ECON-GA 1102 – Spring 2022
Applied Statistics and Econometrics II
Homework 1

Please submit solutions via Brightspace by Wednesday Feb. 23rd 11:59pm.

Problem 1:

The Grunfeld Investment model is as follows:

$$I_{it} = b_{1i} + b_{2i}F_{it} + b_{3i}C_{it} + e_{it}$$

where

I_{it} = gross investment for firm i at time t
F_{it} = market value of firm i at t
C_{it} = capital stock of firm i at t.

a) Estimate the model by OLS, equation-by-equation, and compare the results obtained with SUR(GLS) estimation. Why are they different?

b) Calculate the covariance and correlation matrix of the OLS residuals. Conduct the cross-sectional dependence/contemporaneous correlation using Breusch-Pagan LM test of Independence.

c) Estimate the pooled model and test the coefficients for homogeneity across equations.

d) Now, compare the SUR(GLS) results with those from iterated SUR(GLS). Would iterating the SUR(GLS) have made any differences?

The data for this problem is available on Brightspace or you can retrieve it directly from the Greene website http://pages.stern.nyu.edu/~wgreene/Text/econometricanalysis.htm (Table F10.4 under Data Sets).

F10.4 (csv format)	Table F10.4: Grunfeld Investment Data, 200 Yearly Observations On 10 Firms For 1935-1954 Sources: Moody's Industrial Manual, Survey of Current Business • I = Gross investment, from Moody's Industrial Manual and annual reports of corporations; • F = Value of the firm from Bank and Quotation Record and Moody's Industrial Manual; • C = Stock of plant and equipment, from Survey of Current Business.

Problem 2:

Consider the two-equation system

$$y_{1s} = \alpha_1 y_2 + \beta_1 z_1 + u_1$$
$$y_{1d} = \alpha_2 y_2 + \beta_2 z_2 + u_2$$

as a typical supply/demand structural form, with the variable "quantity" appearing on the left-hand side and $y_{1s} = y_{1d} = y_1$ as implied by the market clearing condition.

a) If $\alpha_1 = 0$ or $\alpha_2 = 0$, explain why a reduced form exists for y_1. (Hint: a reduced form expresses y_1 as a linear function of the exogenous variables and the structural errors.)
b) If $\alpha_1 \neq 0$ and $\alpha_2 = 0$, find the reduced form for y_2.
c) If $\alpha_1 \neq 0, \alpha_2 \neq 0$, and $\alpha_1 \neq \alpha_2$, find the reduced form for y_1. Does y_2 have a reduced form in this case?
d) Is the condition $\alpha_1 \neq \alpha_2$ likely to be met in supply and demand examples? Explain.