Problem Set 1
Econometrics 718
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Due: Wed. Feb. 21

Problem 1. Take any data set you would like and with any software you would like think about the exactly identified IV problem. I would like you to produce the IV estimate in three different ways and show they are numerically equivalent (I don't care whether the instrument is really uncorrelated with the residual):

a) IV, that is $(Z'X)^{-1}Z'Y$ (you can use ivregress with the gmm option in stata)

b) Two staged least squares. That is first run the treatment variable on the instrument and the X's, form the predicted value, then run a regression of the outcome on the predicted value and the other X's.

c) Ratio of reduced form coefficients. Run the two reduced forms and take the ratio of the coefficients on the Z.

Problem 2. Verify the measurement error result. That is I want you to use your statistical package to construct

- T_i to have whatever distribution you want (a uniform might be easy)
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$$Y_i = \beta_0 + \beta_1 T_i + u_i$$

where u_i is $N(0, \sigma_u^2)$. You can choose these parameters to be anything you want.

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$$\tau_{1i} = T_i + \xi_i$$

where ξ_i is $N(0, \sigma_\xi^2)$

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$$\tau_{2i} = T_i + \eta_i$$

where η_i is $N(0, \sigma_\eta^2)$

Show that

a) If you run a regression of Y_i on T_i you get something close to β_1

b) If you run a regression of Y_i on τ_{1i} you get something close to

$$\beta_1 \frac{Var(T_i)}{Var(T_i) + \sigma_\xi^2}$$

c) Doing IV using τ_{2i} as an instrument for τ_{1i} gives an estimate close to β_1