MECT2 2009: RICHARD BLUNDELL
TUTORIAL SHEET 2

1. Consider the normal linear selection model $y_i = x_i'\beta + u_i$ where $u_i \sim N(0, \sigma^2)$ and in which we only observe y_i when $D_i = 1$. Assume that D_i is equal to unity when $z_i'\gamma + v_i > 0$, $v_i \sim N(0, \sigma^2)$.

(a) Write down and interpret the expression for the selection bias. You may assume that the unobservable variables are jointly normally distributed. How does this expression change if you know that selection occurs when $y_i > 0$.

(b) How would you construct a test for selection bias?

(c) Explain how identification of this model is achieved when the joint distribution of the errors is unknown. Outline a semiparametric method for estimating the unknown coefficient vector β in this case.

2. Consider the treatment model:

$$y_i = \beta + \alpha_i d_i + u_i$$

where α_i and u_i represent unobserved individual heterogeneity and d_i is a binary treatment indicator.

(a) Suppose d_i was assigned according to a randomised control trial. Show that the ordinary least squares estimator for this model would provide a consistent estimator of the ATE.

(b) Suppose treatment is assigned according to $d_i = 1\{Z_i'\gamma > v_i)$. What properties would Z_i need to staistfy for it to be considered as an instrumental variable? Under what conditions would an Instrumental Variables (IV) estimator provide a consistent estimator of the ATE in this model?

(c) For the case of a binary instrumental variable examine the difference between the Local Average Treatment Effect (LATE) parameter and the ATE. You may assume that there are no other covariates in the regression model.

(d) Contrast the identifying assumption for Discontinuity Design with those for LATE.