

17.874, Spring 2004
Problem Set 10

1. Describe a problem in your area of study that involves a simultaneous relationship (such as strategic behavior or a market).

- a. What are the structural equations or behavioral relationships of interest?
- b. Find at least two research papers that attempt to estimate those relationships. What do they find, and how do they design the study?
- c. Think of at least one instrumental variable that you think might help solve this problem. Justify the exclusion restriction (verbally).

2. Simulation of 2SLS.

In STATA, generate a system of 2 simultaneous equations that have the following form:

$$y_1 = .5y_2 - 2X_1 + \epsilon_1$$

$$y_2 = 1y_2 + 3X_2 + \epsilon_2$$

Simulate 500 observations for this structure with normal errors. Then implement various estimators.

- a. Describe how you simulated the system and data.
- b. Regress y_1 on y_2 , and x_1 . Report your results.
- c. Regress y_2 on X_2 and X_1 , and generate the predicted values. Implement 2SLS by generating predicted values of y_2 and regressing y_1 on \hat{y}_2 and x_1 . Also, use the IV procedure in STATA: `reg y1 y2 x1 (x1 x2)`.
- d. Calculate the bias in OLS estimator using the coefficients in the structural form model and the variances of the variables you have generated. How does this compare to the difference between IV and OLS estimators?
- e. Comment on the analyses you have done. How does IV work? How does it correct for bias? How much loss of efficiency is there?