

Homework 9. Due Wednesday November 15.

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. Verify that the formula for Ω at the bottom of page 16 and for Ω^{-1} on top of page 17 in the note about panel data.

3. Verify the formula for $\hat{\alpha}_i$ on top of page 8 in the note about panel data.