Econometrics 710
Final Exam
May 10, 2006

1. Consider the model

$$\begin{aligned} y_{1i} &= x_{1i}'\beta_1 + y_{2i}'\beta_2 + e_i \\ E(e_i \mid x_i) &= 0 \\ E\left(e_i^2 \mid x_i\right) &= \sigma^2 \end{aligned}$$

where $x_i = (x_{1i}, x_{2i})$, and y_{2i} is binary (either 0 or 1) with

$$P(y_{2i} \mid x_i) = p(x_i)$$

where $p(x)$ is a known function. What are the optimal instrumental variables to estimate β_1 and β_2?

2. Consider the model

$$\begin{aligned} y_i &= z_i'\beta + e_i \\ E(x_i e_i) &= 0 \\ z_i &= \Gamma x_i + u_i \\ E(x_i u_i') &= 0 \end{aligned}$$

Let $\hat{\Gamma}$ be some consistent estimate of Γ (not necessarily the OLS estimator) and let.$\hat{\beta}$ be the OLS coefficient from a regression of y_i on $\hat{z}_i = \hat{\Gamma} x_i$. Is $\hat{\beta}$ consistent for β? Demonstrate your claim.

3. Take the model

$$\begin{aligned} y_{1i} &= x_{1i}\beta_1 + x_{2i}\beta_2 + x_{3i}\beta_3 + x_{4i}\beta_4 + e_i \\ E(x_i e_i) &= 0 \end{aligned}$$

Describe how you would test

$$\begin{aligned} H_0 &: \frac{\beta_1}{\beta_2} = \frac{\beta_3}{\beta_4} \\ H_1 &: \frac{\beta_1}{\beta_2} \neq \frac{\beta_3}{\beta_4} \end{aligned}$$

4. The model is

$$\begin{aligned} y_{1i} &= x_{1i}'\beta_1 + x_{2i}\beta_2 + e_i \\ E(x_i e_i) &= 0 \end{aligned}$$

where $x_{2i} \in R$. You want to test

$$H_0 : \beta_2 = 0$$

$$H_1 : \beta_2 \neq 0$$

Describe how to test H_0 using the nonparametric bootstrap.

5. Take the model

$$y_i = z_i\beta + e_i$$

where $z_i \in R$ is considered endogenous. You consider using state of residence for instrumentation to estimate β.

   (a) What are the assumptions required to justify this choice of instruments?

   (b) Describe the estimator of β.

   (c) Is the model over-identified?

6. You are interested in estimating the equation

$$y_i = x_i'\beta + e_i.$$

where x_i is exogenous, but you are uncertain about the properties of the error. You estimate the equation by both least absolute deviation (LAD) and OLS. A colleague suggests that you should prefer the OLS estimates, because it produces a lower R^2 and $\bar{R}^2$ than the LAD estimates. Is your colleague correct?