Macroeconometrics Spring 2024

Homework 1. Due Wednesday January 24.

Remember: in this course, I want one or more of you to show the results you got in class, rather than me grading.

1. Simulate and estimate the model

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

where y_0 is fixed and e_t are standard independent normals. Set the number of observations $T = 50, 100$ and 500.

Do, say, 200 simulations (more is better, but no reason for large number if it takes time) for each value of T and for values of $\rho = 0.9, 0.95$, and 1.0 and report the average values of $\hat{\rho}$ and their empirical t-statistics.

2. Simulate two random walks

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

and

$$x_t = x_{t-1} + u_t \ ,$$

where u and e are independent standard normals. Run the regression

$$y_t = \mu + \gamma x_t + w_t \, .$$

Do a number of simulations for $T = 50, 100$ and 500 and report the average values of $\hat{\gamma}$ and the associated t-statistics. (Spurious regression.)

3. Simulate the random walk (if you want, you can do this at the same time as question 2) and use the same y_ts.)

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

and

$$x_t = 0.5 y_t + u_t \ ,$$

where u and e are independent standard normals. Run the regression

$$y_t = \mu + \gamma x_t + w_t \, .$$

Do a number of simulations for $T = 50, 100$ and 500 and report the average values of $\hat{\gamma}$ and the associated t-statistic. (Cointegrated regression.)