \text{------------------------------------------}(1)$$

$$Y_{2t} = \beta_0 + \beta_1 Y_{1t} + \beta_2 Y_{2t-1} + \beta_3 Y_{2t-2} + \beta_4 Y_{2t-3} + U_{2t} \text{ ----------------------}(2)$$

Where, $Y_{1t}$ and $Y_{2t}$ are endogenous variables in period t. **[8 marks]**

(c) Show how your identification will be if the variable $Y_{2t-3}$ in your second equation was substituted with $Y_{1t-1}$. **[5 marks]**

(d) What interpretation can you give to the parameters in the reduced form model? **[8 marks]**

## Question 5

(a) Given the 2x2 singular matrix A=$\begin{bmatrix} 8 & 4 \\ 4 & 2 \end{bmatrix}$ use the characteristics equation to find the eigenvalues or characteristics root $\lambda_t$. Find the characteristics vectors or eigenvectors that correspond to $\lambda_i$. **[5 marks]**

(b) A simple VAR(1) is formulated for the export supply equation in Cameroon which has the variables $EXP_{st}$=export supply, Domestic income =Y and foreign income =FY, is presented as follows.

$$\begin{bmatrix} EXPst \\ Yt \\ FYt \end{bmatrix} = \psi D + A \begin{bmatrix} EXPst-1 \\ Yt-1 \\ FYt-1 \end{bmatrix} + \begin{bmatrix} \Sigma 1 \\ \Sigma 2 \\ \Sigma 3 \end{bmatrix}$$

With the aid of Pc Give, from 1970 to 2009 based on annual data with unrestricted constant and restricted trend, some of the output obtained from testing for cointegration in the system and estimating the cointegrated VAR is reported below:

AERC CREA

| Eigen values and likelihood | | Rank r |
|---|---|---|
| ---------- | -47.74787 | 0 |
| 0.276846 | -12.3366 | 1 |
| 0.146296 | -10.85566 | 2 |
| 0.008678 | -5.34683 | 3 |

The respective ρ-values for sequential tests for the rank of the long-run matrix are 0.004, 0.313 and 0.671. Assume r = 2

The restricted long-run matrix:

| | $Esp_{st}$ | $y_t$ | $Fy_t$ | Trend |
|---|---|---|---|---|
| $ExP_{st}$ | -0.06143 | 0.08461 | -0.0037 | 0.00107 |
| $Y_t$ | - 0.06754 | 0.00924 | -0.00563 | 0.001185s |
| $Fy_t$ | -7.1432 | 0.9486 | -0.37946 | 0.12493 |

Use the above output to compute the Johansen Likelihood ratio (LR) statistics showing how testing for the number of cointegrating vectors or the rank of the Long-run matrix is carried out, and decide on the number of cointegrating vectors. **[5 marks]**

(c) Write the Long-run relationship that relates export supply to domestic income and foreign income. **[5 marks]**

(d) What are the criticisms on the Augmented Dickey-Fulley (1979) and Phillips-Peron (1998) as instruments for detecting stationary in time series and how have the methodology provided by GLS-detrended Dickey-Fuller (Elliot, Rothenberg and stock 1996), Kwiatkowski, Phillips, Schmidt and Shin (KPSS 1992), Elliot, Rothenberg and Stock point optimal (ERS, 1996) and Ng and Perron (NG, 2001) added values in the dictation of Unit roots in a time series. **[5 marks]**

(e) What is meant by GARCH (1,1) model? **[2 marks]**

(f) Show that an GARCH (1,1) model implies that the squared error, ($\sum^2 t$) precedes a ARMA (1,1) model. How can the presence of ARCH in a linear and non-linear regression be tested? **[3 marks]**