ECONOMETRICS II, FALL 2021

Homework 10. Due Friday November 19.

1. Simulate and estimate the model

$$y_{it} = \mu_i + \rho y_{it-1} + e_{it} \ ,$$

where y_{it} is drawn from the stationary distribution and e_{it} are standard normals, independent across i and t, and $\rho = 0.9$. Set $N = 100$ and $T = 2, 5, 10$, and 50.

a) Do, say, 50 simulations for each value of T and report the average value of ρ and its empirical standard deviation.

b) Using the same simulated data, instead estimate

$$\Delta y_{it} = \alpha + \rho \Delta y_{it-1} + u_{it} \ ,$$

by OLS. Is the bias better?

c) Estimate the differenced model with IV, using Δy_{it-2} and y_{it-2} as instruments. Is this better? (If you have energy, you can try with more or fewer instruments, but they have to be lagged at least two periods.)

2. Simulate and estimate the model

$$y_t = \mu + \rho y_{t-1} + e_t \ ,$$

where y_0 is fixed and e_t are standard normals, independent t. Set $T = 50, 100$ and 500.

Do, say, 50 simulations for each value of T and for values of $\rho = 0.9, 0.95$, and 1.0 and report the average values of ρ and their empirical t-statistic.

3. Use the posted program to replicate the study by Hansen and Singleton. Try and estimate the model using 3–5 different sets of instruments. Try a set of instruments which you may think is good (argue why) and one which you may think is not so good. Try different lag-lengths. Try using a lot of instruments and try to use just a few. Comment on your results. Are the results stable to the choice of instruments?