

90-907, PhD Econometrics II
Heinz School, Carnegie Mellon University
Fall, 2006

Homework #2, due October 7, 2005

1. In each of the following examples, please discuss:
 - the possibility of endogeneity bias
 - how the bias is likely to affect the results (intuitively if not formally)
 - how you might correct the problem: merely saying “find and instrument” is not an answer.
 - (a) Consider a cost function regression: a firm’s total costs are regressed on the firm’s output and its input prices.
 - (b) Consider a “practice-makes-perfect” regression: a physician’s performance on a difficult procedure (say his mortality rate) is regressed on the number of such procedures he did last year.
 - (c) Consider a regression of wages on schooling.
 - (d) Consider a regression of health status on whether or not a person has insurance.

2. Please use the coalgas dataset on the website to build a four equation model for the demand and supply of coal and natural gas. You may assume all of the following for purposes of building your system:
 - (a) Coal is used to generate electricity, which is used both for air conditioning and heating. Gas is used for heating and also for generating electricity. (This tells you something about what belongs in the demand equations).
 - (b) cdd shifts demand for electricity via air conditioning. hdd (heating degree days) shifts demand for heating.
 - (c) Coal is not used in supplying gas, and gas is not used in supplying coal.
 - (d) Gas, like coal, is costly to ship.
 - (e) Both the coal and gas markets are adequately described by a supply-and-demand model.

Please estimate the system in both structural and reduced form equations. Be sure to discuss identification issues. Be sure to discuss the influence of using IV (& the sensitivity to instrument choice) or 2SLS. Finally, it is almost always a good idea to write the D and S equations with *price* rather than quantity on the LHS. (Think about why)

Suppose a tax of 0.5 is imposed on coal. How does this affect the price and quantity of coal and gas? Who pays the tax, producers or consumers?

3. Consider the equation:

$$Y_i = \beta_0 + \beta_1 X_i + \epsilon_i \quad (1)$$

Suppose that all of the assumptions of the CLRM hold for this equation. Suppose further that there is an instrument Z for X (obviously satisfying the requirements of an instrument). Now consider this equation:

$$X_i = \alpha_0 + \alpha_1 Y_i + \nu_i \quad (2)$$

- (a) If we estimate equation 1 by OLS, what will our estimate of β_1 go to in probability?
- (b) If we estimate equation 2 by OLS, what will our estimate of α_1 go to in probability?
- (c) If we estimate equation 1 by IV using Z as an instrument for X , what will our estimate of β_1 go to in probability?
- (d) If we estimate equation 2 by IV using Z as an instrument for Y , what will our estimate of α_1 go to in probability?
- (e) Discuss.