

MECT2 2014: RICHARD BLUNDELL
TUTORIAL SHEET 1

1. For the binary response model $y^* = x_i'\beta + u_i$, $y_i = 1[y_i^* > 0]$, $i = 1, 2, \dots, N$.
 - 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 $u \sim N(0, 1)$. Explain why consistency of the resulting MLE of β 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 $u \sim N(0, 1)$. State clearly any further assumptions you make.
 - d. Suggest two semiparametric estimators for the coefficients β under exogeneity and contrast their identification strategy and properties.

2. Consider the censored regression model:

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

- (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 β that relaxes the normal distribution assumption on u but retains a symmetry assumption.