Homework 9. Due Wednesday November 13.

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. 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?