AFRICAN ECONOMIC RESEARCH CONSORTIUM

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

JOINT FACILITY FOR ELECTIVES
JUNE – OCTOBER 2005

ECONOMETRICS

Second Semester: Final Examination

Time: 09.00 AM – 12.00 Noon **Wednesday September 28, 2005**

INSTRUCTION: ***FOUR*** Questions, ***AT LEAST TWO*** from each Section.

SECTION A:

Question 1

a) What is the subject matter of microeconometrics? (2 points)

b) Explain the distinctive aspects of microeconometrics (5 points)

c) Explain the main types of microeconomic data. (5 points)

d) Distinguish between simple random sampling and stratified sampling. (3 points)

Question 2

a) Suppose you want to estimate a model in which a binary variable, a decision to participate in the labor force (Y), is determined by a continuous variable, the wage rate (X); and you decide to adopt the following representation:

$$P_i = E(Y = 1 \mid X_i) = \frac{1}{1 + e^{-(\alpha+\beta X_i)}}$$

where X is wage rate, Y=1 means individual i partipates in the labor force, Y=0 means an individual does not participate in the labor market.

(i) What is the assumption about the error tem? (1 point)

(ii) Show that unlike the linear probability model, this representation will not produce "nonsensical" predictions, i.e. predictions outside the $(0 \leq P_i \leq 1)$ range. (3 points)

(iii) Show that the interpretation of β is not straight forward, β does not measure the effect of change in the wage rate on the *probability* that individual i participates in the labor market, but it measures the effect of change in the wage rate on the *log of the odds ratio*. (3 points)

(iv) How would you measure the goodness of fit of the model? (3 points)

(b) suppose you are interested in estimating a model to examine factors that determine the probability of a household being poor (y=0 if household's income is equal or above the poverty line, and 1 otherwise), using the logit procedure, and the following are the regressors:

h_educ	Level of education of household head
h_age	Age of household head
sqage	Square of age of household head
mon	Degree of monetization of household's economic activities
marktdist	Distance to the nearest market place
flandy1	Farming land owned this year (in acres)
flandy2	Farming land owned last year (in acres)

You obtain the following results

Log likelihood = -10234.557

p0bn	Coef.	Std. Err.	z
h_educ	-0.258	0.0116	-22.14
h_age	0.086	0.0067	12.9
sqage	-0.001	0.0001	-11.26
mon	-1.211	0.0682	-17.75
marktdist	0.006	0.0047	1.21
flandy1	0.001	0.0023	0.53
flandy2	-0.003	0.0026	-1.08
constant	-1.729	0.1713	-10.09

You then decide to drop two variables, flandy1 and fland2, and you estimate the restricted model and obtain the following results:

	Coef.	Std. Err.	z
h_educ	-0.256	0.01158	-22.13
h_age	0.085	0.00664	12.78
sqage	-0.001	0.00007	-11.14
mon	-1.207	0.06757	-17.86
marktdist	0.005	0.00468	1.16
constant	-1.706	0.17019	-10.02

Likelihood ratio statistic = 5.50, p-value = 0.3574

(i) Comment on the Likelihood ratio statistic. (2 points).

(ii) Compute the log likelihood of the restricted model. (3 points)

Question 3

Suppose you have a two-period panel data, and you have the following unobserved effects model:

$$y_{it} = \beta_0 + \lambda_0 d2_t + \beta_1 x_{it} + \alpha_i + \varepsilon_{it}, \ t = 1,2.$$

where i denotes a cross section unit (it can be a firm, or a household),

t denotes time period. $d2_t$ is a dummy variable. It is equal to zero when $t = 1$, and equals to one when $t = 2$. The dummy does not change across i. α_i captures all unobserved, time invariant factors that influence y_{it}. ε_{it} is the idiosyncratic error, representing factors that change over time, and affect y_{it}.

(a) Under which assumption(s) would the fixed effects and random effects models be appropriate? (2 points)

(b) Derive the first–differenced equation. (State the major assumption(s) that would justify the use of first—differenced equation). (5 points)

(c) In what sense is the estimation of first—differenced equation justifiable, rather than estimating a standard cross sectional relationship? (2 points)

(d) What is the fixed effects estimator? (2 points)

(e) Suppose the unobserved effects, α_i, are not correlated with the regressor, x_{it}, would the pooled ols estimator be appropriate in estimating the model? Why? (4 points)

SECTION B

Question 4

For a dynamic panel data model

$$y_{it} = \gamma y_{i,t-1} + x_{it}^{'}\beta + \alpha_i + u_{it},\ \ i = 1,.....,N,\ \ t = 1,.....,T.$$
$$|\gamma| < 1$$

(a) Why the OLS, fixed effects, and random effects estimators are are inappropriate for estimating the model? (6 points)

(b) Explain the alternative consistent estimators. (6 points)

(c) Distinguish between the Levin and Lin unit root tests and Im, Pesaran and Shin unit root tests. (3 points)

Question 5

The density of the Poisson regression model for a single observation is given by

$$f(y_i \mid X_i, \beta) = \frac{e^{-\exp(\mathbf{X}_i^{'}\beta)}\exp(\mathbf{x}_i^{'}\beta)}{y_i!}$$

(a) Derive a log likelihood function, which the Poisson ML estimator maximizes. (6 points)

(b) What are the major deficiencies of the Poisson model? (2 points)

(c) Explain the negative binomial model as an alternative to the Poisson model. (7 points)

Question 6

Suppose you are interested in estimating the following Tobit model, in which the dependent variable, y_1 is censored from below:

$$y_1^* = \alpha_1 y_2 + x_1' \beta_1 + u_1, \; u_1 \sim N[0, \sigma^2] \quad \ldots\ldots\ldots\ldots (1)$$

$$y_1 = \begin{cases} y_1^* & \text{if } y_1^* > 0, \\ - & \text{if } y_1^* \leq 0, \end{cases}$$

You are also know that y_2, which is continuous and uncensored, is an endogenous variable determined by the following relationship

$$y_2 = \alpha_1 y_1^* + x_2' \beta_2 + u_2$$

(a) Is the Tobit ML estimator appropriate for estimating equation (1)? If not, why? (3 points)

(b) Explain how you would use a two-step estimation procedure to estimate equation (1). (8 points)

(c) How would you know that the estimate of α in the second Tobit regression is consistent? (4 points)