AFRICAN ECONOMIC RESEARCH CONSORTIUM

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

JOINT FACILITY FOR ELECTIVES (JFE)

JUNE – OCTOBER 2009

ECONOMETRICS THEORY AND PRACTICE I

First Semester: Final Examination

Duration: 3 Hours **Date: Friday, August 14, 2009.**

INSTRUCTION:

Attempt **ANY THREE (3)** Questions

Question 1

(a) Hausman's asymptotic test for exogeneity is based on $\frac{\left(\hat{B}^{IV} - \hat{B}^{OLS}\right)^2}{Var\left(\hat{B}^{IV}\right) - Var\left(\hat{B}^{OLS}\right)} \overset{a}{\sim} \chi^2(k)$ where $\hat{B}^{IV}$ is an estimator for B using an instrumental variable approach and $\hat{B}^{OLS}$ is an estimator for B using OLS. Explain the basis of this test. **(7 marks)**

(b) Consider the following regression on a sample of countries:

$$Y_i = \beta_0 + \beta_1 X_i + u_i$$

where Y is economic growth and X is the size of government budget relative to GDP. Suppose that we expect a negative effect of X on Y ceteris paribus. Suppose that there is some unmeasured variable W, a measure of corruption that affects X and also Y (at any level of X).

(i) Is the OLS estimator for β_1 consistent? **(8 marks)**

(ii) Someone proposes using electoral cycles for instrumenting for the government budget. In election years, governments tend to increase spending in order to increase their chances to get re-elected. Formally, the IV would be a dummy, 1 if the given country is in election year, 0 otherwise. Do you think this is a good instrument? **(5 marks)**

Question 2

(a) To analyse the consequences of mis-specification consider the following linear model. $Y = X_1\beta_1 + X_2\beta_2 + e$

(i) Suppose the model was over-specified i.e. $E(Y|X)$ is a linear function of X_1 alone. How does the superfluous regressor affect the efficiency of the model? **(8 marks)**

(ii) Suppose instead the investigator regressed y against X_1 but the true model involves both X_1 and X_2 what are the consequences of this? **(7 marks)**

(b) Consider two non-nested regression models explaining the same variable Y_i. How can you select one against the other? **(5 marks)**

Question 3

(a) Consider the following general regression model $Y = X\beta + u$; $u \sim (0, \Omega)$, where Ω is a positive definite matrix. What is the consequence of this on the OLS estimator for β? Explain why generalised least squares estimator is a better estimator compared to OLS estimator in this case. **(8 marks)**

(b) Consider the Classical Linear Regression Model, $Y = X\beta + u$, in which X is fixed $n \times k$ matrix such that $(X'X)^{-1}$ exists, and the $n \times 1$ column vector of disturbances, u, is $N(0, \sigma^2 I_n)$ independent of X. Explain why the Maximum Likelihood Estimator, attains the Cramer-Rao lower bound **(7 marks)**

(c) Explain what recursive estimation is and how it can be used to assess the stability of an equation. **(5 marks)**

Question 4

(a) Explain how you can use Engle-Granger two stage procedure to test for cointegration. **(2 marks)**

(b) Consider the following *VAR* model: $Y_t = \Phi Y_{t-1} + \varepsilon_t$; where $\varepsilon_t \sim NIID(0, \Sigma)$ and matrices Φ and Σ represent the dynamic parameters and contemporaneous varaince-covariance matrix of the shocks, respectively.

(i) Obtain the effect of an unanticipated shocks to Y_{t+j} **(3 marks)**

(ii) Suppose Σ is not diagonal how does this affect the impulse response function? **(5 marks)**

(iii) What can be done to obtain orthogonalised innovations? **(5 Marks)**

(c) Show that an $GARCH(1,1)$ model implies that the squared error, ε_t^2, follows an $ARMA(1,1)$ model. Explain how the presence of $ARCH$ in a linear regression can be tested. **(5 Marks)**

Question 5

(a) Consider the following consumption model estimated based on the sample period 1966-2007:

$$\Delta LogC_t = 0.135 + 0.402\Delta LogY_t + 0.12\Delta LogW_t - 0.37LogC_{t-1} + 0.28LogY_{t-1} + 0.08LogW_{t-1}$$

where C is private consumption, Y is disposable income and W is wealth.

(i) What is the short-run elasticity of private consumption in period t with respect to disposable income in period t and with respect to disposable income in period $t-1$? **(5 marks)**

(ii) What is the relationship between consumption and income in the long run? **(5 marks)**

(b) Consider the following 3-dimensional VAR model:

$$\begin{bmatrix} y_t \\ x_t \\ w_t \end{bmatrix} = A_1 \begin{bmatrix} y_{t-1} \\ x_{t-1} \\ w_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} y_{t-2} \\ x_{t-2} \\ w_{t-2} \end{bmatrix} + \ldots\ldots\ldots\ldots + A_K \begin{bmatrix} y_{t-K} \\ x_{t-K} \\ w_{t-K} \end{bmatrix} + \begin{bmatrix} \varepsilon_{it} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix}$$

(i) Obtain the error-correction representation. **(4 marks)**

Let the matrix of long-run coefficients obtained in (b) above be denoted as Π:

(ii) Suppose the rank of Π is zero i.e. $r(\Pi) = 0$ what are the implications in estimating the VAR system if all the variables are $I(1)$. **(2 marks)**

(iii) Suppose $r(\Pi) = 3$ what are the implications in estimating the VAR system. **(2 marks)**

(iv) Suppose $r(\Pi) = 2$ what are the implications in estimating the VAR system if all the variables are $I(1)$. **(2 marks)**

Question 6

Explain the following terms **(5 marks each):**

(a) Gauss-Newton numerical search method

(b) Engle-Yoo three stage procedure

(c) Johansen cointegration test procedure

(d) GMM estimator

THE END