ECONG107: Econometrics 2016:

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TUTORIAL SHEET 1

1. For the binary response model $y^* = x_i'\beta + u_i$, $y_i = 1[y_i^* > 0]$, $i = 1, 2, ...N$.

a. Write down and explain the assumptions underlying the linear probability representation of this model. Examine the advantages and disadvantages of this specification.

b. Writing the model as $y^* = x_i'\beta + u_i$, $y_i = 1[y_i^* > 0]$, derive the average log likelihood for a random sample of $N$ observations on $y$ and $x$. You can assume $u \sim \mathbb{N}(0, 1)$. Explain why consistency of the resulting MLE of $\beta$ depends on the correct specification for the distribution of unobservables $u$. Explain how this differs from the case where $y^*$ is fully observed.

c. Derive a test for the exogeneity of an explanatory variable where you can assume $u \sim \mathbb{N}(0, 1)$. State clearly any further assumptions you make.

d. Suggest two semiparametric estimators for the coefficients $\beta$ under exogeneity and contrast their identification strategy and properties.

2. Consider the censored regression model:

$$y_i^* = x_i'\beta + u_i, \text{ where } y_i = y_i^*.1\{y_i^* > 0\}.$$

(a) Assuming $u_i \sim N(0, \sigma^2)$, derive the log likelihood for a random sample of size $N$ observations on $y$ and $x$.

(b) Show that the solution to the first-order conditions for ML estimation can be interpreted as an EM algorithm.

(c) Derive an estimator which relaxes the exogeneity of an explanatory variable in $x$. State clearly any further assumptions you make.

(d) Outline a semiparametric estimator for $\beta$ that relaxes the normal distribution assumption on $u$ but retains a symmetry assumption.