POLS W4912 Spring 2008

Problem Set #6

Show all work. For those questions that require you to write `R` code, hand in the programs that you wrote and the output you obtained. This assignment is due on 5/6.

1. Consider the following system of equations:

$$
\begin{aligned}
y_i &= \alpha_0 + \alpha_1 X_i + \varepsilon_i \\
r_i &= \beta_0 + \beta_1 y_i + \beta_2 Q_i + \eta_i \\
s_i &= \delta_0 + \delta_1 y_i + \delta_2 r_i + \delta_3 W_i + \nu_i
\end{aligned}
$$

   All of the right-hand side variables denoted by capital letters are exogenous. The right-hand side variables denoted by lowercase letters are endogenous in that they are related to other variables in the system.

   (a) Prove that estimation of these equations via OLS will result in unbiased and consistent estimates of the coefficients. (10 points)

   (b) How does this change if the second equation is the following?

$$r_i = \beta_0 + \beta_1 y_i + \beta_2 s_i + \beta_3 Z_i + \eta_i$$

   (15 points)

2. Consider the following model:

$$
\begin{aligned}
y_{1i} &= \alpha_0 + \alpha_1 y_{2i} + \alpha_2 x_{1i} + \alpha_3 x_{2i} + \varepsilon_{1i} \\
y_{2i} &= \beta_0 + \beta_2 y_{1i} + \beta_3 x_{2i} + \varepsilon_{2i}
\end{aligned}
$$

   (a) Write down the reduced-form equations and check the order condition for the equations. (10 points)

   (b) The file `semdta.txt` (available from the course web site) contains data for estimating these equations. The fields in this file are (1) y_1, (2) y_2, (3) x_1, and (4) x_2. Write R code to estimate β_2 by indirect least squares, if this is appropriate. You need only compute the point estimate. (25 points)

   (c) Write R code to estimate the second equation by two stage least squares (compute the point estimates and standard errors). How does this compare with the results in part (b)? Is this what you expected? Why or why not? (30 points)

3. Figure 1 displays plots of two time series. After observing these plots, a colleague of yours states that neither of these series is stationary. Do you agree or disagree? Explain your reasoning. (10 points)

Figure 1: Time Series Plots