Problem Set 3

EE426 Econometrics 2

Due April 2, 2015

Please report the regression results in each problem and print STATA .do file attached at the end of your answer.

1. [SUR] Use the data in traffic2.dta for this exercise. We are looking at the determinants on number of accidents (using log(number of accidents) to interpret the results as percentage change). There are three categories of routes: highways (ushigh), cntyrds (county roads), and strtes (state roads). We decide to use seemingly uncorrelated regressions (SUR) to estimate these determinants as the following equations:

$log(ushigh)_i = \alpha_0 + \alpha_1 unem_i + \alpha_2 spdlaw_i + \alpha_3 beltlaw_i + u_{1i}$ (1)

$log(cntyrds)_i = \alpha_0 + \alpha_1 unem_i + \alpha_2 spdlaw_i + \alpha_3 beltlaw_i + u_{1i}$ (2)

$log(strtes)_i = \alpha_0 + \alpha_1 unem_i + \alpha_2 spdlaw_i + \alpha_3 beltlaw_i + u_{1i}$ (3)

Note: Here we treat all observations as pooled cross-section.

spdlaw is equal to 1 when speed limit of 65 miles per hour was effective.

beltlaw is equal to 1 when seatbelt law was effectivie.

(1.1) Run the above system of equations using SUR (sureg in STATA) and check correlations of residuals across equations. Intepret your results on each equation.

Hint: use option 'corr' or calculate correlations on the residuals directly (see my code on STATA lab class document, under Lab class #1 folder, or SUR.do)

(1.2) Test the null hypothesis that the effect of speed law on highway roads is the same as the effect of speed law on county roads and state roads.

Hint: see 'help sureg post estimation' on STATA

(1.3) Run the above equations separately by OLS. Then, compare your results with (1.1)

2. Consider the following three-equation structural model

$y_1 = \gamma_{12} y_2 + \delta_{11} z_1 + \delta_{13} z_3 + u_1$ (4)

$y_1 = \gamma_{22} y_2 + \gamma_{23} y_3 + \delta_{21} z_1 + \delta_{22} z_2 + u_2$ (5)

$y_3 = \delta_{31} z_1 + \delta_{32} z_2 + \delta_{33} z_3 + \delta_{34} z_4 + u_3$ (6)

where $z_1 \equiv 1$ (to allow an intercept), $E(u_g) = 0$ for all g, and each z_j is uncorrelated with each u_g. You might think of the first two equations as demand and supply equations, where the supply equation depends on a possibly endogenous variable y_3 (such as wage costs which are determined by exogenous variables) that might be correlated with u_2.

(2.1) Please show whether each equation can be identified using order and rank conditions. Determine any conditions for the rank condition to hold. If it is identified, please specify what type of identification (just identified or overidentified)

(2.2) Explain how we can estimate the (just or over-) identified equation(s) from (2.1). Show the reduced form in estimating each equation. What variables can be used for instrumenting in each equation?

3. Use the data in OPENNESS.dta for this exercise.

Romer (1993) proposes theoretical models that more open countries should have lower inflation rates. He has a two-equation system:

$inf = \beta_{10} + \alpha_1 open + \beta_{11} log(pcinc) + u_1$ (7)

$open = \beta_{20} + \alpha_2 inf + \beta_{21} log(pcinc) + \beta_{22} log(land) + u_2$ (8)

His hypothesis is that $\alpha_1 < 0$. The second equation reflects the fact that the degree of openess might depend on the average inflation rate, and other factors. The idea is that, ceteris paribus, a smaller country is likely to be more open, $\beta_{22} < 0$.

(3.1) Check whether which equation is identified. Then, write and estimate the reduced form equation, and test whether log(*land*) can be used as an IV for the model. If so, estimate equation (7) using log(*land*) as an IV for *open*.

(3.2) Because log(pcinc) is insignificant in (3.1)'s estimation, drop it from the analysis. Estimation equation (7) by OLS and IV without log(pcinc). Do any important conclusions change?

(3.3) Return to equation (7). Add the dummy variable *oil* to the equation and treat it as exogenous. Estimate the equation by IV. Does being an oil producer have a ceteris paribus effect on inflation?

4. Consider the following demand-supply model:

Demand function: $Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 I_t + u_{1t}$ (8)

Supply function: $Q_t = \beta_0 + \beta_1 P_t + \beta_2 P_{t-1} + u_{2t}$ (9)

I is income and P_{t-1} is price lagged one period (pre-determined variable).

(4.1) Solve the reduced-form equations for P_t and Q_t

(4.2) Consider structural coefficients and reduced-form coefficients. How can we deduce the structural equations from the reduced-form coefficients? Please show your solution clearly. Which equation (or both) can be identified?